Query Management Facility
Version 13 Release 1

Developing QMF applications

SC28-2793-00

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" at the end of this information.

2023-08-16 edition

This edition applies to Version 13 Release 1 IBM® Db2 Query Management Facility (QMF) Classic Edition and Enterprise Edition, which are features of IBM Db2 13 for z/OS (5698-DB2). It also applies to Version 13 Release 1 of IBM Db2 QMF for z/OS (5698-QMF), which is a stand-alone IBM Db2 for z/OS tool. This information applies to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

About this information

IBM Db2® Query Management Facility for TSO and CICS® is a tightly integrated, powerful, and reliable tool that offers query and reporting functions that help you access and present data from any of the following relational databases:

- Db2 for z/OS®
- Db2 for Linux®, UNIX, and Windows
- DB2® for iSeries
- DB2 Server for VSE and VM

This information is written for application programmers responsible for developing applications that make use of QMF functions. These topics help you to:

- Make application programming design decisions
- Choose between different programming techniques
- Understand how to use the QMF command and callable interfaces
- Write bilingual applications

Specific programming examples are provided for Assembler, C, FORTRAN, COBOL, PL/I, and REXX.

What you should know before you begin

You should be familiar with the components that make up your specific environment, as well as some concepts and terms, before you begin application programming for QMF.

Products

To develop applications for QMF, you may need to be familiar with some or all of the following products, depending on your environment and your business needs:

- The z/OS operating system.
- Db2, the database manager for QMF.
- Time Sharing Option(TSO), which is an environment that supports Db2 QMF and its related products.
- Interactive System Productivity Facility (ISPF), a dialog manager for Db2 QMF.
- Customer Information Control System(CICS), a general-purpose data communication and online transaction processing system. CICS provides the interface between Db2 QMF and z/OS.
- The base Graphical Data Display Manager (GDDM) product, which is required to display panels and create charts. You can also use GDDM to provide printing services from QMF.
- Assembler, C, COBOL, FORTRAN, PL/I or REXX, which you might use to create callable interface applications for QMF.

Concepts

QMF applications let you work with QMF objects and perform QMF functions from within an application program written in one of the languages QMF supports. This information assumes you already know how to write queries and procedures, format reports, and modify the database.

Related information

IBM Publications Center: Search for publications that explain the products.

Service updates and support information

To find service updates and support information, including software fix packs, PTFs, Frequently Asked Questions (FAQs), technical notes, troubleshooting information, and downloads, refer to the following Web page:

IBM Software Support website

Highlighting conventions

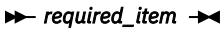
This information uses the following highlighting conventions:

- **Boldface** type indicates commands or user interface controls such as names of fields, folders, icons, or menu choices.
- `Monospace` type indicates examples of text that you enter exactly as shown.
- *Italic* indicates the titles of other publications or emphasis on significant terms. It is also used to indicate variables that you should replace with a value.

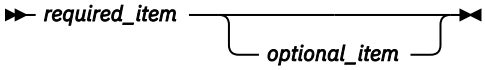
How to read syntax diagrams

The following rules apply to the syntax diagrams that are used in this information:

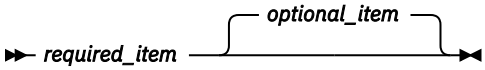
- Read the syntax diagrams from left to right, from top to bottom, following the path of the line. The following conventions are used:
  - The >>--- symbol indicates the beginning of a syntax diagram.
  - The ---> symbol indicates that the syntax diagram is continued on the next line.
  - The >--- symbol indicates that a syntax diagram is continued from the previous line.
  - The --->< symbol indicates the end of a syntax diagram.
- Required items appear on the horizontal line (the main path).



- Optional items appear below the main path.

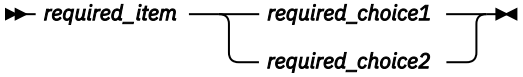


If an optional item appears above the main path, that item has no effect on the execution of the syntax element and is used only for readability.

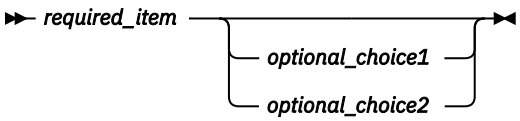


- If you can choose from two or more items, they appear vertically, in a stack.

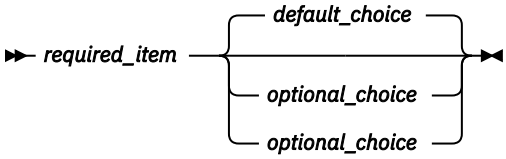
  If you *must* choose one of the items, one item of the stack appears on the main path.



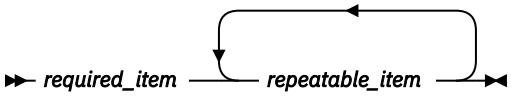
If choosing one of the items is optional, the entire stack appears below the main path.



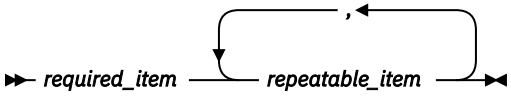
If one of the items is the default, it appears above the main path, and the remaining choices are shown below.



- An arrow returning to the left, above the main line, indicates an item that can be repeated.



If the repeat arrow contains a comma, you must separate repeated items with a comma.



A repeat arrow above a stack indicates that you can repeat the items in the stack.

- Keywords, and their minimum abbreviations if applicable, appear in upper case. They must be spelled exactly as shown. Variables appear in all lowercase italic letters (for example, *column-name*). They represent user-supplied names or values.
- Separate keywords and parameters by at least one space if no intervening punctuation is shown in the diagram.
- Enter punctuation marks, parentheses, arithmetic operators, and other symbols exactly as shown in the diagram.
- Footnotes are shown by a number in parentheses; for example, (1).

How to send your comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this book or any other documentation, use either of the following options:

- Use the online reader comment form, which is located at:

  http://www.ibm.com/software/data/rcf
- Send your comments by e-mail to comments@us.ibm.com. Be sure to include the name of the book, the part number of the book, the version of your product, and, if applicable, the specific location of the text you are commenting on (for example, a page number or table number).

Chapter 1. QMF application development overview

Application development refers to the process of creating a procedure or application in QMF.

You can use many of the functions of QMF in your own applications. For example, you can write applications that:

- Run queries or procedures
- Export or import QMF objects and tables
- Display or print reports or charts
- Enable the user to enter or change data in the database
- Enable the user to make global changes to several objects at once

You can also write applications that provide helpful functions to your users in QMF. For example, write a command that prints QMF reports at a remote location, or a function key that generates a chart of weekly sales results.

What is application development in QMF?

The word *application* can have many meanings. In QMF, an application is a procedure or program that issues QMF commands and uses QMF services to accomplish a specific business task.

Application development includes:

- Understanding the problem that your procedure or application needs to solve
- Designing the procedure or application
- Writing the code, associated messages, and help panels

How can users use your application?

There are two major types of QMF applications: applications in which the users interact with the application, and applications in which the application can be started from within QMF.

Interacting primarily with the application

If your application is intended for users who are unfamiliar with QMF, you probably want them to interact primarily with your application.

You might not want your users to know that QMF is active. In this case, your application uses QMF services, but runs outside of QMF. Your program issues QMF commands only as needed.

Suppose that you write an application that uses QMF services. This application provides the user with a menu-driven interface. In the following example, your application controls QMF. Your user interacts only with your user interface and is not aware that QMF is active.

If the user selects option 1, the application executes a QMF procedure that runs a query and prints the resulting report.

```
                        J & H Supply Company
                         Information System


Please select one of the following:

   1.  Print the monthly sales report

   2.  Create a new report

   3.  Modify information in the database

   4.  End the application

====> 1
```

Figure 1. An example of an application-defined panel

Related concepts

Starting the application from a QMF session

If your users are familiar with QMF, you might want your users to see your application as an extension or customization of QMF. In this case, you need to set up your application to run within QMF.

Starting the application from a QMF session

If your users are familiar with QMF, you might want your users to see your application as an extension or customization of QMF. In this case, you need to set up your application to run within QMF.

Suppose that you write an application called SEND_TO that sends a QMF report from one user to another.

You expect your users to run your application from within the QMF environment. The users can use the command line to issue a QMF command synonym called SEND_TO (which you create). Alternatively, you can assign the application to a function key that automatically runs your application.

After generating a report, the user can send the report to Smith by entering the customized QMF command SEND_TO SMITH on the QMF command line.

```
 REPORT                                          LINE 1     POS 1     79


   NAME         DEPT  JOB        SALARY        COMM
   ---------  ------  -----  ----------  ----------
   DANIELS        10  MGR      19260.25           -
   JONES          10  MGR      21234.00           -
   LU             10  MGR      20010.00           -
   MOLINARE       10  MGR      22959.20           -
   HANES          15  MGR      20659.80           -
   KERMISCH       15  CLERK    12258.50      110.10
   NGAN           15  CLERK    12508.20      206.60
   ROTHMAN        15  SALES    16502.83     1152.00
   JAMES          20  CLERK    13504.60      128.20
   PERNAL         20  SALES    18171.25      612.45
   SANDERS        20  MGR      18357.50           -
   SNEIDER        20  CLERK    14252.75      126.50
   ABRAHAMS       38  CLERK    12009.75      236.50
   MARENGHI       38  MGR      17506.75           -
 1=Help         2=            3=End       4=Print       5=Chart        6=Query
 7=Backward     8=Forward     9=Form     10=Left       11=Right       12=
 OK, here is your report.
 COMMAND ===> SEND_TO SMITH
```

Figure 2. An example of a user entering a customized QMF command

Related concepts

Interacting primarily with the application

If your application is intended for users who are unfamiliar with QMF, you probably want them to interact primarily with your application.

What QMF application development tools are available?

You can write applications that use QMF procedures and application programming interfaces to QMF.

You can create command synonyms to invoke your procedures and applications. A command synonym is a command that runs a QMF, TSO, or CICS command. You create a command synonym by entering the command and its definition into a command synonyms table. During initialization, QMF loads the command synonyms table that is specified in the QMF profile of the user who started QMF.

QMF procedures

QMF procedures are QMF objects that run within QMF and issue QMF commands. QMF procedures can be run interactively or non-interactively. You can run a procedure non-interactively by starting QMF in batch mode. If you are using QMF for TSO, you can also start QMF as a Db2 for z/OS stored procedure.

QMF procedures can execute any QMF commands available at your site. QMF provides two types of procedures: linear procedures and procedures with logic.

- *Linear procedures* contain only QMF commands and comments. You can use linear procedures in all environments supported in QMF.
- *Procedures with logic* combine QMF commands with REXX logic that helps you to create more powerful programs. You can use procedures with logic in all environments supported in QMF except CICS. Procedures with logic can contain QMF commands and any statement that is valid in a REXX program, including system commands.

QMF provides a system initialization procedure and other methods that enable you to run commands and set global variables before the user sees the QMF home panel.

Related concepts

Application programming interfaces to QMF
There are two application programming interfaces to QMF: Callable interface and command interface.

Procedures as applications
You can write applications entirely as procedures. If you are using QMF in the CICS environment, you can write *linear procedures*, which are procedures that include only QMF commands or synonyms that issue QMF commands. If you are using QMF in the TSO environment, you can write *procedures with logic* in addition to linear procedures. Procedures with logic can include REXX statements and functions in addition to QMF commands and command synonyms.

Related reference

Global variables that control how commands and procedures are executed

Application programming interfaces to QMF

There are two application programming interfaces to QMF: Callable interface and command interface.

Callable interface

You can use the QMF callable interface to create an application that is invoked outside of QMF. That application then starts a QMF session and sends commands to QMF for execution.

The callable interface is a programming interface that provides access to QMF services. The callable interface is available for the programming languages and environments shown in the following table.

Table 1. Callable interface support

	CICS	TSO	Native z/OS batch
Assembler	×	×	×

Table 1. Callable interface support (continued)			
	CICS	**TSO**	**Native z/OS batch**
C	×	×	×
COBOL	×	×	×
Fortran		×	×
PL/I	×	×	×
REXX		×	×

QMF supports all versions of these programming languages that are supported by Db2 for z/OS.

Command interface (TSO only)

You can create applications that submit commands to QMF from an ISPF dialog by using the QMF command interface. QMF communicates with the ISPF dialog through the ISPF variable pool through this command interface. QMF must be started before the ISPF application is started.

The command interface is available only where ISPF is available; it is not available in CICS. You can write a command interface application in any programming language that is supported by ISPF.

Related concepts

QMF procedures
QMF procedures are QMF objects that run within QMF and issue QMF commands. QMF procedures can be run interactively or non-interactively. You can run a procedure non-interactively by starting QMF in batch mode. If you are using QMF for TSO, you can also start QMF as a Db2 for z/OS stored procedure.

The callable interface and QMF applications
Programming languages can use the QMF callable interface to run QMF commands.

Issuing QMF commands from an ISPF dialog
You can issue QMF commands from an ISPF dialog that is running under QMF by using the QMF command interface.

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Use NLFs to allow users to enter QMF commands, view help, and complete QMF tasks in languages other than English. NLFs are installed as separate features of Db2 QMF.

All tasks described in this information can be completed for the base QMF product (English language) and for any NLF. The procedures for both the base and NLF sessions are the same; however, any special considerations for NLF users are identified.

Some names of programs or data sets shown in this information have the variable *n* in them, indicating that this character of the name can vary. Replace the variable *n* with the one-character national language identifier (NLID) in the following table that matches the language feature that you are using. The table also shows the names by which QMF recognizes each language.

Table 2. QMF NLFs and their identifying information		
National Language Feature	**Identifier (NLID)**	**Name that QMF uses for this NLF**
English	E	ENGLISH
Uppercase English	U	UPPERCASE

Table 2. QMF NLFs and their identifying information (continued)

National Language Feature	Identifier (NLID)	Name that QMF uses for this NLF
Canadian French	C	FRANCAIS CANADIEN
Danish	Q	DANSK
French	F	FRANCAIS
German	D	DEUTSCH
Italian	I	ITALIANO
Japanese Kanji	K	NIHONGO
Korean Hangeul	H	HANGEUL
Brazil Portuguese	P	PORTUGUES
Spanish	S	ESPANOL
Swedish	V	SVENSKA
Swiss French	Y	FRANCAIS (SUISSE)
Swiss German	Z	DEUTSCH (SCHWEIZ)

The Uppercase English feature uses the English language, but converts all text to uppercase characters. The uppercase characters allow users who work with Katakana display devices to use the product and get English online help and messages.

Chapter 2. Procedures as applications

You can write applications entirely as procedures. If you are using QMF in the CICS environment, you can write *linear procedures*, which are procedures that include only QMF commands or synonyms that issue QMF commands. If you are using QMF in the TSO environment, you can write *procedures with logic* in addition to linear procedures. Procedures with logic can include REXX statements and functions in addition to QMF commands and command synonyms.

If you are writing an application that operates on a procedure in QMF temporary storage, you cannot write your application as a procedure. When you run a procedure, it becomes the current procedure in QMF temporary storage.

Related concepts

ISPF services in a procedure with logic
You must transfer from the QMF program dialog to an ISPF command dialog to run ISPF commands from a QMF procedure with logic that is running under ISPF.

Initial procedures

An initial procedure is a procedure that runs immediately after your QMF session starts. Use the DSQSRUN parameter to specify the name of this procedure and understand how initial procedures behave in specific situations.

You can use the DSQSRUN parameter:

- With the DSQQMF*n* command when QMF is started interactively (where *n* is a one-character national language identifier that matches the language feature that you are using).
- With the QMF START command when QMF is started through the callable interface.

In TSO, ISPF, and nativez/OS batch, applications can also set program parameters by using a REXX program. The program is specified by the DSQSCMD parameter of the QMF START command. Because QMF for CICS does not support REXX, you must specify all program parameters on the START command by using DSQSMODE=I. This value for DSQSMODE specifies interactive operation, in CICS. The default mode from the callable interface is B (for batch operation).

Considerations for writing initial procedures

Consider the following points when you write and use an initial procedure:

- By default, QMF reruns the initial procedure whenever the user issues the END command in an interactive session of QMF started by DSQQMF*n*. (The variable *n* is a one-character national language identifier that matches the language feature that you are using). The DSQEC_RERUN_IPROC global variable specifies whether the initial procedure is rerun. The default value of this variable is 1 to rerun the procedure; a setting of 0 prevents the initial procedure from being rerun.

  In callable interface programs, the initial procedure is never rerun, so this global variable does not affect your callable interface programs.
- When you write initial procedures to use in an interactive QMF session, avoid using the home panel as the current panel at the end of the procedure. QMF does not interactively display a panel at the end of the procedure in this case. If no severe errors occurred and DSQEC_RERUN_IPROC is set to 1, QMF reruns the initial procedure without interacting with the user. This results in an uninterruptible loop that can appear as though QMF is not starting.

  To avoid creating an uninterruptible loop, consider one of these options:

  – Make sure that the current panel at the end of the procedure is not the home panel.
  – Make sure that the procedure contains either a QMF EXIT or an INTERACT command.
  – Set DSQEC_RERUN_IPROC to zero (0).

- The number of ampersands (&) you must use before the name of the substitution variables in initial procedures can vary depending on your environment. For example, you can specify DSQSRUN as:

```
DSQSRUN=INITPROC (&VAR1 = value)
```

  The number of ampersands that you need to specify with VAR1 depends on whether QMF is running under CICS, TSO, or native z/OS batch. The number varies if ISPF is present and if the program that starts QMF is written in REXX.

Initial procedures and remote unit of work

The initial procedure must be stored at the system on which you start QMF (the local system).

When you use the QMF CONNECT command in initial procedures, you must disconnect from the remote location. In other words, code the application to reconnect to your original location before you can code an END command to invoke your initial procedure again. If you are still connected to the remote location, you receive an error. Disconnecting is also required with QMF CONNECT issued from the command line during an interactive session that is set up by an initial procedure.

Related reference

Conventions for National Language Feature information
Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

START command keywords
You can specify keywords on the START command.

QMF CONNECT within a procedure

To connect to another user ID or to a remote Db2 database to use remote-unit-of-work support, issue the QMF CONNECT command. You can use this command within a linear procedure or a procedure with logic.

When you write procedures that use the QMF CONNECT command to access remote databases, be aware of the following circumstances:

- If you are connected to a remote database and issue a RUN PROC command, that procedure and all the objects used in that procedure must be stored at the remote database.
- All QMF commands in the procedure are run in QMF temporary storage at the system where QMF is running (the local system). However, all objects used by these QMF commands (such as queries, procedures, or forms) must be defined in the database at the current location (the remote system).
- Commands that affect the database (SQL statements, QMF queries, or EDIT TABLE updates) run at the current location.
- If the procedure contains system-specific commands (CICS or TSO), these commands run at the system where QMF is running (the local system). If your procedures contain system-specific commands that do not run on the system where QMF is running, your procedure cannot run successfully.
- Any data sets or data queues used in a system-specific command must exist on the system where QMF is running (the local system).
- If your site uses TSO and takes advantage of RACF® support for mixed-case passwords, ensure that the CASE option of your QMF profile is set to MIXED. Otherwise, QMF converts all input to uppercase, causing the CONNECT command to fail. When CASE=MIXED, ensure that you tell QMF application users to enter all input in uppercase, because QMF recognizes commands only in uppercase.
- If the procedure is passed as a parameter on a CALL statement that starts QMF for TSO by using the stored procedure interface, the procedure cannot access remote databases. Any commands in the procedure that attempt to access a remote database must be removed or commented out before the procedure is run with this interface.

Substitution variables in procedures

You can use QMF substitution variables in linear procedures and procedures with logic.

A substitution variable is any variable that you can use in a QMF command. A substitution variable is always preceded by an ampersand (&). You can assign a value to a substitution variable in these ways:

- Setting global variables with the SET GLOBAL command
- Specifying values on the RUN command
- Specifying values on the RUN command prompt panel.

Related reference

SET GLOBAL (extended syntax)
To create your own global variables and use them in QMF commands as substitution variables, issue the SET GLOBAL command. You can also use the SET GLOBAL command to set values for QMF predefined global variables, which start with "DSQ."

Specifying values on the RUN command

You can assign a value to a substitution variable by using the RUN command.

If the procedure is a linear procedure, assign the variable value on the RUN PROC command as follows:

```
RUN PROC SCHEDULE (&&TYPE='VACATION'
```

If the procedure is a procedure with logic, assign the variable value on the RUN PROC command as follows:

```
"RUN PROC SCHEDULE (&&TYPE='VACATION'"
```

The value of &TYPE is available only to the procedure called SCHEDULE.

In this example:

- The variable value VACATION is surrounded by single quotation marks because the value is a character string.
- TYPE is preceded by double ampersands (&&) to indicate that the value is being set on the RUN statement to be passed to the procedure named SCHEDULE. If the RUN statement specifies &TYPE, the procedure that contains this statement prompts the user for the value.

This value for the substitution variable is active only within the procedure that defines it. The value is not active in any procedure or module called from the defining procedure.

Related concepts

Specifying values on the RUN command prompt panel
When you run a query or procedure with a substitution variable, you can assign a value on the RUN command or through a global variable. However, if the variable in the query or procedure does not have a value, QMF presents a RUN command prompt panel. You can then specify the value for the variable on this panel.

Specifying values on the RUN command prompt panel

When you run a query or procedure with a substitution variable, you can assign a value on the RUN command or through a global variable. However, if the variable in the query or procedure does not have a value, QMF presents a RUN command prompt panel. You can then specify the value for the variable on this panel.

This value for the substitution variable is active only within the procedure that defines it. The value is not active in any procedure or module called from the defining procedure.

Prompting for variables in linear procedures

In a linear procedure, QMF scans the procedure for substitution variables and resolves them before it processes any commands. The user is prompted for all variables before the procedure runs.

Prompting for variables in procedures with logic

In a procedure with logic, the user is not prompted for variables until REXX encounters the statement that contains the variables. To prompt the user one time, you can run a separate procedure that prompts for variables.

For example, you want to be prompted once for the substitution variables LASTNAME and DEPT_NUM. These variables occur on two different lines in your procedure with logic:

```
/* This procedure runs two queries, displaying the report after each */
/* query has run.                        */

"RUN QUERY REG_QUERY (&&LASTNAME=&LASTNAME";
"INTERACT"
"RUN QUERY REG2_QUERY (&&DEPT_NUM=&DEPT_NUM";
```

Figure 3. Prompting for variable values in a procedure with logic

Add this line to the beginning of your procedure with logic, immediately following the comment lines:

```
"RUN PROC PROMPT_ME (&LASTNAME, &DEPT_NUM";
```

Important: All procedures with logic must begin with at least one comment line.

In this command, PROMPT_ME is a procedure with logic like the following, which contains a comment line and no instructions:

```
/* This procedure is a dummy procedure that provides prompting */
```

The complete procedure includes the RUN PROC command for the PROMPT_ME procedure that prompts for variables:

```
/* This procedure runs two queries, displaying the report after each */
/* query has run                         */

"RUN PROC PROMPT_ME (&LASTNAME, &DEPT_NUM";
"RUN QUERY REG_QUERY (&&LASTNAME=&LASTNAME";
"INTERACT"
"RUN QUERY REG2_QUERY (&&DEPT_NUM=&DEPT_NUM";
```

Figure 4. Procedure with logic that prompts for variables

Alternatively, you can use the SET GLOBAL command to prompt for all the values in your procedure at the same time, as in the following example:

```
"SET GLOBAL (LASTNAME=&LASTNAME,DEPTNUM=&DEPT_NUM";
```

Related concepts

Specifying values on the RUN command
You can assign a value to a substitution variable by using the RUN command.

REXX variables in procedures with logic

You can use REXX variables in a procedure with logic. The values for these variables are known only within the procedure in which you defined them.

You can use REXX variables in a procedure with logic in these ways:

- Copy a REXX variable to a QMF variable with the SET GLOBAL command

- Copy a global variable to a REXX variable with the GET GLOBAL command
- Use REXX variables in your REXX statements

Passing arguments to a procedure with logic

For procedures with logic, QMF provides an ARG option on the RUN PROC command. Use this option to pass arguments, or values, to a procedure with logic.

Use the ARG option when you are running a procedure that contains a REXX PARSE ARG or ARG statement, as in the example shown here:

```
PROC              WILDE.SHOW_ARGS                    MODIFIED    LINE 1

/*********************************************************************/
/* This procedure shows you how to use the 'ARG=' option on the RUN  */
/* PROC command.                                                     */
/*********************************************************************/
parse upper arg query_name form_name
"RUN QUERY" query_name "(FORM="form_name
```

Figure 5. Passing variable values using the ARG option of the RUN PROC command

The RUN command for this procedure is as follows:

```
RUN PROC SHOW_ARGS (ARG=(query_name form_name)
```

In this command, *query_name* and *form_name* are REXX variable names that describe the parameters that are passed to the procedure with logic. Use these variables, which contain the object names for a query and a form, to reference the parameters that were passed to the procedure with logic.

REXX error-handling statements in procedures with logic

You can use REXX error handling techniques, such as the REXX SIGNAL instruction, in a procedure with logic. You can also use QMF commands and variables with the REXX EXIT instruction to help clarify nonzero return codes.

Branching to error-handling subroutines

The REXX SIGNAL ON ERROR instruction tells REXX to leave the current line and branch to a label marked `error` when a nonzero return code is encountered.

This statement requires two parts:

- SIGNAL ON ERROR instruction

  After every command, REXX puts the return code of the command in a variable called *rc*.

  If a command has a nonzero return code, REXX branches to the `error` label.

  SIGNAL ON ERROR returns errors from the QMF REXX procedure (ADDRESS QRW) command environment, but not the REXX callable interface.

- Error label

  The SIGNAL ON ERROR instruction requires that you provide a label that the procedure can branch to if it encounters a nonzero return code. The label precedes your error handling code. The return code is in the variable *rc*. You can use this variable to branch to another subroutine, or you can use it in your EXIT instruction, as in the following example:

  ```
  /*  error handling code for a procedure with logic */
  error:
    exit rc
  ```

Messages with the REXX EXIT statement

You can use the REXX EXIT instruction to exit a procedure with logic. QMF always issues a message when it finishes running a procedure with logic.

If you use the EXIT instruction, the message you see depends on these factors:

- If the last QMF command encountered an error
- If the return code was zero

This table shows which message you see, based on the conditions.

Table 3. Messages returned from QMF

Return code from the last QMF command	Procedure return code	Examples of messages at the completion of the procedure
0	0	`OK, your procedure was run`
0	Nonzero	`The return code from your procedure was 8`
Nonzero	0	The error message provided by QMF
Nonzero	Nonzero	The error message provided by QMF

A QMF error message takes precedence over the return code message if you have an incorrect QMF command and a nonzero return code.

If you want to show the error message from the last command and exit with a QMF return code, use the MESSAGE command and the EXIT DSQ_RETURN_CODE instruction. For example:

```
⋮
"MESSAGE (TEXT='"dsq_message_text"'"
exit dsq_return_code
```

The variables `dsq_message_text` and `dsq_return_code` are REXX variables provided by QMF. You can use the MESSAGE command and the `dsq_message_text` variable to store and display a message later, as shown in this example:

```
 /* Monthly report */
signal on error
"DISPLAY TABLE JUNE_INFO"
"PRINT REPORT"
exit(0);
error:    original_msg = dsq_message_text
/* Saves error message. */
"RUN PROC GENERAL_RECOVERY"
/* This proc generates  */
/* new dsq_message_text. */
"MESSAGE (TEXT='" original_msg "'"
/* Display original error msg. */
exit dsq_return_code;
```

Related reference

Interface communications variables for REXX
The interface communications variables consist of several REXX variables. They are set after the completion of every call and must not be altered by the calling program.

MESSAGE
When you create applications, you often want to send specific messages to your users about the information displayed for them or their next action. You can write your own messages and display them

on QMF panels through the MESSAGE command. In ISPF, you can also choose to have QMF display the message help for an ISPF error message.

Calling REXX programs from a procedure with logic

You use different methods to invoke your REXX program when you use substitution variables and when you do not.

Calling REXX programs without substitution variables

If your REXX program does not contain an embedded RUN command that includes substitution variables, invoke your program by using the ADDRESS or CALL instruction. You can also call the program as a function.

Use one of these commands to invoke your program:

- The ADDRESS instruction

  This instruction establishes a command environment. For example, if your program is named PANDA, and you want to call it from within the TSO environment, the command is:

  ```
  ADDRESS TSO "PANDA"
  ```

- The CALL instruction

  This instruction invokes a program. For example, for the program named PANDA, the command is:

  ```
  CALL PANDA
  ```

- A function

  You also can call the program PANDA as a function:

  ```
  answer = PANDA()
  ```

You might consider removing the substitution variables from the RUN command if you want to call your programs with one of the REXX invocation calls. In that case, QMF prompts the user for the variables.

Related concepts

ADDRESS QRW and the QMF command environment
When QMF is started in TSO, ISPF, or native z/OS, QMF creates a REXX command environment called QRW. When you are executing a REXX program, you can set the default command environment to QRW by issuing the REXX ADDRESS command ADDRESS QRW. With ADDRESS QRW, QMF remains the default command environment until you issue another ADDRESS command.

Calling REXX programs that contain substitution variables

If your REXX application contains a QMF RUN command with a substitution variable, you must invoke it using the TSO *program_name* command.

Whether you are running a procedure with logic or a callable interface program invoked by a procedure with logic, commands come into QMF the same way. In this context, the callable interface program becomes a logical extension of the procedure itself.

For example, consider the following command:

```
RUN QUERY WEEKLY_Q (&DEPT=58
```

In a procedure with logic, use two ampersands on the substitution variable to pass the variable to the query:

```
"RUN QUERY WEEKLY_Q (&&DEPT=58"
```

If a substitution variable has only one ampersand, QMF resolves the variable for the procedure itself and cannot pass the variable to the query.

If you call your REXX callable interface application from a procedure with logic and that application contains the command `RUN QUERY WEEKLY_Q (&DEPT=58,` QMF resolves the variable just as it would for the calling procedure. Because only one ampersand is used, the variable is not passed to the query.

To pass variables to QMF from a REXX callable interface application called by a procedure with logic, you have three choices:

- Use the TSO command to call the application.

  When you call the application, QMF does not process any substitution variables it encounters. In the preceding RUN QUERY command, &DEPT=58 is passed to the query, where the substitution variable is resolved.
- Treat all substitution variables in your application as though you were using them in a procedure with logic.

  Add an ampersand to every substitution variable so the procedure with logic does not resolve it.
- Use global variables.

  You can define global variables at the start of your application and use them throughout your QMF session. You can also set the DSQEC_USERGLV_SAV global variable to save global variable values from one session to another.

Related reference

Global variables that control how commands and procedures are executed

Chapter 3. The callable interface and QMF applications

Programming languages can use the QMF callable interface to run QMF commands.

Related reference

Programming language specifications for using the callable interface

The QMF application programming interface is available for several programming languages.

What is the callable interface?

The QMF callable interface provides standard interfaces for different programming languages, and provides common storage and access to program variables.

When an application program needs to run a QMF command, it must start communication between the program and QMF. This communication is made by issuing a call to a QMF interface routine. QMF supplies a routine for each supported language.

The application program can issue one or more QMF commands after the initial START call. The application program calls the routine to issue each QMF command.

After the QMF command finishes processing, QMF supplies a return code that indicates the status of QMF. The callable interface gathers other information about the processing of the command and stores this information in variables accessible to both QMF and the application program. These variables are contained in either a *variable pool* or in an *interface communications area*. When the callable interface returns control to the calling application program, the application can refer to these variables but not alter them.

When the application program no longer needs to use QMF, the program issues a call to terminate communication between the program and QMF. This call is made to the QMF routine.

Considerations for using the QMF callable interface

The flow of control between your application and QMF using the callable interface is subject to certain rules.

Keep in mind the following points as you write application programs to be used with the QMF callable interface:

- A call to QMF returns control to the calling application program only after QMF finishes processing the QMF command.
- QMF is in an inactive state when not processing a call.
- The application program and QMF communicate with return codes and variable data stored in the variable pool or in the interface communications area.
- All QMF commands must be coded in uppercase English letters.

  If you are using a QMF national language feature (NLF), your QMF commands must be written in the presiding NLF language. Your commands must also be written in uppercase or converted to uppercase by QMF. Commands are converted to uppercase by QMF if the CASE option in your QMF profile is set to UPPER. You set the presiding language when you start QMF, by providing a value for the DSQALANG parameter on the START command. This value is recorded in the DSQEC_NLFCMD_LANG global variable.
- The maximum length of the passed commands is 2,048 bytes for REXX programs and 32,768 bytes for all other languages.

This diagram shows how the application passes commands through the callable interface to QMF.

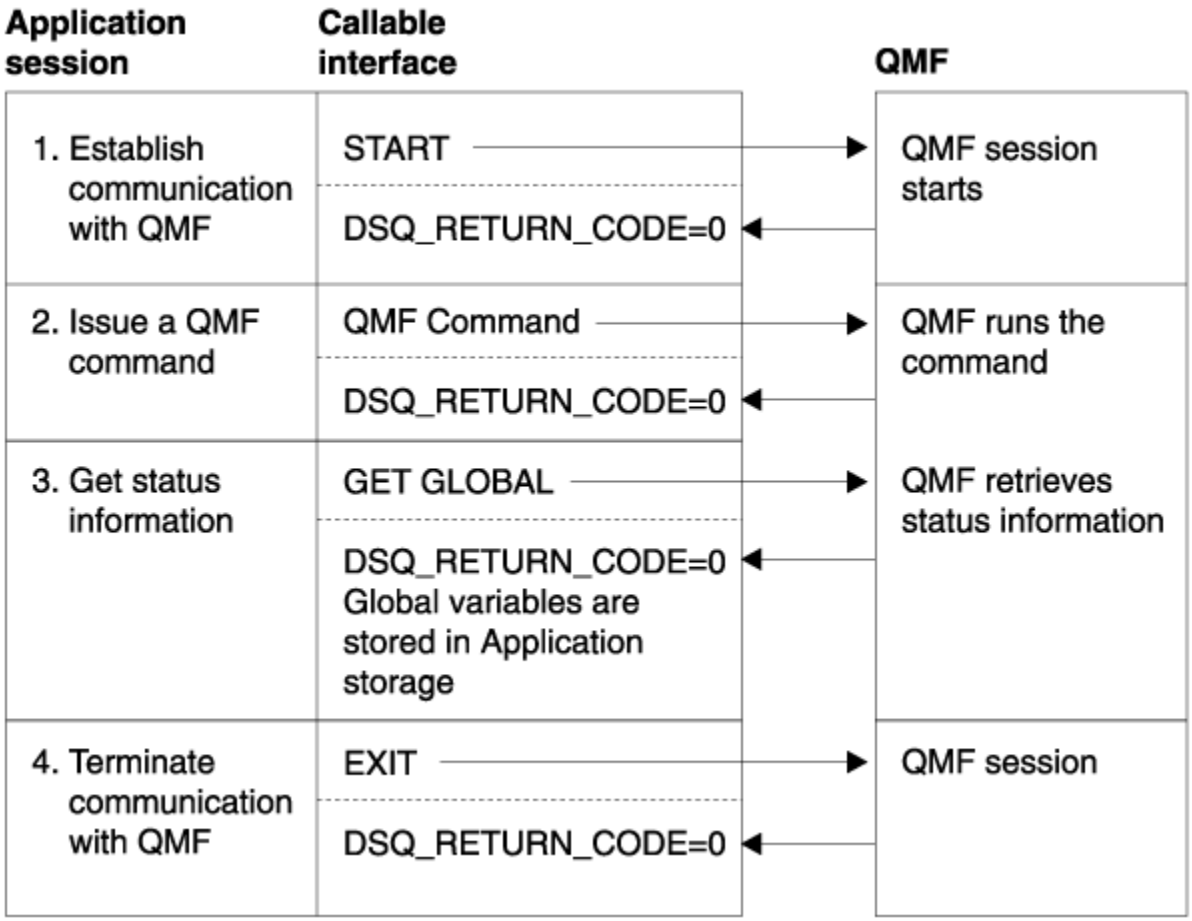


Figure 6. How an application uses the QMF callable interface to communicate with QMF

Related reference

START command keywords
You can specify keywords on the START command.

The interface communications area (DSQCOMM)

QMF provides an interface communications area for each supported programming language. This area contains definitions of return and reason codes and definitions of the function calls to QMF

The interface communications area defines storage for the interface communications variables. The variables stored in this area are accessible to both QMF and the callable interface application. However, allow only QMF to alter the values. Ensure that the application program treats these variables as read-only.

The REXX callable interface uses interface communications variables provided by QMF rather than using a communications area.

The QMF callable interface communications area is required for all callable interface calls. Storage for the callable interface communications area is allocated by the program that is using QMF.

The START command establishes a unique instance or occurrence of a QMF session. The START command can establish only one QMF session:

- In a TSO address space
- From a single CICS transaction

When running the START command, QMF updates the variables within the interface communications area.

These variables must never be altered by the application program, with the following exceptions:

DSQ_COMM_LEVEL
Set DSQ_COMM_LEVEL to the value of DSQ_CURRENT_COMM_LEVEL to identify the level of DSQCOMM. This exception does not apply to REXX.

DSQ_INSTANCE_ID
If you call a callable interface program from within QMF, you need to set the DSQ_INSTANCE_ID to zero (0) on the first call. With this setting, QMF resets the variable to the value set by the initial START command.

All calls that follow the START command must pass the address of the interface communications area that corresponds to the QMF instance. The application program is responsible for pointing to the correct interface communications area.

Each supported programming language has a unique interface communications area. Application programs must reference variables by variable name rather than value if they are to be portable, because the values can be different on other systems.

The variables within the interface communications area contain the information shown in this table:

Table 4. DSQCOMM fields that must not be altered

Information provided by the variable	**Description**
Return code	Indicates the status of QMF processing after QMF processes a command
Instance identifier	Identifies the instance of QMF that was started by the START command
Completion message ID	Contains the message ID of the message that QMF displays This field is set at the completion of every QMF command. It contains the message QMF displays at the end of a command.
Query message ID	Contains the message ID of the message that is displayed on the query panel upon completion of a RUN QUERY command This field is set when an error occurs while a query is running. It contains the message that QMF displays within the query object at the end of a command.
START command parameter in error	Contains the name of the parameter in error when the START command fails because of a parameter error
Cancel indicator	Indicates whether the user canceled processing while QMF was running the command
Completion message	Contains the completion message that QMF displays
Query message	Contains the query message text of the message that is displayed on the query panel upon completion of a RUN QUERY command For example, if you run a query object with an error, QMF displays a message that describes the error that prevented the query from running. The query message field then contains this error message text.

Related reference
Programming language specifications for using the callable interface

The QMF application programming interface is available for several programming languages.

Return codes

Return codes are returned after each call to the QMF callable interface. Return code values are described by the interface communications area provided with QMF.

The values of return codes can be different on other systems. If you want your applications to be portable across systems, the applications must reference the values of these codes by the variable names. The names of the return-code variables within the interface communications area are documented with the programming language specification.

This table shows the possible return codes for callable interface conditions.

Table 5. Callable interface return codes

Value	Explanation
0	Successful execution
4	QMF session marked for termination by an EXIT or END command
8	Execution failed, but the error did not mark the session for termination
16	Severe error: session marked for termination

Related reference

Programming language specifications for using the callable interface
The QMF application programming interface is available for several programming languages.

Commands for using the callable interface

You can use the callable interface to issue any QMF command that you would use in a procedure. However, some commands have special syntax for the callable interface: START, GET GLOBAL, SET GLOBAL, and TRACE.

The START and TRACE commands work only in the callable interface. To use the GET GLOBAL and SET GLOBAL commands in a callable interface application written in a language other than REXX, use the *extended syntax* for these commands.

For examples of the START and SET GLOBAL commands in a programming language, see the specification for that language.

Related concepts

QMF commands in applications
Certain commands are designed to be used in applications, and you can create your own command synonyms.

Related reference

GET GLOBAL (extended syntax)
You can use the GET GLOBAL command to access QMF global variables in your application. For languages other than REXX, QMF provides an extended syntax for the GET GLOBAL command.

SET GLOBAL (extended syntax)
To create your own global variables and use them in QMF commands as substitution variables, issue the SET GLOBAL command. You can also use the SET GLOBAL command to set values for QMF predefined global variables, which start with "DSQ."

Programming language specifications for using the callable interface

The QMF application programming interface is available for several programming languages.

Starting QMF from an application

Before you can run any other command from an application, you must start QMF. When using the callable interface, you start QMF by issuing the START command in your application. You can have only one QMF session at a time.

Your application can issue a START command to test whether QMF is started. If QMF is not started, it starts. If QMF is started, the return code is nonzero, and you receive the following message number and message:

```
DSQ50720 QMF already active; secondary session not permitted.
```

If your START command results in a non-severe error (a return code of 4 or 8), QMF starts, and a session is established. In this case, you must issue a QMF EXIT command to stop QMF. Inspect the contents of the interface communications area or the QMF trace data output for the cause of the error.

To pass parameters to QMF, specify the wanted command keywords on the START command.

Related reference

START
When you start QMF through the callable interface, you need to use the START command.

Running your callable interface application

When you run your callable interface application, you must set up your environment as though you were going to run QMF interactively.

For information about setting up your environment and compiling and running your callable interface application, see the coding sample in the appropriate language specification.

Related reference

Programming language specifications for using the callable interface
The QMF application programming interface is available for several programming languages.

The callable interface in QMF

If you need to modify a QMF object from a user program, you can use the callable interface from within QMF. For example, you can export or import objects through the callable interface during an interactive QMF session. You can use the callable interface from within QMF by using the TSO command to call the application. You can run any valid QMF command from the application.

Restriction: You cannot use the callable interface from within QMF while in the CICS environment.

You must set the DSQCOMM instance identifier (DSQ_INSTANCE_ID) to zero (0) before your first call to QMF. QMF determines the current instance and updates DSQ_INSTANCE_ID for use in subsequent QMF calls.

Error handling

At the completion of every QMF command, the DSQCOMM communications area contains message text in the dsq_message_text variable and a return code in the dsq_return_code variable.

The return code is assigned one of the following values:

dsq_success
Successful completion of the command

dsq_warning
Normal completion with warnings

dsq_failure
Command did not run correctly

dsq_severe
Severe error; QMF session terminated

The variables and fields in each DSQCOMM area are documented with the programming language specifications.

Related reference
Programming language specifications for using the callable interface
The QMF application programming interface is available for several programming languages.

Running callable interface programs under CICS

To run programs that use the QMF callable interface, install them on CICS with your normal method of installing CICS programs.

In addition to the normal CICS requirements, the following considerations apply to all QMF callable interface programs that run on CICS:

Environment
When your program calls the QMF product, your program takes on the same characteristics as the interactive QMF product; it becomes a large conversational program.

QMF is an assembler-language program that contains CICS commands. It can be link-edited with other assembler-language programs or with programs supported by the callable application programming interface. When you call QMF using a high-level language, the program must be link-edited first. In addition, the resource definition online (RDO) program definition must specify that high-level language. Each high-level program has specific CICS considerations and restrictions.

In CICS, if you want to override any of the default QMF program parameters, you must specify the override values as parameters on the START command. For example, the default mode of operation from the callable interface is batch mode. To run an interactive QMF session you must issue the START command with DSQSMODE=I.

CICS region considerations
The user program that contains the QMF interface communications module and the main QMF module must run in the same region or partition. QMF resources, as described during QMF installation, must also be allocated to the CICS region or partition that runs QMF.

Database
The CICS transaction that invokes your program must be described to Db2.

Related concepts
Application programming interfaces to QMF
There are two application programming interfaces to QMF: Callable interface and command interface.

Chapter 4. Issuing QMF commands from an ISPF dialog

You can issue QMF commands from an ISPF dialog that is running under QMF by using the QMF command interface.

Restriction: The QMF command interface requires ISPF to run, but ISPF does not run in the CICS environment. Therefore, you need to use the QMF callable interface for application development under CICS.

Using the QMF command interface, QMF communicates with the dialog through the ISPF variable pool, as shown in this diagram.

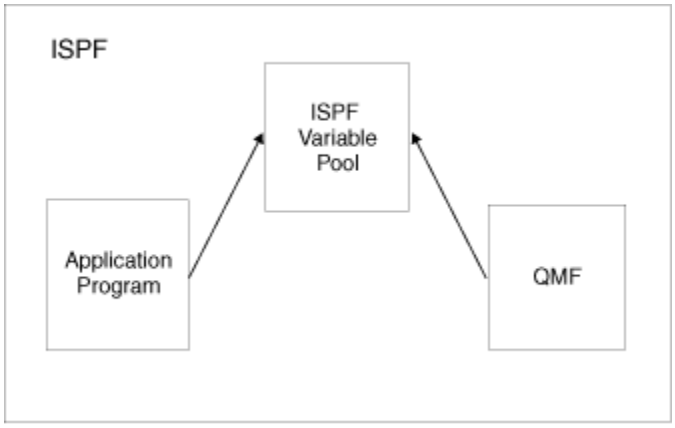


Figure 7. QMF command interface application interacting with QMF

To use the command interface effectively, you also need to understand ISPF services and variable pools.

Writing a program that uses the command interface: an example

In this example you write a program to display an ISPF panel that prompts the user to specify a query name, runs the specified query, and displays a report.

Procedure

1. Write your command interface REXX program:
   a) Display the ISPF panel with the DISPLAY services:
   In this example, the panel name is **QRYNAME**

   ```
   ADDRESS ISPEXEC "DISPLAY PANEL(QRYNAME)"
   ```

   b) Run a QMF query based on user input from the previous DISPLAY service.
   The ISPF variable *QNAME* contains the name of the QMF query

   ```
   ADDRESS ISPEXEC "SELECT PGM(DSQCCI) PARM(RUN QUERY" QNAME ")"
   ```

   c) Display the result of the query:

   ```
   ADDRESS ISPEXEC "SELECT PGM(DSQCCI) PARM(INTERACT)"
   ```

2. Call your program with the TSO command from the QMF command line.
   For example, if your program is named GETINFO, use this command:

   ```
   TSO GETINFO
   ```

Invoking the command interface

The command interface is a program named DSQCCI. You can invoke it from a program through the ISPF SELECT service.

To start the command interface, first start ISPF. Then start QMF using the ISPF SELECT service to call the QMF command interface (DSQCCI). You can pass QMF commands by using the PARM option of the ISPF SELECT PGM command.

After you start the command interface, you can pass QMF commands you want to run by using the PARM parameter of the ISPF SELECT PGM command:

```
SELECT PGM(DSQCCI) PARM(qmf_command)
```

All QMF commands specified as parameters to the command interface must be in uppercase, regardless of the QMF profile setting. ISPF does not convert the commands from lowercase to uppercase. If you specify your QMF commands in lowercase, QMF does not recognize them.

If you want to use QMF command prompts from your ISPF application, you can issue the INTERACT command. Follow the INTERACT command with the QMF command for which you need a prompt to open and end the statement with a question mark. For example, to display the RUN QUERY prompt panel, issue the following command:

```
SELECT PGM(DSQCCI) PARM(INTERACT RUN QUERY ?)
```

The SELECT service requires you to use double ampersands on a RUN QUERY command. Using double ampersands prevents ISPF from interpreting the variable as one of its own.

On the invocation, do not specify the NEWPOOL or NEWAPPL option. Omitting the NEWPOOL or NEWAPPL options ensures that the command interface can access the variables of your application. The command interface uses the shared pool to communicate between QMF and your application.

The END command

The END command terminates the DSQCCI program and returns control to the calling application when issued while the command interface is running. The QMF session remains active.

QMF sets the global variable DSQCSESC to mark the session for termination if it encounters an EXIT command or a severe error during a command interface invocation. When the program that called DSQCCI ends and returns control to QMF, the QMF session terminates.

Variables in the command interface

The STATE command provides the current value for each variable provided by QMF. The STATE command can be used only in the command interface. You can place the QMF variables in the ISPF variable pool through the VPUT command.

Related reference

QMF global variables

Command interface return codes

Return codes for the command interface can be positive or zero. A value of zero indicates successful execution. A positive value indicates that the execution failed or was abnormal in some way. Return codes are the same regardless of the language of your application.

Return codes are displayed in a variable in the user's exec or CLIST. If you run a REXX exec, the return code is in the REXX variable called RC; if you run a CLIST, the return code is in the CLIST variable &LASTCC.

The following example shows an exec that examines a return code. The example shows how to run a query and test for an error with the REXX variable RC:

```
ADDRESS ISPEXEC SELECT PGM(DSQCCI) PARM(RUN QUERYA (FORM=FORMA))
Select
  When (RC = 0)  Then nop
  When (RC = 64) Then
      Say "You must run QMF with ISPF to use command interface."
  When (RC = 100) Then
      Say "You need to start QMF before you begin your application"
  Otherwise
      Say "Unexpected error ("RC") from QMF command interface."
End
```

You can place code for handling errors in program modules and in execs or CLISTs.

Return codes 0 through 16

Return codes 0 through 16 describe the QMF processing of the command passed with the command interface. Along with the code, the command interface returns the values of the QMF command message variables in the ISPF shared pool of the application.

Table 6. Return codes 0 through 16

Value	Explanation
0	Successful execution
4	QMF session marked for termination by an EXIT or END command
8	Execution failed, but the error did not cause the session to be marked for termination
16	Severe error: session marked for termination

A return code of 4 occurs only on the command that caused the session to be marked for termination. If the application then attempts to run another command, QMF returns another return code value to the application.

Return codes of 20 or higher

These codes usually reflect some failure in the command interface (DSQCCI). The failure prevents the interface from copying a variable into the application shared pool. As a result, the QMF variables might be invalid or they might not be set. The same result might be true of the STATE variables if your program uses the STATE command. (A variable is set if it is copied into the application shared pool.)

These return codes usually indicate more serious errors than return codes in the 0 through 16 range. Some return codes might require the services of IBM Software Support.

In this table, *shared variables* refers to the QMF variables (and the STATE variables, if the current command is the STATE command). Some codes indicate that the command was run but the shared variables were not set. QMF ran the STATE command properly, but the command interface failed to set the updated shared QMF and STATE variables. The reason for the failure is described in the explanation of the error code.

Table 7. Return codes of 20 or more

Value	Explanation
20	A user exit routine called the command interface; these calls are always invalid. The command passed to the command interface was not run. The shared variables were not set.
24	An error occurred in an ISPF VCOPY command. The command passed to the command interface was run. The shared variables were not set.

Table 7. Return codes of 20 or more (continued)	
Value	**Explanation**
32	An error occurred in an ISPF VREPLACE command. The command passed to the command interface was run. The shared variables were not set.
36	An error occurred in an ISPF VPUT command. The command passed to the command interface was run. The shared variables were not set.
40	An error occurred in an ISPF VREPLACE command. This code applies only to the execution of the STATE command. The command passed to the command interface was run, but the shared variables were not set.
44	An error occurred in an ISPF VPUT command. This code applies only to the execution of the STATE command. The QMF variables were set, but the STATE variables were not.
60	An invalid call was made to the command interface. The command passed to the command interface was not run. The shared variables were not set.
64	This error is issued when DSQCCI is run and ISPF is not active. For example, the user called DSQCCI without using an ISPF SELECT PGM command.
100	This error occurs when an application tries to issue a QMF command when QMF is not active. Start QMF before you begin your application. The command passed to the command interface was not run. The shared variables were not set.
104	The anchor was not located. The command passed to the command interface was not run. The shared variables were set but are not valid.

Chapter 5. ADDRESS QRW and the QMF command environment

When QMF is started in TSO, ISPF, or native z/OS, QMF creates a REXX command environment called QRW. When you are executing a REXX program, you can set the default command environment to QRW by issuing the REXX ADDRESS command ADDRESS QRW. With ADDRESS QRW, QMF remains the default command environment until you issue another ADDRESS command.

Restriction: ADDRESS QRW is not supported in the CICS environment.

You can also direct a single command to be executed by the QRW environment by issuing the REXX ADDRESS command followed by the QMF command:

```
ADDRESS QRW qmf_command
```

In this situation, QMF is the command environment only for the command that follows the ADDRESS QRW statement.

When you are using a QMF procedure with logic, QRW is the default command environment.

The following example shows how to use the QMF command environment:

```
⋮
call dsqcix "START (DSQSMODE=INTERACTIVE"
if dsq_return_code=dsq_severe | dsq_return_code=dsq_failure
  then exit dsq_return_code

ADDRESS QRW
"RUN PROC MONDAY_P"
if dsq_return_code=dsq_severe | dsq_return_code=dsq_failure
  then exit dsq_return_code

"EXIT"
if dsq_return_code=dsq_severe | dsq_return_code=dsq_failure
  then exit dsq_return_code
⋮
```

Chapter 6. Writing QMF applications that use ISPF services

You can bypass the QMF panels by writing applications that have their own user interfaces. You can use either the callable interface or the command interface to write applications that use ISPF.

Restriction: ISPF does not run in the CICS environment, so ISPF services are not available under CICS.

Related concepts

The callable interface and QMF applications
Programming languages can use the QMF callable interface to run QMF commands.

Issuing QMF commands from an ISPF dialog
You can issue QMF commands from an ISPF dialog that is running under QMF by using the QMF command interface.

Starting and running QMF from an ISPF application

When you start and run QMF using the callable interface from an ISPF application, you must follow certain rules.

When you write a callable interface application that uses ISPF, you need to ensure that you follow these requirements:

- The callable interface application must match the language of your ISPF dialog.

  For example, if your ISPF dialog is a PL/I program, you must use the QMF callable interface for PL/I to write your application.

- You must use the correct national language identifier.

  You must start your ISPF application with an ID of DSQ*n*, where *n* is a National Language Feature (NLF) identifier. This application ID prevents QMF from overriding your ISPF environment, such as the function key settings and labels. The ID also ensures that the ISPF environment remains intact even after QMF is started. For example, this statement begins a PL/I program MYPROG that starts QMF using the callable interface START command:

  ```
  SELECT PGM(MYPROG) NEWAPPL(DSQn)
  ```

- Use the GET GLOBAL or SET GLOBAL commands in your application instead of the STATE command to set and retrieve variable values.

  The STATE command works only for variables that contain state information. The GET GLOBAL and SET GLOBAL commands work for all the QMF global variables. However, you cannot set global variables that are read-only.

Related reference

Conventions for National Language Feature information
Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

START command keywords
You can specify keywords on the START command.

Global variables for state information not related to the profile

Global variables for profile-related state information

Running queries that contain variables

Applications that use ISPF services can run queries that contain variables.

You can run these queries from an application that uses ISPF services in one of three ways:

- Use ISPF file-tailoring services.

  With this technique, you represent the query by an ISPF file-tailoring skeleton. In that skeleton, the portions of the query that can change are displayed as ISPF dialog variables. After giving these variables the appropriate values, your program starts certain ISPF file-tailoring services. The result is a sequential file that contains the query.

  The program can then import the query into QMF temporary storage and have QMF run it. The required IMPORT and RUN commands can be run through the callable interface or command interface.

  To use this technique, you must know how to define ISPF dialog variables in your program that uses the ISPF dialog service.
- Use the Program Development Facility (PDF) editor to create QMF objects

  You can use the PDF editor with PDF edit macros to design and control data entry to queries, procedures, forms, and profiles. You can use REXX to write PDF macros.
- Create a query that uses an ISPF dialog.

  Your program can use ISPF display services to display a screen and create a file based on input from the user. This file, which then contains an SQL query, is then imported into QMF and run.

Starting a program that uses ISPF services from within QMF

If you want to start your ISPF program from within QMF, you must call the program from a linear procedure or a procedure with logic.

To call your program, use the ISPF SELECT PGM service by including the following command in your procedure:

```
ADDRESS ISPEXEC "SELECT PGM(programname)"
```

Use the CMD keyword to indicate to ISPF that you are running your program as an ISPF dialog function. The syntax for this command is:

```
ADDRESS ISPEXEC "SELECT CMD(cmdname)"
```

or

```
ADDRESS ISPEXEC "SELECT CMD(cmdname parameters)"
```

In this statement, *cmdname* is the name of your callable interface command.

ISPF services in a procedure with logic

You must transfer from the QMF program dialog to an ISPF command dialog to run ISPF commands from a QMF procedure with logic that is running under ISPF.

To set the correct ISPF environment and run a program that contains your ISPF commands, use the following ISPF SELECT CMD statement with the CMD keyword:

```
ADDRESS ISPEXEC "SELECT CMD(userprogram)"
```

In this statement, *userprogram* is the program that contains your ISPF commands.

For example, if the program that contains your ISPF commands is called DIALOG, include the following command in your procedure with logic:

```
ADDRESS ISPEXEC "SELECT CMD(DIALOG)"
```

You can also use a QMF TSO command to run your program that contains ISPF commands (for example, TSO DIALOG). In this case, QMF issues the ISPF SELECT CMD statement for you.

When running QMF under ISPF, a procedure with logic that starts a program that requires ISPF services must use the ISPF SELECT CMD environment. For example, suppose that you are running QMF under ISPF and your procedure with logic issues the Db2 command DSN. Because the DSN command uses ISPF services, use one of the following commands to issue the DSN command:

```
ADDRESS ISPEXEC "SELECT CMD(DSN)"
```

or

```
ADDRESS ISPEXEC "SELECT CMD(DSNEXEC)"
```

In the second statement, DSNEXEC is a program that contains the ADDRESS TSO DSN statement.

The EDIT command with ISPF

When you run your QMF application under ISPF, you can edit your QMF SQL query or procedure by using the EDIT QUERY command or the EDIT PROC command.

If you issue the QMF EDIT command from a **PROC** panel or **QUERY** panel, you do not need to specify the PROC or QUERY object types. EDIT assumes these values when you invoke it from the respective panels. By default, the QMF EDIT command places your procedure or query in a PDF editor session. QMF starts the PDF editor by using the QMF application ID DSQ*n*, where *n* is the NLF identifier. QMF also sets the function keys and the location of the command line to match your QMF application.

To override the default editor, use the EDIT QUERY and EDIT PROC commands as follows:

```
EDIT QUERY (E=name
EDIT PROC (E=name
```

In these statements, *name* can be either of the following values:

- An editor available to you
- The name of a REXX program that specifies an application ID other than the default. The default application ID is DSQ*n*, where *n* is the national language identifier for the NLF you are using)

  Use an application ID different from the QMF default application ID if you want to have function keys different from the keys that QMF provides.

If you are using PDF EDIT options that require PDF PROFILE data set members, you must create those members. For example, the PDF EDIT RECOVERY option requires a DSQ*n*EDRT PROFILE data set member (where *n* is the appropriate NLF character). The NLF must be installed before you issue the command.

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

ISPF and debugging applications

The QMF trace facility can help you trace QMF activity at various levels of detail. To help you more effectively debug applications that use ISPF you can also use the ISPF log service and PDF dialog test service. These services complement the QMF trace facility.

The ISPF log service

You can use the ISPF log service to write a message to the ISPF log file. For example, in REXX, the ISPF command to write a message to the ISPF log is:

```
ADDRESS ISPEXEC LOG MSG (message-id)
```

In this statement, *message-id* is the identification code for the message that is to be retrieved from the message library and written to the log.

The PDF dialog test service

If your site has PDF, you can use the PDF dialog test service to log ISPF application service calls to the ISPF log file. Additionally, you can use the log option of the PDF dialog test service to browse the contents of the log file or data set. You can also print the log file or data set when you exit ISPF.

The dialog test service has many other useful options for debugging your application. For example, you can debug interactively. You can run all or portions of your application, examine the results, change your application, and rerun it. You can also use dialog test services to accomplish these goals:

- Start selection panels, command procedures, and programs
- Display panels
- Add variables and modify variable values
- Run ISPF dialog services
- Add, modify, and delete breakpoint definitions
- Add, modify, and delete function and variable trace definitions

To create, change, and delete trace definitions, use the trace (TRACES) option of the dialog test service. Also use this option to monitor dialog service calls and dialog variable usage. During processing, if any of the trace definitions are satisfied, trace output is written to the ISPF log. You can use the LOG option of the dialog test services to browse the ISPF log, or examine the printed output when you exit ISPF.

Related concepts

Debugging your QMF applications

In addition to error handling, QMF provides debugging facilities for your callable interface applications.

Chapter 7. Writing bilingual applications

Many business applications need to run in several different national languages. You can write one English application and run it in any national language that QMF supports.

Each national language that QMF supports is called a National Language Feature (NLF). An NLF provides a user with a QMF session that is tailored to a specific national language.

QMF provides bilingual support for commands and forms. You can run English QMF commands and display English forms in any NLF.

Related reference

Conventions for National Language Feature information
Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Comparing the English and NLF environments

Although aspects of the QMF session environment are the same no matter which National Language Features (NLF) is in use, there are some differences. When no NLFs are installed, the only available QMF session environment is the English-language environment.

Environmental similarities

These similarities are the most important ones in the QMF session environments no matter which NLF is in use:

Capabilities
In general, you can do anything in an NLF session that you can do in an English-language session. You can create objects in temporary storage and save them in the database, format and print reports, and issue SQL commands. You can also run Prompted Query, SQL, and QBE queries, and QMF procedures. The difference between environments lies not in what you can do, but in how you need to enter your input and what languages are displayed

SQL and QBE
The verbs, operators, and keywords of the SQL and QBE languages are not translated.

Usage codes for forms
The codes are identical; they are not translated.

System commands
TSO and CICS commands can still be issued from QMF through the TSO or CICS command. These commands are unaffected by translation: enterTSO or CICS followed by the command to be run, and enter the command exactly as you would if you were running it outside of QMF.

Environmental differences

Some of the differences between the NLF environment and the English-language environment are:

The QMF command language
Every NLF has a complete set of translated QMF verbs and keywords. These translated verbs and keywords must appear in your QMF commands when you are operating in the language environment of an NLF. For a particular NLF, these words might be translated. For example, suppose that in the German NLF the verb DISPLAY and the keyword PROC are translated into ANZEIGEN and PROZEDUR. During a German NLF session, you can issue the command ANZEIGEN PROZEDUR but you cannot issue the command DISPLAY PROC.

Some elements of the QMF language are command synonyms and can be translated. As a result, each NLF has its own uniquely named command synonym table. When the NLF is installed, its command

synonym table is created, and the profile for the NLF indicates the command synonym table name for that NLF.

QMF panels and messages
Every NLF has a complete set of translated QMF messages and panels. Like the verbs and keywords for QMF commands, these messages and panels might or might not be translated. In most cases, they are translated. Within the panels and messages, the fixed portions of text can be translated. Information that can vary within each panel or message, such as query names, is not translated.

Allowable panel input
Many QMF panels that require user input restrict the range of some entries to a small set of keywords, which are translated. Examples of these panels include prompt panels and form panels. YES and NO responses in English, for example, are JA and NEIN in German.

Profile parameter values
In a multilingual environment, users have a separate profile for each available NLF they can use for a QMF session. For each of these profiles, the parameters are the same and have the same meanings, but the parameter names are translated. Certain parameter values are also translated.

For example, in an English profile, the CASE parameter can have the value UPPER, STRING, or MIXED. In a German profile, the CASE parameter is the SCHRIFT parameter, and the valid values are GROSS, KETTE, and GEMISCHT.

Exported and saved form objects
Use the SAVE, EXPORT, and IMPORT commands to specify the language in which you want form objects to be saved. You can save them in English or in the presiding language of your current session.

Sample tables and queries

IBM supplies translated versions of the English sample tables and queries, except for the Swedish and Uppercase features. Sample tables are not provided for these features.

Creating objects for use in bilingual applications

The objects in a bilingual application are like any other QMF object. The key is that you either create or save them in English.

How you create or save bilingual applications in English depends on the specific object:

Queries
You can create prompted and QBE queries in any language supported by the QMF NLFs or you can create SQL queries in English.

Forms
Always create forms in the presiding language. Save them by either using the default language on the SAVE command (ENGLISH) or use the presiding language.

The global variable DSQEC_FORM_LANG controls the language in which a form is saved, imported, or exported. The default value is 1 for English. A value of zero specifies that the forms are to be saved, imported, and exported in the presiding session language.

Procedures
You can create procedures in either English or the presiding language.

Analytics
You can create analytics objects in either English or the presiding language.

You can translate to English a form that you create and save in an NLF by issuing a SAVE command. For example, the French command to save a form called SEMAINE_F in English as WEEKLY_F is:

```
SAUVER FORMAT SEMAINE_F EN WEEKLY_F (LANGUE=ANGLAIS
```

This command converts your NLF form to an English form that you can use in your bilingual application.

Related reference
Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

The command language variable

To use English commands in an NLF session, set the presiding language variable, DSQEC_NLFCMD_LANG, to English. Use this variable to switch between English and the presiding language of the NLF session.

For example, suppose that your application is a procedure named WEEKLY_P. The commands shown here demonstrate how to switch between English and the presiding NLF language.

```
"GET GLOBAL (CURR_LANG=DSQEC_NLFCMD_LANG"     1
"SET GLOBAL (DSQEC_NLFCMD_LANG='1'"           2
"RUN PROC WEEKLY_P"                           3
"SET GLOBAL (DSQEC_NLFCMD_LANG=CURR_LANG"     4
```

These commands can be part of any valid QMF application, from an initial procedure to a high-level language program, but they must be in this order:

1

This line of the procedure saves the presiding language value in a variable.

The GET GLOBAL command saves the value for the presiding language in a variable called CURR_LANG.

2

This line of the procedure sets the presiding language to the language for which the application was written.

The WEEKLY_P application in this example was written with English commands. For this reason, the SET GLOBAL command sets the presiding language to English by setting the DSQEC_NLFCMD_LANG variable to 1.

3

This line of the procedure runs the application.

After the QMF session is set to English, the application in the example can be run. User commands must be in English. However, if a user presses a function key, the underlying command is assumed to be in the presiding language.

QMF assumes that prompt panels are in the user's presiding language. For the EXPORT and IMPORT command prompt panels, the default data set type, data queue type, or path name is also in the presiding language.

The QMF profile in effect for the session is the user's profile under the NLF that was set when the application started. The QMF profile of the presiding language is not the profile in effect. For example, a user who runs QMF in both English and German has both English and German QMF profiles. If the user starts a QMF session under the German NLF, the options in the German QMF profile are in effect. Then the user sets the DSQEC_NLFCMD_LANG variable to English to run a procedure written with English commands. In this case, the options in the German QMF profile remain in effect throughout the session.

4

This line of the procedure returns to the presiding language.

After the application ends, reset the command language variable to its original value as shown in the example.

Initial procedures in bilingual applications

If your application starts QMF and runs an initial procedure, QMF runs that procedure every time the user issues the END command. QMF terminates if this procedure encounters an error.

For example, a user who runs QMF in English issues an END command in the presiding language. QMF interprets the command as an error and terminates.

You can avoid this situation in one of two ways:

- Change the initial procedure to handle bilingual applications.

  A bilingual initial procedure includes the commands shown here:

```
"GET GLOBAL (CURR_LANG=DSQEC_NLFCMD_LANG"
"SET GLOBAL (DSQEC_NLFCMD_LANG=0"
⋮
/* QMF commands in the presiding language */
⋮
"SET GLOBAL (DSQEC_NLFCMD_LANG=CURR_LANG"
```

- Avoid running the initial procedure after the END command.

  You can set the variable DSQEC_RERUN_IPROC to 0 so that QMF does not run the initial procedure when the user issues the END command.

English-only commands

For most QMF commands, you must change the presiding language variable before you can run the command in English. However, some commands must be issued in English even when the presiding language variable is not set to English.

For example, you have an interactive application that you want to write in English and run in an NLF. You must use the MESSAGE command to send the user customized messages. In addition, you need the INTERACT command to display the message, as in this example (which can be run in a French NLF session):

```
proceed_text = 'Continue...'
"RUN WEEKLY_Q"                    /* Use the English RUN command  */
"SET GLOBAL (DSQEC_NLFCMD_LANG=0" /* switch back to French        */
"MESSAGE (TEXT='"proceed_text"'"  /* message in French            */
"INTERACT"                        /* show the report with message */
```

Figure 8. Using the MESSAGE and INTERACT commands to display messages

The following English commands work in any NLF:

- GET GLOBAL
- INTERACT
- MESSAGE
- SET GLOBAL
- START
- TRACE

Multilingual environments

When one or more NLFs are installed, a multilingual environment is created. With the appropriate authorization, you can choose a presiding language for each QMF session.

For example, you can choose English for one session and German for another, provided the German NLF is installed. Although you cannot switch languages during a QMF session, you can switch the command language variable. End the current session and start another to obtain the appropriate language environment.

Creating translatable applications

You can save time in adapting an application to new languages by using variables for as many language-sensitive objects as you can. Use variables to run the same program in several NLFs.

These variables can include:

- The verbs, object names, and options of a QMF command
- User-defined panel names

  If you create your own ISPF panels for your application, you need a set of translated panels for each language in which the application is run. Give these panels unique names and make them available to the application users. The application can then use variables for the panel names.
- User-defined message identifiers

  If you create your own ISPF panels, you also create messages to be issued by ISPF. These messages panels have unique IDs and you can use variables to refer to them. Translate the message text into the appropriate NLF languages. The application can use variables for the message names.

Chapter 8. QMF commands in applications

Certain commands are designed to be used in applications, and you can create your own command synonyms.

Commands designed for applications

Any command that is valid on the QMF command line in a particular environment is valid in an application. However, certain commands are specially designed to be used in applications.

Commands that are designed for applications can be used in both callable and command interface applications, with two exceptions. You can use the START and TRACE commands only with the callable interface.

CONNECT

Use the QMF CONNECT command to access data and objects on a remote server. When you connect to the remote system, this system becomes the current location.

When you write applications, you can issue the CONNECT command from:

- The callable interface
- The command interface
- Within a procedure (linear or with logic)

  However you cannot issue the CONNECT command if the procedure is a parameter on the CALL statement that starts QMF for TSO as a Db2 for z/OS stored procedure. Connectivity with remote servers is not supported when QMF is started as a stored procedure.

Certain aspects of your applications can be affected when you use the QMF CONNECT command to access a remote server. Be aware of the following considerations:

- When your application connects to a new location, the QMF profile, command synonyms, and function keys are reinitialized to the values at the new (current) location.
- When QMF starts, the program can issue a QMF CONNECT command to connect to a remote server. Any subsequent QMF commands or SQL statements that affect database objects are run at the remote server.
- Different types of commands behave differently with remote unit of work. When your applications use remote unit of work, all system-specific and most QMF commands run at the system where QMF is running (the local system). However, when a QMF command does either of the following, the commands affect the database at the remote server:
  - Sends SQL commands to the database
  - Uses or alters QMF objects and data stored in the database
- If your site uses TSO and takes advantage of RACF support for mixed-case passwords, ensure that the CASE option of your QMF profile is set to MIXED. Otherwise, QMF converts all input to uppercase, causing the CONNECT command to fail because the case of the password is incorrect. When CASE=MIXED, ensure that you tell QMF application users to enter all input in uppercase, because QMF recognizes commands only in uppercase.

The following example statements show how a REXX callable interface program can use the QMF CONNECT command. The program connects to a remote server, performs a predefined task, and exits QMF:

1. The following statement starts a QMF session:

```
CALL DSQCIX "START"
```

2. The following statement connects to the remote Db2 database (DALLAS):

```
CALL DSQCIX "CONNECT TO DALLAS"
```

3. This statement runs a procedure with logic (EARNINGS) that queries the remote server for data, formats the data, and prints the report:

```
CALL DSQCIX "RUN PROC EARNINGS"
```

   The procedure EARNINGS contains the following logic:

```
⋮
"RUN QUERY EARNQ (FORM=EARNF"
"PRINT REPORT"
⋮
```

4. This statement ends the QMF session:

```
CALL DSQCIX "EXIT"
```

END

You can use the END command to set the QMF home panel as the current panel.

For example, a QMF report is the current QMF panel. Issuing the END command from a callable interface or command interface program sets the QMF home panel as the current screen. When the QMF home panel is the current screen, issuing the END command has no effect on the QMF session.

EXIT

The EXIT command works the same regardless of how the QMF session was started: it marks all the user's sessions for termination.

When the EXIT command is entered on the command line, the session in which it is entered is terminated immediately. Each session begun by the INTERACT command terminates as the application that started it completes. When the EXIT command is issued in an application, the session ends when the original QMF session ends. All interactive sessions begun by the INTERACT command must end before QMF terminates.

In a callable interface program, it is important to include the QMF EXIT command when the application no longer needs QMF. If you forget to include this command, your QMF session remains active until you log off, or until your batch job completes.

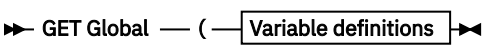
When the user or an application issues the EXIT command, QMF sets DSQAO_TERMINATE to 1 (marked for termination). Only an application that runs within QMF can test and use this global variable. If DSQAO_TERMINATE is set to 1 when QMF returns to the main QMF session, QMF immediately terminates and releases resources.

Related reference

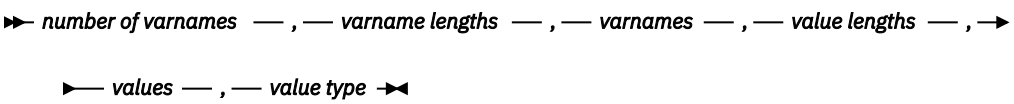
Global variables for state information not related to the profile

GET GLOBAL (extended syntax)

You can use the GET GLOBAL command to access QMF global variables in your application. For languages other than REXX, QMF provides an extended syntax for the GET GLOBAL command.



Variable definitions



You can use the GET GLOBAL command to copy the value of a QMF global variable into an application-defined variable for use by the application. The parameters you specify on the GET GLOBAL command define the application variable.

number of varnames
The number of variables requested.

varname lengths
A list of lengths for each variable name specified.

The length of the variable name. An 18-character area padded with trailing blanks is allowed.

varnames
A list of names of the QMF variables.

Do not specify trailing blanks in global variable names; QMF deletes trailing blanks.

value lengths
A list of the lengths of the values of the variables.

The following rules apply to the variable value:

- If the value length you supply is less than the value stored in QMF, QMF truncates on the right and returns a truncated value.
- If the value length you supply is greater than the value stored in QMF, QMF returns a value padded with trailing blanks.

values
A list of variable values.

value type
The data type of the storage area that contains the values; it must be either character or integer.

INTERACT

You can use the INTERACT command to display the current QMF panel and allow users to interact with QMF at different points in your application. The INTERACT command has two forms: session and command.

When the user issues the END command from a QMF panel, QMF returns control to the application. When the user issues the EXIT command from a QMF panel, the QMF session is marked for termination and QMF returns control to the application.

The session form of INTERACT

When you issue the INTERACT command, QMF places the user on the current panel and allows the user to issue QMF commands interactively. The INTERACT command provides another QMF session within your current session.

The INTERACT command can place the user in either an interactive QMF session or an interactive GDDM ICU session.

- For an interactive QMF session:

  Issue the INTERACT command after a QMF command that would normally display a QMF panel. In this session, the user can enter any commands that are valid for interactive QMF.
- For an interactive GDDM ICU session:

  Issue the INTERACT command after a command that normally makes QMF start GDDM ICU and display the ICU panel. In this session, the user can enter any commands that are valid for the ICU.

A scenario

This example shows a procedure that requires only one step to produce a report.

```
/* This procedure prints the weekly sales report. */
"RUN QUERY WEEKLY_SALES_Q (FORM=WEEKLY_SALES_F"
"PRINT REPORT"
```

Figure 9. A simple procedure without the INTERACT command

QMF displays the REPORT panel that contains your formatted data with a message that says, `"OK, your procedure was run."`

You write a procedure that involves several steps and you want to see the intermediate results of the procedure. For example, you want to see the intermediate results of a procedure that runs more than one query. Use the INTERACT command at the points in the procedure where you want to see the results of a command. In this case, insert an INTERACT command immediately following the first RUN QUERY command in the following procedure:

```
/* This procedure generates a report showing annual sales.  */
"RUN QUERY WEEKLY_SALES_Q (FORM=WEEKLY_SALES_F"
"INTERACT"
"RUN QUERY YEAR_TOTAL_Q (FORM=YEAR_TOTAL_F"
```

Figure 10. Using INTERACT in a procedure

When you run this procedure from the home panel, QMF displays the REPORT panel that contains your formatted data. Next, enter the END command from the REPORT panel. The procedure runs the second query and displays the final report. If you omit the INTERACT command, QMF displays only the final report without showing the result of the first query.

Suppressing the display of reports

If you run a query in a QMF callable interface application, QMF displays the resulting report. However, you can tell QMF not to automatically display the report by setting the DSQDC_DISPLAY_RPT global variable to zero (0). You can also set this global variable on the START command by specifying `DSQADPAN=0`.

This global variable is valid only when the RUN QUERY command is issued from an application. It does not affect the display of reports when the RUN QUERY command is issued from the QMF command line.

Ending a session started by the INTERACT command

When the user issues the END command, control returns to the process that issued the INTERACT command; however, the two sessions are not independent. Anything done during the INTERACT session remains in effect when the old session resumes. For example, the user modifies the current form object in the new interactive session. In this case, the current form object in the old session contains these modifications when the new session ends.

You can make your application display the QMF home panel after the user issues an END command from a QMF object panel. Add the logic of an INTERACT loop.

Related concepts

The command form of INTERACT
The command interface (DSQCCI) runs QMF commands interactively only when the command interface application uses the command form of INTERACT and QMF is running an interactive session (DSQSMODE=I).

Related reference

A REXX example of using an INTERACT loop

You can make the END command in an interactive session behave similarly to the way END behaves in interactive QMF.

The command form of INTERACT

The command interface (DSQCCI) runs QMF commands interactively only when the command interface application uses the command form of INTERACT and QMF is running an interactive session (DSQSMODE=I).

The command form of INTERACT has no effect on a command issued through the callable interface. In the callable interface, the only way to control whether commands are run interactively is to set DSQSMODE=I on the START command.

Use the following command syntax to request interactive execution of a designated command:

```
INTERACT command
```

In this statement, *command* is the command that you want to run interactively. Various QMF prompt and status panels can appear in this dialog.

For example, the following command displays the command prompt panel for RUN QUERY command options:

```
INTERACT RUN QUERY ABC ?
```

If interactive execution is not allowed, the command form of INTERACT has no effect on the command it precedes. An interactive session is not allowed in a QMF batch session or when QMF for TSO is started as a Db2 for z/OS stored procedure.

You can check whether interactive execution is allowed in the current session by examining a global variable named DSQAO_INTERACT. A value of 1 for the DSQAO_INTERACT global variable means that INTERACT is allowed.

Related concepts

The session form of INTERACT
When you issue the INTERACT command, QMF places the user on the current panel and allows the user to issue QMF commands interactively. The INTERACT command provides another QMF session within your current session.

Related reference

START command keywords
You can specify keywords on the START command.

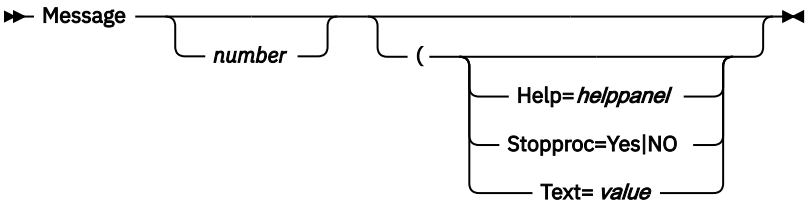
Global variables for state information not related to the profile

MESSAGE

When you create applications, you often want to send specific messages to your users about the information displayed for them or their next action. You can write your own messages and display them on QMF panels through the MESSAGE command. In ISPF, you can also choose to have QMF display the message help for an ISPF error message.

Syntax

The MESSAGE command syntax is as follows:



number (with ISPF only)

number is only valid under ISPF. This parameter is the identification number of a message definition in an ISPF message library.

HELP

Use this parameter to specify a help panel other than the one defined with the message normally displayed in this situation. Replace *helppanel* with the appropriate panel ID.

You cannot modify a QMF panel to be displayed if its definition is in DSQPNLE.

In ISPF, if you want to create and display your own panel, the definition of the panel must be in an ISPF panel library. This library must be concatenated to your ISPPLIB data set. The panel must be a help panel, not a menu or a data-entry panel.

In ISPF, if you specified *number*, *helppanel* defaults to the help-panel indicator for the message definition specified by *number*.

In ISPF, if the message definition specified by *number* does not reference a help-panel indicator, then the MESSAGE command does not provide message help. Instead, the QMF help for the object panel is displayed on the user's screen when the user requests help.

STOPPROC

Use `Stopproc` to suppress the execution of linear procedures by setting the procedure termination switch. The following command sets the procedure termination switch:

```
Message (Stopproc=Yes
```

When Stopproc=Yes, the procedure termination switch is on. The default value is No (off). This switch affects only linear procedures.

While this switch is on, any QMF procedure that receives control ends its execution immediately. While the switch is off, procedures run normally.

When the switch is off, only a MESSAGE command can turn it back on. When the switch is on, it stays on until one of the following happens:

- Another QMF command is issued. This command can be any QMF command except a MESSAGE command with the option to turn on the switch.
- Control returns to the user when the application ends. A user can always issue online commands that run QMF procedures.

You can check to see whether the procedure termination switch is on by examining the DSQCM_MESSAGE variable. If the termination option is in effect, this variable contains the message for the MESSAGE command that turned on the termination switch.

TEXT

Use the TEXT option to define a message or to override the text in an ISPF message definition. Replace *value* with the character string to be used for the message. A value that contains blank characters must be surrounded with delimiters. Valid delimiters for a message value are single quotation marks, parentheses, and double quotation marks. When the delimiters are double quotation marks, the quotation marks are displayed as part of the message. The maximum length for a message value is 360 single-byte characters. How much of the message can be displayed is determined by the width of the display device you are using. A value longer than 78 characters is truncated to contain only the first 78 characters. QMF does not fold the text to uppercase; however, ISPF might fold the text to uppercase if MESSAGE is issued through the command interface.

If your message contains quotation marks, you need to double the quotation marks in the TEXT= specification.

In ISPF, the default is the long message text of the ISPF message specified by *number*, which becomes the generated message. The text is left as it is; no folding takes place, regardless of the value of the CASE setting in the user's QMF profile.

Suppose that you want to write an application by using a procedure that runs two queries and displays two reports. When QMF displays the first report, you want to tell users how to view the second report. You can write a linear procedure like the one shown here, which includes on the **REPORT** panel a message defined by the MESSAGE command. To have your message be displayed on the **REPORT** panel, place the MESSAGE command immediately before the INTERACT command, as shown here:

```
⋮
   RUN QUERY WEEKLY_SALES_Q (FORM=WEEKLY_SALES_F
   MESSAGE (TEXT='OK, press END when you are finished viewing this report.'
   INTERACT
   RUN QUERY YEAR_TOTAL_Q (FORM=YEAR_TOTAL_F
⋮
```

Figure 11. Example of using the MESSAGE command

If you are using a procedure with logic, you can use a REXX variable in place of the text string you specify for the MESSAGE command, as shown here. When you use REXX variables, you must use double quotation marks around the variable name in the message text string.

```
oktext = 'OK, press END when you are finished viewing this report.'
"RUN QUERY WEEKLY_SALES_Q (FORM=WEEKLY_SALES_F"
"MESSAGE (TEXT='"oktext"'"
"INTERACT"
"RUN QUERY YEAR_TOTAL_Q (FORM=YEAR_TOTAL_F"
```

Figure 12. Using REXX variables with the MESSAGE command in a procedure

This message spans multiple lines with REXX continuation characters.

```
/* QMF REXX PROCEDURE */
MSGTEXT="You entered a data value incompatible with "||,
"the column data type; check the data type of the   "||,
"column and try again."
"MESSAGE(TEXT=("MSGTEXT"))"
EXIT
```

Examples

Here are some examples of how to issue the MESSAGE command under various conditions.

- Example of issuing the MESSAGE command from a QMF linear procedure:

  This message spans multiple lines by using continuation characters for linear procedures:

  ```
  MESSAGE(TEXT='You entered a data value incompatible with
  +the column data type; check the data type of the
  +column and try again.')
  ```

- Examples of using MESSAGE commands with ISPF:

  The following are examples of how you can use the MESSAGE command if you are building an application that uses ISPF:

  – `MESSAGE MSG011X`

    - The message text is the long message in MSG011X.
    - The message help panel is the panel identified (if any) in MSG011X.
    - Whether the procedure termination switch is set after QMF processes the command is determined by the procedure termination switch in MSG011X.

– MESSAGE MSG011X (HELP=PANELX STOPPROC=YES
  - The message text is the long message in MSG011X.
  - The message help panel is a panel named PANELX.
  - The procedure termination switch is turned on, which suppresses the execution of QMF linear procedures in the application.

SET GLOBAL (extended syntax)

To create your own global variables and use them in QMF commands as substitution variables, issue the SET GLOBAL command. You can also use the SET GLOBAL command to set values for QMF predefined global variables, which start with "DSQ."

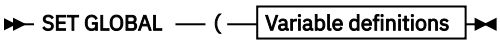
Restriction: You cannot use the SET GLOBAL command to set global variables that are defined as read-only.

Syntax of SET GLOBAL (extended syntax)

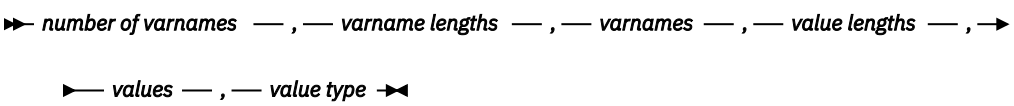
You can use the extended syntax of the SET GLOBAL command to change the values of variables in callable interface languages other than REXX. Examples of other languages include Assembler, C, COBOL, Fortran, and PL/I.

The variable name can be up to 18 characters long for variables used with callable interface applications. If the variable is to be used as a substitution variable, the name can be up to 17 characters long. The maximum length of the command, including the command syntax, is 2,000 bytes.

The syntax of the command is as follows:



Variable definitions



number of varnames
The number of variables requested.

varname lengths
A list of lengths for each variable name specified.

Ensure that the length of the global variable name is equal to the actual length of the global name in your program. An 18-character area padded with trailing blanks is allowed.

varnames
A list of names of the QMF variables.

value lengths
A list of lengths of the values of the variables. If the value length you supply is less than the length of the value stored in your storage area, the value is truncated on the right when it is stored in QMF.

QMF uses the value from your program, starting at the address you assign for the length you assign. If the length is too long, QMF might abend.

values
A list of variable values.

value type
The data type of the storage area that contains the values. It must be either character or integer.

Examples of how to use the extended syntax of the SET GLOBAL command are documented with the programming language specifications.

Related reference

Programming language specifications for using the callable interface
The QMF application programming interface is available for several programming languages.

Guidelines for defining and using global variables

Global variable names are subject to certain rules.

When you are defining and using global variable names, keep the following rules in mind:

- On the SET GLOBAL command, variable names are not preceded with an ampersand as they are on the RUN and CONVERT commands.
- If you create a global variable with the same name as a form variable or aggregation variable, QMF does not use the global variable in the form. QMF uses the form variable (or aggregation variable) value in the form rather than the global variable value.
- The QMF form does not recognize global variables with question marks in the names.
- Global variable names are limited to 18 characters unless the variable is to be used as a substitution variable. Substitution variable names are limited to 17 characters.
- A global variable name can contain numeric characters, but the first character of a global variable name cannot be numeric.
- Global variable names cannot begin with DSQ because QMF reserves these letters for QMF predefined global variables.
- The first character of a global variable name must be an alphabetic character (A through Z) or one of these special characters:

  ¢ ! $ ~ { } ? @ # % \
- A global variable name cannot contain blanks or any of the following characters:

  * ( ) - + ¬ | : ; " ' < > ⁄ . , = &
- QMF strips the trailing blanks from global variable names.
- By default, a global variable value is retained until you reset it or end the QMF session. However, you can set the DSQEC_USERGLV_SAV global variable to save global variable values from one session to another.

Related reference

Global variables that control how commands and procedures are executed
QMF global variables

START

When you start QMF through the callable interface, you need to use the START command.

General syntax

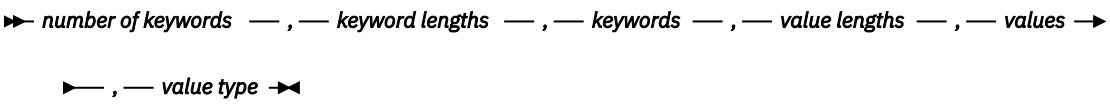
The syntax of the START command depends on which programming language you are using for your callable interface application

Only one QMF session can be active at a time. When you start QMF from an application, issue a START command to test whether QMF is started.

Examples of the syntax for each programming language are documented with the programming language specifications.

The following is the general syntax for the START command:

Keyword definitions



Assembler, C, COBOL, Fortran, and PL/I use the following specifications for the START command:

number of keywords
The number of START command keywords you are using in your START command.

keyword lengths
The length of each START command keyword specified.

keywords
Names of the START command keywords.

value lengths
A list that contains the lengths of the values for each START command keyword.

values
A list of values for the START command keywords specified in this command.

value type
The data type of the value. The data type must be character for the START command.

Related concepts

Starting QMF from an application
Before you can run any other command from an application, you must start QMF. When using the callable interface, you start QMF by issuing the START command in your application. You can have only one QMF session at a time.

Related reference

Programming language specifications for using the callable interface
The QMF application programming interface is available for several programming languages.

START command keywords
You can specify keywords on the START command.

START command keywords

You can specify keywords on the START command.

These keywords are available on the START command:

- DSQADPAN
- DSQALANG
- DSQSBSTG
- DSQSCMD (TSO only)
- DSQSDBCS
- DSQSDBNM
- DSQSDBQN (CICS only)
- DSQSDBQT (CICS only)
- DSQSDBUG
- DSQSIROW
- DSQSMODE
- DSQSMRFI
- DSQSPILL
- DSQSPLAN (TSO only)
- DSQSPRID (TSO only)

- DSQSPTYP (TSO only)
- DSQSRSTG (TSO only)
- DSQSRUN
- DSQSSPQN (CICS only)
- DSQSSUBS (TSO only)

These keywords are described in the following table.

You can specify START command keywords with the following conventions:

- You can specify any keyword on the START command. In TSO, you can also specify any keyword in the REXX program named by the DSQSCMD keyword. Because QMF for CICS does not support REXX, you must specify all keywords on the START command.
- If your application or the initial procedure (specified by the DSQSRUN keyword) specifies keywords that are not supported in a particular environment, those keywords are ignored. With this convention, you can compile a single program to run in multiple QMF environments without changing the environment-specific keywords.
- If you do not specify any keywords, QMF uses the values of the START command keywords as they appear in the program specified by the DSQSCMD keyword. If you do not use this program, QMF uses the default values of each keyword shown in this table.

Table 8. START command keywords, descriptions, and default values

START command keywords	**Description**	**Default value**
DSQADPAN	Meant for use only with the callable interface, this START command parameter sets the DSQDC_DISPLAY_RPT global variable. This variable controls whether QMF displays the report when a query is run from within an application program. A value of 1 displays the report when a query is run. Set the value to 0 to not display the report.	1 (display report)
DSQALANG	Determines the presiding national language for the session you are starting. You can specify this parameter in your applications so that users can enter or specify QMF commands in a national language. The value for this parameter is a one-character national language identifier, shown here. If you want to enter English commands when the presiding language is a language other than English, you can use QMF bilingual support. The national language feature for the language you specify must be installed. C - Canadian French D - German E - English F - French H - Korean (Hangeul) I - Italian K - Japanese (Kanji) P - Brazilian Portuguese Q - Danish S - Spanish U - Uppercase English V - Swedish Y - Swiss French Z - Swiss German	E (English)

Table 8. START command keywords, descriptions, and default values (continued)

START command keywords	Description	Default value
DSQSBSTG	Specifies the maximum amount of virtual storage per user that is to be used to generate QMF reports. Valid values are: **0 - 2147483647** Specifies storage in bytes. **0KB - 2097152KB** Specifies storage in KB. **0MB - 2048MB** Specifies storage in MB. **0GB - 2GB** Specifies storage in GB. **1% - 100%** Specifies a percent of available storage. Percentages are valid in TSO only. If you are using CICS, you can specify a fixed amount of storage in bytes, KB, MB, or GB. If you are using TSO, by default QMF determines the maximum amount of storage that is to be used for generating QMF reports. If you set the DSQSBSTG parameter to a valid non-zero value, the amount of storage that you specify for the parameter is used instead. If you are using TSO, you can specify the value for DSQSBSTG as a fixed amount of storage or as a percentage of the available virtual storage. If you set the DSQSBSTG parameter to 0 and set the DSQSRSTG parameter to a non-zero value, the DSQSRSTG parameter is used to determine the maximum amount of storage for reports. If you specify valid non-zero values for both DSQSBSTG and DSQSRSTG, the value of DSQSBSTG is used. If you set the DSQSBSTG value to less than the minimum amount of storage that is required to produce a report, QMF automatically allocates the minimum amount of storage required. In TSO, the minimum amount of storage is 15,000 bytes. Storage availability is reassessed throughout the QMF session. **Restrictions:** • Percent values must include the percent sign (%) and contain no spaces. • Values in GB, MB, or KB format cannot contain spaces (for example, you cannot enter 2 GB). • Values in GB, MB, or KB format cannot contain characters after the units (for example, you cannot enter 2GBxyz). • GB, MB, or KB entered with no preceding number is handled as a value of 0.	In CICS: 500000 In TSO: 0

Table 8. START command keywords, descriptions, and default values (continued)

START command keywords	Description	Default value
DSQSCMD (TSO only)	This keyword specifies the REXX program that sets the QMF program parameters in QMF for TSO. When QMF receives the START command from a callable interface application, TSO calls the REXX program specified by this keyword. This REXX program provides values for the QMF program parameters unless you specified their values directly on the START command. The default program provided with TSO is DSQSCMDE, which provides default English program parameter values for all keywords shown in this table. A value of NULL for a particular parameter indicates that TSO uses the default value for that parameter. If you are using an NLF, you can change the default program name to DSQSCMD*n*. The *n* variable is the national language identifier (NLID) for the language you are using. Though not shown in this table, the DSQSDBLG parameter is also set by default in the DSQSCMDE program provided with TSO. This parameter is set when you start QMF for TSO as a Db2 for z/OS stored procedure. It cannot be externally set outside the context of the stored procedure interface.	DSQSCMDE
DSQSDBCS	Determines whether QMF allows double-byte characters when the display device does not support the double-byte character set (DBCS). Values are YES or NO. Set the value to YES when you intend to print DBCS data from a non-DBCS display device or run a QMF batch job that prints DBCS data. Otherwise, set the value to NO.	NO
DSQSDBNM	Specifies the remote server to connect to when starting a QMF session. A null value means that QMF connects to the default database (the database it normally connects to without remote unit of work).	NULL
DSQSDBQN (CICS only)	Specifies the name of the CICS storage queue to be used for QMF trace data. The name must conform to CICS name specifications for the type of CICS queue specified by DSQSDBQT.	DSQD
DSQSDBQT (CICS only)	Specifies the type of CICS storage to be used for QMF trace data. The values are: **TD** Uses a CICS transient data queue. **TS** Use a CICS auxiliary temporary storage queue. Use caution when specifying temporary storage, because QMF can generate a large amount of trace data.	TD

Table 8. START command keywords, descriptions, and default values (continued)

START command keywords	Description	Default value
DSQSDBUG	Specifies whether product activity is traced during QMF initialization. The values are: **ALL** Specifies the most detailed QMF tracing. **NONE** Specifies no QMF tracing. When you start QMF in batch mode, all messages and commands are traced (equivalent to an L2 level of tracing) regardless of how you set DSQSDBUG.	NONE
DSQSIROW	Indicates the number of rows QMF fetches before displaying the first screen of data for a RUN QUERY, IMPORT DATA, or DISPLAY command.	100
DSQSMODE	Specifies the mode in which to start QMF. **I** Specifies interactive mode. **B** Specifies batch mode. When the value of DSQSMODE is B, panel display is inhibited so that QMF can run as a background job.	B (batch)
DSQSMRFI	Specifies whether the QMF session that you are starting uses Db2 multirow fetch and insert. Db2 multirow fetch and insert increases performance for many QMF commands (such as DISPLAY TABLE, EXPORT DATA or EXPORT TABLE, IMPORT TABLE, PRINT REPORT or PRINT TABLE, RUN QUERY or RUN PROC) when these commands retrieve data. Db2 multirow fetch and insert also increases performance for commands such as SAVE DATA, DPRE, and BOTTOM or FORWARD during report navigation. This parameter sets the DSQAO_DSQSMRFI global variable. **YES** Specifies that QMF uses Db2 multirow fetch and insert. When MR is set to YES and you use a QMF command that includes a three-part name, the servers must run Db2 for z/OS. Both the requester where the command is initiated and the server to which the command is directed must run at this version level. Commands with three-part names cannot be directed to DB2 for VSE and VM servers. **NO** Specifies that QMF will not use Db2 multirow fetch and insert capabilities. When retrieving XML or LOB data, QMF uses single-row fetch, regardless of the DSQSMRFI parameter setting.	NO

Table 8. START command keywords, descriptions, and default values (continued)

START command keywords	Description	Default value
DSQSPILL	Specifies whether QMF uses spill storage when extra storage for reports is needed. Possible values are YES or NO. If you specify a value of YES for DSQSPILL and are using QMF for TSO, ensure that the DSQSPTYP parameter is set to accommodate the type of spill storage you use. If you are using CICS, see the explanation of the DSQSSPQN keyword for how to name the temporary storage queue that holds spill data.	For CICS: NO For TSO: YES
DSQSPLAN (TSO only)	Specifies the Db2 application plan ID assigned to QMF.	QMF12
DSQSPRID (TSO only)	Specifies whether to use the TSO logon ID or the primary database authorization ID to select the appropriate row from Q.PROFILES and to qualify Q.ERROR_LOG entries. Allowable values are PRIMEID or TSOID.	PRIMEID
DSQSPTYP (TSO only)	When the DSQSPILL parameter is set to YES, specifies the type of storage to use for spill data. A value of FILE specifies a file; a value of 64BIT specifies extended storage. When extended storage is specified, QMF acquires storage on each call to the extended storage manager in the amount specified in the DSQEC_EXTND_STG global variable.	FILE
DSQSRSTG (TSO only)	Dynamically allocates virtual storage available for reports. You can alternatively use the DSQSBSTG keyword to set the maximum amount of storage as a fixed amount or a percentage of the available storage. If DSQSBSTG is set to a non-zero value, QMF ignores the DSQSRSTG value.	0
DSQSRUN	Specifies the name of the QMF initial procedure to run after QMF is started. The initial procedure runs only once with the callable interface. In this procedure, you can include commands to set global variables and profile values to customize the user's session.	NULL
DSQSSPQN (CICS only)	Specifies the name of the CICS temporary storage queue that is used for QMF spill data. When the program parameter DSQSPILL has a value of YES, this spill area is used to contain report data.	DSQSv*id*, where *id* is the CICS terminal ID
DSQSSUBS (TSO only)	Specifies the ID of the Db2 database in which QMF is started. The database ID you specify on this keyword must be configured as an application requester.	DSN

Related concepts

Writing bilingual applications

Many business applications need to run in several different national languages. You can write one English application and run it in any national language that QMF supports.

Related reference

Conventions for National Language Feature information
Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

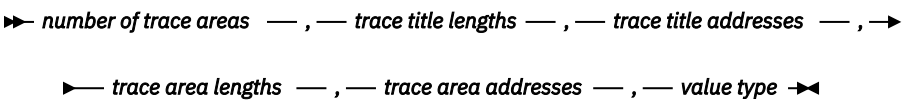
Global variables that control how commands and procedures are executed

TRACE

You can use the TRACE command to add trace information from callable interface applications to the QMF trace data output. This command can be used in Assembler, C, COBOL, Fortran, and PL/I applications. It cannot be issued from the QMF command line.

The TRACE command syntax is as follows:

Trace area definitions



number of trace areas
The number of trace area definitions that you are using in your TRACE command. This number must be in the range of 1 through 10.

trace title lengths
A list of lengths for each trace title that is specified.

trace title addresses
A list of addresses that point to the trace titles that are to be used for each trace area. A trace title can be up to 40-characters long. Trailing blanks are removed. When the first trace title is SNAPREGS, all other trace titles and trace area addresses are ignored, and QMF register values are written to the QMF trace.

trace area lengths
A list that contains the number of bytes of storage that are to be displayed starting at the corresponding trace area address. Trace area lengths must be contained in FIXED(31) integer values.

trace area addresses
A list of addresses that are to be displayed in the trace output. The number of bytes of storage that are displayed at each trace area address is determined by the trace area length. When the first trace title is "SNAPREGS," all trace area addresses and trace area lengths are ignored. When the trace area address is 0, the trace area length is also considered to be 0.

value type
Must be value "FINT." "FINT" is a constant value that is provided in the interface communications area (DSQCOMM) for each programming language. The constant is a name that is similar to DSQ_VARIABLE_FINT. Check the interface communications area for your programming language to confirm the variable value.

The TRACE command writes trace area definitions to the QMF trace data output, regardless of QMF trace settings. If you want to write trace output only if QMF trace settings are active, use the DSQAO_APPL_TRACE or DSQAP_TRACE QMF global variables.

PL/I coding example for TRACE

You can use the TRACE command in a PL/I application to write trace information for the application to the QMF trace output.

The following coding example first verifies that the user is tracing QMF application activity by checking that the global variable DSQAO_APPL_TRACE is not set to '0'. If the application trace is on, then the TRACE command is issued. The TRACE command specifies three trace area definitions to write to the QMF trace output.

This example is not included in the DSQABFP file that is distributed with QMF.

```
DSQABFP: PROCEDURE OPTIONS(MAIN REENTRANT) REORDER;
/*********************************************************************/
/* Sample Program:  DSQABFP                                          */
/* PL/I Version of the QMF Callable Interface                        */
/*********************************************************************/

/*********************************************************************/
/* Include and declare query interface communications area           */
/*********************************************************************/
%INCLUDE SYSLIB(DSQCOMML);

/*********************************************************************/
/* Builtin function                                                  */
/*********************************************************************/
DCL LENGTH BUILTIN;

/*********************************************************************/
/* Query interface command length and commands                       */
/*********************************************************************/
DCL COMMAND_LENGTH         FIXED BIN(31);
DCL START_QUERY_INTERFACE  CHAR(5)  INIT('START');
DCL SET_GLOBAL_VARIABLES   CHAR(10) INIT('SET GLOBAL');
DCL GET_GLOBAL_VARIABLES   CHAR(10) INIT('GET GLOBAL');
DCL RUN_QUERY              CHAR(12) INIT('RUN QUERY Q1');
DCL PRINT_REPORT           CHAR(22) INIT('PRINT REPORT (FORM=F1)');
DCL TRACE_COMMAND          CHAR(5)  INIT('TRACE');
DCL END_QUERY_INTERFACE    CHAR(4)  INIT('EXIT');

/*********************************************************************/
/* Query command extension, number of parameters and lengths         */
/*********************************************************************/
DCL NUMBER_OF_PARAMETERS   FIXED BIN(31);/* number of variables     */
DCL KEYWORD_LENGTHS(10)    FIXED BIN(31);/* lengths of keyword names*/
DCL DATA_LENGTHS(10)       FIXED BIN(31);/* lengths of variable data*/

/*********************************************************************/
/* Trace command parameters                                          */
/*********************************************************************/
DCL AREA_DESCRIPTION(10)        CHAR(40);
DCL AREA_DESCRIPTION_LENGTH(10) FIXED BIN(31);
DCL AREA_PTR(10)                PTR;
DCL AREA_LENGTH(10)             FIXED BIN(31); /* Length of area at */
                                               /* AREA_PTR to be    */
                                               /* displayed.        */

/*********************************************************************/
/* Keyword parameter and value for START command                     */
/*********************************************************************/
DCL 1 START_KEYWORDS,
    3 START_KEYWORDS_1     CHAR(8)  INIT('DSQSMODE'),
    3 START_KEYWORDS_2     CHAR(8)  INIT('DSQSDBUG'),
    3 START_KEYWORDS_3     CHAR(8)  INIT('DSQSSUBS'),
    3 START_KEYWORDS_4     CHAR(8)  INIT('DSQSPLAN');
DCL 1 START_KEYWORD_VALUES,
    3 START_KEYWORD_VALUES_1 CHAR(11) INIT('BATCH'),
    3 START_KEYWORD_VALUES_2 CHAR(3)  INIT('ALL'),
    3 START_KEYWORD_VALUES_3 CHAR(4)  INIT('DSNA'),
    3 START_KEYWORD_VALUES_4 CHAR(6)  INIT('QMFDEV');

/*********************************************************************/
/* Keyword parameter and value for SET command                       */
/*********************************************************************/
DCL 1 SET_KEYWORDS,
      3  SET_KEYWORDS_1    CHAR(7) INIT('MYVAR01'),
      3  SET_KEYWORDS_2    CHAR(5) INIT('SHORT'),
      3  SET_KEYWORDS_3    CHAR(7) INIT('MYVAR03');
```

```
DCL 1 SET_VALUES,
      3  SET_VALUES_1      FIXED BIN(31),
      3  SET_VALUES_2      FIXED BIN(31),
      3  SET_VALUES_3      FIXED BIN(31);

/*********************************************************************/
/* Keyword parameter and value for GET command                       */
/*********************************************************************/
DCL 1 GET_TRACE_KEYWORDS,
    3 GET_TRACE_KEYWORDS_1 CHAR(16) INIT('DSQAO_APPL_TRACE');

DCL 1 GET_TRACE_VALUE,
    3  GET_TRACE_VALUE_1 CHAR(1);

/*********************************************************************/
/* Main program                                                      */
/*********************************************************************/
DSQCOMM = '';
DSQ_COMM_LEVEL = DSQ_CURRENT_COMM_LEVEL;

/*********************************************************************/
/* Start a query interface session                                   */
/*********************************************************************/
NUMBER_OF_PARAMETERS = 4;
COMMAND_LENGTH = LENGTH(START_QUERY_INTERFACE);
KEYWORD_LENGTHS(1) = LENGTH(START_KEYWORDS_1);
KEYWORD_LENGTHS(2) = LENGTH(START_KEYWORDS_2);
KEYWORD_LENGTHS(3) = LENGTH(START_KEYWORDS_3);
KEYWORD_LENGTHS(4) = LENGTH(START_KEYWORDS_4);
DATA_LENGTHS(1) = LENGTH(START_KEYWORD_VALUES_1);
DATA_LENGTHS(2) = LENGTH(START_KEYWORD_VALUES_2);
DATA_LENGTHS(3) = LENGTH(START_KEYWORD_VALUES_3);
DATA_LENGTHS(4) = LENGTH(START_KEYWORD_VALUES_4);

CALL DSQCIPX(DSQCOMM,
             COMMAND_LENGTH,
             START_QUERY_INTERFACE,
             NUMBER_OF_PARAMETERS,
             KEYWORD_LENGTHS,
             START_KEYWORDS,
             DATA_LENGTHS,
             START_KEYWORD_VALUES,
             DSQ_VARIABLE_CHAR);

/*********************************************************************/
/* Find out current trace setting                                    */
/*********************************************************************/
NUMBER_OF_PARAMETERS = 1;
COMMAND_LENGTH = LENGTH(GET_GLOBAL_VARIABLES);
KEYWORD_LENGTHS(1) = LENGTH(GET_TRACE_KEYWORDS_1);
DATA_LENGTHS(1) = LENGTH(GET_TRACE_VALUE_1);

CALL DSQCIPX(DSQCOMM,
             COMMAND_LENGTH,
             GET_GLOBAL_VARIABLES,
             NUMBER_OF_PARAMETERS,
             KEYWORD_LENGTHS,
             GET_TRACE_KEYWORDS,
             DATA_LENGTHS,
             GET_TRACE_VALUE,
             DSQ_VARIABLE_CHAR);

/*********************************************************************/
/* Set numeric values into query using SET command                   */
/*********************************************************************/
NUMBER_OF_PARAMETERS = 3;
COMMAND_LENGTH = LENGTH(SET_GLOBAL_VARIABLES);
KEYWORD_LENGTHS(1) = LENGTH(SET_KEYWORDS_1);
KEYWORD_LENGTHS(2) = LENGTH(SET_KEYWORDS_2);
KEYWORD_LENGTHS(3) = LENGTH(SET_KEYWORDS_3);
DATA_LENGTHS(1) = 4;
DATA_LENGTHS(2) = 4;
DATA_LENGTHS(3) = 4;
SET_VALUES_1 = 20;
SET_VALUES_2 = 40;
SET_VALUES_3 = 4;

CALL DSQCIPX(DSQCOMM,
             COMMAND_LENGTH,
             SET_GLOBAL_VARIABLES,
             NUMBER_OF_PARAMETERS,
```

```
             KEYWORD_LENGTHS,
             SET_KEYWORDS,
             DATA_LENGTHS,
             SET_VALUES,
             DSQ_VARIABLE_FINT);

/*********************************************************************/
/* Run a Query                                                       */
/*********************************************************************/
COMMAND_LENGTH = LENGTH(RUN_QUERY);

CALL DSQCIPL(DSQCOMM,
            COMMAND_LENGTH,
            RUN_QUERY);

/*********************************************************************/
/* Trace command                                                     */
/*********************************************************************/
IF GET_TRACE_VALUE_1 ^= '0' THEN DO;
  NUMBER_OF_PARAMETERS = 3;
  COMMAND_LENGTH = LENGTH(TRACE_COMMAND);
  AREA_DESCRIPTION(1) = 'DSQAO_APPL_TRACE:';
  AREA_DESCRIPTION_LENGTH(1) = LENGTH(AREA_DESCRIPTION(1));
  AREA_PTR(1) = ADDR(GET_TRACE_VALUE_1);
  AREA_LENGTH(1)  = LENGTH(GET_TRACE_VALUE_1);
  AREA_DESCRIPTION(2) = 'DSQ_COMM_LEVEL:';
  AREA_DESCRIPTION_LENGTH(2) = LENGTH(AREA_DESCRIPTION(2));
  AREA_PTR(2) = ADDR(DSQ_COMM_LEVEL);
  AREA_LENGTH(2)  = LENGTH(DSQ_COMM_LEVEL);
  AREA_DESCRIPTION(3) = 'DSQ_CURRENT_COMM_LEVEL:';
  AREA_DESCRIPTION_LENGTH(3) = LENGTH(AREA_DESCRIPTION(3));
  AREA_PTR(3) = ADDR(DSQ_CURRENT_COMM_LEVEL);
  AREA_LENGTH(3)  = LENGTH(DSQ_CURRENT_COMM_LEVEL);

  CALL DSQCIPX(DSQCOMM,
               COMMAND_LENGTH,
               TRACE_COMMAND,
               NUMBER_OF_PARAMETERS,
               AREA_DESCRIPTION_LENGTH,
               AREA_DESCRIPTION,
               AREA_LENGTH,
               AREA_PTR,
               DSQ_VARIABLE_FINT);
  END;

/*********************************************************************/
/* Print the results of the query                                    */
/*********************************************************************/
COMMAND_LENGTH = LENGTH(PRINT_REPORT);

CALL DSQCIPL(DSQCOMM,
            COMMAND_LENGTH,
            PRINT_REPORT);

/*********************************************************************/
/* End the query interface session                                   */
/*********************************************************************/
COMMAND_LENGTH = LENGTH(END_QUERY_INTERFACE);

CALL DSQCIPL(DSQCOMM,
            COMMAND_LENGTH,
            END_QUERY_INTERFACE);

END       DSQABFP;
```

When the program detects that the user has tracing set on, the following trace output is written to the QMF trace output:

```
-------------------------------------------------------------------
         DSQDTRC :TRACE COMMAND OUTPUT                  (14534)
         TRACE_AREA_NUMBER
341033B8:  00000001                             *....            *
         TRACE_AREA_TITLE
341036A4:  C4E2D8C1 D66DC1D7 D7D36DE3 D9C1C3C5    *DSQAO_APPL_TRACE*
341036B4:  7A                                   *:               *
         TRACE_AREA_CONTENTS
340D0A14:  F2                                   *2               *
-------------------------------------------------------------------
         DSQDTRC :TRACE COMMAND OUTPUT                  (14535)
         TRACE_AREA_NUMBER
```

```
341033B8:  00000002                              *....            *
         TRACE_AREA_TITLE
341036A4:  C4E2D86D C3D6D4D4 6DD3C5E5 C5D37A     *DSQ_COMM_LEVEL: *
         TRACE_AREA_CONTENTS
340D0500:  C4E2D8D3 6EF0F0F1 F0F0F24C            *DSQL>001002<    *
-------------------------------------------------------------------
         DSQDTRC :TRACE COMMAND OUTPUT                  (14536)
         TRACE_AREA_NUMBER
341033B8:  00000003                              *....            *
         TRACE_AREA_TITLE
341036A4:  C4E2D86D C3E4D9D9 C5D5E36D C3D6D4D4   *DSQ_CURRENT_COMM*
341036B4:  6DD3C5E5 C5D37A                       *_LEVEL:         *
         TRACE_AREA_CONTENTS
33F00C50:  C4E2D8D3 6EF0F0F1 F0F0F24C            *DSQL>001002<    *
-------------------------------------------------------------------
```

Commands you can use in a RUN QUERY report minisession

Some commands you use in QMF applications force the display of a report while the application is running. This environment is called a report minisession. You can limit users' access to QMF by using report minisessions. In a report minisession, QMF limits the commands that a user can issue while viewing a report.

A report minisession behaves as a nested session (a session within a session). In minisessions, your initial QMF session remains intact, but becomes temporarily unavailable while you are viewing a report. The minisession becomes your current, active session until you issue the END command (or press the End function key). When you end a minisession, you either return to the initial QMF session or to the calling application, depending on how you write the application. The application cannot continue to issue subsequent commands until the report minisession ends.

The QMF global variable DSQDC_DISPLAY_RPT determines whether QMF starts a report minisession. This situation is because DSQDC_DISPLAY_RPT determines whether QMF displays a report after running a query. Set this variable to 1 to display the report and 0 to suppress display.

When you start QMF using the callable interface:

- The default value for global variable DSQDC_DISPLAY_RPT is 1. When QMF is started with DSQQMF*n* (either interactively or in batch mode) the default value of this global variable is 0. The variable *n* here represents the national language identifier.
- If you run a procedure or an application that runs a query, QMF starts a report minisession. QMF displays the report that results from the query in this minisession.
- If your procedure or application does not run a query, or if you run a query from the SQL Query panel, QMF does not start a report minisession.

If you do not want QMF to start a report minisession, take one of the following actions:

- Change the value of DSQDC_DISPLAY_RPT to 0.
- Set the DSQADPAN parameter to 0 when you start QMF from the callable interface.

From a report minisession, you can issue the following commands and synonyms for those commands. Restrictions are shown in parentheses.

- BACKWARD
- BOTTOM
- CANCEL (when pop-up window is active)
- CICS
- DISPLAY REPORT
- DISPLAY CHART
- END
- FORWARD
- GET GLOBAL

- HELP
- INTERACT
- ISPF
- LEFT
- MESSAGE
- PRINT REPORT
- PRINT CHART
- QMF
- RETRIEVE
- RIGHT
- SAVE DATA
- SET PROFILE
- SET GLOBAL
- SHOW REPORT
- SHOW CHART
- SWITCH (when online help is active)
- TOP
- TSO

The following are commands that are *not* valid in a minisession:

- ADD
- CANCEL
- CHANGE
- CHECK
- CLEAR
- CONNECT
- CONVERT
- DELETE
- DESCRIBE
- DISPLAY (QUERY, PROC, PROFILE, FORM, ANALYTICS)
- DRAW
- EDIT
- ENLARGE
- ERASE
- EXIT
- EXPORT
- EXTRACT
- GETQMF
- IMPORT
- INSERT
- INTERACT
- LIST
- NEXT
- PREVIOUS

- PRINT (QUERY, PROC, PROFILE, FORM)
- REDUCE
- REFRESH
- RESET GLOBAL
- RESET (Query, Proc, Form)
- RUN
- SAVE
- SEARCH
- SHOW
- SORT
- SPECIFY
- START
- SWITCH
- TRACE

QMF returns an error message when you run a CLIST or a procedure that issues a restricted command.

Related reference

Conventions for National Language Feature information
Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

SET GLOBAL (extended syntax)
To create your own global variables and use them in QMF commands as substitution variables, issue the SET GLOBAL command. You can also use the SET GLOBAL command to set values for QMF predefined global variables, which start with "DSQ."

Command synonyms

You can create command synonyms, which are commands that resemble QMF commands and can perform a variety of functions.

Command synonyms give you flexibility and they are useful for users. For example, command synonyms can perform the function of a command or start an application.

Chapter 9. Exporting and importing objects

You can write applications that issue QMF EXPORT and IMPORT commands to place objects outside of the QMF environment.

Your applications can export tables and the following QMF objects:

- DATA
- QUERY
- PROC
- FORM
- REPORT
- CHART

When you export objects except reports or objects that are in CSV format, QMF converts the object to an externalized format. QMF stores the externalized format of the object in a UNIX file (in the case of data or tables only), a TSO data set, or a CICS data queue. The externalized format of QMF objects is a powerful element of QMF application development.

The IMPORT command reads the externalized format and places the object either in QMF temporary storage or in the database. The location depends on how you issue the command.

What you can do with an exported UNIX file, TSO data set, or CICS data queue

The QMF EXPORT and IMPORT commands on data objects are useful in several situations.

For example, you can use the IMPORT and EXPORT commands to accomplish these goals:

- Provide query results to your application

  Use the QMF EXPORT command to get data out of the database and into your application.
- Create objects within your application and use them in QMF

  You can create an object outside of the QMF environment by using the appropriate format for the object. For example, in the case of data or tables, when you import the UNIX file into QMF, a new QMF object is created. A new object is also created when you import a TSO data set or CICS data queue that contains the object.

  You cannot import reports, charts, or CSV files into QMF. For reports and charts, you can instead import the data and the forms that were used to create them.
- Make QMF objects available to other environments or products.

  Attention: Use caution when transferring exported objects between systems with different CCSIDs or character sets, such as between EBCDIC and ASCII systems, or between different NLF environments. Transferring the objects between systems in this way might render them unusable.

  If you need to import a prompted or QBE query into a program other than QMF, you must first use the CONVERT QUERY command. The CONVERT QUERY command converts the query to an SQL query that you can export and use in other products.

  You can transfer QMF objects between QMF under TSO, ISPF, or native z/OS batch. You can also transfer QMF objects under CICS by using CICS extrapartition transient data queues.
- Save objects and data outside of the database

  For example, in the middle of a program, you can export your data so that an external program can manipulate it.

- Create bilingual applications

  You can create a QMF form in your presiding language and translate it to English by using the LANGUAGE option on the EXPORT command. You can also use the LANGUAGE option on the IMPORT and EXPORT commands to translate an English form to your presiding language.

Exporting versus saving data

The difference between the EXPORT DATA and SAVE DATA commands is in where and how the object is stored.

This difference in how objects are stored affects what you can do with the results:

- Exporting a data object produces a UNIX file, TSO data set, or CICS data queue. You can read, modify, or print each item sequentially through QMF application programs or other external applications.
- The SAVE DATA command produces a database table. Actions that use saved data must be taken through the database.

Exporting data objects and database tables

You can export data and table objects in the QMF, Integrated Exchange Format (IXF), XML, or comma-separated value (CSV) format. The QMF format is the default.

When you run a query, QMF displays the result in a report. The raw data for the report is stored in a temporary storage area as a data object. Relational tables and views that are stored in the database are referred to as table objects.

You can export data and table objects to storage areas external to QMF. The exported formats of a table in temporary storage (DATA) and a table stored in the database (TABLE) are identical. An object that is exported as data can be imported as a table, and vice versa, unless the data is in CSV format.

You can create your own tables outside of QMF. Use the QMF, IXF, or XML format and import the contents of the UNIX file, TSO data set, or CICS data queue that contains the table. Include the required fields and add your own data as appropriate. Then import the UNIX file, TSO data set, or CICS data queue into QMF as a table object.

Related concepts

Rules and information for exporting and importing data objects and tables
QMF exports data and table objects to temporary storage and has rules for how it allocates that storage. QMF also has specific ways for handling import errors.

Exporting data or tables in QMF format

The data file that you export by using the EXPORT command with the DATAFORMAT=QMF clause consists of two parts: header records, which describe the data in the records, and the data records, which contain the data.

Header records

Header records describe the exported data in the data file.

The record length of an external data file is the length of a row of the data, as described in the data record. The header records that precede the data records are the same length as the data records. If the header information exceeds the length of the data record, multiple header records are written.

Two formats are used for header records. One is used for short column names, and the other is used for long column names. The following tables show the information that is contained in each format of the header records.

Table 9. Header record information for short column names	
Byte position	**Information and type**
1-8	QMF object format level (8 characters of data) These byte positions say REL 1.0 when all the column names are short names and the DSQDC_SHORT_EXPT global variable is set to 1.
9-10	Number of header records (halfword signed integer)
11-12	Number of data columns (halfword signed integer)
13-30	Column name The maximum column width is 18 bytes.
31-32	Data type (halfword signed integer) Data type codes are shown in Table 11 on page 62. This field stores the hexadecimal equivalent of the decimal codes shown in the table for each data type.
33-34	Column width (halfword signed integer); for most data types this width is the width of the column in bytes, with the following exceptions: • In DECIMAL columns, the first byte of the halfword represents the precision, and the second byte represents the scale. • In GRAPHIC and VARGRAPHIC columns, this value reflects the width of double-byte characters. • In FLOAT columns, this value is either 4, indicating single-precision floating point, or 8, indicating double-precision floating point. • In DECFLOAT columns, this value is 8 for long-format values and 16 for extended-format values.
35	Nulls allowed: Y if nulls are allowed; N if they are not allowed (1 character of data)
36	Unused byte

The block that is described by bytes 13-36 repeats for as many columns as there are in the data.

Table 10. Header record information for long column names	
Byte position	**Information and type**
1-8	QMF object format level (8 characters of data) These byte positions say REL 3.0 when the DSQDC_SHORT_EXPT global variable is set to 0.
9-10	Number of header records (halfword signed integer)
11-12	Number of data columns (halfword signed integer)
13-42	Column name The default maximum name length is 30 bytes. However, you can use the DSQDC_SHORT_EXPT global variable to set a maximum column width of 18 bytes before you export the data. In that case, the header record format for short column names is used.

Table 10. Header record information for long column names (continued)	
Byte position	**Information and type**
43-44	Data type (halfword signed integer) Data type codes are shown in Table 11 on page 62. This field stores the hexadecimal equivalent of the decimal codes shown in the table for each data type.
45-46	Column width (halfword signed integer); for most data types this width is the width of the column in bytes, with the following exceptions: • In DECIMAL columns, the first byte of the halfword represents the precision, and the second byte represents the scale. • In GRAPHIC and VARGRAPHIC columns, this value reflects the width of double-byte characters. • In FLOAT columns, this value is either 4, indicating single-precision floating point, or 8, indicating double-precision floating point. • In DECFLOAT columns, this value is 8 for long-format values and 16 for extended-format values. The default maximum column width is 30 bytes. However, you can use the DSQDC_SHORT_EXPT global variable to set a maximum column width of 18 bytes before you export the data. In that case, the header record format for short column names is used.
47	Nulls allowed: Y if nulls are allowed; N if they are not allowed (1 character of data)
48	Unused byte

The block that is described by bytes 13-48 repeats for as many columns as there are in the data.

The data type codes are shown in this table. The hexadecimal codes shown in the first column are used to indicate each data type shown in the third column.

Table 11. Data type codes			
Code in hexadecimal	**Code in decimal**	**Data type**	**Meaning**
X'180'	384	DATE	Date
X'184'	388	TIME	Time
X'188'	392	TIMESTAMP	Timestamp
X'1C0'	448	VARCHAR	Varying-length character
X'1C4'	452	CHAR	Fixed-length character
X'1D0'	464	VARGRAPHIC	Varying-length graphic
X'1D4'	468	GRAPHIC	Fixed-length graphic
X'1E0'	480	FLOAT	Floating point
X'1E4'	484	DECIMAL	Decimal
X'1EC'	492	BIGINT	Big integer
X'1F0'	496	INTEGER	Integer
X'1F4'	500	SMALLINT	Small integer

Table 11. Data type codes (continued)			
Code in hexadecimal	**Code in decimal**	**Data type**	**Meaning**
X'38C'	908	VARBINARY	Varying-length binary
X'390'	912	BINARY	Fixed-length binary
X'3E4'	996	DECFLOAT(16) and DECFLOAT(34)	Long-format decimal floating point and extended-format decimal floating point
X'990'	2448	TIMESTAMP WITH TIME ZONE	Timestamp with time zone

Columns containing DATE, TIME, TIMESTAMP, or TIMESTAMP WITH TIME ZONE data types are always exported in ISO format.

Data records

Data records are in fixed block (FB) format and contain the data to be exported.

The maximum allowable length of a data record is 7,000 bytes. The length of a data record is the sum of the widths of the data types that are included in the record. Use the following table to calculate the widths of each data type.

Table 12. Widths of data records. Calculate the width of a particular data record by adding the number of bytes in each column.				
Data type	**Null indicator**	**Length field**	**SO/SI**	**Data**
Character 8 for long-format values; 16 for extended-format values	2			Length in header (LIH)
Date 8 for long-format values; 16 for extended-format values	2			LIH
Floating point 8 for long-format values; 16 for extended-format values	2			8
Decimal floating point	2			8 for long-format values; 16 for extended-format values
Big integer 8 for long-format values; 16 for extended-format values	2			LIH
Integer 8 for long-format values; 16 for extended-format values	2			LIH

Table 12. Widths of data records. Calculate the width of a particular data record by adding the number of bytes in each column. *(continued)*				
Data type	**Null indicator**	**Length field**	**SO/SI**	**Data**
Small integer 8 for long-format values; 16 for extended-format values	2			LIH
Time 8 for long-format values; 16 for extended-format values	2			LIH
Timestamp 8 for long-format values; 16 for extended-format values	2			LIH
Timestamp with time zone	2	2		LIH
Decimal	2			(Precision + 2) // 2
Graphic	2		2	(LIH × 2)
Variable character	2	2		LIH
Variable graphic	2	2	2	(2 × LIH)
Binary	2			LIH
Variable binary	2	2		LIH

Important: The LIH is the width given in the header record for that column.

Every data record has 2 bytes of indicator information, which can have the values and meanings shown in this table:

Table 13. Hex values that show the validity of data records	
Value	**Meaning**
X'0000'	The column contains valid data.
X'FFFF' or X'FFFE'	The column contains a null value; any data in the column is meaningless.

Interpreting a data object in QMF format

You can calculate the length of the header record when you have the length of the data records.

For example, suppose that you export the following data from the Q.STAFF table:

```
    ID  NAME             COMM
------  ---------  ----------
    10  SANDERS             -
    20  PERNAL         612.45
```

In this example, each data record is 23 bytes long. Table 10 on page 61 shows that the first 12 bytes contain level and number information.

Calculate the widths of each column as shown in this table:

Table 14. Calculating column widths			
Column name	**Data type**	**Column width (length in header)**	**Width of column**
ID	SMALLINT	2	2 + 2 = 4
NAME	VARCHAR	9	2 + 2 + 9 = 13
COMM	DECIMAL (7,2)	7	(7 + 1)/2 + 2 = 6
		Length of data record:	**23**

There are 24 bytes for each column of data, and there are three columns. Thus, for this three-column data object, the header is 84 bytes:

(12 + (24 x 3) = 84)

Each header record is the same length as the data records: 23 bytes. The 84 bytes are spread across four 23-byte header records; the last record is padded with blanks.

This sample header shows the header from the report and its hexadecimal representation. 40 is the hexadecimal code for a blank character. The reversed-type numbers are associated with notes that follow the sample.

```
       R  E  L      3  .  0             I  D
       [1]
1      D9 C5 D3 40 F1 4B F0 40 0004 0003 C9 C4 40 40 40 40 40 40 40 40
                               [2]  [3] [4]
                                      N     N  A M  E
2      40 40 40 40 40 40 40 01F4 0002  D5 00 D5 C1 D4 C5 40 40 40 40 40 40
                            [5]   [6] [7]
                                     Y     C  O  M  M
3      40 40 40 40 40 40 40 40 01C0 0009 E8 00 C3 D6 D4 D4 40 40 40 40 40
                                          Y
4      40 40 40 40 40 40 40 40 40 01E4 07 02 E8 00 40 40 40 40 40 40 40
```

Figure 13. Sample header records for an exported data object in QMF format

The next sample shows the data from the report and the hexadecimal representation of that data. For information about what the byte positions mean, see Table 10 on page 61.

```
              10             S  A  N  D  E  R  S
1   00 00 00 0A 00 00 00 07 E2 C1 D5 C4 C5 D9 E2  00 00 FF FF 00 00 00 40 40
              [8]          [9]                                [10]
              20             P  E  R  N  A  L
2   00 00 00 14 00 00 00 06 D7 C5 D9 D5 C1 D3 00 00 00 00 00 00 61 24 5C
```

Figure 14. Sample data records for an exported data object in QMF format

1 REL 3.0
Object format level: 3.0

The object format level tells QMF which version of the object format this object is using. Every time a QMF object format is changed, the level number is changed; object formats are not changed with every new release.

2 X'0004'
Number of header records: 4

3 X'0003'
Number of data columns: 3

4 **X'C9 C4'**
Column name: ID

5 **X'1F4'**
Data type: SMALLINT

6 **X'0002'**
Column width: 2

7 **X'D5'**
Nulls allowed: N signifies no

8 **X'0A'**
Value for the first column of the first data record: 10

9 **X'07'**
Length of the name in the second column of the first data record: 7

10 **X'FFFF'**
Indicator information: column contains a null value

Exporting data or tables in IXF format

When you use the EXPORT command to export a data object or table with the DATAFORMAT=IXF option, the data is exported in the Integrated Exchange Format (IXF). QMF supports a subset of IXF.

The TSO data set or CICS data queue that contains the exported data or table consists of the following records:

- Header record (H)
- Table record (T)
- Column records (C)
- Data records (D)

The exported data set or CICS data queue consists of one H record, followed by one T record. The T record contains a count of how many C records follow the T record. There is a C record for each column in the table. D records follow C records. There is a D record for each row in the table. The arrangement of the records is displayed in the following graphic:

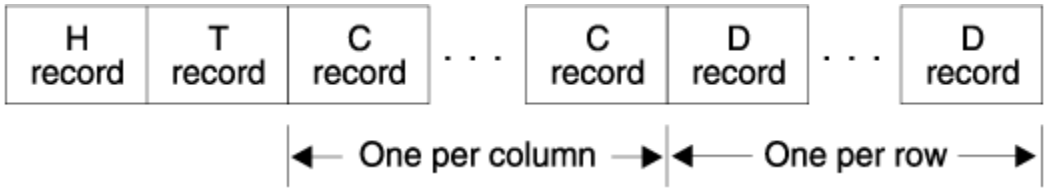


Figure 15. Arrangement of records in an exported data set or CICS data queue (IXF format)

Header record (H)

A header record (which is mandatory) in IXF format is the first record in the data set or CICS data queue.

The header record is a 42-byte record that contains character data. The format of the H record is shown in this table:

Table 15. Parts of a header record in an IXF data set or data queue that contain an exported data object or database table

Byte position	Information and type
01	Header record indicator (H)
02-04	TSO data set or CICS data queue identifier

Table 15. Parts of a header record in an IXF data set or data queue that contain an exported data object or database table (continued)	
Byte position	**Information and type**
05-08	IXF version; the version can be one of the following types: • 0000, which supports data or tables that contain short column names (18 or fewer characters) and no TIMESTAMP WITH TIME ZONE columns • 0001, which supports data or tables that contain at least one long column name (19 characters or more) and no TIMESTAMP WITH TIME ZONE columns • 0002, which supports data or tables that contain short column names (18 or fewer characters) and at least one TIMESTAMP WITH TIME ZONE column • 0003, which supports data or tables that contain at least one long column name (19 characters or more) and at least one TIMESTAMP WITH TIME ZONE column
09-14	Originating product name (QMF)
15-20	Originating product release level (VDR1M0)
21-28	Date that the data set or CICS data queue was created, in the form *YYYYMMDD*
29-34	Time that the data set or CICS data queue was created, in the form *HHMMSS*
35-39	The number of records that precede the first D (data) record in the data set or CICS data queue; this value is a five-digit numeric value expressed in character form
40	DBCS indicator that tells whether DBCS data is a possibility; Y or N
41-42	Blanks

Table record (T)

A table record in IXF format follows the header record. Each data set or data queue that contains an object in IXF format must have a T record. A table record contains table and data information about the object that was exported with the EXPORT TABLE or EXPORT DATA command.

Names of tables that are exported in IXF format are truncated at 18 characters and owner names are truncated at 8 characters. If you run a query and export the resulting DATA object, the table record contains a blank owner and name.

The format of a T record is shown in this table:

Table 16. Parts of a table record in an IXF data set or data queue that contain an exported data object or database table	
Byte position	**Information and type**
01	Table record indicator (T)
02-03	Data name length (18)
04-21	Name of the table from which data is retrieved; left-aligned, padded with blanks to the right The entire 18-byte field is blank if the table does not have a name.

Table 16. Parts of a table record in an IXF data set or data queue that contain an exported data object or database table (continued)	
Byte position	**Information and type**
22-29	Data name qualifier; name of the owner of the database table from which the data is retrieved The 8-byte field is blank if the table does not have an owner.
30-41	Data source (database)
42	Convention used to describe data: C for columnar data
43	Data format: C for character (OUTPUTMODE=CHARACTER); M for machine (OUTPUTMODE=BINARY)
44	Data location: I for internal
45-49	Count of column (C) records: a numeric value in character form that specifies the number of C records before the first data (D) record
50-51	Reserved
52-81	Blanks

Column records (C)

A column record in IXF format describes the data characteristics of the column. There is a column record for each column in the table.

When a column name longer than 18 characters exists, the column name field in the column record must be increased from 18 to 30 characters. The IXF version number that is used in the header record depends not only on whether there is a column name longer than 18 characters, but also whether the data contains a TIMESTAMP WITH TIME ZONE column. Table 15 on page 66 shows the IXF version numbers used in each case.

The following table shows the format of a column record for data or tables that contain no TIMESTAMP WITH TIME ZONE columns (IXF version numbers 0000 or 0001). For information about data or tables that contain one or more TIMESTAMP WITH TIME ZONE columns (IXF version numbers 0002 or 0003), see Table 18 on page 69.

Table 17. IXF format with no TIMESTAMP WITH TIME ZONE columns (IXF version numbers 0000 or 0001)	
Byte position	**Information and type**
01	Column record indicator (C)
02-03	Column name length
04-21	Column name, as obtained from the database or generated by QMF (in the case where the column did not originally have a name) The name is left-aligned, and padded with blanks to the right if necessary.
22 or 34	Indicator that tells if nulls are allowed; Y or N
23 or 35	Column-selected indicator (Y)
24 or 36	Key column indicator (Y)
25 or 37	Data class (R)

Table 17. IXF format with no TIMESTAMP WITH TIME ZONE columns (IXF version numbers 0000 or 0001) (continued)	
Byte position	**Information and type**
26-28 or 38-40	Data type (For data type codes, see Table 20 on page 71)
29-33 or 41-45	Code page
34-38 or 46-50	Reserved
39-43 or 51-55	Column data length; a decimal value in character form If the data type is DECIMAL, the first 3 bytes represent data precision and the next 2 bytes represent the scale. If the data type is BIGINT, INTEGER, or SMALLINT, this field is blank because the length is inherent in the data type.
44-49 or 56-61	Starting position of column data; a decimal value in character form This value reflects the offset of the data for a column from the start of the data record. If the column allows nulls, this field points to the null indicator. If the column does not allow nulls, it points to the data itself. Whether the column allows nulls, space for the null indicator is always present in the record. The starting position is based from the first byte that contains data. Therefore, the first five bytes of the data (D) record are not included in any consideration for starting position of the actual data. (The first data position is position 1, not position 0.)
50-79 or 62-91	Column label information, if available (if not available, these byte positions contain blanks)
80-81 or 92-93	Two bytes of zeros in character form (00)

If the data or table contains one or more TIMESTAMP WITH TIME ZONE columns, the format of the column record is as follows:

Table 18. IXF format with one or more TIMESTAMP WITH TIME ZONE columns (IXF version numbers 0002 or 0003)	
Byte position	**Information and type**
01	Column record indicator (C)
02-03	Column name length
04-21	Column name, as obtained from the database or generated by QMF (in the case where the column did not originally have a name) The name is left-aligned, and padded with blanks to the right if necessary.
22 or 34	Indicator that tells if nulls are allowed; Y or N
23 or 35	Column-selected indicator (Y)
24 or 36	Key column indicator (Y)
25 or 37	Data class (R)
26-29 or 38-41	Data type (see Table 20 on page 71 for data type codes)
30-34 or 42-46	Code page

Table 18. IXF format with one or more TIMESTAMP WITH TIME ZONE columns (IXF version numbers 0002 or 0003) (continued)	
Byte position	**Information and type**
34-38 or 47-50	Reserved
39-43 or 51-55	Column data length; a decimal value in character form If the data type is DECIMAL, the first 3 bytes represent data precision and the next 2 bytes represent the scale. If the data type is BIGINT, INTEGER, or SMALLINT, this field is blank because the length is inherent in the data type.
44-49 or 56-61	Starting position of column data; a decimal value in character form This value reflects the offset of the data for a column from the start of the data record. If the column allows nulls, this field points to the null indicator. If the column does not allow nulls, it points to the data itself. Whether the column allows nulls, space for the null indicator is always present in the record. The starting position is based from the first byte that contains data. Therefore, the first five bytes of the data (D) record are not included in any consideration for starting position of the actual data. (The first data position is position 1, not position 0.)
50-79 or 62-91	Column label information, if available (if not available, these byte positions contain blanks)
80-81 or 92-93	Two bytes of zeros in character form (00)

Data records (D)

Data records in IXF format are in variable block (VB) format. There is a data record for each row in the table.

This table shows the format of a data record:

Table 19. Format of a data record in an IXF data set or data queue that contains an exported data object or table	
Byte position	**Information and type**
01	Data record indicator (D)
02-04	Reserved
05	Blank
06-end of record	Row data in binary or character form, depending on whether byte 43 of the table record is M (machine) or C (character) Byte 6 represents the start (position 1) of row data for the first column.

Column data format

Data in D records for *n* columns is placed side by side, as shown in this figure.

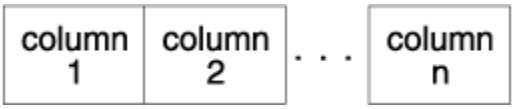


Figure 16. Format of column data in D records

For each column, the data consists of a null indicator followed by the data itself. If nulls are allowed (byte 22 or 34 of the C record has a value of Y), then bytes 44-49 or 56-61 of each C record point to the null indicator that precedes the data for that column. If nulls are not allowed (byte 22 or 34 of the C record has a value of N), then bytes 44-49 or 56-61 point to the data itself. However, in the latter case, space for the null indicator is left in the data record. The first position in bytes 44-49 or 56-61 is represented by a value of 1, which points to byte 6 of a D record (bytes 1 through 5 are ignored).

The representation of the null indicator depends on what is specified for OUTPUTMODE: character or binary. OUTPUTMODE is reflected in byte 43 of the T record: C for character or M for machine (binary). When the data format is character, 1 byte is used for the null indicator:

- A dash (-) indicates that the data is null
- A blank indicates that the data is not null

When the data format is binary, 2 bytes are used for the null indicator:

- X'FFFF' indicates that the data is null
- X'0000' indicates that the data is not null

For more information about the null indicator, see the examples that help you interpret an object in IXF format, below.

Format of column data by data type

The length and format of IXF column data in D records can differ depending on the OUTPUTMODE.

This table shows the length and format of column data in D records for each data type for both character and binary export formats. In the table, IXFCLENG refers to the contents of bytes 39-43 or 51-55 of a C record (length of column data).

Table 20. Format of IXF column data by data type

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)

384	DATE	The value in IXFCLENG is not significant for this data type. The length (10 bytes) is inherent in the data type.
		The format is:
		`yyyy-mm-dd`
		where *yyyy* represents the year, *mm* the month, and *dd* the day. *yyyy*, *mm*, and *dd* must be numeric characters. Leading zeros cannot be omitted. The allowable range for *yyyy* is 0001-9999; for *mm* it is 01-12. The *dd* range depends on the month. For example, the following value specifies a date of February 28, 2002:
		`2002-02-28`
			Same as character format

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)
388	TIME	The value in IXFCLENG is not significant for this data type. The length (8 bytes) is inherent in the data type. The format is: `hh.mm.ss` where *hh* represents the hour in 24-hour format, *mm* is minutes, and *ss* is seconds. *hh*, *mm*, and *ss* must all be numeric characters. Leading zeros cannot be omitted. Allowable ranges are: • 00 - 23 for *hh* • 00 - 59 for *mm* • 00 - 59 for *ss* The special value 24.00.00 for midnight is valid. Examples: `10.37.42` is 10:37:42 AM `08.00.00` is 8 AM exactly `23.30.00` is 11:30 PM	Same as character format

392	TIMESTAMP	The length of TIMESTAMP(0) is 19; the length of TIMESTAMP(*n*) is 20+*n*, where *n* is a number from 1 to 12. For example, a column defined as TIMESTAMP(12) has a length of 32.
		The format is:
		`yyyy-mm-dd-hh.mm.ss.nnnnnnnnnnnn`
		where *yyyy* is the year, *mm* is the month, *dd* is the day, *hh* is hour in 24-hour format, *mm* is minutes, *ss* is seconds, and *nnnnnnnnnnnn* is fractional seconds. Valid ranges for year, month, day, hour, minutes, and seconds are the same as the DATE and TIME data types.
		Examples:
		`2010-12-31-23.59.59.999999999999`
		(the last fractional second in 2010)
		`2010-01-01-00.00.00.000000000001`
		(the first fractional second in 2010)
		24.00.00.000000000000 is valid for the time portion of a timestamp.
			Same as character format

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)
448	VARCHAR LONG VARCHAR	IXFCLENG is the maximum length of the character string. Data length consists of *n* bytes indicated by IXFCLENG preceded by a 5-byte character count field. (The allowable range for *n* is 0-32704 and for the count field it is 0-*n*.) The number of characters indicated by the count field are valid; the rest are meaningless. For example, if IXFCLENG=00010, the data takes this format: `00005JONESxxxxx` In this format, each *x* is a blank character (X'40').	IXFCLENG is the maximum length of the character string. The data length consists of *n* bytes indicated by IXFCLENG preceded by a 2-byte binary count field. (The allowable range for *n* is 1-32704 and for the count field it is 0-*n*.) The number of characters indicated by the count field are valid; the rest are meaningless. For example, if IXFCLENG=00010, the data format is as follows: `nnJONESxxxxx` In this format, *nn*=X'0005' and each *x* is a blank character (X'40').
452	CHAR	IXFCLENG is the length of the character string. Data length is indicated by *n* bytes of IXFCLENG. (The allowable range for *n* is 1-254). For example, if IXFCLENG=00005, the data takes this format: `JONES` In this format, JONES is the 5-byte character string pointed to by bytes 44-49 or 56-61 of the C record.	Same as character format

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)
464	VARGRAPHIC LONG VARGRAPHIC	IXFCLENG is the maximum number of double-byte characters (2×*n* bytes). Data length consists of a 5-byte character count field, plus twice the number of bytes indicated by IXFCLENG, plus 2 (for shift characters). The number of 2-byte characters in the count field are valid plus a shift-out (X'0E') immediately preceding the data, and a shift-in (X'0F') immediately following the data. The rest can be meaningless. (The allowable range for *n* is 1-16352 and for the count field the allowable range is 0-*n*.) For example, if IXFCLENG = 00006, the data takes this format: `00003oZZYYXXixxxxxx` In this format, the letter *o* is shift-out, *i* is shift-in, and each *x* is a blank character (X'40').	Data length consists of a 2-byte binary count field followed by twice the number of bytes indicated by IXFCLENG. The allowable range for IXFCLENG is 1-16352, and for the count field it is 0-IXFCLENG. The number of 2-byte characters in the count field are valid. There are no surrounding shift-out and shift-in characters. The rest can be meaningless. For example, if IXFCLENG = 00008, the data takes this format: `nnZZYYXXWWxxxxxxxx` In this format, *nn*=X'0004' and each *x* is a blank character (X'40').
468	GRAPHIC	IXFCLENG is the number of double-byte characters (2*n bytes). Data length is 2*n bytes plus a shift out (X'0E') immediately preceding the data, and a shift-in (X'0F') immediately following the data. For example, if IXFCLENG=00005, the data takes this format: `oZZYYXXWWVVi` In this format, the letter *o* is shift-out and *i* is shift-in.	Same as character format except that there are no surrounding shift-in and shift-out characters in the data string For example, if IXFCLENG=00005, the data format is as follows: `ZZYYXXWWVV`

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)

480	FLOAT	The value in IXFCLENG is 4 for single-precision values and 8 for double-precision values. The length and format of the data is determined by the precision of the value.
		Single-precision values consist of up to 14 characters in the following format:
		`sn.nnnnnnnEsee`
		In this format:
		• *s* is an optional sign (a plus, a minus, or, in the case of the first position, a blank if the number is positive).
		• *n* represents the digits of the significand, which can be up to 8 digits. A decimal point must be in the second position of the significand.
		• E signifies the beginning of the exponent.
		• *e* represents the digits of the exponent, which can be one or two digits.
		The value must be in the range +/-5.4E-79 to +/-7.2E+75.
		Examples:
		`-1.2345679E+07`
		` 6.2345679E-01`
		` 0.0000000E+00`
		Double-precision values consist of up to 23 characters in the following format:
		`sn.nnnnnnnnnnnnnnnEsee`
		In this format:
		• *s* is an optional sign (a plus, a minus, or, in the case of the first position, a blank if the number is positive).
		• *n* represents the digits of the significand, which can be up to 18 digits. A decimal point must be in the second position of the significand.
		• E signifies the beginning of the exponent.
		• *e* represents the digits of the exponent, which can be 1 or 2 digits.
		The value must be in the range +/-5.4E-79 to +/-7.2E+75.
		Examples:
		`-1.2345678901234568E+14`
		` 6.2345678901234568E-01`
		` 0.0000000000000000E+00`
			The value in IXFCLENG is 4 for single-precision values and 8 for double-precision values. The data consists of a 4-byte floating-point value for single precision and an 8-byte floating-point value for double precision.

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)

484	DECIMAL	Bytes 39-43 or 51-55 of the C record represent the precision, or P (first 3 bytes), and scale, or S (next 2 bytes), of the number. The allowable range for P is 0-15. S can be any value less than or equal to P.
		Data is formatted as a P+2-byte character value (or P+1 bytes if S=0), right-aligned, with the first byte reserved for a sign, and a decimal point (the position of which is implied by S) present only if S is not equal to zero. For example, if P=005 and S=00, the data takes the following format:
		`12345`
		If P=006 and S=02, the data takes the following format:
		`+2345.10`
		If P=004 and S=03, the data takes the following format:
		`-8.515`
			Bytes 39-43 or 51-55 of the C record represent the precision, or P (first 3 bytes), and scale, or S (next 2 bytes), of the number. The allowable range for P is 0-15. S can be any value less than or equal to P.
			The data consists of a (P+2)/2-byte decimal value in packed decimal format. The last byte indicates the sign of the value. For example, if P=005 and S=00, the data format is as follows:
			`X'12345C'`
			If P=006 and S=02, the data format is as follows:
			`X'0234510D'`

492	BIGINT	The value in IXFCLENG is not significant for this data type. The length and format of the data is inherent in the data type. The data consists of a 20-byte character value, right-aligned, with the first character reserved for a sign. Examples:
		`00000000000000000033`
		`+9223372036854775807`
		`-9223372036854775808`
			The value in IXFCLENG is not significant. The length and format of the data is inherent in the data type. The data consists of an 8-byte binary value.

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)

496	INTEGER	The value in IXFCLENG is not significant for this data type. The length and format of the data is inherent in the data type.
		The data consists of an 11-byte character value, right-aligned, with the first character reserved for a sign. Examples:
		`0000000013`
		`+1187642200`
		`-0033588727`
			The value in IXFCLENG is not significant. The length and format of the data is inherent in the data type.
			The data consists of a 4-byte binary value.

500	SMALLINT	The value in IXFCLENG is not significant for this data type. The length and format of the data is inherent in the data type.
		The data consists of a 6-byte character value, right-aligned, with the first character reserved for a sign. Examples:
		`00023`
		`+00763`
		`-21311`
			The value in IXFCLENG is not significant. The length and format of the data is inherent in the data type.
			The data consists of a 2-byte binary value.

908	VARBINARY	Not applicable	Same as VARCHAR, except that: • IXFCLENG is the maximum length (number of bytes) of the binary string. • The allowable range for *n* is 0-32704.
912	BINARY	Not applicable	Same as CHAR, except that: • IXFCLENG is the length (number of bytes) of the binary string sequence. • The allowable range for *n* is 1-255.

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)

996	DECFLOAT	The value in IXFCLENG is 16 for long-format values and 34 for extended-format values. The length and format of the data is determined by the precision of the value.
		Long-format values consist of up to 23 characters in the following format:
		`sn.nnnnnnnnnnnnnnEseee`
		In this format:
		• *s* is an optional sign (a plus, a minus, or, in the case of the first position, a blank if the number is positive).
		• *n* represents the digits of the significand, which can be up to 16 digits. A decimal point must be in the second position of the significand.
		• E signifies the beginning of the exponent.
		• *e* represents the digits of the exponent, which can be up to 3 digits.
		The value must be in the range +/-1.0E-398 to +/-1.0E+384.
		Examples:
		`-1.234567890123456E+003`
		`1.234567890123456E-015`
		`0.000000000000000E+000`
		Extended-format values consist of up to 42 characters in the following format:
		`sn.nnnnnnnnnnnnnnnnnnnnnnnnnnnnnnEseeee`
		In this format:
		• *s* is an optional sign (a plus, a minus, or, in the case of the first position, a blank if the number is positive).
		• *n* represents the digits of the significand, which can be up to 34 digits. A decimal point must be in the second position of the significand.
		• E signifies the beginning of the exponent.
		• *e* represents the digits of the exponent, which can be up to 4 digits.
		The value must be in the range +/-1.0E-6176 to +/-1.0E+6144.
		Examples:
		`-1.234567890123456789012345678901234E+0033`
		`4.321098765432109876543210987654321E-0001`
			The value in IXFCLENG is 8 for long-format values and 16 for extended-format values. The data consists of an 8-byte decimal floating-point value for long format and a 16-byte decimal floating-point value for extended format.

Table 20. Format of IXF column data by data type (continued)

Data type code	Data type	Data length information (when OUTPUTMODE = CHARACTER)	Data length information (when OUTPUTMODE = BINARY)
2448	TIMESTAMP WITH TIME ZONE	The length is 147 for TIMESTAMP(0) WITH TIME ZONE and 148 + *n* for TIMESTAMP(*n*) WITH TIME ZONE, where *n* = 1-12. The format is: `yyyy-mo-dd-hh-mm-ss-nnnnnnnnnnnnzth:tm` where *yyyy-mo-dd-hh-mm-ss* specifies the timestamp in the same way as for TIMESTAMP data and: • *nnnnnnnnnnnn* specifies a 0-12 digit number that represents the number of fractional seconds. • *z* is a plus (+) or minus (-) sign that indicates the time zone offset relative to Coordinated Universal Time UTC), formerly known as Greenwich Mean Time (GMT). • *th* is a two-digit value that represents the time zone hours. • *tm* is a two-digit value that represents the time zone minutes. The valid range for the time zone portion of the format is from -24:00 to +24:00. To specify UTC, you can either specify a time zone of -0:00 or +0:00 or replace the time zone offset and its sign with an uppercase Z. For example, 2010-09-30-13.08.36.123456654321-08:00 indicates a time of 1:08 P.M. and 36.123456654321 seconds on September 30, 2010, in San Jose, California, in the United States. The timestamp 2010-09-30-13.08.36.123456654321Z indicates a time of 1:08 P.M. and 36.123456654321 seconds wherever UTC is in effect.	Same as character format

Interpreting an object exported in IXF format

The following example helps you interpret data that is exported in IXF format.

Assume that the table shown in the example of a data object in QMF format is now exported with the IXF format (with OUTPUTMODE=CHARACTER). The table to be exported is as follows:

```
    ID  NAME             COMM
------  ---------  ----------
    10  SANDERS             -
    20  PERNAL         612.45
```

The exported data set or CICS data queue consists of a total of seven records; an H record, a T record, three C records, and two D records as shown here:

```
HIXF0000QMF   VAR1M0201012040956000005N
T18                        database         CCI00003
C02ID                NYNR50000000          000002                      00
C04NAME              YYNR44800000     00009000008                      00
C04COMM              YYNR48400000     00702000023                      00
```

```
D      00010 00007SANDERSxx  -
D      00020 00006PERNALxxx  00612.45
```

Unprintable binary characters are shown as *x* characters. This figure gives more detailed information about these records.

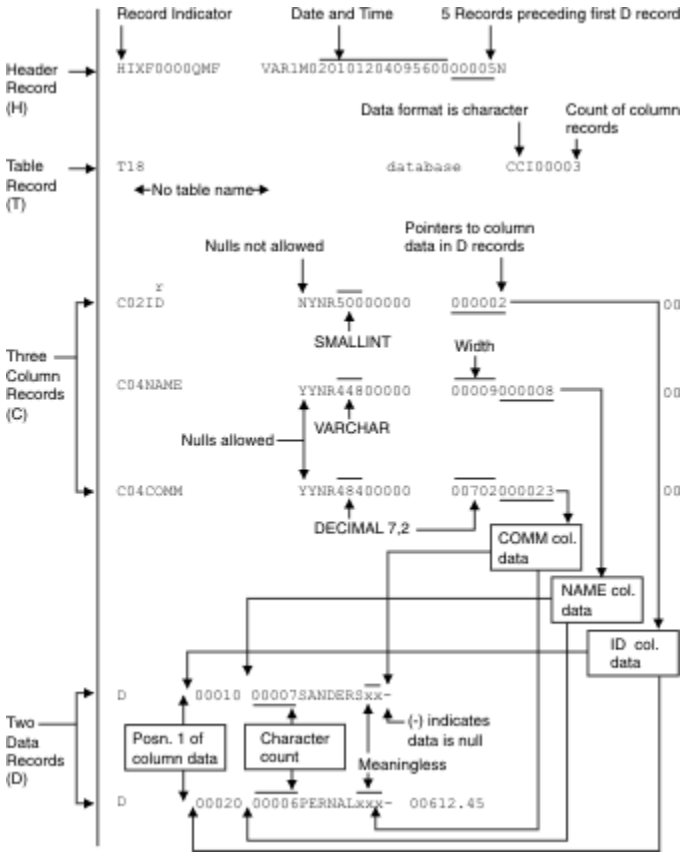


Figure 17. Format of sample IXF records (OUTPUTMODE=CHARACTER)

Now suppose that the same table is exported with the IXF format, but with OUTPUTMODE=BINARY. The exported data set or CICS data queue consists of seven records which are shown in the table:

```
HIXF0000QMF   VAR1M020101204095650000005N
T18                          database        CMI00003
C02ID               NYNR50000000          000003                    00
C04NAME             YYNR44800000     00009000005                    00
C04COMM             YYNR48400000     00702000018                    00
D    xxxxxxxxSANDERSxxxxxxxxx
D    xxxxxxxxPERNALxxxxxxxxx
```

Except for bytes 44-49 or 56-61 (starting position of column data), the information in the H, T, and C records is essentially the same. The data in the D records, however, differs significantly. The following figure contains more information about the records of the exported data set or CICS data queue.

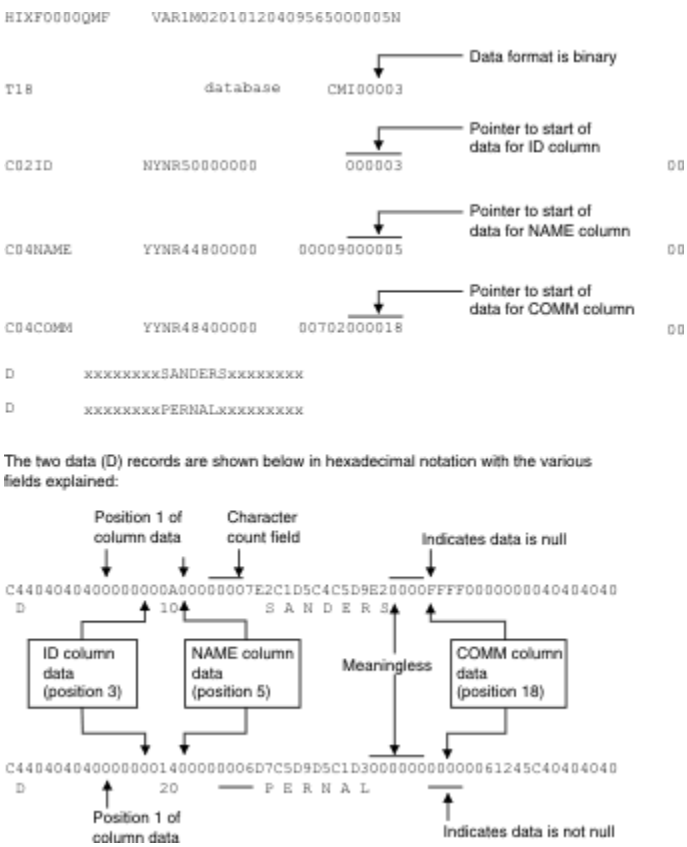


Figure 18. Format of sample IXF records (OUTPUTMODE=BINARY)

Exporting data or tables in XML format

If your data or table contains an XML column or LOB data, you must use the DATAFORMAT=XML clause on the EXPORT DATA or EXPORT TABLE command. This format can also be used when the data or table to be exported does not contain an XML column or LOB data.

Restriction: QMF supports operations with XML data only when you are connected to a database release that supports the XML data type.

When you export data or tables in XML format, the data is exported to the UNIX file, TSO data set, or CICS data queue that you specify in the command. QMF uses the XML 1.0 specification (fourth edition) when importing and exporting data.

QMF uses z/OS XML parse services and z/OS Unicode conversion services when processing XML data for export or import, so these services must be configured and active.

All tags shown in the XML examples must be present before you import the XML column data. The tags must be present in the contents of the file, data set, or CICS data queue because QMF uses these tags to parse the file. When QMF encounters the <extensions> tag at the end of the file, the cursor is closed and the import is finished. Modifying or deleting this tag results in an infinite read of the data.

The data is exported as an XML document in Unicode UTF-8 format with a CCSID of 1208. The exported XML data set or CICS data queue consists of header records, records that define the result set, metadata records for each column in the data or table, and data records for each row in the exported data or table.

Header records

The header records in the exported XML file contain the version of XML that is used, the encoding scheme, and the style sheet that is used to format the exported XML document.

The following example shows the type of information that is included in the header records of an exported file:

```
<?xml version="1.0" encoding="UTF-8" ?>
  <!-- ?xml-stylesheet type="text/xsl" href="qmf.xslt" ? -->
```

QMF provides a style sheet that you can use to format your exported XML data. The default style sheet (with the default name `qmf.xslt`) is supplied as member DSQ1STSH of the QMF samples data set, QMF1310.SDSQSAP*n* (where *n* is a national language identifier). Copy this default style sheet to the location of the exported file, then open the XML document to have it formatted to these specifications. If you use a different name for the style sheet, change the header in the exported file to refer to the new style sheet name.

Records that define the result set

The result set definition contains a namespace definition and a schema definition for the QMF schema file that is used with the XML file.

This example shows the records for the result set definition in a sample exported XML file that contains seven columns:

```
<DataSet xmlns="http://www.ibm.com/QMF" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" >
<ResultSet>
 <Metadata>
  <SourceDescription />
  <ColumnsAmount>7</ColumnsAmount>

    .....Definitions for each column go here.

 </Metadata>
 <Data>

   .....Data for each row goes here.

 </Data>
</ResultSet>
<Extensions />
</DataSet>
```

Metadata records

The column metadata in the exported XML file consists of the number of columns, column names, column labels (if applicable), data types, data lengths, whether the data is null, and the format.

An example of the metadata for a column called "ID" is shown here. The exported XML file contains one column-description block for each column.

```
<ColumnDescription id="1">
  <Name>ID</Name>
  <Label>ID</Label>
  <Type>smallint</Type>
  <Width>2</Width>
  <Nullable>false</Nullable>
  <Format>plain</Format>
</ColumnDescription>
```

Data records

The exported XML file contains one row-definition block for each row of exported data. Data records are in variable block spanned (VBS) format.

A <cell> tag identifies each column in the row by number, as shown here for the first row of the Q.STAFF sample table:

```
<Row id="0">
  <Cell id="1">10</Cell>
  <Cell id="2">SANDERS</Cell>
  <Cell id="3">20</Cell>
```

```
  <Cell id="4">MGR</Cell>
  <Cell id="5">7</Cell>
  <Cell id="6">99999.99</Cell>
  <Cell id="7" null="1" />
</Row>
```

When you use the DATAFORMAT=XML clause on the EXPORT DATA or EXPORT TABLE command and the data contains a column defined with the XML data type, QMF wraps the XML data in CDATA tags. The CDATA tags prevent the parser from trying to process the XML data. Here is an example of how XML data appears in an exported file.

```
<Data>
<Row id="0">
<Cell id="1">Murphy</Cell>
<Cell id="2">1234</Cell>
<Cell id="3"[CDATA[xml version="1.0" encoding="utf-8"?]]Cell>
</Row>
</Data>
```

How QMF validates the XML

An XML schema document describes the structure of an XML document and defines parameters for the validity of elements and attributes within the XML document.

A default schema file is provided with QMF as member DSQ1SCEM of the QMF samples data set, which is QMF1310.SDSQSAP*n* (where *n* is a national language identifier). Copy this member to the directory where the file that contains the XML document is stored. Name the schema document `qmf_data.xsd`, which is the name for the default schema document under QMF for Workstation and QMF for WebSphere®. You can modify the default schema file according to your business needs for formatting XML data. If you use a name other than qmf_data.xsd or use a different schema file, change the name in any files that reference the schema document.

Exporting data or tables in CSV format

You can export data or tables in CSV (comma-separated value) format. You can then download the exported data to your workstation where the data in CSV format can be used with applications such as Microsoft Excel.

When you export data or tables in CSV format, you can use the HEADER option to specify whether to export column headings along with the data. The default is to include the column headings. If you export column headings, the value of the DSQDC_COL_LABELS global variable controls whether column labels or column names are exported. The default of DSQDC_COL_LABELS is 1, which means that column labels are exported.

Exported data is formatted as rows of column values that are separated by the column separator. If HEADER=YES is specified, one row of column names separated by a column separator precedes the rows of column values. The column separator value is determined by the user's Q.PROFILES.DECIMAL value.

Data that is exported in CSV format is encoded in the local Db2 for z/OS SBCS encoding scheme.

Rules and information for exporting and importing data objects and tables

QMF exports data and table objects to temporary storage and has rules for how it allocates that storage. QMF also has specific ways for handling import errors.

Allocation of UNIX files, TSO data sets, or CICS data queues

The QMF IMPORT DATA command appears to store the data in the QMF temporary storage area and display the report on the screen. Actually, only a portion of the data is stored and displayed. The UNIX file, TSO data set, or CICS data queue remains open and allocated to QMF. QMF reads records when the user scrolls through the data.

This connection is maintained until the data object is replaced or reset, or QMF reads all the records. Then the UNIX file, TSO data set, or CICS data queue is closed and is no longer considered allocated to QMF. An

application should not attempt to delete or alter a UNIX file, TSO data set, or CICS data queue allocated to QMF with an IMPORT DATA command. The application needs either to use another data source or empty the QMF temporary storage area for the data object (by using a RESET DATA command). Then the application can try to alter or delete the file, data set, or data queue it is reading.

During the execution of the IMPORT command, QMF does not lock the UNIX file, TSO data set or CICS data queue while it is being read. It does not take steps to prevent the file, data set, or queue from being altered while it is being read. If the file, data set, or queue is erased or altered before QMF finishes reading it, the results are unpredictable and can cause a system error.

An incomplete data prompt can occur when there is not enough temporary storage to retrieve the entire object to be exported. If you need extra storage, you can use the DSQSPILL parameter to specify the use of spill storage. If you are using QMF under TSO, you can specify the DSQSPTYP parameter in addition to the DSQSPILL parameter to use extended storage for spilling data.

Export errors

After QMF imports data from a UNIX file, TSO data set, or CICS data queue, QMF displays the REPORT panel and a confirmation message.

If the file, data set, or data queue contains format errors, QMF does not display the REPORT panel. If there are format errors, QMF displays an error message on the object panel that was current before QMF processed the IMPORT command. However, if the current object panel was the REPORT panel, and QMF finds errors in the imported data, QMF displays the home panel and an error message.

Exporting forms, reports, and prompted queries

The form and prompted query objects are exported and imported in an encoded format that represents the object in a tabular structure. Reports are also exported in an encoded format; however, they cannot be imported.

The encoded format helps you manipulate individual parts of an object more easily. The following conditions apply when you export an object with the encoded format:

- All table and field numbers are written out as four-digit numbers.
- The table columns are written out in the order in which they normally appear in the object, except that the column with the maximum length is moved to the right end of the table record and associated row records.
- Numeric lengths are three digits long (including leading zeros, if necessary).
- A blank character is used as a delimiter in all records.
- The delimiter is not written following the last character of each record.
- Blanks are written in all reserved fields.
- An E record is the last record written to the output file.

Related reference

Size specifications for externalized objects

External tables and objects have both record size and record format specifications that vary by the type of object.

General format of the exported file

The encoded format of a form, report, or prompted query consists of fixed-format header records and variable-format records that the object is comprised of.

Header records

Most records of exported forms, reports, or prompted queries have a variable format. However, header records have a fixed format, even though the data set or data queue that contains the records can be of variable format.

These records are used to identify the contents of the exported form, report, or prompted query. A header record is the first record of the exported data set or data queue. It describes the characteristics of the object.

A header record contains the information described in this table. An asterisk indicates that the field is required for import.

Table 21. Header record information

Byte position	Information and type
01*	Header record indicator (H)
02	Blank
03-05*	Product identifier (QMF)
06	Blank
07-08	QMF release level in which the form, report, or prompted query was exported; this number is 20 for QMF Version 13 Release 1
09	Blank
10*	Type of object: • F for form • R for report • T for prompted query
11	Blank
12-13*	QMF object level: • 01 for report • 04 for form • 01 for prompted queries that do not contain a time period specification • 02 for prompted queries in which at least one of the tables in the query has a time period specification The object level denotes a change in the format of an object. Each time the format is changed in a QMF release, its object level is also changed. The object level increases only when the change in the format might create an error in your application.
14	Blank
15*	Data format of the object ("E" for encoded format used to export form, report, and prompted query objects)
16	Blank

Table 21. Header record information (continued)	
Byte position	**Information and type**
17	Status of the object: E - Contains errors (for form only); W - Contains warning; V - Valid
18	Blank
19	Whole or partial object indicator (W for whole object)
20	Blank
21	National language in use when the object was exported (E for English)
22	Blank
23*	You can create a form, report, or prompted query outside of QMF in the appropriate format and import it into QMF. Code an R in this byte position if you want QMF to replace the object in temporary storage with the object you are importing.
24	Blank
25-26	Length of control area at the beginning of each record: • 01 for form • 02 for report • 01 for prompted query
27	Blank
28-29	Length of integer length fields specified in V and T records (03)
30	Blank
31-38	Date stamp in the format *yy*/*mm*/*dd*
39	Blank
40-44	Timestamp in the format *hh*:*mmmm*
45	Blank
51	Blank

Related reference

Exporting a form

The form object contains all the information specified in all the QMF form panels. When you export a form, QMF converts to the encoded format any form panels whose values deviate from the default values.

Exporting a prompted query

An exported prompted query object contains the information displayed in the echo area of the **Prompted Query** primary panel.

Exporting a standard report

When QMF displays a report, you see the result of interaction between the form and the data object in temporary storage. A report object does not exist in temporary storage. When you export a report, QMF is really exporting the interaction of a form and a data object.

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Records of the exported object

Except for header records, which are fixed-format records, all records of exported forms, reports, and prompted queries are variable-format records. Variable-format records are accepted on input.

Variable-format records have the general form shown in this figure:

Figure 19. General form of variable-format records

The contents of the control area are shown here:

Table 22. General form of variable-format records

Byte position	Description
01	Record identifier (H, V, T, R, E, *, L, C)
02	Blank (sometimes omitted; see specific type of variable-format record)

The record data area is a variable-length area that contains information about that specific record. Fields in this area are separated by a delimiter (a blank character is used in these examples).

Data value records (V)

Value records of exported forms, reports, or prompted queries are used to provide a value for a single field in an object, such as blank lines before the heading in the form.

V records contain:

- A field number unique to the object
- The length of the field
- The value of the field

The control area for V records is shown in this table:

Table 23. Control area for V records

Byte position	Description
01	Value record identifier (V)
02	Blank (used only for reports; omitted for forms and prompted queries)

The record data area for V records is shown in this table:

Table 24. Record data area for V records

Byte position	Description
01	Blank
02-05	Field number (1001-9999)
06	Blank

Table 24. Record data area for V records (continued)	
Byte position	**Description**
07-09	Length of the data value (000-999) Can also be an asterisk (*) followed by two blanks. An asterisk indicates that the data value is delimited by the end of the record.
10	Blank
11-end	Data

In the record data area for V records:

- Record data area byte positions are offset from the end of the control area, the length of which is indicated in the header record.
- An omitted data value (an end-of-record or only blanks following the length field) indicates that the field contains a null value.
- If the length field is zero, the default value for the field is applied and a warning message is issued.
- If the specified length is different from the actual data that follows, QMF issues a warning.

Data table description records (T)

In the encoded format, most data in an object appears in tables. These tables are not relational tables in the database, but rather a means of grouping information within the encoded format. Each T record defines one table, and each table corresponds to a particular part of an object, such as summary calculations in the form. Thus, one exported file can contain many of these encoded tables.

A T record is always followed by R records. The T record describes the R records that follow it. If there are no R records following a T record, the table is omitted.

Be sure that your application program refers to the contents of tables of an exported form, report, or prompted query by using the encoding in the T record to correctly locate the values in the R records. Your application program should not use fixed offsets to locate information in R records.

The control area for T records is shown in this table:

Table 25. Control area for T records	
Byte position	**Description**
01	Table record identifier (T)
02	Blank (used only for reports; omitted for forms and prompted queries)

The record data area for T records is shown in this table. The byte positions in the table are offsets that follow the end of the control area, the length of which is indicated in the header record.

Table 26. Record data area for T records	
Byte position	**Description**
01	Blank
02-05	Table number (1001-9999)
06	Blank

Table 26. Record data area for T records (continued)	
Byte position	**Description**
07-09	The number of rows (R records) in this table An asterisk (*) used instead of a numeric value means that the table consists of all the R records that follow.
10	Blank
11-13	The number of columns in the record (000-999)
14	Blank
15-18, 24-27, ...	The field number for this column (repeating field)
19, 28, ...	Blank (repeating field)
20-22, 29-31, ...	The length of the data values in this column (repeating field)

Bytes 11-13 (number of columns) indicate how many field number/data value length pairs follow. So, the information from byte 15 on is repeated for each column.

Keep the following information about T records in mind as you export and import objects:

- When a form or prompted query is imported, the number of R records must match the row count specified in bytes 07-09 of the record data area of the T record. Otherwise, QMF issues a warning.
- When a form or prompted query is imported, the number of columns indicated in bytes 11-13 must agree with the field number/length pairs in the bytes that follow. If not, QMF issues a warning.
- The number of field number/length pairs is limited to the number of columns in the table, and their order is arbitrary.
- Columns with a length of zero are set to their default values when the object in the temporary storage area is updated and a warning is issued. Columns not included in this table are also handled in this way. However, with prompted queries, a default is supplied when possible. Otherwise, an error occurs.
- To set a column field to blank, the column must have a positive length in the T record and a blank value in the R record.

Table row records (R)

R records of exported forms, reports, or prompted queries provide a set of values for a single row in an encoded table. R records contain a list of values arranged in an order described by the associated T record. An R record matches the description of the positions and lengths of the data values specified in the T record.

The control area for R records is shown in this table:

Table 27. Control area for R records	
Byte position	**Description**
01	Row record identifier (R)
02	Blank (used only for reports; omitted for forms and prompted queries)

Following the control area, the data area for R records consists of a series of values separated by a delimiter (blank character). The format is as follows:

```
_value.._value..._value..
```

In this format, `value...` represents the data value for this row and column and _ is the delimiter.

Keep in mind the following information as you work with R records:

- An R record must immediately follow another R record or a T record.
- The number of data values must match the description in the associated T record.
- A data value length of zero in the associated T record indicates that no value is to be applied to this row and column of the object. In other words, the row and column is set to its default value. However, the presence of the field in the T record requires that the R record contain an extra blank for this field. A zero-length value results in one blank followed by another in the R record.

End-of-object record (E)

The E record of an exported form, report, or prompted query specifies the end of an exported object. It is the last record of an exported file, appearing as the character E. For an exported report, an E record is followed by a blank character to complete its control area. For a form, the blank is omitted.

Any records that follow the E record are ignored. If an E record is not included with the file that is imported, QMF assumes that an end-of-file implies the end of the object.

Application data record (*)

Application data records of exported forms, reports, or prompted queries allow application programs to associate their own data with an object in the external file. Application programs frequently use these records as comment records to further describe the object in the file.

The information that follows the asterisk is ignored and has no effect on the input process.

Application data records can appear anywhere in the external file except before the header (H) record. QMF does not write out application data records upon export. However, you can use these records in the data set or CICS data queue you create. The contents of an application data record are shown in this table:

Table 28. Contents of an application data record

Byte position	**Description**
01	Application data record identifier (*)
02-end of record	Data

Here is an example of an application data record that appears in an exported form:

```
*This is the form that groups by DEPT.
```

Report line records (L)

Each formatted line in a report is described by an L record. There is one L record for each line in the report.

Like other variable-format records (V, T, and R), L records consist of a control area followed by a record data area. The format of the control area is similar to the other records. The record data area is composed of a fixed area that precedes the formatted report line itself. The fixed area provides information about the report line that follows it. The format of an L record is shown in the following figure.

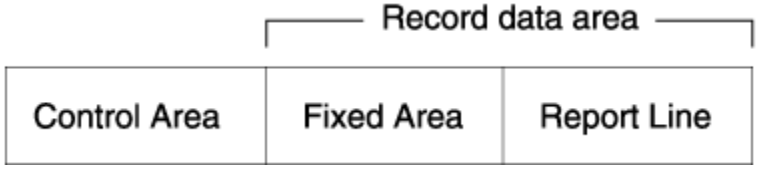


Figure 20. Format of an L record

The control area for an L record is shown in this table:

Table 29. Control area for an L record	
Byte position	**Description**
01	Value record identifier (L)
02	Continuation indicator Indicates whether the current record is continued to a data continuation record: • C for continued A C record immediately follows an L record marked with a continuation character in byte 2 of the control area. • D for continued with DBCS delimiters S0 and SI inserted at the end of the current record and the beginning of the data portion of the next record When D is specified for the continuation indicator in the control area, the current record is too long to fit into a single physical record. In the process of splitting up the record, S0 (shift out) and SI (shift in) characters were added to the current and next records to preserve the integrity of any DBCS data that is continued. • Blank if not continued

The record data area for an L record is shown in this table. Bytes 6-13 are line type attributes. Byte 06 is always 1. Each byte in bytes 7 through 13 indicates the presence or absence of the corresponding line type attribute in the formatted report line (1 = attribute present, 0 = attribute absent).

Table 30. Record data area for an L record	
Byte position	**Description**
01	Blank
02-04	Report part indicator: 110 = Page heading 120 = Page footing 13*n* = Break heading (*n* is the break number, 1-6) 15*n* = Break footing (*n* is the break number, 1-6) 170 = Column heading 171 = Detail heading 180 = Detail line 181 = Group summary line 190 = Final footing
05	Blank
06	1
07	Data
08	Text
09	Separator

Table 30. Record data area for an L record (continued)	
Byte position	**Description**
10	Column wrap Attributes for column wrap (byte 10) and line wrap (byte 11) are used to indicate the continuation of a single logical report line to multiple physical report lines. The presence of either attribute in a L format record means that the column data or wrapped line is continued on a following L format record.
11	Line wrap Attributes for column wrap (byte 10) and line wrap (byte 11) are used to indicate the continuation of a single logical report line to multiple physical report lines. The presence of either attribute in a L format record means that the column data or wrapped line is continued on a following L format record.
12	Second data line (across reports only) Across reports that contain percent or cumulative sum columns can contain two data lines for each group (also break and final) summary. The first summary data line contains the cumulative percent or cumulative sum values of the column as computed across each unique "across" value. The second summary data line contains the cumulative percent or cumulative sum values of the column as computed down each group (in the report or within a control break). The second data line (byte 12) line type identifies the second data line in exported reports of this nature.
13	Reserved
14	Blank

The following example shows an L record for a break footing line in a report that contains text and data:

```
L  151 11100000    DEPARTMENT TOTALS     93,659.45
```

Data continuation records (C)

A C record in an exported form, report, or prompted query is used to continue a value or set of values across more than one record. It immediately follows the record that is continued. The format of a C record corresponds to the format of the original record that is continued.QMF uses C records to continue L records only.

The control area for a C record is shown in this table:

Table 31. Control area for a C record	
Byte position	**Description**
01	Value record identifier (C)

Table 31. Control area for a C record (continued)	
Byte position	**Description**
02	Continuation indicator. Indicates whether the current record is continued to another C record: • C for continued A C record immediately follows an L record marked with a continuation character in byte 2 of the control area. • D for continued with DBCS delimiters S0 and SI inserted at the end of the current record and the beginning of the data portion of the next record When D is specified for the continuation indicator in the control area, the current record is too long to fit into a single physical record. In the process of splitting up the record, S0 (shift out) and SI (shift in) characters were added to the current and next records to preserve the integrity of any DBCS that is continued. • Blank if not continued

The record data area for a C record is shown in this table. The byte positions shown are offset from the end of the control area, the length of which is indicated in the header record.

Table 32. Record data area for a C record	
Byte position	**Description**
01	Blank
02-end	Value or set of values that are continued

Exporting a form

The form object contains all the information specified in all the QMF form panels. When you export a form, QMF converts to the encoded format any form panels whose values deviate from the default values.

The following panels are in the encoded format only if you modified the panel:

- FORM.BREAK*n*, where *n* = 1-6
- FORM.CALC
- FORM.CONDITIONS
- All variation panels greater than 1 for FORM.DETAIL

Eliminating unused panels from the externalized format helps you save space on your system.

Creating a default form to see example export results

You can create a default form by running any query that creates an empty report, such as the query shown here:

```
SELECT JOB
FROM Q.STAFF
WHERE NAME='NO_NAME'
```

When QMF displays the report, enter `EXPORT FORM TO DEFAULT` (including the `QUEUETYPE=`*xx* parameter in CICS).

How the exported form looks

Your data set or CICS data queue named DEFAULT contains the information shown in this sample format of an exported form:

```
H QMF 20 F 04 E V W E R 01 03 13/01/15 16:20

T 1110 001 011 1112 007 1113 040 1114 007 1115 006 1116 005 1117 005 1118 003 1119 008 1120 008
  1122 006 1121 050
R CHAR    JOB                                          2      5     C     1   DEFAULT
  DEFAULT  NO
V 1201 001 0
V 1202 001 2
T 1210 001 003 1212 004 1213 006 1214 055
R 1    CENTER
V 1301 001 2
V 1302 001 0
T 1310 001 003 1312 004 1313 006 1314 055
R 1    CENTER
V 1401 002 NO
V 1402 001 1
V 1403 001 0
T 1410 001 003 1412 004 1413 006 1414 055
R 1    RIGHT
V 1501 001 1
V 1502 003 YES
V 1503 003 YES
V 1504 003 YES
V 1505 003 YES
V 1506 003 YES
V 1507 003 YES
V 1508 003 YES
V 1509 003 YES
V 1510 003 YES
V 1511 004 NONE
V 1512 002 NO
V 1513 007 DEFAULT
V 1514 002 NO
V 1515 004 NONE
V 2790 001 1
V 2791 003 YES
V 2805 003 YES
T 2810 001 003 2812 004 2813 006 2814 055
R 1    LEFT
V 2901 002 NO
V 2902 001 1
V 2904 001 0
V 2906 002 NO
V 2907 002 NO
T 2910 001 003 2912 004 2913 006 2914 055
R 1    LEFT
V 3080 001 1
V 3101 002 NO
V 3102 002 NO
V 3103 001 0
V 3104 001 0
T 3110 001 003 3112 004 3113 006 3114 055
R 1    LEFT
V 3201 002 NO
V 3202 001 1
V 3203 001 0
V 3204 001 1T 3210 001 003 3212 004 3213 006 3214 055
R 1    RIGHT
V 3080 001 2
V 3101 002 NO
V 3102 002 NO
V 3103 001 0
V 3104 001 0
T 3110 001 003 3112 004 3113 006 3114 055
R 1    LEFT
V 3201 002 NO
V 3202 001 1
V 3203 001 0
V 3204 001 1
T 3210 001 003 3212 004 3213 006 3214 055
R 1    RIGHT
E
```

You can import your default data set or CICS data queue every time you log on by issuing the command `IMPORT FORM FROM DEFAULT` (including the `QUEUETYPE=`*xx* parameter in CICS) in your initial procedure.

Interpreting the header record in the exported data set or queue

The following example shows a header record for a QMF form:

```
H QMF 20 F 04 E V W E R 01 03 13/01/15 16:20
```

This table explains the example.

Table 33. Example of a form header record

Value from example	Description
H QMF 20 F	This record is a QMF form header record for Version 13.1.
04	The structure of the form is at object level 4.
E	The format is encoded (the format used for exported forms, reports, and prompted queries).
V	The exported form does not contain any errors or warnings.
W	The file contains the entire form.
E	The national language in use when the object was exported is English.
R	When importing, the object in temporary storage is replaced.
01	The length of the control area is 1 byte.
03	The length of integer length fields is 3 bytes.
13/01/15	The date stamp specifies January 15, 2013.
16:20	The timestamp specifies a time of 4:20 PM.

When you export a form from a non-English session, you can either export the form in the current session language or in English. So, the national language identifier in the H record might not reflect the language of the session from which you exported the form.

Interpreting the records of the exported form

"How the exported form looks" on page 94 shows an example of an exported form. The exported form contains V, T, and R records whose associated codes have special meanings to help you interpret the exported result. This table explains each field and code in the exported form.

Field 3080, a V record, acts as a "trigger" for the break panels that follow it. This record appears once for every break panel in your form. The value of the field reflects the number of the break panel that the fields that follow field 3080 describe.

Table 34. Table and field numbers for an exported FORM object

Table or field number	Record type	Description	Form panel
1110	T	Column headings table	FORM.COLUMNS

Table 34. Table and field numbers for an exported FORM object (continued)

Table or field number	Record type	Description	Form panel
1112	R	Column data type The column data type is not displayed on the form panels but is associated with the form in its external format. The column data type is not required when a form is imported. If it is missing during import, CICS provides default data type information from the edit codes. (For more information, see "Importing a form object" on page 99.) During export, the column data type QMF provides is based on the specified edit code. For edit codes U, V, M, or invalid edit codes, QMF specifies the data type keyword UNKNOWN. Table 35 on page 99 shows the data type keywords that QMF uses.	FORM.COLUMNS
1113	R	Column heading	FORM.COLUMNS
1114	R	Column usage code	FORM.COLUMNS
1115	R	Column indentation	FORM.COLUMNS
1116	R	Column width	FORM.COLUMNS
1117	R	Column edit code	FORM.COLUMNS
1118	R	Column sequence	FORM.COLUMNS
1119	R	Column heading alignment	FORM.COLUMNS
1120	R	Column data alignment	FORM.COLUMNS
1121	R	Column definition	FORM.COLUMNS
1122	R	Pass nulls on column definition	FORM.COLUMNS
1180	T	Summary calculations table	FORM.CALC
1182	R	Calculation identification number	FORM.CALC
1183	R	Summary calculation expression	FORM.CALC
1184	R	Summary calculation width	FORM.CALC
1185	R	Summary calculation edit code	FORM.CALC
1186	R	Pass nulls on calculation	FORM.CALC
1201	V	Blank lines before heading	FORM.PAGE
1202	V	Blank lines after heading	FORM.PAGE
1210	T	Page heading table	FORM.PAGE
1212	R	Page heading line number	FORM.PAGE
1213	R	Page heading alignment	FORM.PAGE

Table 34. Table and field numbers for an exported FORM object (continued)

Table or field number	Record type	Description	Form panel
1214	R	Page heading text	FORM.PAGE
1301	V	Blank lines before footing	FORM.PAGE
1302	V	Blank lines after footing	FORM.PAGE
1310	T	Page footing table	FORM.PAGE
1312	R	Page footing line number	FORM.PAGE
1313	R	Page footing alignment	FORM.PAGE
1314	R	Page footing text	FORM.PAGE
1401	V	New page for final text	FORM.FINAL
1402	V	Final summary line number	FORM.FINAL
1403	V	Blank lines before final text	FORM.FINAL
1410	T	Final text table	FORM.FINAL
1412	R	Final text line number	FORM.FINAL
1413	R	Final text alignment	FORM.FINAL
1414	R	Final text	FORM.FINAL
1501	V	Detail line spacing	FORM.OPTIONS
1502	V	Outlining for break columns	FORM.OPTIONS
1503	V	Default break text	FORM.OPTIONS
1504	V	Function name in column heading for grouping	FORM.OPTIONS
1505	V	Column-wrapped lines kept on a page	FORM.OPTIONS
1506	V	Across-summary column	FORM.OPTIONS
1507	V	Separators for column heading	FORM.OPTIONS
1508	V	Separators for break summary	FORM.OPTIONS
1509	V	Separators for across heading	FORM.OPTIONS
1510	V	Separators for final summary	FORM.OPTIONS
1511	V	Width of wrapped report lines	FORM.OPTIONS
1512	V	Page renumbering at breaks	FORM.OPTIONS
1513	V	Width of break or final text	FORM.OPTIONS
1514	V	Column reordering	FORM.OPTION
1515	V	Fixed columns	FORM.OPTIONS
2790	V	Detail variation number	FORM.DETAIL
2791	V	Detail variation selection	FORM.DETAIL
2805	V	Include column heading	FORM.DETAIL
2810	T	Detail heading table	FORM.DETAIL

Table 34. Table and field numbers for an exported FORM object (continued)

Table or field number	Record type	Description	Form panel
2812	R	Detail heading text line	FORM.DETAIL
2813	R	Detail heading alignment	FORM.DETAIL
2814	R	Detail heading text	FORM.DETAIL
2901	V	New page for detail text	FORM.DETAIL
2902	V	Line number of column data	FORM.DETAIL
2904	V	Number of lines to skip after detail text	FORM.DETAIL
2906	V	Repeat detail heading	FORM.DETAIL
2907	V	Number of detail text lines to keep together	FORM.DETAIL
2910	T	Detail text table	FORM.DETAIL
2912	R	Detail text line number	FORM.DETAIL
2913	R	Detail text alignment	FORM.DETAIL
2914	R	Detail text	FORM.DETAIL
3080	V	Break panel number	FORM.BREAKn
3101	V	New page for break heading	FORM.BREAKn
3102	V	Repeat break heading	FORM.BREAKn
3103	V	Number of lines to skip before break heading	FORM.BREAKn
3104	V	Number of lines to skip after break heading	FORM.BREAKn
3110	T	Break heading text table	FORM.BREAKn
3112	R	Break heading line number	FORM.BREAKn
3113	R	Break heading alignment	FORM.BREAKn
3114	R	Break heading text	FORM.BREAKn
3201	V	New page for break text	FORM.BREAKn
3202	V	Break text summary line	FORM.BREAKn
3203	V	Number of lines to skip before break text	FORM.BREAKn
3204	V	Number of lines to skip after break text	FORM.BREAKn
3210	T	Break text table	FORM.BREAKn
3212	R	Break text line	FORM.BREAKn
3213	R	Break text alignment	FORM.BREAKn
3214	R	Break text	FORM.BREAKn
3310	T	Conditions table	FORM.CONDITIONS
3312	R	Condition identification number	FORM.CONDITIONS

Table 34. Table and field numbers for an exported FORM object (continued)			
Table or field number	**Record type**	**Description**	**Form panel**
3313	R	Conditional expression	FORM.CONDITIONS
3314	R	Pass nulls on conditions panel	FORM.CONDITIONS

The following table shows the data-type keywords QMF generates for the edit codes specified on the form. In this table, *x* represents the number of decimal places to be displayed, where *x* is an integer from 0 to 99.

Table 35. Data type keywords generated for edit codes specified on the QMF form panels	
Edit code specified	**Data type keyword**
C, CW, CT, CD*x*	CHAR
B, BW, X, XW	BINARY
G, GW	GRAPHIC
E, D, I, J, K, L, P, EZ, DZ, IZ, JZ, KZ, LZ, PZ, DZC, D*x*, I*x*, J*x*, K*x*, L*x*, P*x*	NUMERIC
Any edit code that starts with the characters TD	DATE
Any edit code that starts with the characters TT	TIME
TSI	TIMEST
TSZ	TSTMPTZ
M	UNKNOWN
U, V	UNKNOWN
Invalid edit codes entered	UNKNOWN

When you export a form, QMF exports only those variation panels with values that were changed from the default. Therefore, the total number of variations in the external form can be fewer than what is shown in the variation count indicator on the panel. QMF can alter the individual variation numbers to put the variations back into a continuous sequence.

Importing a form object

When you import a form, these fields must be in uppercase:

- Record identifier for all records
- The following fields in the header record:
  - Product identifier (QMF)
  - Type of object (F)
  - Format of object (E)
  - Action against object (R)
- Data type values (numeric, character, graphic, or unknown data types) in the R records for the COLUMNS table

  If your site supports date/time data types, data type values DATE, TIME, TIMEST, and TSTMPTZ must also be in uppercase.
- All the form keywords and substitution variables used in the form panels

When a form is imported, all the input in the form is left intact. If a form keyword is in lowercase, the error indicator in the form panel is turned on. To correct the error, the field must be typed over. If the data-type value is not in uppercase, an error occurs, and the IMPORT ends.

The T record of the COLUMNS table (field number 1110) must immediately follow the header record. The T record must also include a numeric count of the number of rows in the encoded format (an * row count is not allowed).

If the entire COLUMNS table is read in, unspecified fields are set to their default values, and the form is displayed.

- Variation panels

  The variation number field (field number 2790) determines which variation panel is updated by all the variation panel information that follows the field. This V record should precede all other V, T, and R records for a variation panel.

  If a value for a particular variation appears more than once in the encoded format, the later values replace the original values. The number of variations in the form are equal to the highest variation number in the form. There is no required order for variation numbers when importing.

- Translated forms

  When you import an English-language form into a non-English session and the national language identifier in the H record is an E, QMF translates the reserved words. QMF translates the reserved words into your current session's language. Examples of reserved words are values in the USAGE column in FORM.COLUMNS

- Omitting data type, edit code, and width in an imported form

  In the COLUMNS table, data type (field number 1112), edit code (field number 1117), and width (field number 1116) can optionally be omitted when the following rules are observed:

  – Edit code must be included if data type and width are omitted. Based on the specified edit code, QMF inserts appropriate defaults for data type and width.
  – Data type must be included if edit code and width are omitted. QMF provides default values for edit code and width.
  – Width must be accompanied by either data type or edit code.

  This table contains information about values for the field that contains the data type of the column. In addition to the data type values shown here, there is an UNKNOWN data type keyword that QMF uses in response to a U, V, or invalid edit code.

Table 36. Values for the field that contains the data type of the column

Data type as it appears in externalized form	**Code in decimal**	**Data type**	**Meaning**
DATE	384	DATE	Date
TIME	388	TIME	Time
TIMEST	392	TIMESTAMP	Timestamp
NUMERIC	496 500 492 484 480 996	INTEGER SMALLINT BIGINT DECIMAL FLOAT DECFLOAT	Integer Small integer Big integer Decimal Floating point Decimal floating point

Table 36. Values for the field that contains the data type of the column (continued)

Data type as it appears in externalized form	Code in decimal	Data type	Meaning
CHAR	448 452 456 904	VARCHAR CHAR LONG VARCHAR ROWID	Varying-length character Fixed-length character Long varying-length character Row identifier
GRAPHIC	464 468 472	VARGRAPHIC GRAPHIC LONG VARGRAPHIC	Varying-length graphic Fixed-length graphic Long varying-length graphic
BINARY	908 912	VARBINARY BINARY	Varying-length binary Fixed-length binary
TSTMPTZ	2448	TIMESTAMP WITH TIME ZONE	Timestamp with time zone

- Detecting errors during import

  If QMF detects an error in the format of the form file during import, the import function ends. QMF issues a message describing the error and its location in the file.

  If an error is encountered in the header record and a form exists in the temporary storage area, the existing form is displayed. If the form is successfully imported, QMF displays the form panel.

  If an error is encountered after the header record is read, any existing form in the temporary storage area is discarded, and the home panel is displayed. However, if the data object exists, QMF generates a default form for the data but does not display it.

  Certain minor errors detected by QMF do not terminate the import. In such cases, QMF issues a warning message and, where appropriate, applies defaults. Some examples are:

  – V records
    - Zero-length fields
    - The specified length field does not match the length of the data supplied.
  – T records
    - Zero column length
    - The number of columns specified does not match the following field number/length pairs.

  You can respond to errors and warnings as follows:

  – Fix one problem at a time.
  – Set the TRACE option of the profile to L2 (by using the command `SET PROFILE (TRACE=L2)` and run the IMPORT FORM command. The L2 tracing option traces messages and commands at the highest level of detail. This option allows you to see all the message text related to the IMPORT command.

  The following command displays the message text associated with a particular message code:

  ```
  HELP DSQnnnnn
  ```

  where *nnnnn* is a 5-character, unique message code.

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Considerations for QMF form objects in applications

Some tips might help you create and use a QMF form in an application.

When using a QMF form in an application, keep in mind the following points:

Creating a form data set or CICS data queue outside of QMF

If you create a form outside of QMF (not with EXPORT FORM), it is not necessary to have a complete form object to import it successfully into QMF. You need only the header (H) record followed by the T and R records of the COLUMNS table. Default values are applied for the rest of the form when it is imported.

When you create your own form data set or CICS data queue, it does not have to be exactly like the data set or queue you get if you use EXPORT FORM. For example, when QMF exports a form, all data values in a value (V) record are preceded by a length. However, you can use an asterisk (*) signifying that the data value is delimited by the end of the record when you import a form.

QMF keeps the excess lines if an R record count in an imported form is less than the number of default lines it allocated for the associated area in the default form.

Checking the object level in the header record

The object level in the header record of a data set or queue that contains a form indicates the level of the format structure at the time the form was generated. (Object level is indicated in bytes 12 and 13 of the header record.) Make sure that your application properly interprets the contents of the data set or data queue that contains the form. Check that the object level represents the format upon which your application is based.

Using application data records

The application data records can be useful in your application program. Use application data records to include your own comments within a data set or CICS data queue for a form object. You can place the records anywhere in the data set or CICS data queue following the header record. When QMF reads such a record, it ignores all data in the record that follows the * character. The record, therefore, has no effect on the import process.

Restrictions for using forms in CICS

REXX is not available under QMF for CICS. The areas on the QMF form that rely on REXX do not work if you try to run the form in the CICS environment. These areas include anything entered on the FORM.CALC panels, the FORM.CONDITIONS panels, and the Specify Definition window. REXX calculations, conditional row formatting, and column definitions are not available to QMF for CICS users.

Related concepts

Importing forms and prompted queries
Be aware of the rules for importing a form or prompted query.

Related reference

Exporting a form
The form object contains all the information specified in all the QMF form panels. When you export a form, QMF converts to the encoded format any form panels whose values deviate from the default values.

Application data record (*)
Application data records of exported forms, reports, or prompted queries allow application programs to associate their own data with an object in the external file. Application programs frequently use these records as comment records to further describe the object in the file.

Header records

Most records of exported forms, reports, or prompted queries have a variable format. However, header records have a fixed format, even though the data set or data queue that contains the records can be of variable format.

Exporting a standard report

When QMF displays a report, you see the result of interaction between the form and the data object in temporary storage. A report object does not exist in temporary storage. When you export a report, QMF is really exporting the interaction of a form and a data object.

A report cannot be saved in the database, and an exported report cannot be imported back to QMF. However, you can use exported reports to:

- Extract data from the report and use it in an application
- Modify the appearance of the report for printing or redisplay by the application

A sample report (before export)

This sample shows a tabular report with a level 1 break.

For a list of the field numbers, see "Interpreting the report header record in the exported data set or queue" on page 104.

```
REPORT                                          LINE 1      POS 1     79

                        J & H SUPPLY COMPANY
                    AVERAGE SALARIES (DEPTS 10, 15, 20)
                              REPORT 17


                   AVERAGE
    DEPT  JOB       SALARY
  ------  -----  ----------
      10  MGR      20865.86
                 ----------
              *    20865.86

      15  CLERK    12383.35
          MGR      20659.80
          SALES    16502.83
                 ----------
              *    15482.33

      20  CLERK    13878.68
          MGR      18357.50
          SALES    18171.25
                 ----------
              *    16071.53

                 ==========
                   17473.24


                                COMPANY NAME
                                  REPORT 17
```

Figure 21. A tabular QMF report before exporting

How the exported report looks

Here is the format of the exported report from the sample tabular report.

```
H QMF 20 R 01 E V W E R 02 03 13/01/15 16:20
V  1001 006 PERIOD
V  1002 003 016
T  1010 003 006 1013 005 1014 006 1015 006 1016 006 1017 006 1012 008
R  L     000001 000003 000008 000001 BREAK1
```

```
R  C     000009 000011 000015 000001 GROUP
R  L2    000016 000018 000027 000001 AVERAGE
L  110 10100000                            J & H SUPPLY COMPANY
L  110 10100000                       AVERAGE SALARIES (DEPTS 10, 15, 20)
L  110 10100000                                  REPORT 17
L  110 10000000
L  110 10000000
L  170 10000000                       AVERAGE
L  170 10000000     DEPT  JOB         SALARY
L  170 10010000   ------  -----  ----------
L  181 11000000       10  MGR      20865.86
L  151 10010000                  ----------
L  151 11100000               *    20865.86
L  151 10000000
L  181 11000000       15  CLERK    12383.35
L  181 11000000           MGR      20659.80
L  181 11000000           SALES    16502.83
L  151 10010000                  ----------
L  151 11100000               *    15482.33
L  151 10000000
L  181 11000000       20  CLERK    13878.67
L  181 11000000           MGR      18357.50
L  181 11000000           SALES    18171.25
L  151 10010000                  ----------
L  151 11100000               *    16071.52
L  151 10000000
L  190 10010000                  ==========
L  190 11000000                    17473.24
L  120 10000000
L  120 10000000
L  120 10100000                                    COMPANY NAME
L  120 10100000                                      REPORT 17
E
```

When exporting a report, QMF writes the full text of the formatted report with additional information to interpret the contents of the report.

The header record is the first record of the exported file. It is followed by the appropriate V, T, and R records. If the report is an across-style report, it has another group of V, T, and R records that follows the first group.

In addition to H, V, T, R, and E records, exported reports also require two additional types of records:

- Report line, or L, records
- Data continuation, or C, records

These two records follow the last group of V, T, and R records.

If you want to use only the formatted data of the report in your application, you can have QMF send print output to a data set or CICS data queue. This data set or CICS data queue contains only the formatted data without any layout information.

Interpreting the report header record in the exported data set or queue

The following example shows a header record for a QMF report:

```
H QMF 20 R 01 E V W E R 02 03 13/01/15 16:20
```

This table explains this example.

Table 37. Example of a header record for a report

Value from example	Description
H QMF 20 R	This record is a QMF report header record for Version 13 Release 1.
01	The structure of the report is at object level 1.
E	The format is encoded (the format used for exported forms, reports, and prompted queries).

Table 37. Example of a header record for a report (continued)	
Value from example	**Description**
V	The exported report does not contain any errors or warnings.
W	The file contains the entire report.
E	English was the national language in use when the object was exported.
R	This indicator is ignored.
02	The length of the control area is 2 bytes.
03	The length of integer length fields is 3 bytes.
13/01/15	The date stamp specifies January 15, 2013.
16:20	The timestamp specifies a time of 4:20 PM.

Interpreting the records of the exported report

This table shows the table numbers for T records and field numbers for V records of the exported report shown in “How the exported report looks” on page 103.

Table 38. Table and field numbers for an exported report		
Table or field number	**Record type**	**Description**
1001	V	Profile DECIMAL option
1002	V	Length of L record control area + fixed area
1010	T	Formatted report table
		For each formatted data column in the report:
1012	T	For all usage codes except OMIT
1013	T	Edit code by which data is formatted
1014	T	Starting position for field that contains formatted data (including indent area)
1015	T	Starting position for field that contains formatted data (excluding indent area)
1016	T	Ending position for field that contains formatted data
1017	T	Number of relative physical report line within logical report line in which formatted column value appears

When working with table and field numbers in an exported report, note the following points:

- Position 1 of the report line immediately follows the L-record fixed area.
- R records for text lines in each report heading (PAGE or BREAK) or footing (PAGE, BREAK, or FINAL) are only written up to and including the last line that contains modifications to the form defaults.

  At least one R record is written for each heading or footing even when the fields for a given heading or footing all have their original values.
- Continuation records are written for the report object when the maximum record length would otherwise be exceeded.

Related reference

Exporting an across-style report
Exported across-style reports include fields not found in standard exported reports

Data continuation records (C)
A C record in an exported form, report, or prompted query is used to continue a value or set of values across more than one record. It immediately follows the record that is continued. The format of a C record corresponds to the format of the original record that is continued.QMF uses C records to continue L records only.

Report line records (L)
Each formatted line in a report is described by an L record. There is one L record for each line in the report.

Exporting a report in HTML format

When you export a report in HTML format, QMF places the necessary HTML tags before and after the body of your report. You can then place the report on a web server and display it in an HTML-compliant web browser.

This sample illustrates the HTML coding that QMF places around the report. Each of these tag sets consists of a start tag and an end tag. The end tags begin with a forward slash (/), and all tags are enclosed in angle brackets.

For a full description of these tags, see your HTML documentation.

```
<HTML>
<HEAD>
<TITLE>
Report
</TITLE>
</HEAD>
<BODY>
<PRE>

                J & H SUPPLY COMPANY
           AVERAGE SALARY  (DEPTS  10,  15,  20)
                       REPORT 17

                         AVERAGE
        DEPT  JOB          SALARY
        ----  -----     ---------
        10    MGR        20865.86
                        ---------
                    *   20865.86

        15    CLERK      12383.53
              MGR        20659.80
              SALES      16052.83
                        ---------
                    *   15482.33

        20    CLERK      13878.67
              MGR        18357.50
              SALES      18171.25
                        ---------
                    *   16071.52
                        =========
                        17473.52

                        COMPANY NAME
                         REPORT  17



</PRE>
</BODY>
</HTML>
```

This table briefly explains this HTML coding:

Table 39. HTML tags used in exported HTML reports	
Tag set	**Description**
<HTML></HTML>	These tags define the file as an HTML document.
<HEAD></HEAD>	These tags mark the boundaries of the document header.
<TITLE></TITLE>	QMF inserts the word "Report" between these tags. Content between these tags is included in the HTML document title. Placement of the title is browser- and platform-dependent. These tags are placed within the header.
<BODY></BODY>	These tags follow the header and contain the body of the document. Report output is placed in the body of the document.
<PRE></PRE>	The content between these tags is displayed as-is. No HTML formatting is performed between them. QMF places report output between these tags in the body of the HTML document.

Exporting a report without control information

When you export a report, QMF places control information around the report by default.

For example an exported report might have the following format:

```
H QMF 17 R 01 E V W E R 02 03 14/03/05 11:07
V  1001 006 PERIOD
V  1002 003 016
T  1010 005 006 1013 005 1014 006 1015 006 1016 006 1017 006 1012 008
R  L     000001 000003 000010 000001
R  C     000011 000013 000026 000001
R  L     000027 000029 000035 000001
R  C     000036 000038 000047 000001
R  C     000048 000050 000062 000001
L  110 10000000
L  110 10000000
L  170 10000000   DEPTNUMB  DEPTNAME        MANAGER  DIVISION    LOCATION
L  170 10010000   --------  --------------  -------  ----------  -------------
L  180 11000000         10  HEAD OFFICE         160  CORPORATE   NEW YORK
L  180 11000000         15  NEW ENGLAND          50  EASTERN     BOSTON
L  180 11000000         20  MID ATLANTIC         10  EASTERN     WASHINGTON
L  180 11000000         38  SOUTH ATLANTIC       30  EASTERN     ATLANTA
L  180 11000000         42  GREAT LAKES         100  MIDWEST     CHICAGO
L  180 11000000         51  PLAINS              140  MIDWEST     DALLAS
L  180 11000000         66  PACIFIC             270  WESTERN     SAN FRANCISCO
L  180 11000000         84  MOUNTAIN            290  WESTERN     DENVER
L  120 10000000
L  120 10000000
E
```

Figure 22. Sample exported report with control information.

If you specify the DATAFORMAT=TEXT option on your EXPORT REPORT command, you can export reports without the control information, as in the following example.

```
DEPTNUMB  DEPTNAME        MANAGER  DIVISION    LOCATION
  --------  --------------  -------  ----------  -------------
         10  HEAD OFFICE         160  CORPORATE   NEW YORK
         15  NEW ENGLAND          50  EASTERN     BOSTON
         20  MID ATLANTIC         10  EASTERN     WASHINGTON
         38  SOUTH ATLANTIC       30  EASTERN     ATLANTA
         42  GREAT LAKES         100  MIDWEST     CHICAGO
         51  PLAINS              140  MIDWEST     DALLAS
         66  PACIFIC             270  WESTERN     SAN FRANCISCO
         84  MOUNTAIN            290  WESTERN     DENVER
```

Figure 23. Sample report exported without control information

Exporting an across-style report

Exported across-style reports include fields not found in standard exported reports

This sample shows an exported across-style report.

```
REPORT                                          LINE 1      POS 1     79

                          J & H SUPPLY COMPANY
                          DEPT AVERAGE SALARIES
                        REPORT 18 (ACROSS REPORT)


          <---------------- JOB ----------------->
          <- CLERK -->  <-- MGR --->  <- SALES -->  <- TOTAL -->
               AVERAGE       AVERAGE       AVERAGE       AVERAGE
    DEPT       SALARY        SALARY        SALARY        SALARY
  ------    ----------    ----------    ----------    ----------
      10                    20865.86                    20865.86
      15      12383.35      20659.80      16502.83      15482.33
      20      13878.68      18357.50      18171.25      16071.53
      38      12482.25      17506.75      17407.15      15457.11
            ==========    ==========    ==========    ==========
              12914.76      19998.21      17372.10      16880.26


                                  COMPANY NAME
                                    REPORT 18
                                     PAGE 1
```

The following encoded format is the result of exporting the sample across-style report.

```
H QMF 20 R 01 E V W E R 02 03 13/01/15 16:20

V  1001 006 PERIOD
V  1002 003 016
T  1010 002 006 1013 005 1014 006 1015 006 1016 006 1017 006 1012 008
R  L     000001 000003 000008 000001 GROUP
R  L2    000003 000005 000014 000001 AVERAGE
V  2001 005 C
V  2002 003 001
V  2003 003 YES
T  2010 004 003 2012 006 2013 006 2014 006
R  000014 000018 000009
R  000029 000031 000023
R  000042 000046 000037
R  000056 000060 000051
L  110 10100000                             J & H SUPPLY COMPANY
L  110 10100000                             DEPT AVERAGE SALARIES
L  110 10100000                           REPORT 18 (ACROSS REPORT)
L  110 10000000
L  110 10000000
L  170 10000000           <---------------- JOB ----------------->
L  170 11000000           <- CLERK -->  <-- MGR --->  <- SALES -->  <- TOTAL -->
L  170 10000000                AVERAGE       AVERAGE       AVERAGE       AVERAGE
L  170 10000000     DEPT       SALARY        SALARY        SALARY        SALARY
L  170 10010000   ------    ----------    ----------    ----------    ----------
L  181 11000000       10                    20865.86                    20865.86
L  181 11000000       15      12383.35      20659.80      16502.83      15482.33
L  181 11000000       20      13878.68      18357.50      18171.25      16071.53
L  181 11000000       38      12482.25      17506.75      17407.15      15457.11
L  190 10010000             ==========    ==========    ==========    ==========
L  190 11000000               12914.76      19998.21      17372.10      16880.26
ddL  120 10000000
L  120 10000000
L  120 10100000                                   COMPANY NAME
L  120 10100000                                     REPORT 18
L  120 10100000                                      PAGE 1
E
```

Table 38 on page 105 explains field numbers that are common to both standard reports and across-style reports. The following table shows the additional fields that you see in the exported across-style reports.

Table 40. Field numbers for exported across-style report		
Field number	**Record type**	**Description**
2001	V	Edit code by which across value is formatted
2002	V	Number of data lines per across group
2003	V	Indicates whether the across summary column exists
2010	T	Across report table
		For each across value:
2012	T	Starting position for formatted across value (the across value appears in the column heading lines)
2013	T	Ending position for formatted across value
2014	T	Starting position for the set of report columns associated with this across value, including preceding indent area

For aggregated columns in an across report, fields 1014, 1015, and 1016 describe the relative starting and ending positions of the field within the set of aggregated columns of an across value. (See field 2014 in the table.)

Exporting a prompted query

An exported prompted query object contains the information displayed in the echo area of the **Prompted Query** primary panel.

A sample query (before export)

A data set or data queue that contains an exported prompted query can be imported into the QMF in two ways. The data set or data queue can either be imported into the QMF temporary storage area or directly into the database. When you import a prompted query, QMF checks whether the incoming query is consistent with the data in the database. For example, if the prompted query that is imported has columns A, B, and C in table XYZ, QMF verifies that table XYZ with columns A, B, and C exists in the database.

This example shows sample echo text that appears on the Prompted Query primary panel before exporting.

```
Tables:
  Q.STAFF(A)
  Q.ORG(B)
  Q.STAFF(C)

Join Tables:
  A.DEPT And B.DEPTNUMB
  And A.ID And C.ID

Columns:
  A.ID
  A.DEPT
  A.JOB
  A.SALARY
  DEPTNUMB
  C.SALARY
  C.SALARY+A.COMM

Row Conditions:
  If A.SALARY Is Greater Than 10000
  And A.DEPT Is Equal To 84 or 96

Sort:
  Descending by C.SALARY+A.COMM

Duplicate Rows:
  Keep duplicate rows
```

How the exported query looks

This example shows the format of the exported prompted query.

```
H QMF 20 T 01 E V W E R 01 03 13/01/15 16:20
T 1110 003 002 1112 001 1113 050
R A Q.STAFF
R B Q.ORG
R C Q.STAFF
T 1150 002 002 1152 020 1153 020
R A.DEPT               B.DEPTNUMB
R A.ID                 C.ID
T 1210 007 002 1212 001 1213 255
R C A.ID
R C A.DEPT
R C A.JOB
R C A.SALARY
R C B.DEPTNUMB
R C C.SALARY
R C C.SALARY+A.COMM
T 1310 009 003 1312 001 1313 008 1314 255
R 1 C        A.SALARY
R 2 IS       GT
R 3          10000
R 4 I
R 1 C        A.DEPT
R 2 IS       EQ
R 3          84
R 3          96
R 4 A
T 1410 001 002 1412 001 1413 255
R D C.SALARY+A.COMM
V 1501 001 K
E
```

Interpreting the header record in the exported data set or queue

This following table shows the meaning of this header record in the exported prompted query shown in “How the exported query looks” on page 110.

```
H QMF 20 T 01 E V W E R 01 03 13/01/15 16:20
```

Table 41. Example of a prompted query header record	
Value from example	**Description**
H QMF 19 T	This prompted query header record specifies QMF V12.1.
01	The structure of the prompted query is at object level 1. If the exported query object contains a period specification, object level 2 is specified instead.
E	The format is encoded (the format used for exported forms, reports, and prompted queries).
V	The exported prompted query does not contain any errors or warnings.
W	The file contains the entire prompted query.
E	English was the national language in use when the object was exported.
R	When importing, the object in the temporary storage area is replaced.
01	The length of the control area is 1 byte.
03	The length of integer length fields is 3 bytes.
13/01/15	The date stamp specifies January 15, 2013.
16:20	The timestamp specifies a time of 4:20 PM.

See "How the exported query looks" on page 110 for a complete example of the Prompted Query encoded format.

Interpreting the records of the exported prompted query

Table definitions (field number 1110) are always exported. Join conditions (field number 1510) are always exported if more than one table is selected.

To import a prompted query file, the file must have an H record followed by the T record of the encoded table. If no tables are specified, an empty query is imported. Join conditions are not required unless more than one table is selected.

Table 42. Table and field numbers for an exported prompted query object

Record type	Table number	Field number	Field description

T	1110	-	Table definitions table
			
			The T record in this section of the exported prompted query in “How the exported query looks” on page 110 identifies this section as the portion that contains the table names involved in the query:
			
			`T 1110 003 002 1112 001 1113 050`
			
			'003' refers to 3 tables, while '002' refers to 2 field numbers (1112 and 1113). If the exported query object contains a period specification, a value of '003' is used to indicate 3 field numbers (1112, 1113, and 1114) instead.
			
			Each T record is followed by R records and, in this example, the R records identify the tables involved in the prompted query join:
			
			`R A Q.STAFF`
			`R B Q.ORG`
			`R C Q.STAFF`
			
			This portion of the exported file corresponds to the following part of the prompted query shown in “#unique_109/unique_109_Connect_42_ASampleQuerybeforeExport” on page 109:
			
			`Tables:`
			`  Q.STAFF(A)`
			`  Q.ORG(B)`
			`  Q.STAFF(C)`

		1112	Table ID (valid table IDs are A-Z, and #,$,@)
		1113	Table name (maximum of 280 characters)
		1114	Period specification (maximum of 560 characters). This field number is included only if the exported query object contains a period specification.

Table 42. Table and field numbers for an exported prompted query object (continued)

Record type	Table number	Field number	Field description

T	1150	-	Join conditions table
			
			The T record in this section of the exported prompted query in "How the exported query looks" on page 110 identifies this section as the portion that contains the join conditions involved in the query. Each T record is followed by R records that identify which tables will be joined:
			
			`T 1150 002 002 1152 020 1153 020`
			`R A.DEPT B.DEPTNUMB`
			`R A.ID C.ID`
			
			This portion of the sample exported query corresponds to the following part of the sample prompted query shown in "#unique_109/unique_109_Connect_42_ASampleQuerybeforeExport" on page 109:
			
			`Join Tables:`
			`A.DEPT And B.DEPTNUMB`
			`And A.ID And C.ID`

		1152	Column 1 name: Short length (22) Expanded length (34)
		1153	Column 2 name: Short length (22) Expanded length (34)

T	1210	-	Columns table
			
			The T record in this section of the exported prompted query in "How the exported query looks" on page 110 identifies this section as the portion that contains the column names involved in the query. Each T record is followed by R records that identify the column names. The section appears as follows in the exported query:
			
			`T 1210 007 002 1212 001 1213 255`
			`R C A.ID`
			`R C A.DEPT`
			`R C A.JOB`
			`R C A.SALARY`
			`R C B.DEPTNUMB`
			`R C C.SALARY`
			`R C C.SALARY+A.COMM`
			
			This section of the exported query corresponds to the following section of the sample query shown in "#unique_109/unique_109_Connect_42_ASampleQuerybeforeExport" on page 109:
			
			`Columns:`
			`A.ID`
			`A.DEPT`
			`A.JOB`
			`A.SALARY`
			`DEPTNUMB`
			`C.SALARY`
			`C.SALARY+A.COMM`

Table 42. Table and field numbers for an exported prompted query object (continued)

Record type	Table number	Field number	Field description
		1212	Column type: • C=column • E=expression • S=summary function with expression • F=summary function with only a column
		1213	Column name, expression, or summary function: Short length (255) Expanded length (560)

T	1310	-	Row selection conditions
			The T record in this section of the exported prompted query in “How the exported query looks” on page 110 identifies this section of the exported query as the portion that contains the query conditions. Each T record is followed by R records that characterize each condition. The section appears as follows in the exported prompted query:
			`T 1310 009 003 1312 001 1313 008 1314 255`
			`R 1 C A.SALARY`
			`R 2 IS GT`
			`R 3 10000`
			`R 4 I`
			`R 1 C A.DEPT`
			`R 2 IS EQ`
			`R 3 84`
			`R 3 96`
			`R 4 A`
			This section of the exported query corresponds to the following section of the query shown in “#unique_109/unique_109_Connect_42_ASampleQuerybeforeExport” on page 109:
			`Row Conditions:`
			`If A.SALARY Is Greater Than 10000`
			`And A.DEPT Is Equal To 84 or 96`

		1312	Entry type: • 1 - left of operator • 2 - operator • 3 - right of operator • 4 - connector
		1313	For entry type '1', identifies column type: • C=column • E=expression • S=summary function • F=summary function (column name only specified)

Table 42. Table and field numbers for an exported prompted query object (continued)

Record type	Table number	Field number	Field description
			For entry type '2', identifies the verb: • IS for 'is' (default) • ISN for 'is not'
			For entry type '3' (not used)
			For entry type '4', identifies a connector: • O for 'or' • A for 'and' (default)
		1314	For entry type '1' this field is a column name, expression, or summary function: Short length (255) Expanded length (560)
			For entry type '2', identifies the operator: • EQ for 'equal to' • LT for 'less than' • LE for 'less than or equal to' • GT for 'greater than' • GE for 'greater than or equal to' • BT for 'between' • SW for 'starting with' • EW for 'ending with' • CT for 'containing' • NL for NULL
			For entry type '3', identifies a value
			For entry type '4' (not used)

T	1410	-	Sort conditions table
			The T record in this section of the exported prompted query in “How the exported query looks” on page 110 identifies this section as the portion that contains the sort conditions for the query. Each T record is followed by R records that characterize each sort condition. This section appears as follows in the exported prompted query:
			`T 1410 001 002 1412 001 1413 255`
			`R D C.SALARY+A.COMM`
			This section of the exported query corresponds to the following section of the sample query in “#unique_109/ unique_109_Connect_42_ASampleQuerybeforeExport ” on page 109:
			`Sort:`
			`  Descending by C.SALARY+A.COMM`

Table 42. Table and field numbers for an exported prompted query object (continued)			
Record type	**Table number**	**Field number**	**Field description**
		1412	Sort direction: • A for 'ascending' • D for 'descending'
		1413	Column: Short length (255) Expanded length (560)

V		1501	Treatment of duplicate rows:
			• K for 'keep'
			• D for 'discard'
			For example, the following line in the sample exported prompted query in “How the exported query looks” on page 110 shows that the record length of the value K is 1 ("001"). The line also shows that the user who built the query specified to keep duplicate rows ("K"):
			`V 1501 001 K`
			This section of the exported query corresponds to the following section of the sample query shown in “#unique_109/ unique_109_Connect_42_ASampleQuerybeforeExport ” on page 109:
			`Duplicate Rows:`
			`  Keep duplicate rows`

The meaning of values for fields 1313 and 1314 depends on the sequence number indicated in field number 1312 in table number 1310.

Related reference

Header records
Most records of exported forms, reports, or prompted queries have a variable format. However, header records have a fixed format, even though the data set or data queue that contains the records can be of variable format.

Table row records (R)
R records of exported forms, reports, or prompted queries provide a set of values for a single row in an encoded table. R records contain a list of values arranged in an order described by the associated T record. An R record matches the description of the positions and lengths of the data values specified in the T record.

Ensuring that the exported prompted query has a valid format

Importing a prompted query object that your application modified is subject to certain rules.

If you want to import a prompted query object that your application modified, be aware of the following conditions:

- When a prompted query file is imported, the incoming records must be in this specific order after the header (H) record:
  1. T records for table definitions
  2. R records for table names
  3. T records for column definitions

4. R records for columns
5. Row condition records (table number 1310) must be in order within each condition according to the entry type sequence number (field number 1312). In other words, the records must be in the same order in which row data appears in the Prompted Query echo area.

The remaining records can be in any order.

- The Table definitions table (T record 1110) must appear before any other tables or V records.
- The value of row count in the Tables T record must be * or an integer from 0 through 15. A zero value in the row count causes everything in the query to be ignored, which means that an empty query is imported.
- QMF does not issue warnings for prompted query imports.
- If a second Tables table (table 1110) is specified, QMF issues an error, and the contents of the table are ignored. Prompted Query does not supply default values on import.
- If there is a Sort table, there must be a Columns table that precedes it.
- QMF accepts duplicate records in the import file. The most recent value for the record is used.
- All column names must be qualified by the table identifier during import.
- When a prompted query is exported to a pre-allocated data set, the minimum logical record length (LRECL) allowed is 259 bytes.
- The exported format of a prompted query is the same regardless of the national language used; the format is language-independent. The language byte in the header record is ignored during import. The codes used when exporting a prompted query are described in the list of table and field numbers for an exported prompted query object.

  Summary functions and expressions are not translated; thus, summary functions COUNT, AVG, SUM, MIN, and MAX remain unchanged.

Importing forms and prompted queries

Be aware of the rules for importing a form or prompted query.

When you import a form or prompted query:

- The file can consist of variable-length or fixed-length records.
- The record identifier (H, V, T, R, E, *, L, or C) must be in the first position of every record.
- The first two bytes are reserved for control information (the control area).
- Every data field (including field numbers, lengths, and values) must be preceded and followed by one delimiter, with the following exception: the last data field in a record does not need to be followed by a delimiter because the end-of-record acts like a delimiter. (The examples in this information use the blank character as the delimiter.)
- If QMF encounters a duplicate data value or table while importing, it replaces the previous value or table. However, duplicates are not allowed where they would violate the rules for a particular object. For example, the number of columns provided for a form cannot be changed after the first COLUMNS table is processed.
- Table numbers, field numbers, and numeric lengths can contain leading zeros or leading blanks. However, trailing blanks (except for the blank delimiter) are not allowed; fields must be right-aligned.
- When * is used instead of a length or count, it must be left-aligned and padded with trailing blanks.
- If the value supplied for a data entry field is shorter than the field, it is padded with trailing blanks. If the value supplied is longer than the field, it is truncated.
- If the record is shorter than its fixed-format length, those fields left unspecified are assumed to be blank.

Related reference

Exporting a form

The form object contains all the information specified in all the QMF form panels. When you export a form, QMF converts to the encoded format any form panels whose values deviate from the default values.

Size specifications for externalized objects
External tables and objects have both record size and record format specifications that vary by the type of object.

Procedures and SQL queries

The format of the TSO data set or CICS data queue that represents these objects is the simplest of all the formats. Each record in the data set or data queue is essentially an image of a line as it is displayed on the screen (a fixed-length record of 79 bytes).

Although each line of these objects is 79 bytes, the logical record length (LRECL) for new and existing data sets can be 79 - 32,760 bytes. If you export to a new data set, the LRECL is the value that is specified by global variable DSQEC_DSLRECL1. If the LRECL is greater than 79, QMF pads each object record with blanks during export.

Here is an example of a simple SQL query:

```
SQL query

SELECT *
FROM Q.STAFF
```

Figure 24. A simple SQL query

This example shows the query in its externalized format:

```
SELECT *
FROM Q.STAFF
```

Because of the simplicity of the record format, creating or editing an SQL query or procedure outside of QMF is straightforward. An SQL query or procedure consists of fixed-length data in columns 1 - 79. Any data in columns 80 - 32,760 is ignored during import. When you import the resulting data set or data queue, your query or procedure is in the QMF temporary storage area, ready to be run.

Exported form-based charts and QBE queries

You can export form-based charts and Query-by-Example (QBE) query objects for processing outside of the QMF environment.

Exported form-based charts

A form-based chart cannot be saved as a QMF object in the database or retrieved from the database. You cannot import form-based charts into QMF.

When you export a chart in QMF, it converts the data from the report to Graphics Data Format (GDF). GDF, a GDDM format, is an existing standard for data interchange. You can print the exported chart data by using GDDM utilities, or include it in documents.

You can use an exported chart object just as you would any GDF-formatted data set. For example, through the Document Composition Facility (DCF), an application can combine a QMF report (that uses a printed or exported report) with a QMF chart (that uses an exported chart) and send the formatted information to a printer.

Exported QBE queries

QBE query objects are exported by using a format internal to QMF. This format cannot be altered in any way.

Size specifications for externalized objects

External tables and objects have both record size and record format specifications that vary by the type of object.

The following table contains specifications for both TSO and CICS import and export files. For CICS, record sizes are not enforced. For example, you can import an SQL query from a temporary storage queue with a record size of 32 KB and QMF truncates it to 79 bytes.

Record format is not a factor for CICS temporary storage or transient data queues. A temporary storage queue holds records without regard to their format. A transient data queue is defined to a destination control table (DCT) and ignores the record format.

You must specify a name for your data set or CICS data queue on the EXPORT or IMPORT command. Queue names have no default prefix or suffix. CICS temporary storage queue names are 8 bytes; transient data queue names are 4 bytes.

The following abbreviations are used for record formats in the table:

- FB - fixed block format
- VB - variable block format
- VBS - variable block spanned format

Table 43. File and data set attributes

Object	**Record size**	**Record format**
Data or table (QMF format)	Maximum size: 7,000 bytes	Fixed length (FB)
Data or table (IXF format)	Maximum size: 32,756 The minimum LRECL for an exported form that includes defined columns is 161 bytes. The minimum LRECL that QMF accepts for an IXF data set or CICS data queue during import is 49 bytes. Record size is normally the length of a row of data in the table that is being exported (including space for null indicators and DBCS delimiters) plus the length of the IXF D-type record count field (5 bytes).	Variable length (VB)
Data or table (XML format)	Maximum size: 2 GB	Variable length (VBS)

Table 43. File and data set attributes (continued)

Object	Record size	Record format

Data or table (CSV format)	The maximum LRECL for exporting to new data sets is calculated based on whether YES or NO is specified for the HEADER option of the EXPORT command.
	• If HEADER=YES is specified, the following formula is used:
	`max(Column_Names_Total_Length, Column_Data_Value_Total_Length) + (number of columns * 3 - 1) + 4`
	• If HEADER=NO is specified, the following formula is used:
	`(length of column data values) + (number of columns - 1) + (number of columns * 2) + 4`
	For exporting to existing data sets, the LRECL of the existing data set is the maximum LRECL that can be exported.
		Variable length (VB)

Prompted query	Maximum: 7,290 bytes Minimum: 266 bytes on EXPORT; 41 bytes on IMPORT	Variable length (VB) on EXPORT Either fixed length (FB) or variable length (VB) on IMPORT
SQL query	Must be 79 - 32,760 bytes on EXPORT to new and existing data sets; can be any size on IMPORT, but is truncated to 79 bytes	Either fixed length (FB) or variable length (VB) on EXPORT to existing data sets; fixed length (FB) on EXPORT to new data sets Either fixed length (FB) or variable length (VB) on IMPORT
QBE query	Must be 1,024 bytes An empty QBE query is 828 bytes.	Variable length (VB)
Form	Maximum: 7,290 bytes Minimum: 161 bytes on EXPORT; 23 bytes on IMPORT	Fixed length (FB) on EXPORT Either fixed length (FB) or variable length (VB) on IMPORT
Proc	Must be 79 - 32,760 bytes on EXPORT to new and existing data sets; can be any size on IMPORT, but is truncated to 79 bytes	Either fixed length (FB) or variable length (VB) on EXPORT to existing data sets; fixed length (FB) on EXPORT to new data sets Either fixed length (FB) or variable length (VB) on IMPORT
Report	Maximum: 7,290 bytes Minimum: 65 bytes	Variable length (VB)
HTML report	Maximum: 32,000 bytes	Variable length (VB)

Storage considerations

When you import and export objects to CICS data queues and TSO data sets, be aware of how QMF handles storage.

CICS data queues

For objects exported to a CICS data queue, understand how QMF handles the queues.

When you export an object to a CICS data queue, keep in mind the following conditions:

- In CICS, both the IMPORT and EXPORT commands require that you specify the QUEUETYPE option. There is no default.
- When importing an object from a transient data (TD) queue in CICS, you must specify the correct object type. The queue is emptied after QMF retrieves its contents. For example, if you specify "Form" when the object type in the transient data queue is a procedure, QMF issues an error message. However, you cannot successfully issue the IMPORT command again (even with the correct object type) by using the same queue, because that queue is now empty.
- In CICS, the transient data or temporary storage (TS) queue must contain a single, completed QMF object before you issue the IMPORT command.
- If you export to a transient data queue, the queue must be open, enabled, and empty before you issue the EXPORT command.

QMF handles CICS transient data queues differently than temporary storage queues.

- Transient data queues

  QMF imports the entire transient data queue before displaying the object on the screen. This means that the contents of the entire queue must fit into your storage or spill area. You can use the DSQSPILL parameter to specify use of spill storage. There might be a delay before the object is displayed if the object is large and you are using a file for spill data.

  A CICS intrapartition transient data queue can hold up to 32 KB rows of data. An extrapartition transient data queue can be as large as it needs to be to hold the object.

- Temporary storage queues

  By default, QMF reads approximately 100 rows of temporary storage before displaying them to the user. A temporary storage queue can hold up to 32 KB rows of data.

QMF uses the SUSPEND parameter on the IMPORT and EXPORT commands to allow CICS to regulate when the command is run.

The SUSPEND parameter on the IMPORT and EXPORT commands determines the action to be taken if a queue is busy. When the SUSPEND parameter is set to YES, QMF issues a CICS ENQ (enqueue) for the CICS data queue name. This setting tells CICS to wait until the queue is available before writing the QMF object to the queue. The wait ensures that the QMF transaction does not interfere with any other jobs that are being handled by the queue.

When the SUSPEND parameter is set to NO, the EXPORT command is canceled and a message is returned. The default value of SUSPEND is NO.

TSO data sets

For objects exported to a TSO data set, be sure that you configure your storage management system appropriately.

If you are using standard DASD devices, be sure that your storage management software is configured to handle dynamic allocation of extended data sets. When configuring these data sets, specify the default storage classes. When your storage management system is configured in this manner and you export an object, QMF dynamically allocates a data set. QMF uses the name specified on the EXPORT command if the data set does not exist. If you are exporting data in XML format, you could receive dynamic allocation errors if you have not properly configured your data sets. For more information about how to configure

dynamic allocation of extended data sets, see the information provided with your storage management software.

If you are not using standard DASD devices, you must pre-allocate your data sets before using the EXPORT command. You can use global variables to specify the type and size of new data sets that will contain exported objects:

- Use global variable DSQEC_PO to specify the type of partitioned data set to create when you export an object to a member of a new data set. The type can be the default type for your site, a PDS data set, or a PDSE data set.
- Use global variable DSQEC_DSALLOC_DIR to specify the number of directory blocks when you export a member of a new PDS data set. The default is 20.
- Use global variable DSQEC_DSALLOC_PRI to specify the primary space allocation in tracks. The default is 15 tracks.
- Use global variable DSQEC_DSALLOC_SEC to specify the secondary space allocation in tracks. The default is 105 tracks.

Related reference

Global variables that control how commands and procedures are executed

Chapter 10. Debugging your QMF applications

In addition to error handling, QMF provides debugging facilities for your callable interface applications.

You can use the REXX trace facility through the REXX TRACE statement.

Related concepts

Writing QMF applications that use ISPF services

You can bypass the QMF panels by writing applications that have their own user interfaces. You can use either the callable interface or the command interface to write applications that use ISPF.

Debugging your callable interface applications

QMF provides two trace options, L and A, and various levels of trace detail for debugging your applications.

The L option for tracing

The L option writes messages and commands to an external TSO data set or CICS data queue.

There are two L options you can choose:

L1
Every QMF message is written to the QMF trace data output.

L2
Every QMF message and command is written to QMF trace data output.

You can set the L option in one of two ways:

- Issue the DISPLAY PROFILE command, and when the PROFILE is displayed, change the TRACE option to either L1 or L2.
- Issue the command:

```
SET PROFILE (TRACE=x
```

  In this statement, *x* is either L1 or L2.

Related concepts

Allocating the QMF trace data output

You must allocate the QMF trace data output before you start QMF if tracing is to be used.

The A option for tracing

You can use the A option to specify a level of tracing for QMF application support services.

The A option can be A0, A1, or A2. A0 is the default and provides no A-tracing at all. A1 and A2 provide increasingly detailed results. This pattern is also used for the other QMF trace options.

You specify the A option in the same way you specify the L option: through a QMF SET PROFILE command, or by entering it on the screen after you issue the `DISPLAY PROFILE` command. For example, you can enter the following statement immediately before you call the application you are debugging:

```
SET PROFILE (TRACE=L2A1)
```

When you begin your application, both L2 and A1 tracing are in effect.

To determine the current A option setting, look at the variable DSQAO_APPL_TRACE. Its value is 0, 1, or 2 for the settings A0, A1, or A2. You can use the value of DSQAO_APPL_TRACE to select the tracing you want in your application, as in the REXX application shown here:

```
/*  REXX program to set tracing                */
call dsqcix "GET GLOBAL(A_TRACE=DSQAO_APPL_TRACE"
if a_trace > 0 then
  do
    /* trace code for both A1 and A2 */
    .
    .
    .
    if a_trace = 2 then
      do
         /* trace code for just A2   */
         .
         .
         .
      end
  end
```

Figure 25. Structure of a sample REXX program that you can use to set tracing for application support services

Turning the tracing off

To turn tracing off, use the SET PROFILE command.

If you need to turn the tracing off for any reason, issue the following command: `SET PROFILE (TRACE=NONE`

This command discontinues tracing for the rest of the QMF session, but does not affect the permanent QMF profile.

Allocating the QMF trace data output

You must allocate the QMF trace data output before you start QMF if tracing is to be used.

You might want to reallocate the data set or data queue if the original allocation does not meet your needs.

For examples of how to allocate QMF trace data output for TSO, see the programming language specification for the language you are using.

The commands in the examples allocate a sequential trace data set or data queue that you can examine after your QMF session is over. The output consists of fixed-length, 80-character records.

For CICS, you can use program parameters DSQSDBQT and DSQSDBQN to specify where QMF puts your trace data. Use caution when using CICS temporary storage, because QMF can produce a large amount of trace data. Because trace data that exceeds the size of the queue is discarded, use CICS temporary storage only for trace data from messages or small applications.

Related reference

Programming language specifications for using the callable interface
The QMF application programming interface is available for several programming languages.

START command keywords
You can specify keywords on the START command.

The QMF MESSAGE command for tracing

You can use the QMF MESSAGE command to do more than display a message when an application ends. You can also use it to record messages in the QMF trace data output.

To record messages, run the application with the L tracing option set to L1 or L2. Every message processed through the MESSAGE command is recorded, along with other QMF messages in the QMF trace data output. If the L tracing option is set to L2, commands are also recorded.

By placing MESSAGE commands at strategic points in your program, you can log useful information in the QMF trace file. You can examine the information either on a display device or in printed output.

The following lines show an example of how to turn on tracing and issue meaningful messages that are displayed in the trace output:

```
call dsqcix "SET PROFILE (TRACE=L2"
⋮
call dsqcix "MESSAGE (TEXT='QUERYA COMPLETED SUCCESSFULLY'"
⋮
call dsqcix "MESSAGE (TEXT='EXECB ENTERED WITH VALUE OF 7'"
⋮
```

In this example, records containing the messages "QUERYA COMPLETED SUCCESSFULLY" and "EXECB ENTERED WITH A VALUE OF 7" are written to the QMF trace data output.

Because QMF messages might change from one release to the next, do not use the QMF trace data output as input to an application.

Related concepts

Allocating the QMF trace data output
You must allocate the QMF trace data output before you start QMF if tracing is to be used.

The L option for tracing
The L option writes messages and commands to an external TSO data set or CICS data queue.

Errors on the START or other QMF commands

Depending on its level, the DSQCOMM might contain message text. If the START command (or any QMF command) fails, you can use this message text to troubleshoot problems.

Chapter 11. Programming language specifications for using the callable interface

The QMF application programming interface is available for several programming languages.

IBM provides information about how to assemble (or compile) and link-edit the programs and how to run them using the callable interface. IBM does not provide the REXX execs, JCL, or CLISTs in the examples, but you can copy them and alter them to suit your needs.

Assembler language interface

You can use the Assembler language with the callable interface in QMF.

Interface communications area mapping for Assembler (DSQCOMMA)

DSQCOMMA provides DSQCOMM mapping for the Assembler language; it is provided with the product.

This table shows the values for DSQCOMMA.

Table 44. Contents of the DSQCOMMA interface communications area

Structure name	Data type	Description
DSQ_RETURN_CODE	DS F	Indicates the status of a QMF command after it runs Its values are: **DSQ_SUCCESS** Successful execution of the request **DSQ_WARNING** Normal completion with warnings **DSQ_FAILURE** Command did not execute correctly **DSQ_SEVERE** Severe error; QMF session terminated
DSQ_INSTANCE_ID	DS F	Identifier established by QMF during execution of the START command
DSQ_COMM_LEVEL	DS CL12	Identifies the level of the DSQCOMM In your application, include instructions that initialize this variable to the value of DSQ_CURRENT_COMM_LEVEL before issuing the QMF START command
DSQ_PRODUCT	DS CL2	Identifies the IBM query product in use Variables that begin with DSQ_QMF specify QMF for TSO and QMF for CICS versions.
DSQ_PRODUCT_RELEASE	DS CL2	Release level of QMF in use Variable DSQ_QMF_V13R1 specifies QMF Version 13 Release 1.
DSQ_RESERVE1	DS XL28	Reserved for future use

Table 44. Contents of the DSQCOMMA interface communications area (continued)		
Structure name	**Data type**	**Description**
DSQ_MESSAGE_ID	DS CL8	Completion message ID
DSQ_Q_MESSAGE_ID	DS CL8	Query message ID
DSQ_START_PARM_ ERROR	DS CL8	Name of the parameter in error when the START command failed due to a parameter error
DSQ_CANCEL_IND	DS C	Contains one of two values, depending on whether the user canceled the QMF session while a QMF command was running: • DSQ_CANCEL_YES • DSQ_CANCEL_NO
DSQ_RESERVE2	DS XL23	Reserved for future use
DSQ_RESERVE3	DS XL156	Reserved for future use
DSQ_MESSAGE_TEXT	DS CL128	Completion message text
DSQ_Q_MESSAGE_TEXT	DS CL128	Query message text

Function calls for Assembler language

QMF provides one function call, DSQCIA, for Assembler-language programs. The function call has two formats: regular syntax and extended syntax.

DSQCIA, regular syntax

This call is for QMF commands that do not require access to application program variables. Use this call for most QMF commands.

```
     CALL DSQCIA,(DSQCOMM,CMDLTH,CMDSTR),VL
```

The parameters have the following values:

DSQCOMM
The interface communications area

CMDLTH
Length of the command string (CMDSTR); a FULLWORD parameter

CMDSTR
The QMF command issued on the function call; an uppercase character string of the length specified by CMDLTH

VL is the Assembler VARIABLE LIST statement.

DSQCIA, extended syntax

This extended-syntax format of the DSQCIA function call is for the QMF commands that require access to application program variables: START, TRACE, and the extended formats of GET GLOBAL and SET GLOBAL.

```
     CALL DSQCIA,(DSQCOMM,CMDLTH,CMDSTR,
            PNUM,KLTH,KWORD,VLTH,VALUE,VTYPE),VL
```

The parameters have the following values:

DSQCOMM
The interface communications area.

CMDLTH
The length of the command string (CMDSTR); a FULLWORD parameter.

CMDSTR
The QMF command to execute; an uppercase character string of the length specified by CMDLTH.

PNUM
The number of command keywords or trace areas; a FULLWORD parameter.

KLTH
The length of each specified keyword or trace title; a FULLWORD parameter or array of FULLWORD parameters.

KWORD
QMF keyword, keywords, or address of trace titles; a character, array of characters, or array of addresses to trace titles whose lengths are specified by KLTH.

VLTH
The length of each value that is associated with the keyword or trace title; a FULLWORD parameter or array of FULLWORD parameters.

VALUE
The value that is associated with each keyword or the address of a value that is associated with a trace title.

Its type is specified in the VTYPE parameter and can be a character, array of characters, FULLWORD parameter, or array of FULLWORD parameters. For trace data, VTYPE must be FINT.

VTYPE
Data type of the contents of the VALUE parameter.

This parameter has one of two values, which are provided in the interface communications area, DSQCOMMA:

- DSQ_VARIABLE_CHAR for character values

  If VTYPE is DSQ_VARIABLE_CHAR, then VALUE is not validated.
- DSQ_VARIABLE_FINT for integer values

  If VTYPE is DSQ_VARIABLE_FINT, then VALUE is validated, and VALUE must be an integer.

All values that are specified in the VALUE field must have the data type that is specified in VTYPE.

VL is the Assembler VARIABLE LIST statement.

Assembler programming example

IBM provides a sample Assembler program for CICS and TSO. This sample program is a member of the library QMF1310.SDSQSAP*n* (where *n* is a national language identifier).

Sample Assembler program for CICS

IBM provides a sample Assembler program for CICS named DSQABFAC

This sample Assembler program for CICS is in the QMF1310.SDSQSAP*n* library (where *n* is a national language identifier).

This sample program for the Assembler callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1
- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

```
         TITLE 'Sample HLASM Query Callable Interface'
*********************************************************************
*                                                                   *
*  Sample Program:  DSQABFAC                                        *
*  Assembler Version of the QMF Callable Interface for CICS         *
*                                                                   *
*********************************************************************
DSQABFAC DFHEIENT CODEREG=(12),DATAREG=(13),EIBREG=(11)
DSQABFAC AMODE 31
DSQABFAC RMODE ANY
         SPACE 1
*********************************************************************
* Start a query interface session                                   *
*********************************************************************
         LA    R4,CICOMM             ESTABLISH ACCESS TO DSQCOMM
         USING DSQCOMM,R4
         SPACE 1
         MVC   DSQ_COMM_LEVEL,DSQ_CURRENT_COMM_LEVEL
         ST    R4,QMFP1              Address of DSQCOMMA
         LA    R1,STARTQIL           Address of START command length
         ST    R1,QMFP2
         LA    R1,STARTQI            Address of START command
         ST    R1,QMFP3
         LA    R1,1                  One Start command parameter
         ST    R1,NUMPARMS
         LA    R1,NUMPARMS           Address of number of parameters
         ST    R1,QMFP4
         LA    R1,STARTKYL           Address of keyword lengths
         ST    R1,QMFP5
         LA    R1,STARTKY            Address of keywords
         ST    R1,QMFP6
         LA    R1,STARTVL            Address of value lengths
         ST    R1,QMFP7
         LA    R1,STARTV             Address of values
         ST    R1,QMFP8
         LA    R1,DSQ_VARIABLE_CHAR  Address of value data type
         ST    R1,QMFP9
         OI    QMFP9,X'80'           Set end of parameter list
         LA    R1,QMFPLIST           Address of parameter list
         CALL  DSQCIA
         SPACE 1
*********************************************************************
* Set numeric values into query using SET command                   *
*********************************************************************
         SPACE 1
         LA    R1,20                 Set values for SET GLOBAL command
         ST    R1,VVAL1
         LA    R1,40
         ST    R1,VVAL2
         LA    R1,84
         ST    R1,VVAL3
         LA    R1,SETGL              Addr of SET GLOBAL command length
         ST    R1,QMFP2
         LA    R1,SETG               Address of SET GLOBAL command
         ST    R1,QMFP3
         LA    R1,3                  Three SET GLOBAL variables
         ST    R1,NUMPARMS
         LA    R1,NUMPARMS           Address of number of parameters
         ST    R1,QMFP4
         LA    R1,VNAME1L            Address of variable name lengths
         ST    R1,QMFP5
          LA    R1,VNAME1            Address of variable names
          ST    R1,QMFP6
          LA    R1,VVAL1L            Address of value lengths
          ST    R1,QMFP7
          LA    R1,VVAL1             Address of values
          ST    R1,QMFP8
          LA    R1,DSQ_VARIABLE_FINT Address of value data type
          ST    R1,QMFP9
          OI    QMFP9,X'80'          Set end of parameter list
          LA    R1,QMFPLIST          Address of parameter list
          CALL  DSQCIA
          SPACE 1
 *********************************************************************
 * Run a query                                                       *
 *********************************************************************
          LA    R1,QUERYL            Addr of RUN QUERY command length
          ST    R1,QMFP2
          LA    R1,QUERY             Address of RUN QUERY command
```

```
          ST    R1,QMFP3
         OI    QMFP3,X'80'           Set end of parameter list
         LA    R1,QMFPLIST           Address of parameter list
         CALL  DSQCIA
         SPACE 1
*************************************************************************
* Print the result of the query                                         *
*************************************************************************
         LA    R1,REPTL              Addr of PRINT Report command lth
         ST    R1,QMFP2
         LA    R1,REPT               Address of PRINT Report command
         ST    R1,QMFP3
         OI    QMFP3,X'80'           Set end of parameter list
         LA    R1,QMFPLIST           Address of parameter list
         CALL  DSQCIA
         SPACE
1

*************************************************************************
* End the query interface session                                       *
*************************************************************************
         LA    R1,ENDQIL             Address of EXIT command length
         ST    R1,QMFP2
         LA    R1,ENDQI              Address of EXIT command
         ST    R1,QMFP3
         OI    QMFP3,X'80'           Set end of parameter list
         LA    R1,QMFPLIST           Address of parameter list
         CALL  DSQCIA
         SPACE 1
*************************************************************************
* Free Keyboard                                                         *
*************************************************************************
         EXEC  CICS  SEND  CONTROL  FREEKB
         SPACE 1
*************************************************************************
* Return                                                                *
*************************************************************************
         SPACE 1
         XR    R15,R15            ZERO RETURN CODE
         DFHEIRET RCREG=15
*************************************************************************
* Data Areas                                                            *
*************************************************************************
         SPACE 1
*  Query Interface commands
         SPACE 1
STARTQI  DC    C'START'              START FUNCTION
SETG     DC    C'SET GLOBAL'         SET GLOBAL FUNCTION
QUERY    DC    C'RUN QUERY Q1'       RUN QUERY
REPT     DC    C'PRINT REPORT (FORM=F1,QUEUEN=DSQP,QUEUET=TS)'
ENDQI    DC    C'EXIT'               END INTERFACE
         SPACE 1
         DS    0F
STARTQIL DC    AL4(L'STARTQI)        LENGTH OF START FUNCTION
SETGL    DC    AL4(L'SETG)           LENGTH OF SET GLOBAL FUNCTION
QUERYL   DC    AL4(L'QUERY)          LENGTH OF RUN QUERY COMMAND
REPTL    DC    AL4(L'REPT)           LENGTH OF PRINT REPORT COMMAND
ENDQIL   DC    AL4(L'ENDQI)          LENGTH OF END INTERFACE COMMAND
         SPACE 1
*  START command keyword
         SPACE 1
STARTKY  DC    C'DSQSMODE'
STARTV   DC    C'INTERACTIVE'
         DS    0F
STARTKYL DC    AL4(L'STARTKY)
STARTVL  DC    AL4(L'STARTV)
         SPACE 1
*  SET GLOBAL command variable names
         SPACE 1
VNAME1   DC    C'MYVAR01'
VNAME2   DC    C'SHORT'
VNAME3   DC    C'MYVAR03'
         DS    0F
VNAME1L  DC    AL4(L'VNAME1)
VNAME2L  DC    AL4(L'VNAME2)
VNAME3L  DC    AL4(L'VNAME3)
         SPACE 1
*  SET GLOBAL command values
         SPACE 1
VVAL1L   DC    AL4(L'VVAL1)
VVAL2L   DC    AL4(L'VVAL2)
VVAL3L   DC    AL4(L'VVAL3)
```

```
* Callable interface communications definition
         DSQCOMMA
* Equates for registers 0-15
R0       EQU   00
R1       EQU   01
R2       EQU   02
R3       EQU   03
R4       EQU   04
R5       EQU   05
R6       EQU   06
R7       EQU   07
R8       EQU   08
R9       EQU   09
R10      EQU   10
R11      EQU   11
R12      EQU   12
R13      EQU   13
R14      EQU   14
R15      EQU   15
* Local variables located in CICS working storage
DFHEISTG DSECT
         ORG   DFHEIUSR
NUMPARMS DS    F                     NUMBER OF KEYWORDS
* QMF SET GLOBAL command values
VVAL1    DS    F
VVAL2    DS    F
VVAL3    DS    F
* QMF Callable interface parameter list
QMFPLIST DS   0D
QMFP1    DS    F
QMFP2    DS    F
QMFP3    DS    F
QMFP4    DS    F
QMFP5    DS    F
QMFP6    DS    F
QMFP7    DS    F
QMFP8    DS    F
QMFP9    DS    F
* Callable interface communications area
CICOMM   DS    CL(DSQCOMM_LEN)
         CSECT
         SPACE 1
         END   DSQABFAC
```

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Sample Assembler program for TSO

IBM provides a sample Assembler program for TSO named DSQABFA.

This sample Assembler program for TSO is in the QMF1310.SDSQSAP*n* library (where *n* is a national language identifier).

This sample program for the Assembler callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1
- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

```
DSQABFA  TITLE 'SAMPLE QMF CALLABLE INTERFACE'
DSQABFA  CSECT
DSQABFA  AMODE 31
DSQABFA  RMODE ANY
*********************************************************************
*                                                                   *
*  Sample Program:  DSQABFA                                         *
```

```
*  Assembler Version of the QMF Callable Interface                  *
*                                                                   *
*********************************************************************
         SPACE 1
         STM   R14,R12,12(R13)       SAVE ENTRY REGISTERS
         BALR  R12,0                 INITIALIZE BASE REGISTER
         USING *,R12
         LA    R2,SAVEAREA           CHAIN SAVE AREAS
         ST    R2,8(R13)
         ST    R13,SAVEAREA+4
         LR    R13,R2                ESTABLISH SAVE AREA
         SPACE 1
*********************************************************************
* Start a query interface session                                   *
*********************************************************************
         LA    R4,CICOMM             ESTABLISH ACCESS TO DSQCOMM
         USING DSQCOMM,R4
         SPACE 1
         MVC   DSQ_COMM_LEVEL,DSQ_CURRENT_COMM_LEVEL
         LA    R1,1                  1 PARAMETER
         ST    R1,NUMPARMS
         CALL  DSQCIA,
               (CICOMM,              QI COMMON AREA
               STARTQIL,             START COMMAND LENGTH
               STARTQI,              START COMMAND
               NUMPARMS,             NUMBER OF KEYWORDS
               STARTKYL,             KEYWORD LENGTHS
               STARTKY,              KEYWORDS
               STARTVL,              VALUE LENGTHS
               STARTV,               VALUES
               DSQ_VARIABLE_CHAR),VL VALUES ARE CHARACTERS
         SPACE 1
*********************************************************************
* Set numeric values into query using SET command                   *
*********************************************************************
         SPACE 1
         LA    R1,20                 SET VALUES TO BE MODIFIED
         ST    R1,VVAL1
         LA    R1,40
         ST    R1,VVAL2
         LA    R1,84
         ST    R1,VVAL3
         LA    R1,3                  3 PARAMETERS
         ST    R1,NUMPARMS
         SPACE 1
         CALL  DSQCIA,
               (CICOMM,
               SETGL,                SET GLOBAL COMMAND LENGTH
               SETG,                 SET GLOBAL COMMAND
               NUMPARMS,             NUM OF VARIABLES TO BE SET
               VNAME1L,              VARIABLE NAME LENGTHS
               VNAME1,               VARIABLE NAMES
               VVAL1L,               VALUE LENGTHS
               VVAL1,                VALUES
               DSQ_VARIABLE_FINT),VL VALUES ARE INTEGERS
         SPACE 1
*********************************************************************
* Run a query                                                       *
*********************************************************************
         SPACE 1
         CALL  DSQCIA,
               (CICOMM,
               QUERYL,               QUERY COMMAND LENGTH
               QUERY),VL             TEXT OF QUERY COMMAND
         SPACE 1
*********************************************************************
* Print the result of the query                                     *
*********************************************************************
         SPACE 1
         CALL  DSQCIA,(CICOMM,REPTL,REPT),VL
         SPACE 1
*********************************************************************
* End the query interface session                                   *
*********************************************************************
         SPACE 1
         CALL  DSQCIA,(CICOMM,ENDQIL,ENDQI),VL
         SPACE 1
*********************************************************************
* Return                                                            *
*********************************************************************
         SPACE 1
         SR    R15,R15               SET RETURN CODE
```

```
         L     R13,4(R13)
         L     R14,12(R13)          RESTORE CALLER REGISTERS
         LM    R0,R12,20(R13)
         BR    R14
         EJECT
*********************************************************************
* Data Areas                                                        *
*********************************************************************
         SPACE 1
*  Query Interface commands
         SPACE 1
STARTQI  DC    C'START'             START FUNCTION
SETG     DC    C'SET GLOBAL'        SET GLOBAL FUNCTION
QUERY    DC    C'RUN QUERY Q1'      RUN QUERY
REPT     DC    C'PRINT REPORT (FORM=F1)'  PRINT REPORT
ENDQI    DC    C'EXIT'              END INTERFACE
         SPACE 1
         DS    0F
STARTQIL DC    AL4(L'STARTQI)       LENGTH OF START FUNCTION
SETGL    DC    AL4(L'SETG)          LENGTH OF SET GLOBAL FUNCTION
QUERYL   DC    AL4(L'QUERY)         LENGTH OF RUN QUERY COMMAND
REPTL    DC    AL4(L'REPT)          LENGTH OF PRINT REPORT COMMAND
ENDQIL   DC    AL4(L'ENDQI)         LENGTH OF END INTERFACE COMMAND
         SPACE 1
*  START command keyword
         SPACE 1
STARTKY  DC    C'DSQSMODE'
STARTV   DC    C'INTERACTIVE'
         DS    0F
STARTKYL DC    AL4(L'STARTKY)
STARTVL  DC    AL4(L'STARTV)
         SPACE 1
*  SET GLOBAL command variable names
         SPACE 1
VNAME1   DC    C'MYVAR01'
VNAME2   DC    C'SHORT'
VNAME3   DC    C'MYVAR03'
         DS    0F
VNAME1L  DC    AL4(L'VNAME1)
VNAME2L  DC    AL4(L'VNAME2)
VNAME3L  DC    AL4(L'VNAME3)
         SPACE 1
*  SET GLOBAL command values
         SPACE 1
VVAL1    DS    F
VVAL2    DS    F
VVAL3    DS    F
VVAL1L   DC    AL4(L'VVAL1)
VVAL2L   DC    AL4(L'VVAL2)
VVAL3L   DC    AL4(L'VVAL3)
         SPACE 1
NUMPARMS DS    F                    NUMBER OF KEYWORDS
         SPACE 1
*  Callable interface communications area
         SPACE 1
CICOMM   DS    CL(DSQCOMM_LEN)
         SPACE 1
SAVEAREA DS    18F
         EJECT
         DSQCOMMA
         SPACE 1
R0       EQU   00                   EQUATES FOR REGISTERS 0-15
R1       EQU   01
R2       EQU   02
R3       EQU   03
R4       EQU   04
R5       EQU   05
R6       EQU   06
R7       EQU   07
R8       EQU   08
R9       EQU   09
R10      EQU   10
R11      EQU   11
R12      EQU   12
R13      EQU   13
R14      EQU   14
R15      EQU   15
         SPACE 1
         END   DSQABFA
```

Related reference

Conventions for National Language Feature information
Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

DSQCOMM for Assembler

The Assembler interface communications area file is named DSQCOMMA.

The DSQCOMMA file is provided in the QMF1310.SDSQSAP*n* library (where *n* is a national language identifier). A copy of the file is shown here:

```
         MACRO
         DSQCOMMA
*********************************************************************
*  Callable interface - variable constants                          *
*********************************************************************
*
*  Communications Level ID
*
DSQ_CURRENT_COMM_LEVEL   DC    CL12'DSQL>001002<'
*
*  Query Product IDs
*
DSQ_QRW            DC    C'01'
DSQ_QMF            DC    C'02'
DSQ_QM4            DC    C'03'
*
*  Query Product Release IDs
*
DSQ_QRW_V1R2       DC    C'01'
DSQ_QRW_V1R3       DC    C'02'
DSQ_QMF_V2R4       DC    C'01'
DSQ_QMF_V3R1       DC    C'02'
DSQ_QMF_V3R1M1     DC    C'03'
DSQ_QMF_V3R2       DC    C'04'
DSQ_QMF_V3R3       DC    C'05'
DSQ_QMF_V6R1       DC    C'06'
DSQ_QMF_V7R1       DC    C'07'
DSQ_QM4_V1R1       DC    C'01'
DSQ_QMF_V7R2       DC    C'08'
DSQ_QMF_V8R1       DC    C'09'
DSQ_QMF_V9R1       DC    C'10'
DSQ_QMF_V10R1      DC    C'11'
DSQ_QMF_V11R1      DC    C'12'
DSQ_QMF_V11R2      DC    C'13'
DSQ_QMF_V12R1      DC    C'14'
DSQ_QMF_V13R1      DC    C'15'
*
*  Extended parameter data types
*
DSQ_VARIABLE_CHAR  DC    C'CHAR'
DSQ_VARIABLE_FINT  DC    C'FINT'
*
*  Return codes
*
DSQ_SUCCESS        EQU   0
DSQ_WARNING        EQU   4
DSQ_FAILURE        EQU   8
DSQ_SEVERE         EQU   16
*
*  Instance ID values
*
DSQ_CONTINUE       EQU   0
*
*  Cancel indicator
*
DSQ_CANCEL_YES     EQU   C'1'
DSQ_CANCEL_NO      EQU   C'0'
*
*
DSQ_INTERACTIVE    EQU   C'1'
DSQ_BATCH          EQU   C'2'
*
DSQ_YES            EQU   C'1'
DSQ_NO             EQU   C'2'
*
```

```
*********************************************************************
*  Callable interface communications area                           *
*********************************************************************
DSQCOMM             DSECT
DSQ_RETURN_CODE     DS    F             FUNCTION RETURN CODE
DSQ_INSTANCE_ID     DS    F             ID ESTABLISHED IN START CMD
DSQ_COMM_LEVEL      DS    CL12          COMMUNICATIONS LEVEL ID
DSQ_PRODUCT         DS    CL2           QUERY PRODUCT ID
DSQ_PRODUCT_RELEASE DS    CL2           QUERY PRODUCT RELEASE ID
DSQ_RESERVE1        DS    CL28          RESERVED
DSQ_MESSAGE_ID      DS    CL8           COMPLETION MESSAGE ID
DSQ_Q_MESSAGE_ID    DS    CL8           QUERY MESSAGE ID
DSQ_START_PARM_ERROR DS   CL8           START PARAMETER IN ERROR
DSQ_CANCEL_IND      DS    C             CMD CANCEL INDICATOR
DSQ_RESERVE2        DS    CL23          RESERVED
DSQ_RESERVE3        DS    CL156         RESERVED
DSQ_MESSAGE_TEXT    DS    CL128         COMPLETION MESSAGE
DSQ_Q_MESSAGE_TEXT DS     CL128         QUERY MESSAGE
          SPACE 1
DSQCOMM_LEN         EQU   *-DSQCOMM     LENGTH OF DSQCOMM AREA
          MEND
```

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Running your Assembler programs in CICS

After you write your program, you need to translate, assemble, and link-edit it before you can run it.

The REXX JCL and CLISTs in these examples are not provided with QMF, but you can copy them from here, altering them to suit your needs.

When you translate, assemble, and link-edit a program that uses the QMF callable interface, be aware of the following conditions:

- The interface communications area, DSQCOMMA, must be available to the assemble step or copied into your program as a DSECT.
- The QMF interface module, DSQCIA, must be made available during the link-edit step of your program.

The JCL shown here is an example of how to use the procedure DFHEBTAL, supplied with CICS.

```
//sampasm   JOB
//          EXEC PROC=DFHEBTAL
//TRN.SYSIN DD  *
*ASM      XOPTS(CICS translator options .....)
          .
          .
          .
          Your program or copy of QMF sample DSQABFA
          .
          .
          .
/*
//* Provide access to QMF communications macro DSQCOMM
//ASM.SYSLIB   DD DSN=QMF1310.SDSQSAPE,DISP=SHR
//* Provide access to QMF interface module
//* Allocation for your CICS library
//LKED.CICSLOAD DD
//* Allocation for your target library
//LKED.SYSLMOD DD
//* Allocation for the QMF load module library
//LKED.QMFLOAD DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN   DD *
          INCLUDE CICSLOAD(DFHEAI)
          INCLUDE CICSLOAD(DFHEAI0)
          INCLUDE QMFLOAD(DSQCIA)
          ORDER DFHEAI,DFHEAI0
          ENTRY sampasm
          MODE  AMODE(31) RMODE(31)
          NAME  sampasm(R)
/*
```

Running your Assembler programs in TSO

You must assemble and link-edit your program before you can run it in TSO.

Assembling and link-editing in TSO

This listing shows a sample job that assembles and link-edits your program. Some parameters might vary from one QMF installation to the next.

```
//sampasm    JOB
//STEP1      EXEC PROC=ASMACL
//* Provide access to QMF communications macro DSQCOMM
//C.SYSLIB   DD  DSN=QMF1310.SAMPLIB,DISP=SHR
//C.SYSIN    DD  *
          .
          .
          .
          Your program or copy of QMF sample DSQABFA
          .
          .
          .
/*
//* Provide access to QMF interface module
//* Allocation for your target library
//L.SYSLMOD DD
//* Allocation for the QMF load library
//L.QMFLOAD  DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//L.SYSIN    DD  *
          INCLUDE QMFLOAD(DSQCIA)
          ENTRY sampasm
          MODE  AMODE(31) RMODE(31)
          NAME  sampasm(R)
/*
```

Running in TSO with ISPF

After your program is assembled successfully, you can run it under ISPF.

Run your program in TSO under ISPF by writing a program similar to the CLIST shown here:

```
PROC 0
CONTROL ASIS
/************************************************************/
/* Specify attribute list for dataset allocations           */
/************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/************************************************************/
/* Datasets used by TSO                                     */
/************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE','ISR.ISRCLIB')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/************************************************************/
/* Datasets used by ISPF                                    */
/************************************************************/
ALLOC FI(ISPLLIB) SHR REUSE +

      DA('QMF1310.SDSQLOAD','ADM.GDDMLOAD','DSN.DSNEXIT','DSN.DSNLOAD')
ALLOC FI(ISPMLIB) SHR REUSE +
      DA('QMF1310.SDSQMLBE','ISR.ISRMLIB','ISP.ISPMLIB')
ALLOC FI(ISPPLIB) SHR REUSE +
      DA('QMF1310.SDSQPLBE','ISR.ISRPLIB','ISP.ISPPLIB')
ALLOC FI(ISPSLIB) SHR REUSE +
      DA('QMF1310.SDSQSLBE','ISR.ISRSLIB','ISP.ISPSLIB')
ALLOC FI(ISPTLIB) SHR REUSE +
      DA('ISR.ISRTLIB','ISP.ISPTLIB')
/************************************************************/
/* QMF/GDDM Datasets                                        */
/************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
```

```
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/************************************************************/
/* Datasets used by QMF                                     */
/************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/************************************************************/
/* Start your program as the initial ISPF dialog            */
/************************************************************/
ISPSTART PGM(sampasm) NEWAPPL(DSQE)
EXIT CODE(4)
```

The `EXIT CODE(4)` statement suppresses the ISPF disposition panel.

Running in TSO without ISPF

After your program is assembled successfully, you can run it without ISPF.

Run your program in TSO without ISPF by writing a program similar to the CLIST shown here:

```
PROC 0
CONTROL ASIS
/************************************************************/
/* Note: QMF, Db2 and GDDM load libraries must be allocated */
/*       before executing this CLIST.                       */
/*       Name of QMF load library is  "QMF1310.SDSQLOAD".   */
/************************************************************/
/* Specify attribute list for dataset allocations           */
/************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/************************************************************/
/* Datasets used by TSO                                     */
/************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/************************************************************/
/* QMF/GDDM Datasets                                        */
/************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/************************************************************/
/* Datasets used by QMF                                     */
/************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/************************************************************/
/* Start your program using TSO CALL command               */
/************************************************************/
CALL sampasm
EXIT CODE(0)
```

C language interface

You can use the C language with the callable interface in QMF.

Interface communications area mapping for C language (DSQCOMMC)

DSQCOMMC provides DSQCOMM mapping for C language programs and is provided with QMF.

The table shows the values for DSQCOMMC.

Table 45. Interface communications area for DSQCOMMC

Structure name	Data type	Description
DSQ_RETURN_CODE	signed long integer	Indicates the status of a QMF command after it is run Its values are: **DSQ_SUCCESS** Successful execution of the request **DSQ_WARNING** Normal completion with warnings **DSQ_FAILURE** Command did not run correctly **DSQ_SEVERE** Severe error; QMF session terminated
DSQ_INSTANCE_ID	signed long integer	Identifier established by QMF during execution of the START command
DSQ_COMM_LEVEL	character, length 12	Identifies the level of the DSQCOMM In your application, include instructions that initialize this variable to the value of DSQ_CURRENT_COMM_LEVEL before issuing the QMF START command.
DSQ_PRODUCT	character, length 2	Identifies the IBM query product in use Variables that begin with DSQ_QMF specify QMF for TSO and QMF for CICS versions.
DSQ_PRODUCT_RELEASE	character, length 2	Release level of QMF in use Variable DSQ_QMF_V13R1 specifies QMF Version 13 Release 1.
DSQ_RESERVE1	character, length 28	Reserved for future use
DSQ_MESSAGE_ID	character, length 8	Completion message ID
DSQ_Q_MESSAGE_ID	character, length 8	Query message ID
DSQ_START_PARM_ERROR	character, length 8	Parameter in error when START failed due to a parameter error
DSQ_CANCEL_IND	character, length 1	Contains one of two values, depending on whether the user canceled while a QMF command was running: • DSQ_CANCEL_YES • DSQ_CANCEL_NO
DSQ_RESERVE2	character, length 23	Reserved for future use
DSQ_RESERVE3	character, length 156	Reserved for future use
DSQ_MESSAGE_TEXT	character, length 128	Completion message text

Table 45. Interface communications area for DSQCOMMC (continued)		
Structure name	**Data type**	**Description**
DSQ_Q_MESSAGE_TEXT	character, length 128	Query message text

Function calls for the C language

QMF provides two function calls for the C language: DSQCIC and DSQCICE.

DSQCIC

This call is for QMF commands that do not require access to application program variables. Use this call for most QMF commands; its syntax is as follows:

```
      DSQCIC (&DSQCOMM,&CMDLTH,&CMDSTR)
```

The parameters have the following values:

DSQCOMM
The interface communications area

CMDLTH
Length of the command string (CMDSTR); a long type parameter

CMDSTR
The QMF command to run, specified as an array of unsigned character type of the length specified by CMDLTH

The QMF command must be in uppercase.

DSQCICE

This call has an extended syntax for the QMF commands that require access to application program variables: START, TRACE, and the extended formats of GET GLOBAL and SET GLOBAL.

```
      DSQCICE (&DSQCOMM,&CMDLTH,&CMDSTR,
               &PNUM,&KLTH,&KWORD,
               &VLTH,&VALUE,&VTYPE);
```

The parameters have the following values:

DSQCOMM
The interface communications area.

CMDLTH
Length of the command string (CMDSTR); a long integer parameter.

CMDSTR
QMF command to run; an array of unsigned character type. The QMF command must be in uppercase.

PNUM
Number of command keywords or trace areas; a long integer parameter.

KLTH
The length of each specified keyword (KWORD) or trace title; a long integer parameter or an array of long integer parameters.

KWORD
QMF keyword, keywords, or address of trace titles; each is a character, array of characters, or array of addresses to trace titles.

VLTH
The length of each value that is associated with the keyword or trace title; a long integer parameter or array of long integer parameters.

VALUE
The value that is associated with each keyword or the address of a value that is associated with a trace title.

Its type is specified in the VTYPE parameter and can be an unsigned character array, a long integer parameter, or array of long integer parameters. For trace data, VTYPE must be FINT.

VTYPE
Data type of the contents of the VALUE parameter.

This parameter has one of two values, which are provided in the interface communications area, DSQCOMMC:

- DSQ_VARIABLE_CHAR for unsigned character type
- DSQ_VARIABLE_FINT for long integer

All of the values that are specified in the VALUE field must have the data type that is specified by VTYPE.

The C language interface has the following parameter considerations:

- Command strings and the START, GET, and SET command parameters are all input character strings. With these strings, C requires you to pass a storage area that is terminated with a null value, which must be included in the length of the parameter. Use the compile-time length function to obtain the parameter length that is passed to the QMF interface.
- If the string is not terminated by a null value before reaching the end of the string, an error is returned by QMF. The null value (X'00') indicates the end of a character string.
- For C parameters that are output character strings, including values obtained by the GET command, QMF moves data from QMF storage to the storage area of the application. QMF also sets the null indicator at the end of the string. If the character string does not fit in the user's storage area, a warning message is issued and the data is truncated on the right. A null indicator is always placed at the end of the data string.

C language programming example

The sample C program, DSQABFC, is provided with QMF. The sample program is a member of the library QMF1310.SDSQSAP*n* (where *n* is a national language identifier).

The sample program for the IBM C language callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1
- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

```
/*****************************************************************/
/* Sample Program:  DSQABFC
*/
/* C version of the callable interface
*/
/*****************************************************************/

/*****************************************************************/
/* Include standard and string "C" functions
*/
/*****************************************************************/
#include <string.h>
#include <stdlib.h>

/*****************************************************************/
/* Include and declare query interface communications area
*/
/*****************************************************************/
```

```
 #include <DSQCOMMC.H>

int main()
     {

 struct dsqcomm communication_area;      /* DSQCOMM from include
 */

 /*****************************************************************/
 /* Query interface command length and commands
 */
 /*****************************************************************/
 signed long command_length;
 static char start_query_interface[] = "START";
 static char set_global_variables[] = "SET GLOBAL";
 static char run_query[] = "RUN QUERY Q1";
 static char print_report[] = "PRINT REPORT (FORM=F1";
 static char end_query_interface[] = "EXIT";

 /*****************************************************************/
 /* Query command extension, number of parameters and lengths
 */
 /*****************************************************************/
 signed long number_of_parameters;    /* number of variables
 */
 signed long keyword_lengths[10];     /* lengths of keyword names
*/
 signed long data_lengths[10];        /* lengths of variable data
*/

 /*****************************************************************/
 /* Variable data type constants
 */
 /*****************************************************************/
 static char char_data_type[] = DSQ_VARIABLE_CHAR;
 static char int_data_type[]  = DSQ_VARIABLE_FINT;

 /*****************************************************************/
 /* Keyword parameter and value for START command
 */
 /*****************************************************************/
 static char start_keywords[] = "DSQSMODE";
 static char start_keyword_values[] = "INTERACTIVE";
 /*****************************************************************/
 /* Keyword parameter and values for SET command
 */
 /*****************************************************************/
 #define SIZE_VAL 8
 char set_keywords [3][SIZE_VAL];   /* Parameter name array
 */
 signed long set_values[3];         /* Parameter value array
 */

 /*****************************************************************/
 /* MAIN PROGRAM
 */
 /*****************************************************************/

 /*****************************************************************/
 /* Start a query interface session
 */
 /*****************************************************************/
     strncpy (communication_area.dsq_comm_level,
              DSQ_CURRENT_COMM_LEVEL,
              sizeof(communication_area.dsq_comm_level));
     number_of_parameters = 1;
     command_length = sizeof(start_query_interface);
     keyword_lengths[0] = sizeof(start_keywords);
     data_lengths[0] = sizeof(start_keyword_values);
     dsqcice(&communication_area,;

             &command_length,;

             &start_query_interface[0],

             &number_of_parameters,;

             &keyword_lengths[0],
             &start_keywords[0],
             &data_lengths[0],
             &start_keyword_values[0],
             &char_data_type[0]);
```

```
  /*****************************************************************/
  /* Set numeric values into query using SET command               */
  /*****************************************************************/
      number_of_parameters = 3;
      command_length = sizeof(set_global_variables);
      strcpy(set_keywords[0],"MYVAR01");
      strcpy(set_keywords[1],"SHORT");
      strcpy(set_keywords[2],"MYVAR03");
      keyword_lengths[0] = SIZE_VAL;
      keyword_lengths[1] = SIZE_VAL;
      keyword_lengths[2] = SIZE_VAL;
      data_lengths[0] = sizeof(long);
      data_lengths[1] = sizeof(long);
      data_lengths[2] = sizeof(long);
      set_values[0] = 20;
      set_values[1] = 40;
      set_values[2] = 84;
      dsqcice(&communication_area,;

              &command_length,;

              &set_global_variables[0],
              &number_of_parameters,;

              &keyword_lengths[0],
              &set_keywords[0][0],
              &data_lengths[0],
              &set_values[0],
              &int_data_type[0]);

  /*****************************************************************/
  /* Run a query                                                   */
  /*****************************************************************/
      command_length = sizeof(run_query);
      dsqcic(&communication_area,&command_length,;

                    &run_query[0]);

  /*****************************************************************/
  /* Print the results of the query                                */
  /*****************************************************************/
      command_length = sizeof(print_report);
      dsqcic(&communication_area,&command_length,;

                    &print_report[0]);

  /*****************************************************************/
  /* End the query interface session                               */
  /*****************************************************************/
      command_length = sizeof(end_query_interface);
      dsqcic(&communication_area,&command_length,;

                    &end_query_interface[0]);
      exit(0);
 }
```

DSQCOMM for C

The interface communications area file for the C language is named DSQCOMMC.

The DSQCOMMC include file, shown here, is provided with QMF.

```
/*****************************************************************/
/* C include for query callable interface                        */
/*****************************************************************/

/* Structure declare for communications area                     */

struct dsqcomm {
        long int dsq_return_code;   /* Function return code       */
        long int dsq_instance_id;   /* ID established in START cmd*/
        char dsq_comm_level[12];    /* Communications level id    */
        char dsq_product[2];        /* Query product id           */
        char dsq_product_release[2]; /* Query product release     */
```

```
        char dsq_reserve1[28];      /* Reserved                    */
        char dsq_message_id[8];     /* Completion message ID       */
        char dsq_q_message_id[8];   /* Query message ID            */
        char dsq_start_parm_error[8]; /* Start parameter in error */
        char dsq_cancel_ind[1];     /* Cmd cancelled indicator     */
                                /* 1 = cancelled, 0 = not cancelled*/
        char dsq_reserve2[23];      /* RESERVED AREAS              */
        char dsq_reserve3[156];
        char dsq_message_text[128]; /* Message text                */
        char dsq_q_message_text[128]; /* Query message text        */
     } ;

/* RETURN CODES                                                    */

#define DSQ_SUCCESS                0
#define DSQ_WARNING                4
#define DSQ_FAILURE                8
#define DSQ_SEVERE                16

/* Communications Level                                            */

#define DSQ_CURRENT_COMM_LEVEL    "DSQL>001002<"

/* Query Product Codes                                             */

#define DSQ_QRW                 "01"
#define DSQ_QMF                 "02"
#define DSQ_QM3                 "03"

/* Query Product Release Levels                                    */

#define DSQ_QRW_V1R2            "01"
#define DSQ_QRW_V1R3            "02"
#define DSQ_QMF_V2R4            "01"
#define DSQ_QMF_V3R1            "02"
#define DSQ_QMF_V3R1M1          "03"
#define DSQ_QMF_V3R2            "04"
#define DSQ_QMF_V3R3            "05"
#define DSQ_QMF_V6R1            "06"
#define DSQ_QMF_V7R1            "07"
#define DSQ_QM4_V1R1            "01"
#define DSQ_QMF_V7R2            "08"
#define DSQ_QMF_V8R1            "09"
#define DSQ_QMF_V9R1            "10"
#define DSQ_QMF_V10R1           "11"
#define DSQ_QMF_V11R1           "12"
#define DSQ_QMF_V11R2           "13"
#define DSQ_QMF_V12R1           "14"
#define DSQ_QMF_V13R1           "15"

/* INSTANCE CODES                                                  */

#define DSQ_CONTINUE               0

/* CANCELLED INDICATOR                                             */

#define DSQ_CANCEL_YES            "1"
#define DSQ_CANCEL_NO             "0"

/* VARIABLE TYPES                                                  */

#define DSQ_VARIABLE_CHAR       "CHAR"
#define DSQ_VARIABLE_FINT       "FINT"

#define DSQ_INTERACTIVE         "1"
#define DSQ_BATCH               "2"

#define DSQ_YES                 "1"
#define DSQ_NO                  "2"

/* Call interface structure                                        */

/* Calling format for normal call with 3 parameters                */
#define dsqcic(parm1, parm2, parm3 )\
               dsqcicx( parm1, parm2, parm3)

/* Calling format for call with CMD_EXT area 9 parameters          */
#define dsqcice(parm1, parm2, parm3,\
               parm4, parm5, parm6, parm7, parm8, parm9 )\
               dsqcicx( parm1, parm2, parm3,    \
               parm4, parm5, parm6,  \
               parm7, parm8, parm9 )
```

```
/* DECLARE OS LINKAGE FORMAT                                        */

#pragma linkage(dsqcicx, OS)
```

Running your C programs in CICS

After you write your program in C, you need to translate, compile, and link-edit it before you can run it.

These examples show the necessary steps to translate, compile, and link-edit your program. The REXX JCL and CLISTs in these examples are not provided with QMF, but you can copy them from here, altering them to suit your needs.

When you translate, compile, and link-edit a program that uses the QMF callable interface under CICS, consider the following conditions:

- The interface communications area DSQCOMMC must be available to the compile step or copied into your program.
- The QMF interface module DSQCICX must be available during the link-edit step of your program.
- Programs written in C must be link-edited with AMODE=31.

The example shown here uses the procedure DFHYITDL, supplied with CICS.

```
//sampleC JOB
// EXEC PROC=DFHYITDL
//TRN.SYSIN DD *
.
.
.
Your program or copy of QMF sample DSQABFC
.
.
.
/*
//* Provide Access to QMF Communications Macro DSQCOMMC
//C.SYSLIB DD DSN=QMF1310.SDSQSAPE,DISP=SHR
//* Allocation for target library
//LKED.SYSLMOD DD
//* Allocation for QMF load library
//LKED.QMFLOAD DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN DD *
INCLUDE QMFLOAD(DSQCICX)
NAME sampleC(R)
/*
```

Running your C programs in TSO

To run your C program in TSO, compile and link-edit the program, and then run it in either with or without ISPF.

Compiling and link-editing in TSO

You must compile and link-edit your C program before you can run it in TSO.

This job compiles and link-edits your callable interface application by using the IBM C compiler for z/OS. Some parameters might vary from one QMF installation to the next.

```
//sampleC JOB
//STEP1 EXEC PROC=EDCCB,
// INFILE='name of dataset that contains source code',
// OUTFILE='name of dataset that contains executable'
//* Provide Access to QMF Communications Macro DSQCOMM
//COMPILE.SYSLIB DD DSN=QMF1310.SAMPLIB,DISP=SHR
//BIND.QMFLOAD DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//BIND.SYSIN DD *
INCLUDE QMFLOAD(DSQCICX)
/*
```

Running your programs in TSO without ISPF

After your C program compiles successfully, you can run it without ISPF.

Run your program in TSO without ISPF by writing a program similar to the CLIST shown:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Note: QMF, Db2, GDDM and C load libraries must be         */
/*       allocated before running this CLIST.                */
/*       Name of QMF load library is  "QMF1310.SDSQLOAD".    */
/*************************************************************/
/* Specify attribute list for dataset allocations            */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                      */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* QMF/GDDM Datasets                                         */
/*************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/*************************************************************/
/* Datasets used by QMF                                      */
/*************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/*************************************************************/
/* Start your program using TSO CALL command                */
/*************************************************************/
CALL sampleC
EXIT CODE(0)
```

Running your programs in TSO under ISPF

After your C program compiles successfully, you can run it under ISPF.

Run your program in TSO under ISPF by writing a program similar to the CLIST for running DSQABFC shown here:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Specify attribute list for dataset allocations            */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                      */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE','ISR.ISRCLIB')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* Datasets used by ISPF                                     */
/*************************************************************/
ALLOC FI(ISPLLIB) SHR REUSE +

      DA('QMF1310.SDSQLOAD','ADM.GDDMLOAD','DSN.DSNEXIT','DSN.DSNLOAD', +
         'EDC.SEDCLINK','PLI.SIBMLINK')
ALLOC FI(ISPMLIB) SHR REUSE +
      DA('QMF1310.SDSQMLBE','ISR.ISRMLIB','ISP.ISPMLIB')
```

```
ALLOC FI(ISPPLIB) SHR REUSE +
      DA('QMF1310.SDSQPLBE','ISR.ISRPLIB','ISP.ISPPLIB')
ALLOC FI(ISPSLIB) SHR REUSE +
      DA('QMF1310.SDSQSLBE','ISR.ISRSLIB','ISP.ISPSLIB')
ALLOC FI(ISPTLIB) SHR REUSE +
      DA('ISR.ISRTLIB','ISP.ISPTLIB')
/************************************************************/
/* QMF/GDDM Datasets                                        */
/************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/************************************************************/
/* Datasets used by QMF                                     */
/************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/************************************************************/
/* Start your program as the initial ISPF dialog            */
/************************************************************/
ISPSTART PGM(sampleC) NEWAPPL(DSQE)
EXIT CODE(4)
```

The `EXIT CODE(4)` statement suppresses the ISPF disposition panel.

COBOL language interface

You can use the COBOL language with the callable interface in QMF.

Interface communications area mapping for COBOL (DSQCOMMB)

DSQCOMMB provides DSQCOMM mapping for COBOL language programs and is provided with QMF.

The table shows the values for DSQCOMMB.

Table 46. Interface communications area for COBOL (DSQCOMMB)

Structure name	Data type	Description
DSQ-RETURN-CODE	PIC 9(8)	Indicates the status of a QMF command after is run Its values are: **DSQ-SUCCESS** Successful execution of the request **DSQ-WARNING** Normal completion with warnings **DSQ-FAILURE** Command did not run correctly **DSQ-SEVERE** Severe error; QMF session terminated
DSQ-INSTANCE-ID	PIC 9(8)	Identifier established by QMF during execution of the START command
DSQ-COMM-LEVEL	PIC X(12)	Identifies the level of the DSQCOMM In your application, include instructions that initialize this variable to the value of DSQ_CURRENT_COMM_LEVEL before issuing the QMF START command.

Table 46. Interface communications area for COBOL (DSQCOMMB) (continued)		
Structure name	**Data type**	**Description**
DSQ-PRODUCT	PIC X(2)	Identifies the IBM query product in use Variables that begin with DSQ-QMF specify QMF for TSO and QMF for CICS versions.
DSQ-PRODUCT-RELEASE	PIC X(2)	Release level of QMF in use Variable DSQ_QMF_V13R1 specifies QMF Version 13 Release 1.
DSQ-RESERVE1	PIC X(28)	Reserved for future use
DSQ-MESSAGE-ID	PIC X(8)	Completion message ID
DSQ-Q-MESSAGE-ID	PIC X(8)	Query message ID
DSQ-START-PARM-ERROR	PIC X(8)	Parameter in error when START failed due to a parameter error
DSQ-CANCEL-IND	PIC X(1)	Contains one of two values, depending on whether the user canceled while a QMF command was running: • DSQ-CANCEL-YES • DSQ-CANCEL-NO
DSQ-RESERVE2	PIC X(23)	Reserved for future use
DSQ-RESERVE3	PIC X(156)	Reserved for future use
DSQ-MESSAGE-TEXT	PIC X(128)	Completion message text
DSQ-Q-MESSAGE-TEXT	PIC X(128)	Query message text

Function calls for COBOL

QMF provides one function call for the COBOL language: DSQCIB. The function call has two formats: DSQCIB and DSQCIB (extended format).

DSQCIB

This call is for QMF commands that do not require access to application program variables. Use this call for most QMF commands.

```
     CALL DSQCIB USING DSQCOMM CMDLTH CMDSTR
```

The parameters have the following values:

DSQCOMM
The interface communications area

CMDLTH
Length of the command string (CMDSTR); an integer parameter

CMDSTR
QMF command to run; an uppercase character string of the length specified by CMDLTH

DSQCIB (extended format)

This call has an extended syntax for the QMF commands that require access to application program variables: START, TRACE, and the extended formats of GET GLOBAL and SET GLOBAL.

```
     DSQCIB USING
            DSQCOMM CMDLTH CMDSTR
            PNUM KLTH KWORD VLTH VALUE VTYPE
```

The parameters have the following values:

DSQCOMM
The interface communications area.

CMDLTH
The length of the command string (CMDSTR); an integer parameter.

CMDSTR
The QMF command to run; an uppercase character string of the length specified by CMDLTH.

PNUM
The number of command keywords or trace areas; an integer parameter.

KLTH
The length of each specified keyword or trace title; an integer parameter or an array of integer parameters.

KWORD
QMF keyword, keywords, or address of trace titles.

Each is a character, array of characters, or array of addresses to trace titles whose lengths are specified by KLTH. If all the keywords have the same length, you can use an array of characters.

VLTH
The length of each value that is associated with the keyword or trace title; an integer parameter or an array of integer parameters.

VALUE
The value that is associated with each keyword or the address of a value that is associated with a trace title.

Its type is specified in the VTYPE parameter, and can be a character, an array of characters, an integer parameter, or an array of integer parameters. For trace data, VTYPE must be FINT.

VTYPE
Data type of the contents of the VALUE parameter.

This parameter has one of two values, which are provided in the communications area, DSQCOMMB:

- DSQ-VARIABLE-CHAR for character values
- DSQ-VARIABLE-FINT for integer values

All values that are specified in the VALUE field must have the data type that is specified by VTYPE.

The ISPF LIBDEF service with COBOL

Change dynamic calls to the QMF interface (DSQCIB) to static calls to use the LIBDEF function in your QMF application.

For example, consider the following call identifier statement:

```
CALL DSQCIB USING ...
```

You can change this statement to its call literal form as follows:

```
CALL "DSQCIB" USING ...
```

COBOL programming example

The sample COBOL program, DSQABFCO, is provided with QMF. The sample program is a member of the library QMF1310.SDSQSAP*n* (where *n* is a national language identifier).

The sample program for the COBOL callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1
- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

For CICS, the STOP RUN statement must be changed to a GOBACK statement.

```
*****************************************************************
*   The following is a COBOL version of the query               *
*   callable interface *** DSQABFCO **.                         *
*****************************************************************
 IDENTIFICATION DIVISION.
 PROGRAM-ID.  DSQABFCO.
   DATE-COMPILED.
 ENVIRONMENT DIVISION.
 DATA DIVISION.
 WORKING-STORAGE SECTION.
*****************************************************************
* Copy DSQCOMMB definition - contains query interface variables *
*****************************************************************
   COPY DSQCOMMB.

* Query interface commands
 01  STARTQI      PIC X(5)  VALUE "START".
 01  SETG         PIC X(10) VALUE "SET GLOBAL".
 01  QUERY        PIC X(12) VALUE "RUN QUERY Q1".
 01  REPT         PIC X(22) VALUE "PRINT REPORT (FORM=F1 ".
 01  ENDQI        PIC X(4)  VALUE "EXIT".

* Query command length
 01  QICLTH       PIC 9(8) USAGE IS COMP-4.
* Number of variables
 01  QIPNUM       PIC 9(8) USAGE IS COMP-4.
* Keyword variable lengths
 01  QIKLTHS.
   03   KLTHS     PIC 9(8) OCCURS 10 USAGE IS COMP-4.
* Value Lengths
 01  QIVLTHS.
   03   VLTHS     PIC 9(8) OCCURS 10 USAGE IS COMP-4.
* Start command keyword
 01  SNAMES.
   03  SNAME1   PIC X(8) VALUE "DSQSMODE".
* Start command keyword value
 01  SVALUES.
   03  SVALUE1  PIC X(11) VALUE "INTERACTIVE".
* Set GLOBAL command variable names to set
01  VNAMES.
   03  VNAME1   PIC X(7) VALUE "MYVAR01".
   03  VNAME2   PIC X(5) VALUE "SHORT".
   03  VNAME3   PIC X(7) VALUE "MYVAR03".
* Variable value parameters
 01  VVALUES.
   03   VVALS     PIC 9(8) OCCURS 10 USAGE IS COMP-4.

 01   TEMP     PIC 9(8)           USAGE IS COMP-4.
 PROCEDURE DIVISION.
*
* Start a query interface session
     MOVE DSQ-CURRENT-COMM-LEVEL TO DSQ-COMM-LEVEL.
     MOVE 5 TO QICLTH.
     MOVE 8 TO KLTHS(1).
     MOVE 11 TO VLTHS(1).
     MOVE 1 TO QIPNUM.
     CALL DSQCIB  USING DSQCOMM, QICLTH, STARTQI,
                        QIPNUM, QIKLTHS, SNAMES,
*
```

```
* Set numeric values into query variables using SET GLOBAL command
     MOVE 10 TO QICLTH.
     MOVE 7 TO KLTHS(1).
     MOVE 5 TO KLTHS(2).
     MOVE 7 TO KLTHS(3).
     MOVE 4 TO VLTHS(1).
     MOVE 4 TO VLTHS(2).
     MOVE 4 TO VLTHS(3).
     MOVE 20 TO VVALS(1).
     MOVE 40 TO VVALS(2).
     MOVE 84 TO VVALS(3).
     MOVE 3 TO QIPNUM.
     CALL DSQCIB  USING DSQCOMM, QICLTH, SETG,
                        QIPNUM, QIKLTHS, VNAMES,
                        QIVLTHS, VVALUES, DSQ-VARIABLE-FINT.
*
* Run a query
     MOVE 12 TO QICLTH.
     CALL DSQCIB USING DSQCOMM, QICLTH, QUERY.
*
* Print the results of the query
     MOVE 22 TO QICLTH.
     CALL DSQCIB USING DSQCOMM, QICLTH, REPT.
*
* End the query interface session
     MOVE 4 TO QICLTH.
     CALL DSQCIB USING DSQCOMM, QICLTH, ENDQI.

     STOP RUN.
```

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

DSQCOMM for COBOL

The interface communications area file for the COBOL language is named DSQCOMMB.

The DSQCOMMB include file shown here, is provided with QMF:

```
************************************************************
* COBOL INCLUDE FOR QUERY CALLABLE INTERFACE
************************************************************

* STRUCTURE DECLARE FOR COMMUNICATIONS AREA

  01 DSQCOMM.

     03 DSQ-RETURN-CODE PIC 9(8) USAGE IS COMP.
*                               FUNCTION RETURN CODE       *
     03 DSQ-INSTANCE-ID PIC 9(8) USAGE IS COMP.
*                               IDENTIFIER FROM START CMD  *
     03 DSQ-COMM-LEVEL  PIC X(12).
*                               COMMUNICATIONS LEVEL       *
     03 DSQ-PRODUCT     PIC X(2).
*                               QUERY PRODUCT ID           *
     03 DSQ-PRODUCT-RELEASE PIC X(2).
*                               QUERY PRODUCT RELEASE      *
     03 DSQ-RESERVE1 PIC X(28).
*                               RESERVED AREA              *
     03 DSQ-MESSAGE-ID PIC X(8).
*                               COMPLETION MESSAGE ID      *
     03 DSQ-Q-MESSAGE-ID PIC X(8).
*                               QUERY MESSAGE ID           *
     03 DSQ-START-PARM-ERROR PIC X(8).
*                               START PARAMETER IN ERROR   *
     03 DSQ-CANCEL-IND PIC X(1).
*                               1 = COMMAND CANCELLED      *
*                               0 = COMMAND NOT CANCELLED  *
     03 DSQ-RESERVE2 PIC X(23).
*                               RESERVED AREA              *
     03 DSQ-RESERVE3 PIC X(156).
*                               RESERVED AREA              *
     03 DSQ-MESSAGE-TEXT PIC X(128).
*                               QMF MESSAGE TEXT           *
     03 DSQ-Q-MESSAGE-TEXT PIC X(128).
*                               QMF QUERY MESSAGE TEXT     *
```

```
*                              512 BYTES TOTAL            *

*  VALUES FOR DSQ-RETURN-CODE

  01 DSQ-SUCCESS PIC 9(8) USAGE IS COMP VALUE 0.
  01 DSQ-WARNING PIC 9(8) USAGE IS COMP VALUE 4.
  01 DSQ-FAILURE PIC 9(8) USAGE IS COMP VALUE 8.
  01 DSQ-SEVERE  PIC 9(8) USAGE IS COMP VALUE 16.

*  VALUES FOR DSQ-INSTANCE-ID

  01 DSQ-CONTINUE PIC 9(8) USAGE IS COMP VALUE 0.

*  VALUES FOR DSQ-COMM-LEVEL

  01 DSQ-CURRENT-COMM-LEVEL PIC X(12) VALUE "DSQL>001002<".

*  VALUES FOR DSQ-PRODUCT

  01 DSQ-QRW             PIC X(2) VALUE "01".
  01 DSQ-QMF             PIC X(2) VALUE "02".
  01 DSQ-QM4             PIC X(2) VALUE "03".

*  VALUES FOR DSQ-PRODUCT-RELEASE

  01 DSQ-QRW-V1R2        PIC X(2) VALUE "01".
  01 DSQ-QRW-V1R3        PIC X(2) VALUE "02".
  01 DSQ-QMF-V2R4        PIC X(2) VALUE "01".
  01 DSQ-QMF-V3R1        PIC X(2) VALUE "02".
  01 DSQ-QMF-V3R1M1      PIC X(2) VALUE "03".
  01 DSQ-QMF-V3R2        PIC X(2) VALUE "04".
  01 DSQ-QMF-V3R3        PIC X(2) VALUE "05".
  01 DSQ-QMF-V6R1        PIC X(2) VALUE "06".
  01 DSQ-QMF-V7R1        PIC X(2) VALUE "07".
  01 DSQ-QM4-V1R1        PIC X(2) VALUE "01".
  01 DSQ-QMF-V7R2        PIC X(2) VALUE "08".
  01 DSQ-QMF-V8R1        PIC X(2) VALUE "09".
  01 DSQ-QMF-V9R1        PIC X(2) VALUE "10".
  01 DSQ-QMF-V10R1       PIC X(2) VALUE "11".
  01 DSQ-QMF-V11R1       PIC X(2) VALUE "12".
  01 DSQ-QMF-V11R2       PIC X(2) VALUE "13".
  01 DSQ-QMF-V12R1       PIC X(2) VALUE "14".
  01 DSQ-QMF-V13R1       PIC X(2) VALUE "15".

*  VALUES FOR DSQ-CANCEL-IND

  01 DSQ-CANCEL-YES      PIC X(1) VALUE "1".
  01 DSQ-CANCEL-NO       PIC X(1) VALUE "0".

*  VALUES FOR MODE

  01 DSQ-INTERACTIVE     PIC X(1) VALUE "1".
  01 DSQ-BATCH           PIC X(1) VALUE "2".

*  VALUES YES AND NO

  01 DSQ-YES             PIC X(1) VALUE "1".
  01 DSQ-NO              PIC X(1) VALUE "2".

*  CALLABLE INTERFACE PROGRAM NAME

  01 DSQCIB            PIC X(6) VALUE "DSQCIB".

*  VALUES FOR VARIABLE TYPE ON CALL PARAMETER

  01 DSQ-VARIABLE-CHAR PIC X(4) VALUE "CHAR".
  01 DSQ-VARIABLE-FINT PIC X(4) VALUE "FINT".
```

Considerations for running your COBOL callable interface program

Pay attention to the details about running a COBOL program that uses the QMF callable interface.

When you translate, compile, and link-edit a program that uses the QMF callable interface, consider the following conditions:

- The execution environment

QMF is run as an Assembler program in the COBOL environment. Your COBOL program must call the QMF interface program, DSQCIB, by using a COBOL dynamic call.

- Whether to use quotation marks or apostrophes

  You must use either double quotation marks (") or apostrophes (') to delimit literals in a COBOL program. You can specify the delimiter of your choice to the CICS translation process and the COBOL compiler by specifying QU0TE or AP0ST. Make sure the APOST or QUOTE option in effect for the COBOL compiler matches that of the CICS translator.

  The communications area (DSQCOMMB) and the sample COBOL program (DSQABFCO) as distributed by QMF use quotations to delimit literals. If your site or program uses apostrophes instead of quotation marks, change DSQCOMMB or copy the structure to your program, changing quotation marks to apostrophes.

- Availability of the communications area (DSQCOMMB)

  The communications area DSQCOMMB must be available to the COBOL compile step or copied into your program as a control structure.

- Availability of the interface module (DSQCIB)

  The QMF interface module must be available during the link-edit step of your program.

Running your COBOL programs in CICS

After you write your program in COBOL, you need to translate, compile, and link-edit it before you can run it.

The JCL in these examples is not provided with QMF, but you can copy it from here, altering it to suit your needs.

The example shows the procedure DFHEBTVL, supplied with CICS, and which supports COBOL.

```
//samCOBOL  JOB
//          EXEC PROC=DFHEBTVL
//TRN.SYSIN DD  *
*CBL      XOPTS(CICS translator options ...QUOTE COBOL2)
          .
          .
          .
          Your program or copy of QMF sample DSQABFCO
          .
          .
          .
/*
//* Provide access to QMF communications macro DSQCOMMB
//COB.SYSLIB   DD DSN=QMF1310.SDSQSAPE,DISP=SHR
//* Allocation for target library
//LKED.SYSLMOD DD
//* Allocation for QMF load library
//LKED.QMFLOAD DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN   DD *
          INCLUDE CICSLOAD(DFHECI)
          INCLUDE QMFLOAD(DSQCIB)
          ORDER DFHECI
          ENTRY samCOBOL
          MODE  AMODE(31) RMODE(31)
          NAME  samCOBOL(R)
/*
```

Running your COBOL programs in TSO

To run your COBOL program in TSO, compile and link-edit the program, and then run it in either with or without ISPF.

Compiling and link-editing in TSO

You must compile and link-edit your COBOL program before you can run it in TSO.

This job uses the COBOL compiler to compile your callable interface application. It then link-edits your application. Some parameters might vary from one QMF installation to the next.

```
//samCOBOL   JOB
//STEP1      EXEC PROC=IGYWCL
//* Provide access to QMF communications macro DSQCOMM
//COBOL.SYSLIB   DD  DSN=QMF1310.SAMPLIB,DISP=SHR
//COBOL.SYSIN    DD  *
          .
          .
          .
          Your program or copy of QMF sample DSQABFCO
          .
          .
          .
//* Provide access to QMF interface module
//* Allocation for target library
//LKED.SYSLMOD DD
//* Allocation for QMF load library
//LKED.QMFLOAD  DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN    DD  *
          INCLUDE QMFLOAD(DSQCIB)
          ENTRY samCOBOL
          MODE  AMODE(31) RMODE(31)
          NAME  samCOBOL(R)
/*
```

Related reference

Running your programs in TSO without ISPF
After your COBOL program compiles successfully, you can run it with JCL without ISPF.

Running your programs in TSO under ISPF
After your COBOL program compiles successfully, you can run it under ISPF.

Running your programs in TSO without ISPF

After your COBOL program compiles successfully, you can run it with JCL without ISPF.

Run the COBOL compiler and linkage editor in TSO without ISPF by writing a program similar to the CLIST shown here:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Note: QMF, Db2, GDDM and COBOL load libraries must be    */
/*       allocated before running this CLIST.               */
/*       Name of QMF load library is  "QMF1310.SDSQLOAD".   */
/*************************************************************/
/* Specify attribute list for dataset allocations            */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                      */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* QMF/GDDM Datasets                                         */
/*************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
```

```
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/************************************************************/
/* Datasets used by QMF                                     */
/************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/************************************************************/
/* Start your program using TSO CALL command               */
/************************************************************/
CALL samCOBOL
EXIT CODE(0)
```

Related reference

Compiling and link-editing in TSO
You must compile and link-edit your COBOL program before you can run it in TSO.

Running your programs in TSO under ISPF
After your COBOL program compiles successfully, you can run it under ISPF.

Running your programs in TSO under ISPF

After your COBOL program compiles successfully, you can run it under ISPF.

Run your program in TSO under ISPF by writing a program similar to the CLIST shown here:

```
PROC 0
CONTROL ASIS
/************************************************************/
/* Specify attribute list for dataset allocations           */
/************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/************************************************************/
/* Datasets used by TSO                                     */
/************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE','ISR.ISRCLIB')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/************************************************************/
/* Datasets used by ISPF                                    */
/************************************************************/
ALLOC FI(ISPLLIB) SHR REUSE +

      DA('QMF1310.SDSQLOAD','ADM.GDDMLOAD','DSN.DSNEXIT','DSN.DSNLOAD', +
         'PRDUCT.COB2LIB')
ALLOC FI(ISPMLIB) SHR REUSE +
      DA('QMF1310.SDSQMLBE','ISR.ISRMLIB','ISP.ISPMLIB')
ALLOC FI(ISPPLIB) SHR REUSE +
      DA('QMF1310.SDSQPLBE','ISR.ISRPLIB','ISP.ISPPLIB')
ALLOC FI(ISPSLIB) SHR REUSE +
      DA('QMF1310.SDSQSLBE','ISR.ISRSLIB','ISP.ISPSLIB')
ALLOC FI(ISPTLIB) SHR REUSE +
      DA('ISR.ISRTLIB','ISP.ISPTLIB')
/************************************************************/
/* QMF/GDDM Datasets                                        */
/************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/************************************************************/
/* Datasets used by QMF                                     */
/************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
```

```
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/*************************************************************/
/* Start your program as the initial ISPF dialog             */
/*************************************************************/
ISPSTART PGM(samCOBOL) NEWAPPL(DSQE)
EXIT CODE(4)
```

The `EXIT CODE(4)` statement suppresses the display of the ISPF disposition panel.

Related reference

Compiling and link-editing in TSO
You must compile and link-edit your COBOL program before you can run it in TSO.

Running your programs in TSO without ISPF
After your COBOL program compiles successfully, you can run it with JCL without ISPF.

Fortran language interface

You can use the Fortran language with the callable interface in QMF for TSO.

Restriction: Because Fortran is not available under CICS, the QMF callable interface for Fortran does not work under CICS.

Interface communications area mapping for Fortran (DSQCOMMF)

DSQCOMMF provides DSQCOMM mapping for Fortran language programs and is provided with QMF.

The table shows the information for DSQCOMMF, which you must not alter:

Table 47. Interface communications area for Fortran (DSQCOMMF)

Structure name	Data type	Description
DSQ_RETURN_CODE	INTEGER	Indicates the status of a QMF command after it is run Its values are: **DSQ_SUCCESS** Successful execution of the request **DSQ_WARNING** Normal completion with warnings **DSQ_FAILURE** Command did not run correctly **DSQ_SEVERE** Severe error; QMF session terminated
DSQ_INSTANCE_ID	INTEGER	Identifier established by QMF during execution of the START command
DSQ_COMM_LEVEL	CHARACTER(12)	Identifies the level of the DSQCOMM In your application, include instructions that initialize this variable to the value of DSQ_CURRENT_COMM_LEVEL before issuing the QMF START command.
DSQ_PRODUCT	CHARACTER(2)	Identifies the IBM query product in use Variables that begin with DSQ_QMF specify QMF for TSO versions.

Table 47. Interface communications area for Fortran (DSQCOMMF) (continued)		
Structure name	**Data type**	**Description**
DSQ_PRODUCT_RELEASE	CHARACTER(2)	Release level of QMF in use Variable DSQ_QMF_V13R1 specifies QMF Version 13 Release 1.
DSQ_RESERVE1	CHARACTER(28)	Reserved for future use
DSQ_MESSAGE_ID	CHARACTER(8)	Completion message ID
DSQ_Q_MESSAGE_ID	CHARACTER(8)	Query message ID
DSQ_START_PARM_ERROR	CHARACTER(8)	Parameter in error when START failed due to a parameter error
DSQ_CANCEL_IND	CHARACTER(1)	Contains one of two values, depending on whether the user canceled while a QMF command was running: • DSQ_CANCEL_YES • DSQ_CANCEL_NO
DSQ_RESERVE2	CHARACTER(23)	Reserved for future use
DSQ_RESERVE3	CHARACTER(156)	Reserved for future use
DSQ_MESSAGE_TEXT	CHARACTER(128)	Completion message text
DSQ_Q_MESSAGE_TEXT	CHARACTER(128)	Query message text

Function calls for Fortran

QMF provides two function calls for the Fortran language: DSQCIF and DSQCIFE. Both calls are described in the communications area (DSQCOMMF).

DSQCIF

This call is for QMF commands that do not require access to application program variables. Use this call for most QMF commands.

```
  RC = DSQCIF(DSQCOMM,
 +     CMDLTH,
 +     CMDSTR)
```

The parameters have the following values:

DSQCOMM
The communications area.

CMDLTH
The length of the command string (**CMDSTR**); an integer parameter.

CMDSTR
QMF command to run; an uppercase character string of the length that is specified by **CMDLTH**.

DSQCIFE

This call has an extended syntax for the commands that require access to application program variables: START, TRACE, and the extended formats of GET GLOBAL and SET GLOBAL.

The syntax for this call is:

```
 RC = DSQCIFE(DSQCOMM,
+     CMDLTH,
+     CMDSTR,
+     PNUM,
+     KLTH,
+     KWORD,
+     VLTH,
+     VALUE,
+     VTYPE)
```

The parameters have the following values:

DSQCOMM
The interface communications area.

CMDLTH
The length of the command string (**CMDSTR**); an integer parameter.

CMDSTR
The QMF command to run; an uppercase character string of the length that is specified by **CMDLTH**.

PNUM
The number of command keywords or trace areas; an integer parameter.

KLTH
The length of each specified keyword or trace title; an integer parameter or parameter array.

KWORD
QMF keyword, keywords, or address of trace titles; a character, array of characters, or array of addresses to trace titles whose lengths are specified by **KLTH**.

You can use an array of characters if all of the keywords have the same length. The keywords must be in contiguous storage and not separated by any special delimiters.

VLTH
The length of each value that is associated with the keyword or trace title; an integer parameter or parameter array.

VALUE
The value that is associated with each keyword or the address of a value that is associated with a trace title.

Its type is specified in the VTYPE parameter and can be a character, array of characters, integer parameter, or parameter array. For trace data, VTYPE must be FINT. If you have character values, the values must be in contiguous storage and not separated by any special delimiters.

VTYPE
Data type of the contents of the VALUE parameter.

This parameter has one of two values, which are provided in the communications area, DSQCOMMF:

- DSQ_VARIABLE_CHAR for character values
- DSQ_VARIABLE_FINT for integer values

All values that are specified in the VALUE field must have the data type that is specified by VTYPE.

Fortran programming example

The sample program, DSQABFF, is provided with QMF. The sample program is a member of the library QMF1310.SDSQSAP*n* (where *n* is a national language identifier).

The sample program for the Fortran callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1

- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

```
C*********************************************************************
C Sample program: DSQABFF
C FORTRAN version of QMF manager callable interface
C
C Creation Date: 11/21/89
C
C ENVIRONMENT:    API IN FORTRAN
C*********************************************************************
C
C Processing:
C         a. Start a query manager session using the callable interface.
C
C         b. Set global query manager numeric variables.
C
C         d. Run a query manager query using the callable interface.
C
C         e. Print a report using the callable interface.
C
C         f. Exit the query manager session.
C
C Prerequisites:1. Create the SAMPLE database.
C
C               2. Create a prompted query, Q1, which has a SELECT state
C
C               3. Create a form, F1, that displays data for query Q1.
C
C*********************************************************************
      PROGRAM DSQABFF
C*********************************************************************
C Include and declare query interface communications area
C*********************************************************************
      INCLUDE (DSQCOMMF)

C*********************************************************************
C   Query interface command lengths and commands
C*********************************************************************
      INTEGER COMMAND_LENGTH
      CHARACTER START_QUERY_INTERFACE*5,
     +          SET_GLOBAL_VARIABLES*10,
     +          RUN_QUERY*12,
     +          PRINT_REPORT*22,
     +          END_QUERY_INTERFACE*4

C*********************************************************************
C   Query command extension, number of parameters and lengths
C*********************************************************************
      INTEGER NUMBER_OF_PARAMETERS,
     +        KEYWORD_LENGTHS(10),
     +        DATA_LENGTHS(10)

C*********************************************************************
C   Variable data type constants
C*********************************************************************
      CHARACTER CHAR_DATA_TYPE*4,
     +          INT_DATA_TYPE*4

C*********************************************************************
C   Keyword parameter and value for START command
C*********************************************************************
      CHARACTER*8  START_KEYWORDS(1)
      CHARACTER*11 START_KEYWORD_VALUES(1)

C*********************************************************************
C   Keyword parameter and values for SET command
C*********************************************************************
      CHARACTER   SET_KEYWORDS(19)
      CHARACTER   SET_KEYWORD_1*7,
     +            SET_KEYWORD_2*5,
     +            SET_KEYWORD_3*7

      EQUIVALENCE (SET_KEYWORDS( 1), SET_KEYWORD_1),
     +            (SET_KEYWORDS( 8), SET_KEYWORD_2),
     +            (SET_KEYWORDS(13), SET_KEYWORD_3)

      CHARACTER   SET_VALUES(12)
      INTEGER*4   SET_VALUE_1,
     +            SET_VALUE_2,
```

```
     +            SET_VALUE_3

      EQUIVALENCE (SET_VALUES(1), SET_VALUE_1),
     +            (SET_VALUES(5), SET_VALUE_2),
     +            (SET_VALUES(9), SET_VALUE_3)

C*********************************************************************
C Declare command length and return code variables
C*********************************************************************
      INTEGER   LEN,
     +          RC

C*********************************************************************
C Initialization
C*********************************************************************

      DATA START_QUERY_INTERFACE /'START'                /
      DATA SET_GLOBAL_VARIABLES  /'SET GLOBAL'           /
      DATA RUN_QUERY             /'RUN QUERY Q1'         /
      DATA PRINT_REPORT          /'PRINT REPORT (FORM=F1)'/
      DATA END_QUERY_INTERFACE   /'EXIT'                 /

      DATA CHAR_DATA_TYPE        /DSQ_VARIABLE_CHAR      /
      DATA INT_DATA_TYPE         /DSQ_VARIABLE_FINT      /

C*********************************************************
C   Start query session
C*********************************************************
      DSQ_COMM_LEVEL = DSQ_CURRENT_COMM_LEVEL
      NUMBER_OF_PARAMETERS    = 1
      COMMAND_LENGTH          = LEN(START_QUERY_INTERFACE)
      KEYWORD_LENGTHS(1)      = LEN(START_KEYWORDS(1))
      DATA_LENGTHS(1)         = LEN(START_KEYWORD_VALUES(1))
      START_KEYWORDS(1)       = 'DSQSMODE'
      START_KEYWORD_VALUES(1) = 'INTERACTIVE'

      RC = DSQCIFE(DSQCOMM,
     +             COMMAND_LENGTH,
     +             START_QUERY_INTERFACE,
     +             NUMBER_OF_PARAMETERS,
     +             KEYWORD_LENGTHS,
     +             START_KEYWORDS,
     +             DATA_LENGTHS,
     +             START_KEYWORD_VALUES,
     +             CHAR_DATA_TYPE)

C*********************************************************************
C   Set numeric values into query using SET command
C*********************************************************************
      NUMBER_OF_PARAMETERS = 3
      COMMAND_LENGTH       = LEN(SET_GLOBAL_VARIABLES)
      SET_KEYWORD_1        = 'MYVAR01'
      SET_KEYWORD_2        = 'SHORT'
      SET_KEYWORD_3        = 'MYVAR03'
      KEYWORD_LENGTHS(1)   = LEN(SET_KEYWORD_1)
      KEYWORD_LENGTHS(2)   = LEN(SET_KEYWORD_2)
      KEYWORD_LENGTHS(3)   = LEN(SET_KEYWORD_3)
      DATA_LENGTHS(1)      = 4
      DATA_LENGTHS(2)      = 4
      DATA_LENGTHS(3)      = 4
      SET_VALUE_1          = 20
      SET_VALUE_2          = 40
      SET_VALUE_3          = 84

      RC = DSQCIFE(DSQCOMM,
      +             COMMAND_LENGTH,
      +             SET_GLOBAL_VARIABLES,
      +             NUMBER_OF_PARAMETERS,
      +             KEYWORD_LENGTHS,
      +             SET_KEYWORDS,
      +             DATA_LENGTHS,
      +             SET_VALUES,
      +             INT_DATA_TYPE)

 C*********************************************************************
 C   Run a query
 C*********************************************************************
       COMMAND_LENGTH = LEN(RUN_QUERY)
       RC = DSQCIF(DSQCOMM,
      +            COMMAND_LENGTH,
      +            RUN_QUERY)
```

```
C*********************************************************************
C   Print the results of the query
C*********************************************************************
      COMMAND_LENGTH = LEN(PRINT_REPORT)
      RC = DSQCIF(DSQCOMM,
     +            COMMAND_LENGTH,
     +            PRINT_REPORT)

C*********************************************************************
C   End the query interface session
C*********************************************************************
      COMMAND_LENGTH = LEN(END_QUERY_INTERFACE)
      RC = DSQCIF(DSQCOMM,
     +            COMMAND_LENGTH,
     +            END_QUERY_INTERFACE)


END
```

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

DSQCOMM for Fortran

The interface communications area file for the Fortran language is named DSQCOMMF.

The DSQCOMMF include file shown here, is provided with QMF:

```
C*********************************************************************
C       FORTRAN include file for callable interface
C*********************************************************************
C     Return codes
      INTEGER DSQ_SUCCESS, DSQ_WARNING, DSQ_FAILURE, DSQ_SEVERE
      PARAMETER(
     +          DSQ_SUCCESS =  0,
     +          DSQ_WARNING =  4,
     +          DSQ_FAILURE =  8,
     +          DSQ_SEVERE  = 16)

C     Communications level
      CHARACTER DSQ_CURRENT_COMM_LEVEL*12
      PARAMETER(
     +          DSQ_CURRENT_COMM_LEVEL = 'DSQL>001002<')

C     Query product IDs
      CHARACTER DSQ_QRW*2, DSQ_QMF*2, DSQ_QM4*2
      PARAMETER(
     +          DSQ_QRW = '01',
     +          DSQ_QMF = '02',
     +          DSQ_QM4 = '03')

C     Query product release levels
      CHARACTER DSQ_QRW_V1R2*2,   DSQ_QRW_V1R3*2,
     +          DSQ_QMF_V2R4*2,   DSQ_QMF_V3R1*2,
     +          DSQ_QMF_V3R1M1*2, DSQ_QMF_V3R2*2,
     +          DSQ_QMF_V3R3*2,   DSQ_QMF_V6R1*2,
     +          DSQ_QMF_V7R1*2,   DSQ_QM4_V1R1*2,
     +          DSQ_QMF_V7R2*2,   DSQ_QMF_V8R1*2,
     +          DSQ_QMF_V9R1*2,   DSQ_QMF_V10R1*2
       PARAMETER(
     +          DSQ_QRW_V1R2   = '01',
     +          DSQ_QRW_V1R3   = '02',
     +          DSQ_QMF_V2R4   = '01',
     +          DSQ_QMF_V3R1   = '02',
     +          DSQ_QMF_V3R1M1 = '03',
     +          DSQ_QMF_V3R2   = '04',
     +          DSQ_QMF_V3R3   = '05',
     +          DSQ_QMF_V6R1   = '06',
     +          DSQ_QMF_V7R1   = '07',
     +          DSQ_QM4_V1R1   = '01',
     +          DSQ_QMF_V7R2   = '08',
     +          DSQ_QMF_V8R1   = '09',
     +          DSQ_QMF_V9R1   = '10',
     +          DSQ_QMF_V10R1  = '11',
     +          DSQ_QMF_V11R1  = '12',
```

```
     +          DSQ_QMF_V11R2  = '13',
     +          DSQ_QMF_V12R1  = '14',
     +          DSQ_QMF_V13R1  = '15')

C     Host variable types
      CHARACTER DSQ_VARIABLE_CHAR*4, DSQ_VARIABLE_FINT*4
      PARAMETER(
     +          DSQ_VARIABLE_CHAR = 'CHAR',
     +          DSQ_VARIABLE_FINT = 'FINT')

C     Cancel indicator
      CHARACTER DSQ_CANCEL_YES, DSQ_CANCEL_NO
      PARAMETER(
     +          DSQ_CANCEL_YES  = '1',
     +          DSQ_CANCEL_NO   = '0')
      CHARACTER DSQCOMM(512)
      INTEGER   DSQ_RETURN_CODE, DSQ_INSTANCE_ID
      CHARACTER DSQ_COMM_LEVEL*12,
     +          DSQ_PRODUCT*2,
     +          DSQ_PRODUCT_RELEASE*2,
     +          DSQ_RESERVE1*28,
     +          DSQ_MESSAGE_ID*8,
     +          DSQ_Q_MESSAGE_ID*8,
     +          DSQ_START_PARM_ERROR*8,
     +          DSQ_CANCEL_IND*1,
     +          DSQ_RESERVE2*23,
     +          DSQ_RESERVE3*156,
     +          DSQ_MESSAGE_TEXT*128,
     +          DSQ_Q_MESSAGE_TEXT*128

      EQUIVALENCE   (DSQCOMM( 1),  DSQ_RETURN_CODE       ),
     +              (DSQCOMM( 5),  DSQ_INSTANCE_ID       ),
     +              (DSQCOMM( 9),  DSQ_COMM_LEVEL        ),
      +              (DSQCOMM(21),  DSQ_PRODUCT           ),
      +              (DSQCOMM(23),  DSQ_PRODUCT_RELEASE   ),
      +              (DSQCOMM(25),  DSQ_RESERVE1          ),
      +              (DSQCOMM(53),  DSQ_MESSAGE_ID        ),
      +              (DSQCOMM(61),  DSQ_Q_MESSAGE_ID      ),
      +              (DSQCOMM(69),  DSQ_START_PARM_ERROR  ),
      +              (DSQCOMM(77),  DSQ_CANCEL_IND        ),
      +              (DSQCOMM(78),  DSQ_RESERVE2          ),
      +              (DSQCOMM(101), DSQ_RESERVE3          ),
      +              (DSQCOMM(257), DSQ_MESSAGE_TEXT      ),
      +              (DSQCOMM(385), DSQ_Q_MESSAGE_TEXT    )

 C       Callable interface normal and extended calls
       EXTERNAL DSQCIF
       EXTERNAL DSQCIFE
```

Running your Fortran programs

To run your Fortran program in TSO, compile and link-edit the program, and then run it in either with or without ISPF.

Compiling and link-editing your program

You must compile and link-edit your Fortran program before you can run it in TSO.

JCL for running the Fortran compiler and linkage editor uses the Fortran compiler for z/OS. Some parameters might vary from one QMF installation to the next.

The JCL in this example is not provided with QMF, but you can copy it from here, altering it to suit your needs.

```
//samFORT    JOB
//STEP1      EXEC PROC=VSF2CL
//* Provide access to QMF communications macro DSQCOMM
//FORT.SYSLIB   DD  DSN=QMF1310.SAMPLIB,DISP=SHR
//FORT.SYSIN    DD  *
          .
          .
          .
          Your program or copy of QMF sample DSQABFF
          .
          .
          .
```

```
/*
//* Provide access to QMF interface module
//* Allocation for target library
//LKED.SYSLMOD DD
//* Allocation for QMF load library
//LKED.QMFLOAD  DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN    DD  *
          INCLUDE QMFLOAD(DSQCIF)
          INCLUDE QMFLOAD(DSQCIFE)
          ENTRY samFORT
          MODE  AMODE(31) RMODE(31)
          NAME  samFORT(R)
/*
```

Running your programs in TSO without ISPF

After your Fortran program compiles successfully, you can run it with JCL without ISPF.

The JCL in this example is not provided with QMF, but you can copy it from here, altering it to suit your needs.

The program shown here runs your callable interface application by using the Fortran compiler. Some parameters can vary from one QMF installation to the next:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Note: QMF, Db2, GDDM and FORTRAN load libraries must be  */
/*       allocated before running this CLIST.                */
/*       Name of QMF load library is  "QMF1310.SDSQLOAD".   */
/*************************************************************/
/* Specify attribute list for dataset allocations           */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                      */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* QMF/GDDM Datasets                                         */
/*************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/*************************************************************/
/* Datasets used by QMF                                      */
/*************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/*************************************************************/
/* Start your program using TSO CALL command                */
/*************************************************************/
CALL samFORT
EXIT CODE(0)
```

Running in TSO under ISPF

After your Fortran program compiles successfully, you can run it under ISPF.

The CLIST in this example is not provided with QMF, but you can copy it from here, altering it to suit your needs.

The CLIST shown here runs your callable interface application by using the Fortran compiler. Some parameters can vary from one QMF installation to the next:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Specify attribute list for dataset allocations            */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                      */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE','ISR.ISRCLIB')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* Datasets used by ISPF                                     */
/*************************************************************/
ALLOC FI(ISPLLIB) SHR REUSE +
      DA('QMF1310.SDSQLOAD','ADM.GDDMLOAD','DSN.DSNEXIT','DSN.DSNLOAD', +
         'PRDUCT.VSF2LOAD')
ALLOC FI(ISPMLIB) SHR REUSE +
      DA('QMF1310.SDSQMLBE','ISR.ISRMLIB','ISP.ISPMLIB')
ALLOC FI(ISPPLIB) SHR REUSE +
      DA('QMF1310.SDSQPLBE','ISR.ISRPLIB','ISP.ISPPLIB')
ALLOC FI(ISPSLIB) SHR REUSE +
      DA('QMF1310.SDSQSLBE','ISR.ISRSLIB','ISP.ISPSLIB')
ALLOC FI(ISPTLIB) SHR REUSE +
      DA('ISR.ISRTLIB','ISP.ISPTLIB')
/*************************************************************/
/* QMF/GDDM Datasets                                         */
/*************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/*************************************************************/
/* Datasets used by QMF                                      */
/*************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/*************************************************************/
/* Start your program as the initial ISPF dialog             */
/*************************************************************/
ISPSTART PGM(samFORT) NEWAPPL(DSQE)
EXIT CODE(4)
```

The `EXIT CODE(4)` statement suppresses the display of the ISPF disposition panel.

PL/I language interface

You can use the PL/I language with the callable interface in QMF.

Interface communications area mapping for PL/I (DSQCOMML)

DSQCOMML provides DSQCOMM mapping for PL/I and is provided with QMF.

The table shows the values for DSQCOMML.

Table 48. Interface communications area for PL/I (DSQCOMML)

Structure name	Data type	Description
DSQ_RETURN_CODE	FIXED BIN(31)	Indicates the status of a QMF command after it is run Its values are: **DSQ_SUCCESS** Successful execution of the request **DSQ_WARNING** Normal completion with warnings **DSQ_FAILURE** Command did not run correctly **DSQ_SEVERE** Severe error; QMF session terminated
DSQ_INSTANCE_ID	FIXED BIN(31)	Identifier established by QMF during execution of the START command
DSQ_COMM_LEVEL	CHAR(12)	Identifies the level of the DSQCOMM communications area In your application, include instructions that initialize this variable to the value of DSQ_CURRENT_COMM_LEVEL before issuing the QMF START command.
DSQ_PRODUCT	CHAR(2)	Identifies the IBM query product in use. Variables that begin with DSQ_QMF specify QMF for TSO and CICS versions.
DSQ_PRODUCT_RELEASE	CHAR(2)	Release level of QMF in use. Variable DSQ_QMF_V13R1 specifies QMF Version 13 Release 1.
DSQ_RESERVE1	CHAR(28)	Reserved for future use
DSQ_MESSAGE_ID	CHAR(8)	Completion message ID
DSQ_Q_MESSAGE_ID	CHAR(8)	Query message ID
DSQ_START_PARM_ERROR	CHAR(8)	Parameter in error when START failed due to a parameter error
DSQ_CANCEL_IND	CHAR(1)	Contains one of two values, depending on whether the user canceled while a QMF command was running: • DSQ_CANCEL_YES • DSQ_CANCEL_NO
DSQ_RESERVE2	CHAR(23)	Reserved for future use
DSQ_RESERVE3	CHAR(156)	Reserved for future use
DSQ_MESSAGE_TEXT	CHAR(128)	Completion message text
DSQ_Q_MESSAGE_TEXT	CHAR(128)	Query message text

Function calls for PL/I

QMF provides two function calls for PL/I: DSQCIPL and DSQCIPX. Both calls are described in the communications area (DSQCOMML).

DSQCIPL syntax

This call is for QMF commands that do not require access to application program variables. Use this call for most QMF commands.

```
CALL DSQCIPL(DSQCOMM,
             CMDLTH,
             CMDSTR)
```

The parameters have the following values:

DSQCOMM
The interface communications area.

CMDLTH
The length of the command string (CMDSTR).

CMDSTR
The QMF command to run; an uppercase character string of the length specified by CMDLTH.

DSQCIPX syntax

This call is for the commands that require access to application program variables: START, TRACE, and the extended formats of GET GLOBAL and SET GLOBAL.

The syntax for this call is:

```
CALL DSQCIPX(DSQCOMM,
             CMDLTH,
             CMDSTR,
             PNUM,
             KLTH,
             KWORD,
             VLTH,
             VALUE,
             VTYPE)
```

The parameters have the following values:

DSQCOMM
The interface communications area.

CMDLTH
The length of the command string (CMDSTR); an integer FIXED BIN(31) parameter.

CMDSTR
The QMF command to run; an uppercase character string of the length specified by CMDLTH.

PNUM
The number of command keywords or trace areas; an integer FIXED BIN(31) parameter.

KLTH
The length of each specified keyword or trace title; an integer FIXED BIN(31) parameter or parameter array.

KWORD
The QMF keyword, keywords, or address of trace titles.

Each is a character, array of characters, or array of addresses to trace titles whose lengths are specified by KLTH. You can use an array of characters if all of the keywords have the same length. The keywords must be in contiguous storage and not separated by any special delimiters.

VLTH
The length of each value that is associated with the keyword or trace title; an integer FIXED BIN(31) parameter or parameter array.

VALUE
The value that is associated with each keyword or the address of a value that is associated with a trace title.

Its type is specified in the VTYPE parameter and can be a character, array of characters, integer FIXED BIN(31) parameter, or parameter array. If you have character values, the values must be in contiguous storage and not separated by any special delimiters.

VTYPE
Data type of the contents of the VALUE parameter.

This parameter has one of two values, which are provided in the DSQCOMML communications area:

- DSQ_VARIABLE_CHAR for character values
- DSQ_VARIABLE_FINT for integer FIXED BIN(31) values

All values that are specified in the VALUE field must have the data type that is specified in VTYPE.

PL/I programming example

The sample program, DSQABFP, is provided with QMF and uses PL/I. The sample program is a member of the library QMF1310.SDSQSAP*n* (where *n* is a national language identifier).

The sample program for the PL/I language callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1
- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

```
DSQABFP: PROCEDURE OPTIONS(MAIN REENTRANT) REORDER;
/*********************************************************************/
/* Sample program:  DSQABFP                                          */
/* PL/I version of the QMF callable interface                        */
/*********************************************************************/

/*********************************************************************/
/* Include and declare query interface communications area           */
/*********************************************************************/
%INCLUDE SYSLIB(DSQCOMML);

/*********************************************************************/
/* Built in function                                                 */
/*********************************************************************/
DCL LENGTH BUILTIN;

/*********************************************************************/
/* Query interface command length and commands                       */
/*********************************************************************/
DCL COMMAND_LENGTH         FIXED BIN(31);
DCL START_QUERY_INTERFACE  CHAR(5)  INIT('START');
DCL SET_GLOBAL_VARIABLES   CHAR(10) INIT('SET GLOBAL');
DCL RUN_QUERY              CHAR(12) INIT('RUN QUERY Q1');
DCL PRINT_REPORT           CHAR(22) INIT('PRINT REPORT (FORM=F1)');
DCL END_QUERY_INTERFACE    CHAR(4)  INIT('EXIT');

/*********************************************************************/
/* Query command extension, number of parameters and lengths         */
/*********************************************************************/
DCL NUMBER_OF_PARAMETERS   FIXED BIN(31);/* number of variables     */
DCL KEYWORD_LENGTHS(10)    FIXED BIN(31);/* lengths of keyword names*/
DCL DATA_LENGTHS(10)       FIXED BIN(31);/* lengths of variable data*/

/*********************************************************************/
```

```
/* Keyword parameter and value for START command                    */
/*******************************************************************/
DCL START_KEYWORDS         CHAR(8)  INIT('DSQSMODE');
DCL START_KEYWORD_VALUES   CHAR(11) INIT('INTERACTIVE');

/*******************************************************************/
/* Keyword parameter and value for SET command                      */
/*******************************************************************/
DCL 1 SET_KEYWORDS,
      3  SET_KEYWORDS_1    CHAR(7) INIT('MYVAR01'),
      3  SET_KEYWORDS_2    CHAR(5) INIT('SHORT'),
      3  SET_KEYWORDS_3    CHAR(7) INIT('MYVAR03');

DCL 1 SET_VALUES,
      3  SET_VALUES_1      FIXED BIN(31),
      3  SET_VALUES_2      FIXED BIN(31),
      3  SET_VALUES_3      FIXED BIN(31);

/*******************************************************************/
/* Main program                                                     */
/*******************************************************************/
DSQCOMM = '';
DSQ_COMM_LEVEL = DSQ_CURRENT_COMM_LEVEL;

/*******************************************************************/
/* Start a query interface session                                  */
/*******************************************************************/
NUMBER_OF_PARAMETERS = 1;
COMMAND_LENGTH = LENGTH(START_QUERY_INTERFACE);
KEYWORD_LENGTHS(1) = LENGTH(START_KEYWORDS);
DATA_LENGTHS(1) = LENGTH(START_KEYWORD_VALUES);

CALL DSQCIPX(DSQCOMM,
             COMMAND_LENGTH,
             START_QUERY_INTERFACE,
             NUMBER_OF_PARAMETERS,
             KEYWORD_LENGTHS,
             START_KEYWORDS,
             DATA_LENGTHS,
             START_KEYWORD_VALUES,
             DSQ_VARIABLE_CHAR);

/*******************************************************************/
/* Set numeric values into query using SET command                  */
/*******************************************************************/
NUMBER_OF_PARAMETERS = 3;
COMMAND_LENGTH = LENGTH(SET_GLOBAL_VARIABLES);
KEYWORD_LENGTHS(1) = LENGTH(SET_KEYWORDS_1);
KEYWORD_LENGTHS(2) = LENGTH(SET_KEYWORDS_2);
KEYWORD_LENGTHS(3) = LENGTH(SET_KEYWORDS_3);
DATA_LENGTHS(1) = 4;
DATA_LENGTHS(2) = 4;
DATA_LENGTHS(3) = 4;
SET_VALUES_1 = 20;
SET_VALUES_2 = 40;
SET_VALUES_3 = 84;

CALL DSQCIPX(DSQCOMM,
             COMMAND_LENGTH,
             SET_GLOBAL_VARIABLES,
             NUMBER_OF_PARAMETERS,
             KEYWORD_LENGTHS,
             SET_KEYWORDS,
             DATA_LENGTHS,
             SET_VALUES,
             DSQ_VARIABLE_FINT);

/*******************************************************************/
/* Run a query                                                      */
/*******************************************************************/
COMMAND_LENGTH = LENGTH(RUN_QUERY);

CALL DSQCIPL(DSQCOMM,
            COMMAND_LENGTH,
            RUN_QUERY);

/*******************************************************************/
/* Print the results of the query                                   */
/*******************************************************************/
COMMAND_LENGTH = LENGTH(PRINT_REPORT);

CALL DSQCIPL(DSQCOMM,
```

```
            COMMAND_LENGTH,
            PRINT_REPORT);

/*********************************************************************/
/* End the query interface session                                   */
/*********************************************************************/
COMMAND_LENGTH = LENGTH(END_QUERY_INTERFACE);

CALL DSQCIPL(DSQCOMM,
            COMMAND_LENGTH,
            END_QUERY_INTERFACE);

END       DSQABFP;
```

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

DSQCOMM for PL/I

The interface communications area for PL/I, is named DSQCOMML.

```
/*********************************************************************/
/* PL/I include for query callable interface                         */
/*********************************************************************/

/* Structure declare for communications area                         */
DCL
 1 DSQCOMM,
   3 DSQ_RETURN_CODE      FIXED BIN(31),   /* Function return code  */
   3 DSQ_INSTANCE_ID      FIXED BIN(31),   /* Start ID              */
   3 DSQ_COMM_LEVEL       CHAR(12),        /* Communications level  */
   3 DSQ_PRODUCT          CHAR(2),         /* Query product ID      */
   3 DSQ_PRODUCT_RELEASE  CHAR(2),         /* Query product release */
   3 DSQ_RESERVE1         CHAR(28),        /* Reserved              */
   3 DSQ_MESSAGE_ID       CHAR(8),         /* Completion message ID */
   3 DSQ_Q_MESSAGE_ID     CHAR(8),         /* Query message ID      */
   3 DSQ_START_PARM_ERROR CHAR(8),         /* Start parms in error  */
   3 DSQ_CANCEL_IND       CHAR(1),         /* Cmd cancel indicator  */
                          /* 1 = cancelled, 0 = not cancelled*/
   3 DSQ_RESERVE2         CHAR(23),        /* Reserved              */
   3 DSQ_RESERVE3         CHAR(156),       /* Reserved              */
   3 DSQ_MESSAGE_TEXT     CHAR(128),       /* QMF command message   */
   3 DSQ_Q_MESSAGE_TEXT   CHAR(128);       /* QMF query message     */

/* Return codes                                                      */
DCL
   DSQ_SUCCESS             FIXED BIN(31) INIT(0)  STATIC,
   DSQ_WARNING             FIXED BIN(31) INIT(4)  STATIC,
   DSQ_FAILURE             FIXED BIN(31) INIT(8)  STATIC,
   DSQ_SEVERE              FIXED BIN(31) INIT(16) STATIC;

/* Communications level                                              */
DCL
   DSQ_CURRENT_COMM_LEVEL  CHAR(12) INIT('DSQL>001002<') STATIC;

/* Query product ID                                                  */
DCL
   DSQ_QRW                 CHAR(2) INIT('01') STATIC,
   DSQ_QMF                 CHAR(2) INIT('02') STATIC,
   DSQ_QM4                 CHAR(2) INIT('03') STATIC;

/* Query product release ID                                          */
DCL
   DSQ_QRW_V1R2            CHAR(2) INIT('01') STATIC,
   DSQ_QRW_V1R3            CHAR(2) INIT('02') STATIC,
   DSQ_QMF_V2R4            CHAR(2) INIT('01') STATIC,
   DSQ_QMF_V3R1            CHAR(2) INIT('02') STATIC,
   DSQ_QMF_V3R1M1          CHAR(2) INIT('03') STATIC,
   DSQ_QMF_V3R2            CHAR(2) INIT('04') STATIC,
   DSQ_QMF_V3R3            CHAR(2) INIT('05') STATIC,
   DSQ_QMF_V6R1            CHAR(2) INIT('06') STATIC,
   DSQ_QMF_V7R1            CHAR(2) INIT('07') STATIC,
   DSQ_QM4_V1R1            CHAR(2) INIT('01') STATIC,
   DSQ_QMF_V7R2            CHAR(2) INIT('08') STATIC,
   DSQ_QMF_V8R1            CHAR(2) INIT('09') STATIC,
   DSQ_QMF_V9R1            CHAR(2) INIT('10') STATIC,
```

```
   DSQ_QMF_V10R1           CHAR(2) INIT('11') STATIC;

/* Cancelled indicator                                          */
DCL
   DSQ_CANCEL_YES          CHAR(1) INIT('1') STATIC,
   DSQ_CANCEL_NO           CHAR(1) INIT('0') STATIC;

/* Variable types                                               */
DCL
   DSQ_VARIABLE_CHAR       CHAR(4) INIT('CHAR') STATIC,
   DSQ_VARIABLE_FINT       CHAR(4) INIT('FINT') STATIC;

/* Mode                                                         */
DCL
   DSQ_INTERACTIVE         CHAR(1) INIT('1') STATIC,
   DSQ_BATCH               CHAR(1) INIT('2') STATIC;

/* Yes or no                                                    */
DCL
   DSQ_YES                 CHAR(1) INIT('1') STATIC,
   DSQ_NO                  CHAR(1) INIT('2') STATIC;

/* Query interface entry point                                  */
DCL
   DSQCIPL ENTRY (*,                       /* Interface block       */
                  FIXED BIN(31),           /* Length of command     */
                  CHAR(*))                 /* Command string        */
                  EXTERNAL OPTIONS(ASSEMBLER);
DCL
   DSQCIPX ENTRY (*,                       /* Interface block       */
                  FIXED BIN(31),           /* Length of command     */
                  CHAR(*),                 /* Command string        */
                  FIXED BIN(31),           /* # of command keywords */
                  *,                       /* Length of keyword     */
                  *,                       /* Keyword string        */
                  *,                       /* Length of value       */
                  *,                       /* Value of keyword      */
                  CHAR(4))                 /* Data type of value    */
                  EXTERNAL OPTIONS(ASSEMBLER);
```

Running your programs under CICS

After you write your program in PL/I, you need to compile and run it.

When you translate, compile, and link-edit a program that uses the QMF callable interface, consider the following conditions:

- The communications area (DSQCOMML) must be available in the compile step or copied into your program.
- The QMF interface modules DSQCIPL and DSQCIPX must be available during the link-edit step of your program.

This example uses the procedure DFHVITVL supplied with CICS. This JCL is not provided with QMF, but you can copy it and alter it to suit your needs.

```
//samPLI JOB
// EXEC PROC=DFHVITVL
//PLI.SYSIN DD *
.
.
.
Your program or copy of QMF sample DSQABFP
.
.
.
/*
//* Provide access to QMF communications macro DSQCOMML
//PLI.SYSLIB DD DSN=QMF1310.SDSQSAPE,DISP=SHR
//* Provide access to QMF interface module
//* Allocation for target library
//LKED.SYSLMOD DD
//* Allocation for QMF load library
//LKED.QMFLOAD DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN DD *
INCLUDE QMFLOAD(DSQCIPL)
INCLUDE QMFLOAD(DSQCIPX)
```

```
MODE AMODE(31) RMODE(31)
NAME sampPLI(R)
/*
```

Running your programs under TSO

To run your PL/I program in TSO, compile and link-edit the program, and then run it in either with or without ISPF.

Compiling and link-editing in TSO

You must compile and link-edit your PL/I program before you can run it in TSO.

This JCL uses the PL/I compiler to compile your callable interface application and then link-edits the application. Some parameters can vary from one QMF installation to the next.

```
//samPLI JOB
//STEP1 EXEC PROC=IBMZCPL
//* Provide Access to QMF Communications Macro DSQCOMML
//PLI.SYSLIB DD DSN=QMF1310.SAMPLIB,DISP=SHR
//PLI.SYSIN DD *
.
.
.
Your program or copy of QMF sample DSQABFP
.
.
.
//* Allocation for target library
//LKED.SYSLMOD DD
//* Allocation for QMF load library
//LKED.QMFLOAD DD DSN=QMF1310.SDSQLOAD,DISP=SHR
//LKED.SYSIN DD *
INCLUDE QMFLOAD(DSQCIPL)
INCLUDE QMFLOAD(DSQCIPX)
ENTRY CEESTART
MODE AMODE(31) RMODE(ANY)
NAME sampPLI(R)
/*
```

Related reference

Running in TSO without ISPF
After your PL/I program is assembled successfully, you can run it without ISPF.

Running in TSO under ISPF
After your PL/I program is assembled successfully, you can run it under ISPF.

Running in TSO without ISPF

After your PL/I program is assembled successfully, you can run it without ISPF.

Run your program in TSO without ISPF by writing a program similar to the CLIST shown here:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Note: QMF, Db2, GDDM and PL/I load libraries must be     */
/*       allocated before running this CLIST.               */
/*       Name of QMF load library is  "QMF1310.SDSQLOAD".   */
/*************************************************************/
/* Specify attribute list for dataset allocations           */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                     */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* QMF/GDDM Datasets                                        */
```

```
/*************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/*************************************************************/
/* Datasets used by QMF                                      */
/*************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/*************************************************************/
/* Start your program using TSO CALL command                */
/*************************************************************/
CALL sampPLI
EXIT CODE(0)
```

Related reference

Compiling and link-editing in TSO
You must compile and link-edit your PL/I program before you can run it in TSO.

Running in TSO under ISPF
After your PL/I program is assembled successfully, you can run it under ISPF.

Running in TSO under ISPF

After your PL/I program is assembled successfully, you can run it under ISPF.

Run your program in TSO under ISPF by writing a program similar to the CLIST shown here:

```
PROC 0
CONTROL ASIS
/*************************************************************/
/* Specify attribute list for dataset allocations            */
/*************************************************************/
ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)
ATTR DEBUGDCB LRECL(80)  RECFM(F B)   BLKSIZE(3120)
ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)
ATTR EDITDCB  LRECL(79)  RECFM(F B A) BLKSIZE(4029)
/*************************************************************/
/* Datasets used by TSO                                      */
/*************************************************************/
ALLOC FI(SYSPROC) DA('QMF1310.SDSQCLTE','ISR.ISRCLIB')
ALLOC FI(SYSEXEC) DA('QMF1310.SDSQEXCE')
/*************************************************************/
/* Datasets used by ISPF                                     */
/*************************************************************/
ALLOC FI(ISPLLIB) SHR REUSE +
      DA('QMF1310.SDSQLOAD','ADM.GDDMLOAD','DSN.DSNEXIT','DSN.DSNLOAD', +
         'PLI.PLILINK','PLI.SIBMLINK')
ALLOC FI(ISPMLIB) SHR REUSE +
      DA('QMF1310.SDSQMLBE','ISR.ISRMLIB','ISP.ISPMLIB')
ALLOC FI(ISPPLIB) SHR REUSE +
      DA('QMF1310.SDSQPLBE','ISR.ISRPLIB','ISP.ISPPLIB')
ALLOC FI(ISPSLIB) SHR REUSE +
      DA('QMF1310.SDSQSLBE','ISR.ISRSLIB','ISP.ISPSLIB')
ALLOC FI(ISPTLIB) SHR REUSE +
      DA('ISR.ISRTLIB','ISP.ISPTLIB')
/*************************************************************/
/* QMF/GDDM Datasets                                         */
/*************************************************************/
ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE')  SHR REUSE
ALLOC FI(ADMCFORM) DA('QMF1310.DSQCFORM') SHR REUSE
ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE
ALLOC FI(ADMSYMBL) DA('ADM.GDDMSYM')  SHR REUSE
ALLOC FI(ADMGDF)   DA('ADM.GDDM.CHARTLIB') SHR REUSE
ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE
/*************************************************************/
/* Datasets used by QMF                                      */
/*************************************************************/
ALLOC FI(DSQPRINT) SYSOUT(X) USING(PRINTDCB)
ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)
```

```
ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)
ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS
ALLOC FI(DSQEDIT)  NEW UNIT(SYSDA) USING(EDITDCB)
ALLOC FI(DSQPNLE)  DA('QMF1310.DSQPNLE') SHR REUSE
/*************************************************************/
/* Start your program as the initial ISPF dialog             */
/*************************************************************/
ISPSTART PGM(sampPLI) NEWAPPL(DSQE)
EXIT CODE(4)
```

The `EXIT CODE(4)` statement suppresses the ISPF disposition panel.

Related reference

Compiling and link-editing in TSO
You must compile and link-edit your PL/I program before you can run it in TSO.

Running in TSO without ISPF
After your PL/I program is assembled successfully, you can run it without ISPF.

REXX language interface

REXX is an interpretive language; it does not have to be compiled.

However, programs that use compiled REXX or other compiled languages have better performance than the same programs written that use interpretive REXX. A REXX compiler is available for REXX programs, but not for procedures with logic.

Under TSO, start QMF with the REXX callable interface when you use procedures with logic and certain QMF form functions (calculations, defined columns, and conditions). The REXX callable interface can reduce resources required to use REXX services.

For example, fewer resources are required to issue PRINT REPORT or BOTTOM commands on the REPORT panel if QMF is started with the REXX callable interface. The reduction of resource consumption can be substantial and is most noticeable when running QMF under TSO.

The REXX language always operates in a command environment that determines how and where the command is processed. If you write a REXX program that issues QMF commands, you can use the QMF command environment through the ADDRESS QRW command.

Restriction: Because REXX is not available under QMF for CICS, the QMF callable interface for REXX does not work under CICS.

Related concepts

ADDRESS QRW and the QMF command environment
When QMF is started in TSO, ISPF, or native z/OS, QMF creates a REXX command environment called QRW. When you are executing a REXX program, you can set the default command environment to QRW by issuing the REXX ADDRESS command ADDRESS QRW. With ADDRESS QRW, QMF remains the default command environment until you issue another ADDRESS command.

Interface communications variables for REXX

The interface communications variables consist of several REXX variables. They are set after the completion of every call and must not be altered by the calling program.

The interface communications variables for REXX variables are shown in this table:

Table 49. Interface communications variables for REXX	
Structure name	**Description**
dsq_return_code	Integer that indicates the results of executing a QMF command Possible values are: **dsq_success** Successful processing of the request **dsq_warning** Normal completion with warnings **dsq_failure** Command did not process correctly **dsq_severe** Severe error that forces the QMF session to end Additional calls to QMF cannot be made with this instance ID. The value of `dsq_return_code` is also placed in the REXX variable *rc*.
dsq_instance_id	Identifier that is established by QMF during processing of the START command
dsq_product	Identifies the IBM query product in use Variables that begin with `dsq_qmf` specify QMF for TSO versions.
dsq_product_release	Release level of QMF in use Variable `dsq_qmf_v13r1` specifies QMF Version 13 Release 1.
dsq_message_id	Completion message ID
dsq_q_message_id	Query message ID
dsq_start_parm_error	Parameter in error when START failed due to a parameter error
dsq_cancel_ind	Command cancel indicator that indicates whether the user canceled command processing while QMF was running a command; possible values are: **dsq_cancel_yes** The user canceled the command **dsq_cancel_no** The user did not cancel the command
dsq_message_text	Completion message text
dsq_q_message_text	Query message text

Function call for REXX

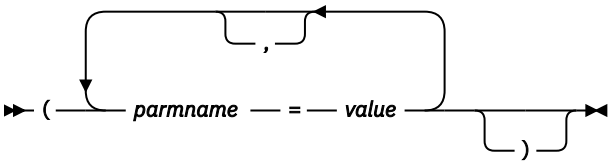
The callable interface is accessed by using normal REXX function calls. QMF provides an external subroutine called DSQCIX, which is used to run all QMF commands issued through the callable interface.

The syntax for the DSQCIX function call is as follows:

```
call DSQCIX cmd parmlist
```

In this syntax, *cmd* is a QMF command written as an uppercase character string and *parmlist* is a list of parameter and value pairs.

Syntax of the parameter list for the DSQCIX function call



Pass the entire command, including the *parmlist*, to QMF as a single REXX variable written as a character string. This string must be enclosed in quotation marks (' ') or (" "). When using REXX variables as part of the command string, do not enclose the argument. For example:

```
CALL DSQCIX "RUN QUERY NAME (&ECN="REXAUG",CONFIRM=YES)"
```

parmname
Name of a parameter

value
Value that is to be associated with the parameter name specified by *parmname*

Here are some examples of function calls:

```
call DSQCIX "RUN QUERY Q1"
call DSQCIX "PRINT REPORT (FORM=F1"
call DSQCIX "EXIT"
```

In the *parmlist*, the same results occur whether the following elements are present or not:

- Comma (,) between parameters (a space produces the same result)
- Closing parenthesis (which is not required)
- Equal sign (=) between *parmname* and *value* (a space produces the same result)

Each of the following would produce the same results:

```
call dsqcix "SET GLOBAL (abc=17, def=26"
call dsqcix "SET GLOBAL ( abc=17 def=26"
call dsqcix "SET GLOBAL ( abc=17 , def=26)"
call dsqcix "SET GLOBAL (abc 17 def=26)"
```

REXX programming example

The sample REXX program, DSQABFX, is provided with QMF.

You can look at the sample source code listing here or you can access it online. The sample program is a member of the library QMF1310.SDSQEXCE.

The sample program for the REXX callable interface performs the following functions:

- Starts QMF
- Sets three global variables
- Runs a query called Q1
- Prints the resulting report by using form F1
- Ends the QMF session

QMF does not supply query Q1 or form F1, but the sample program uses these objects.

```
/*REXX*************************************************************/
/* Sample program:  DSQABFX                                       */
/* REXX version of the QMF callable interface                     */
/*******************************************************************/


/*******************************************************************/
/* Start a query interface session                                 */
/*******************************************************************/
```

```
call dsqcix "START (DSQSMODE=INTERACTIVE"
say dsq_message_id dsq_message_text
if dsq_return_code = dsq_severe then exit dsq_return_code

/*********************************************************************/
/* Set numeric values into query using SET command                   */
/*********************************************************************/

call dsqcix "SET GLOBAL (MYVAR01=20,SHORT=40,MYVAR03=84"
say dsq_message_id dsq_message_text
if dsq_return_code = dsq_severe then exit dsq_return_code

/*********************************************************************/
/* Run a query                                                       */
/*********************************************************************/

call dsqcix "RUN QUERY Q1"
say dsq_message_id dsq_message_text
if dsq_return_code = dsq_severe then exit dsq_return_code

/*********************************************************************/
/* Print the results of the query                                    */
/*********************************************************************/

call dsqcix "PRINT REPORT (FORM=F1)"
say dsq_message_id dsq_message_text
if dsq_return_code = dsq_severe then exit dsq_return_code

/*********************************************************************/
/* End the query interface session                                   */
/*********************************************************************/

call dsqcix "EXIT"
say dsq_message_id dsq_message_text
exit dsq_return_code
```

Running your REXX programs

After you write your program in REXX, you need to run it.

You can run your REXX program in TSO by writing a program similar to the one shown here:

```
 /*********************************************************************/
 /* Issue TSO allocates for QMF product                               */
 /*********************************************************************/
 Address TSO

 "ATTR PRINTDCB LRECL(133) RECFM(F B A) BLKSIZE(1330)"
 "ATTR DEBUGDCB LRECL(80) RECFM(F B) BLKSIZE(3120)"
 "ATTR UDUMPDCB LRECL(125) RECFM(V B A) BLKSIZE(1632)"
 "ATTR EDITDCB LRECL(79) RECFM(F B A) BLKSIZE(4029)"
 "ALLOC FI(SYSPROC) SHR REUSE ",
  "DA('QMF1310.DSQCLSTE,'",
    "'DSN.DSNCLIST')"
 "ALLOC FI(SYSEXEC) SHR REUSE ",
  "DA('QMF1310.SDSQEXCE')"
 "ALLOC FI(ISPLLIB) SHR REUSE ",
  "DA('QMF1310.SDSQLOAD,'",
    "'ADM.GDDM.GDDMLOAD,'",
    "'DSN.DSNLOAD')"
"ALLOC FI(DSQPNLE) DA('QMF1310.DSQPNLE') SHR REUSE"
"ALLOC FI(DSQPRINT) SYSOUT USING(PRINTDCB)"
"ALLOC FI(SYSPRT) SYSOUT(X) LRECL(132) RECFM(FBA) BLKSIZE(132)"
"ALLOC FI(DSQDEBUG) SYSOUT(X) USING(DEBUGDCB)"
"ALLOC FI(DSQUDUMP) SYSOUT(X) USING(UDUMPDCB)"
"ALLOC FI(DSQSPILL) NEW UNIT(SYSDA) SPACE(1,1) TRACKS"
"ALLOC DDNAME(DSQEDIT) UNIT(SYSDA) NEW USING(EDITDCB)"
"ALLOC FI(ADMDEFS)  DA('ADM.GDDM.NICKNAME') SHR REUSE"
"ALLOC FI(ADMGGMAP) DA('QMF1310.SDSQMAPE') SHR REUSE"
"ALLOC FI(ADMCFORM) DA('QMF1310.DSQCHART') SHR REUSE"
"ALLOC FI(DSQUCFRM) DA('QMF1310.DSQUCFRM') SHR REUSE"
"ALLOC FI(ADMGDF)   DA('GDDM.ADMGDF') SHR REUSE"
"ALLOC FI(ADMSYMBL) DA('ADM.GDDM.GDDMSYM') SHR REUSE"

/* The beginning of your REXX program .....    */
.
.
```

```
.
/* The end of your REXX program ........       */
```

A REXX example of using an INTERACT loop

You can make the END command in an interactive session behave similarly to the way END behaves in interactive QMF.

Normally, when your callable interface program issues an INTERACT command and the user issues the END command, QMF immediately returns control to your program. However, interactive QMF allows the user to issue the END command to return to the QMF home panel. Issuing the END command a second time ends the QMF session.

Add the logic in the following example to your program to allow the END command to behave similarly to interactive QMF.

This program uses *dsq_message_id* to determine how to proceed. These values can change from one release to the next.

This program is not distributed with QMF.

```
/*REXX************************************************************/
/* Sample program: Using INTERACT loop                          */
/*****************************************************************/
/*****************************************************************/
/* Start an interactive QMF session                             */
/*****************************************************************/
trace error

parms = "START (DSQSMODE=INTERACTIVE"
call dsqcix parms
if dsq_return_code = dsq_severe then exit dsq_return_code
/*****************************************************************/
/* SET GLOBAL to show panel IDs                                 */
/*****************************************************************/
call dsqcix "SET GLOBAL (DSQDC_SHOW_PANID=1"
if dsq_return_code = dsq_severe then exit dsq_return_code
/*****************************************************************/
/* Issue message                                                */
/*****************************************************************/
call dsqcix "MESSAGE (TEXT='OK, you may enter a command.')"
if dsq_return_code = dsq_severe then exit dsq_return_code
/*****************************************************************/
/* INTERACT loop                                                */
/*****************************************************************/
Continue = "yes"
Do while continue = "yes"
  call DSQCIX "INTERACT"
  Select
    When (dsq_return_code = dsq_severe) Then  /* Severe error        */
          Continue = "no"
    When (dsq_message_id = "DSQ21869")  Then  /* END from HOME panel */
          Continue = "no"
    When (dsq_message_id = "DSQ90557")  Then  /* User issued EXIT    */
          Continue = "no"
    Otherwise nop                             /* OK continue session */
  End
End
/*****************************************************************/
/* End the session                                              */
/*****************************************************************/
if dsq_message_id <> "DSQ90557" then   /* EXIT not issued         */
  call dsqcix "EXIT"                   /* Issue EXIT              */

exit dsq_return_code
```

Appendix A. Product interface macros

This table lists macros that are provided with QMF as General Use Programming Interfaces for customers.

Important: Do not use any QMF macros as programming interfaces other than those macros identified here.

Table 50. Macros that provide interfaces to QMF functions

Purpose	Macro names
Product interface macro	DSQQMF*n* In this program name, *n* is a national language identifier). For English, this identifier is E.
Callable interface macros	• Assembler – DSQCIA – DSQCOMMA • COBOL – DSQCIB – DSQCOMMB • C/C++ – DSQCIC – DSQCICE – DSQCOMMC • Fortran – DSQCIF – DSQCIFE – DSQCOMMF • PL/I – DSQCIPL – DSQCIPX – DSQCOMML • REXX – DSQCIX
Command interface macro	DSQCCI
QMF governor exit routine interface macros	• DXEGOVA • DXEXCBA
QMF user edit exit routine macro	DXEECS

Related reference

Conventions for National Language Feature information

Db2 QMF is available in several different languages, each of which is provided by a National Language Feature (NLF).

Appendix B. QMF global variables

QMF provides many global variables that help you control aspects of your QMF session, QMF commands, and panel display. The global variables also help you control behavior of QMF functions in procedures and applications.

Naming convention for QMF global variables

The naming convention for most global variables that are provided with QMF is DSQ*cc_xxxxxxxxxxxx*. *cc* identifies the category of variable, and *xxxxxxxxxxxx* is a descriptive name up to 12 characters long. An underscore character (_) is included after *cc*.

cc can be any one of the following identifiers:

AP
Variables for profile-related state information

AO
Variables for other (not profile-related) state information

CM
Variables for information about the message produced by the previous command

CP
Variables for information about the Table Editor

DC
Variables that control how QMF displays information displayed on the screen

EC
Variables that control how QMF executes commands and procedures

QC
Variables whose values are produced by a CONVERT QUERY option

QM
Variables that contain RUN QUERY error message information

QW
Variables unique to QMF for Workstation.

Session variables

Session variables follow a different naming convention. Session variables are global variables that store the values that users enter in some fields on some panels if the DSQEC_SESSGLV_SAV global variable is set to 1 or 2. The naming convention for session variables is as follows:

DXY*npppp_ln_dd*

where:

- *n* is the national language identifier
- *pppp* is the last four letters of the panel ID
- *ln* is an ID that is associated with the field
- *dd* is an ID that is associated with the field and is used only if the field is dependent on another field

Setting and displaying values for global variables

If the value you want to assign to a global variable is 55 or fewer bytes, use the SET GLOBAL command to assign the value. If the variable is over 55 bytes, use the SHOW GLOBALS command.

About this task

By default, a global variable value is retained until you reset it or end the QMF session. However, the DSQEC_USERGLV_SAV global variable can be set to save global variable values from one session to another.

To customize global variables at initialization, see the information in Installing and Managing QMF for TSO and CICS about initializing global variables and QMF session behavior when QMF starts.

Procedure

To assign a value that is over 55 bytes to a global variable:

1. Use the SHOW GLOBALS command to display the **GLOBALS** panel.
2. Press the **Show Field** key to display the entire entry field.
   The maximum length for a global variable on the Show Global Variable screen is 32,768 bytes.
3. Type the value for the variable on the lines provided.

Global variables for state information not related to the profile

DSQAO global variables contain status information or settings of parameters or flags. None of these global variables can be modified by the SET GLOBAL command.

Table 51. Global variables for state information not related to the profile

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_APPL_TRACE	DSQATRAC	01	**0** for level A0 **1** for level A1 **2** for level A2
DSQAO_ATTENTION	DSQCATTN	01	User attention flag.
DSQAO_BATCH	DSQABATC	01	Batch or interactive mode; values can be: **1** for an interactive session **2** for a batch-mode session
DSQAO_CONNECT_ID	DSQAAUTH	128	The user ID used to connect to the database and under which work is done. The value of this variable changes when you issue the following command or statement: • Issue a QMF CONNECT command to reconnect to the database under a different authorization ID • Issue a SET CURRENT SQLID statement on a Db2 for z/OS database.
DSQAO_CONNECT_LOC	None	18	The location name of the database to which you are currently connected; the name is 16 characters (padded to the right with blanks, if necessary).

Table 51. Global variables for state information not related to the profile (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_CURSOR_OPEN	DSQACRSR	01`	Database cursor status; values can be: **1** if the cursor is open **2** if the cursor is closed
DSQAO_DATE_FORMAT	None	05	Contains the value that is specified in SYSIBM.DATE_FORMAT. Values can be ISO, USA, EUR, JIS, or LOCAL.
DSQAO_DB_MANAGER	DSQADBMG	01	Database manager, indicated by one of the following values: **1** DB2 for VSE and VM **2** Db2 for z/OS **3** Db2 for Linux, UNIX, and Windows **4** DB2 for iSeries
DSQAO_DBCS	DSQADBCS	01	DBCS support status; values can be: **1** for DBCS support **2** for no DBCS support
DSQAO_DSQSBSTG	None	10	Contains the value specified by the DSQSBSTG parameter or the default if the parameter was not specified.
DSQAO_DSQSFISO	None	01	Contains the value that is specified by the DSQSFISO parameter or the default if the parameter was not specified. The following values are used: **0** QMF is not precompiled with DATE(ISO) and TIME(ISO). **1** QMF is precompiled with DATE(ISO) and TIME(ISO). This is the default.
DSQAO_DSQSMRFI	None	01	This field reflects the value that was specified for the DSQSMRFI program parameter when QMF was started. **0** NO was specified for the DSQSMRFI program parameter, meaning that Db2 single-row fetch and insert is used. **1** YES was specified for the DSQSMRFI program parameter, meaning that Db2 multirow fetch and insert is used. Multirow fetch uses a rowset cursor.

Table 51. Global variables for state information not related to the profile (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_DSQSMTHD	None	01	Contains the value specified by the DSQSMTHD program parameter or the default if the parameter was not specified. The following values are used: **0** NO was specified; QMF runs with one thread. This is the default. **1** YES was specified; QMF will run with a second thread that will be used for commands (RUN QUERY, DISPLAY TABLE) and subsequent scrolling (BOTTOM, TOP, FORWARD, BACKWARD, RIGHT and LEFT) of reports with open cursors.
DSQAO_DSQSPILL	None	01	Contains the value specified by the DSQSPILL parameter or the default if the parameter was not specified. The following values are used: **0** for not using spill storage. This value corresponds with a DSQSPILL parameter value of NO. **1** for using spill storage. This value corresponds with a DSQSPILL parameter value of YES.
DSQAO_DSQSPTYP	None	5	Contains the value specified by the DSQSPTYP parameter or the default if the parameter was not specified. The following values are used: **FILE** for spilling data to a file. **64BIT** for spilling data to extended virtual storage.
DSQAO_DSQSRSTG	None	8	Contains the value specified by the DSQSRSTG parameter or the default if the parameter was not specified.

Table 51. Global variables for state information not related to the profile (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_FORM_PANEL	DSQASUBP	02	Current form panel; values can be: **1** for FORM.MAIN **2** for FORM.COLUMNS **3** for FORM.PAGE **4** for FORM.FINAL **5** for FORM.BREAK1 **6** for FORM.BREAK2 **7** for FORM.BREAK3 **8** for FORM.BREAK4 **9** for FORM.BREAK5 **10** for FORM.BREAK6 **11** for FORM.OPTIONS **12** for FORM.CALC **13** for FORM.DETAIL **14** for FORM.CONDITIONS A blank value means that the form does not exist in QMF temporary storage.
DSQAO_INTERACT	DSQAIACT	01	Setting of the interact flag; values can be: **0** for no interactive execution **1** when interactive execution is allowed
DSQAO_LOCAL_DB2	None	18	The location name of the local Db2 for z/OS database. This value is the location name for the subsystem named in the variable DSQAO_SUBSYS_ID. In a remote unit of work environment, DSQ_LOCAL_DB2 is the name of the application requester. The name is 16 characters (padded to the right with blanks, if necessary).
DSQAO_LOCATION	DSQAITLO	18	Location name of the current object, if any. This value is applicable only if a three-part name was used. The name is 16 characters (padded to the right with blanks, if necessary).
DSQAO_NLF_LANG	DSQALANG	01	National language of user; for the English language environment, this value is ‘E’.
DSQAO_NUM_FETCHED	DSQAROWS	16	Fetched data rows; contains '0' when the DATA object is empty.

Table 51. Global variables for state information not related to the profile (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_OBJ_NAME	DSQAITMN	128	The name of the table (contained in a report), query, procedure, or form shown on the currently displayed panel. If the current panel does not display an object, or if the displayed object has no name, this variable contains blanks.
DSQAO_OBJ_OWNER	DSQAITMO	128	The owner of the table (contained in a report), query, procedure, or form shown on the currently displayed panel. If the current panel does not display an object, or if the displayed object has no owner, this variable contains blanks
DSQAO_OTC_LICENSE	None	01	QMF product identifier **0** Indicates that no product identifier was found. **1** Indicates that the product identifier for DB2 for QMF for z/OS standalone product, 5687-QMF, was found.
DSQAO_PANEL_TYPE	DSQAITEM	01	Type of current panel; values can be: **1** for HOME **2** for QUERY **3** for REPORT **4** for FORM **5** for PROC **6** for PROFILE **7** for CHART **8** for LIST **9** for Table Editor **A** for GLOBALS
DSQAO_QMF_RELEASE	DSQAREVN	02	Numeric release number of QMF, which is displayed in header records for exported forms, reports, and prompted queries. For QMF Version 13 Release 1, this value is '19'.
DSQAO_QMF_VER_RLS	DSQAQMF	10	Version and release of QMF. For QMF Version 13 Release 1, this value is 'QMFV12R1.0'.

Table 51. Global variables for state information not related to the profile (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_QMFADM	None	01	QMF administrator authority: **0** Current authorization ID does not have QMF administrator authority. **1** Current authorization ID has administrator authority.
DSQAO_QRY_SUBTYPE	DSQASUBI	01	Query subtype; values can be: **1** for a subtype of SQL **2** for a subtype of QBE **3** for a subtype of PROMPTED Blank means that the current panel is not QUERY.
DSQAO_QUERY_MODEL	DSQAMODL	01	Model for data access. Value is always '1' for relational.
DSQAO_ROW_LENGTH	DSQAROWW	05	Contains a value indicating the length in bytes of each data row returned from the last processed query (if the report is still in storage). If the report is no longer in storage, the value is reset to 0 (zero). Values can be: **0** No report currently in storage. ***n*** Indicates the number of bytes in the row.
DSQAO_SAME_CMD	DSQACMDM	01	Values can be: **0** if the two commands are not the same **1** if the two commands are the same
DSQAO_STO_PROC_INT	None	01	Shows whether QMF for TSO was started as a Db2 for z/OS stored procedure. Possible values are: **0** QMF was not started as a stored procedure. **1** QMF was started as a stored procedure.
DSQAO_SUBSYS_ID	None	04	If QMF is running in TSO, this value is the ID of the local Db2 subsystem to which QMF is attached. If you specify a value for the DSQSSUBS program parameter in CICS, this global variable contains that value. The parameter is tolerated and the value is not processed. The value is placed in the global variable field and nothing is done with it. This logic permits the same program to be used in multiple environments.

Table 51. Global variables for state information not related to the profile (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAO_SYSTEM_ID	DSQASYST	01	Current operating system; values can be: **2** TSO under z/OS **3** TSO or native z/OS **5** CICS
DSQAO_TERMINATE	DSQCSESC	01	QMF termination flag; values can be: **0** if the session was not marked for termination **1** if the session was marked for termination
DSQAO_TIME_FORMAT	None	05	Contains the value that is specified in SYSIBM.TIME_FORMAT. Values can be ISO, USA, EUR, JIS, or LOCAL.
DSQAO_VARIATION	DSQAVARN	02	Form panel variation number; blank means FORM.DETAIL is not the current panel.

Global variables for profile-related state information

DSQAP global variables store information related to QMF profile settings. None of these global variables can be modified by the SET GLOBAL command.

Table 52. Global variables for profile-related state information

Callable interface variable name	Command interface variable name	Length	Description
DSQAP_CASE	DSQAPCAS	01	CASE parameter; values can be: **1** for UPPER **2** for MIXED **3** for STRING If your site uses RACF support for mixed-case passwords under TSO, set this value to 2. Without this setting, all input (including passwords) is converted to uppercase, causing the CONNECT command to fail. When you set CASE to MIXED, ensure that you enter all input in uppercase, because QMF recognizes commands only in uppercase.
DSQAP_CONFIRM	DSQAPRMP	01	CONFIRM parameter; values can be: **0** for NO **1** for YES

Table 52. Global variables for profile-related state information (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQAP_DECIMAL	DSQAPDEC	01	DECIMAL parameter; values can be: **1** for PERIOD **2** for COMMA **3** for FRENCH
DSQAP_LENGTH	DSQAPLEN	18	LENGTH parameter; its value is that of the parameter ('1' through '999' or 'CONT').
DSQAP_MODEL	None	08	MODEL parameter; its value is that of the parameter.
DSQAP_PFKEY_TABLE	DSQAPPFK	31	Name of the function keys table.
DSQAP_PRINTER	DSQAPPRT	08	PRINTER parameter; values can be: • A nickname for a GDDM printer. • Blanks for the printer associated with DSQPRINT.
DSQAP_QUERY_LANG	DSQAPLNG	01	LANGUAGE parameter; values can be: **1** for SQL **2** for QBE **3** for PROMPTED
DSQAP_QUERY_MODEL	DSQAMODP	01	Model for data access. Value is always '1' for relational.
DSQAP_RESOURC_GRP	DSQAPGRP	16	RESOURCE GROUP parameter.
DSQAP_SPACE	DSQAPSPC	50	SPACE parameter; its value is that of the parameter.
DSQAP_SYNONYM_TBL	DSQAPSYN	31	Name of the synonyms table used for the current QMF session. When a user enters a command synonym, the synonym definition must be stored in the table named here or the command fails.
DSQAP_TRACE	DSQAPTRC	18	TRACE parameter; values can be: **ALL** (maximum tracing) **NONE** (minimum tracing) You can also specify a series of letters and numbers that specifies which components are to be traced at which levels of detail (for example, A2L2C1).
DSQAP_WIDTH	DSQAPWID	18	WIDTH parameter; its value is that of the parameter ('22' through '999').

Global variables associated with CICS

DSQAP global variables are associated with CICS environments. Only DSQAP_CICS_PQNAME and DSQAP_CICS_PQTYPE can be modified by the SET GLOBAL command.

When the queue type is transient data (TD), the maximum length of the corresponding queue name is 4. For example, if DSQAO_CICS_SQTYPE is TD, the maximum length of DSQAO_CICS_SQNAME is 4.

Table 53. Global variables associated with the CICS environment

Callable interface variable name	Command interface variable name	Length	Description
DSQAP_CICS_PQNAME	None	08	Names the CICS data queue to contain the QMF print output.
DSQAP_CICS_PQTYPE			Type of CICS storage used to contain the QMF print output: **TS** Writes the QMF print to a CICS temporary storage queue on an auxiliary storage device. This value is the default. **TD** Writes the QMF print to a CICS transient data queue.
DSQAO_CICS_SQNAME	None	08	Names the CICS data queue to be used as the spill file.
DSQAO_CICS_SQTYPE	None	02	Type of CICS storage used to contain the QMF spill file: **TS** Writes the QMF spill data to a CICS temporary storage queue on an auxiliary storage device. This value is the default. **TD** Writes the QMF spill data to a CICS transient data queue.
DSQAO_CICS_TQNAME	None	08	Names the CICS data queue to contain the QMF trace data.
DSQAO_CICS_TQTYPE	None	02	Type of CICS storage used to contain the QMF trace data: **TS** Writes the QMF trace to a CICS temporary storage queue on an auxiliary storage device. **TD** Writes the QMF trace to a CICS transient data queue. This value is the default.

Global variables related to a message produced by the most recent command

DSQCM global variables contain information about the most recent QMF command that was issued. None of these global variables can be modified by the SET GLOBAL command.

Table 54. Global variables that capture information about the most recently issued command

Callable interface variable name	Command interface variable name	Length	Description
DSQCM_MESSAGE	DSQCM_MESSAGE	80	Message text.
DSQCM_MESSAGE_ALL	DSQCIMSA	360	Complete message text.

Table 54. Global variables that capture information about the most recently issued command (continued)			
Callable interface variable name	**Command interface variable name**	**Length**	**Description**
DSQCM_MSG_HELP	DSQCIMID	08	ID of message help panel.
DSQCM_MSG_NUMBER	DSQCIMNO	08	Message number.
DSQCM_SUB_TXT_*nn*	DSQCIM*nn*	20	Substitution value *nn*.

Global variables associated with the Table Editor

DSQCP global variables are associated with the operations of the Table Editor. All of these global variables can be modified by the SET GLOBAL command.

The following table shows global variables that are associated with the operations of the Table Editor. All of these global variables can be modified by the SET GLOBAL command.

If the CONFIRM option of the EDIT TABLE command is NO, the Table Editor suppresses the display of all confirmation panels. If the CONFIRM option is YES, the Table Editor determines which categories of confirmation are enabled by checking the values of the global variables that are shown in this table.

The Table Editor defaults depend on the SAVE keyword from the EDIT TABLE command:

- When SAVE=IMMEDIATE, the default for each category is to enable.
- When SAVE=END, the default for the DELETE, MODIFY, and END/CANCEL categories is to enable; the default for the ADD and CHANGE categories is to disable.

Table 55. Global variables associated with the Table Editor			
Callable interface variable name	**Command interface variable name**	**Length**	**Description**
DSQCP_RMV_BLANKS	None	01	Retains or removes trailing blanks of VARCHAR columns. This variable affects only the Table Editor in Change mode. Values can be: **0** Trailing blanks of VARCHAR columns are not removed. **1** Trailing blanks of VARCHAR columns are removed. This value is the default.
DSQCP_TEADD	None	01	Displays a confirmation panel after an ADD subcommand; values can be: **0** Panel is disabled. **1** Panel is enabled. **2** Panel is enabled or disabled depending on the Table Editor defaults. This value is the default.
DSQCP_TECHG	None	01	Displays a confirmation panel after a CHANGE subcommand; values can be: **0** Panel is disabled. **1** Panel is enabled. **2** Panel is enabled or disabled depending on the Table Editor defaults. This value is the default.

Table 55. Global variables associated with the Table Editor (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQCP_TEDEL	None	01	Displays a confirmation panel after a DELETE subcommand; values can be: **0** Panel is disabled. **1** Panel is enabled. **2** Panel is enabled or disabled depending on the Table Editor defaults. This value is the default.
DSQCP_TEDFLT	None	01	The reserved character used to indicate the default value for a column in the Table Editor; initially set to a plus sign (+) character.
DSQCP_TEDFLT_DBCS	None	04	The reserved DBCS character used to indicate the default value for a graphic string column in the Table Editor. The value must be a 4-byte mixed string, composed of one DBCS character, preceded by the shift-out character, and followed by the shift-in character. It is initially set to a DBCS plus sign (+) character. This global variable is used only in a DBCS environment.
DSQCP_TEEND	None	01	Displays a confirmation panel when you issue an END subcommand or a CANCEL subcommand to terminate a Table Editor subsession. The panel can be displayed in several variations: • If END or CANCEL is issued • If modifications are made to the database • If the screen contains modified data when END or CANCEL is issued Values can be: **0** Panel is disabled. **1** Panel is enabled. **2** Panel is enabled or disabled depending on the Table Editor defaults. This value is the default.
DSQCP_TEMOD	None	01	Displays a confirmation panel when displayed data is modified and a PREVIOUS, CLEAR, SHOW CHANGE, SHOW SEARCH, REFRESH, or NEXT subcommand is issued. The resulting panel includes the name of the subcommand as part of the panel text. Values can be: **0** Panel is disabled. **1** Panel is enabled. **2** Panel is enabled or disabled depending on the Table Editor defaults.
DSQCP_TENULL	None	01	The reserved character used to indicate the null value for a column in the Table Editor; initially set to a hyphen (-) character.

Table 55. Global variables associated with the Table Editor (continued)			
Callable interface variable name	**Command interface variable name**	**Length**	**Description**
DSQCP_TENULL_DBCS	None	04	The reserved DBCS character used to indicate the null value for a graphic-string column in the Table Editor. The character is also used to indicate ignore in the context of search criteria. The value must be a 4-byte mixed string composed of one DBCS character, preceded by the shift-out character, and followed by the shift-in character. It is initially set to a DBCS hyphen (-) character. This global variable is used only in a DBCS environment.

Global variables that control various displays

DSQDC global variables control the display of certain kinds of information. All of these global variables can be modified by the SET GLOBAL command.

Table 56. Global variables that control the display of certain types of information			
Callable interface variable name	**Command interface variable name**	**Length**	**Description**
DSQDC_COL_LABELS	None	01	Controls whether the column heading shown in FORM.MAIN and FORM.COLUMNS defaults to the database label assigned to the column or the name of the column in the table from which it was selected. **0** Column names are used as column headings in default QMF forms. **1** Database labels are used as column headings in default QMF forms. This value is the default value.
DSQDC_COST_EST	None	01	Controls the display of the database cost estimate; values can be: **0** Does not display the cost estimate. **1** Displays the cost estimate. This value is the default. **2** Does not display the database status and cost estimate panels.

Table 56. Global variables that control the display of certain types of information (continued)

Callable interface variable name	Command interface variable name	Length	Description

DSQDC_CURRENCY	None	18	The currency symbol used when the DC edit code is specified.
			
			The value can be a string with a length from 1 to 18 bytes. For English, the default is the euro currency symbol. The default varies for other languages. In a DBCS environment, this value can be a mixed string of SBCS and DBCS characters. The total length of the mixed string, including the shift-out and shift-in characters, cannot exceed 18 bytes.
			
			If you require a currency symbol that is not represented on the keyboard, you can still specify the symbol. Set the DSQDC_CURRENCY variable in a procedure with logic to the hex value that is equivalent to the correct symbol. For example, the following procedure sets the currency symbol to HEX '9F', which specifies the euro currency symbol in English QMF:
			
			`/*  */`
			`"SET GLOBAL (DSQDC_CURRENCY =" '9F'X`
			
			If trailing blanks are needed for the currency symbol, put the currency symbol in single quotation marks. This example shows the blanks for French QMF:
			
			`SET GLOBAL (DSQDC_CURRENCY = 'FR '`
			
			You can issue this command from the command line or in a linear procedure.

DSQDC_DISPLAY_RPT	DSQADPAN	01	Displays a report after RUN QUERY; values can be: **0** QMF does not display the resulting report from a RUN QUERY command. This value is the default if QMF is started interactively with DSQQMF*n* (where *n* is a where n is a National Language Feature identifier). This value is also the default if QMF is started in batch mode. Changing this variable when QMF is started in batch mode does not cause any QMF screen to display. **1** QMF automatically displays the report. This value is the default if QMF is started with the callable interface. The value can be overridden with the DSQADPAN program parameter on the START command. When setting this global variable to 1, you can review the displayed report and choose whether to commit or roll back changes. To do this, press F3 (END) when you have finished reviewing your changes. You will then be prompted to either commit or roll back changes. Select 1 to commit or 2 to roll back your changes and then press Enter.

Table 56. Global variables that control the display of certain types of information (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQDC_EC_CHAR	None	05	User-defined default edit code for character data (fixed character, varying character, and very long character). **C** Does not change the display of the data. This is the default. **CW** Wraps the data at the column width boundary. **CT** Wraps the data at the column boundary, breaking the line at the nearest blank space. **CD*x*** Wraps the column data according to a delimiter (x) you specify if the data cannot fit on one line. The delimiter can be any character, including a blank and does not appear in the output. **U*xxxx*** User-defined formatting. Replace xxxx with 0 - 4 characters (letters, digits, or special characters). **V*xxxx*** User-defined formatting. Replace xxxx with 0 - 4 characters (letters, digits, or special characters). **B** Binary formatting. **BW** Binary formatting with column wrapping at the column width boundary. **X** Hexadecimal formatting.. **XW** Hexadecimal formatting with column wrapping at the column width boundary. **M** Displays metadata (data type and length) instead of the actual data.
DSQDC_EC_DATE	None	05	Default edit code for DATE data. Values can be: **TDY*x*** Four-digit year with year first. **TDM*x*** Four-digit year with month first. **TDD*x*** Four-digit year with day first. **TDYA*x*** Abbreviated two-digit year with year first. **TDYM*x*** Abbreviated two-digit year with month first. **TDDA*x*** Abbreviated two-digit year with day first. **TDL** Locally defined date format. **TD** Default date format of the database system. This is the default value for this global variable. *x* represents the character that you specify to serve as the delimiter between parts of the date.

Table 56. Global variables that control the display of certain types of information (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQDC_EC_DEC	None	05	User defined default edit code for decimal data. **E or EZ** Scientific notation. A Z in the second position of the edit code suppresses zero values. **D, DC, DZ, DZC, I, IZ, J, JZ, K, KZ, L, LZ, P, PZ** Decimal notation with different combinations of leading zeros, minus signs for negative numbers, thousands separators, currency symbols, and percent signs. Each code can be followed by a ' ' (blank), a number (from 0 to 99) or an * (asterisk). Specifying a blank is the same as specifying a 0. A value of K invokes the same behavior as K0. For example, K, K0, K3 or K* are all valid settings. When the code is followed by a number (from 0 to 99) or blank, that tells how many places to allow after the decimal point. A C in the second or third position of the D edit code displays a user-defined currency symbol instead of the standard currency symbol. A Z in the second position of the edit code suppresses zero values. When the code is followed by an *, QMF will format decimal data based on the column definition of the database. The default value is L*. When L* is specified, QMF will format decimal data based on the column definition of the database. This behavior is consistent with previous releases of QMF. A C in the second or third position of the D edit code displays a user-defined currency symbol instead of the standard currency symbol. A Z in the second position of the edit code suppresses zero values. The default value is L. When L* is specified, QMF will format decimal data based on the column definition of the database. This behavior is consistent with previous releases of QMF. **U*xxxx*** User-defined formatting. Replace *xxxx* with 0 - 4 characters (letters, digits, or special characters). **V*xxxx*** User-defined formatting. Replace *xxxx* with 0 - 4 characters (letters, digits, or special characters). **M** Displays metadata (data type and length) instead of the actual data.

Table 56. Global variables that control the display of certain types of information (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQDC_EC_NUM	None	05	User-defined default edit code for numeric data (integer, small integer, and big integer.) **E or EZ** Scientific notation. A Z in the second position of the edit code suppresses zero values. **D, DC, DZ, DZC, I, IZ, J, JZ, K, KZ, L, LZ, P, PZ** Decimal notation with different combinations of leading zeros, minus signs for negative numbers, thousands separators, currency symbols, and percent signs. A C in the second or third position of the D edit code displays a user-defined currency symbol instead of the standard currency symbol. A Z in the second position of the edit code suppresses zero values. The default value is L. **U*xxxx*** User-defined formatting. Replace *xxxx* with 0 - 4 characters (letters, digits, or special characters). **V*xxxx*** User-defined formatting. Replace *xxxx* with 0 - 4 characters (letters, digits, or special characters). **M** Displays metadata (data type and length) instead of the actual data.
DSQDC_EC_TIME	None	05	Default edit code for TIME data. Values can be: **TTS*x*** 24-hour clock format (including seconds). **TTC*x*** 12-hour clock format (including seconds). **TTA*x*** Abbreviated clock format (no seconds). **TTAN** Abbreviated clock format (no seconds, no delimiter). **TTU*x*** USA format. **TTL** Locally defined time format. **TT** Default time format of the database system. This is the default value for this global variable. *x* represents the character that you specify to serve as the delimiter between parts of the time.

Table 56. Global variables that control the display of certain types of information (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQDC_LIST_ORDER	None	02	Sets the default sort order for objects in a list of database objects. Values for the first character can be: **1** The list uses the default order. **2** The list is sorted by object owner. **3** The list is sorted by object name. **4** The list is sorted by object type. **5** The list is sorted by date modified. **6** The list is sorted by date last used. The list of commands that cause this date to be updated is set by the DSQEC_LAST_RUN global variable. Values for the second character can be: **A** The list is sorted in ascending order. **D** The list is sorted in descending order. This variable applies only to objects that are listed as a result of the LIST command. It does not apply to lists produced in other contexts, such as from a Display Prompt panel, and it does not apply to lists of tables.
DSQDC_POS_SQLCODE	None	01	Sets the action QMF takes when a positive SQL code is returned from the database. Possible values are: **0** Does not log the message to the trace data file (DSQDEBUG) and no help text is provided. **1** Logs the QMF message associated with the SQL code to the trace data file (DSQDEBUG). **2** QMF message help is available for the positive SQL code. This global variable does not apply to SQL codes +495 and +100.
DSQDC_SCROLL_AMT	None	04	Sets the scroll amount for QMF panels; values can be: **Csr** Sets the scroll amount to `cursor`. QMF scrolls the line or column where the cursor is positioned to the bottom of the scrollable area when you scroll backward. Likewise, QMF scrolls to the top when you scroll forward, and to the far left and far right when you scroll left or right. **Half** Sets scroll amount to half the scrollable area. **Page** Sets scroll amount to a full page. This value is the default. ***n*** Sets scroll amount to *n* number of lines or columns. You can specify any number from 1 to 9999 for *n*.

Table 56. Global variables that control the display of certain types of information (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQDC_SHORT_EXPT	None	01	Applies to data or tables exported with a value of QMF on the DATAFORMAT parameter of the EXPORT command. Controls the length of all column name fields in the header records. Possible values are: **0** QMF sets the length of column fields in the header records to 30 bytes. This length is the default length for: • Db2 for z/OS Version 8.1.5, or later • DB2 for iSeries Version 5.2, or later • Db2 for Linux, UNIX, and Windows, Version 8.1, or later **1** QMF sets the length of column fields in the header records to 18 bytes. This length is the default length for: • Db2 for z/OS, Version 8.1.5, or earlier • DB2 for iSeries, Version 5.2, or earlier • Db2 for Linux, UNIX, and Windows, Version 8.1, or earlier • All DB2 Server for VSE and VM databases
DSQDC_SHOW_PANID	DSQCPDSP	01	Displays panel IDs of QMF panels; values can be: **0** Suppresses panel identifiers. This value is the default. **1** Displays panel identifiers.

Related reference

Global variables that control how commands and procedures are executed

DSQEC global variables control how commands and procedures are executed. All of these global variables can be modified by the SET GLOBAL command.

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Table 57. Global variables that control how commands and procedures are executed

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_ALIASES	None	31	View for retrieving lists of table and view aliases when you request a list of tables from a Db2 for z/OS location. Also applies if the current server is Db2 for z/OS or Db2 for Linux, UNIX, and Windows.
DSQEC_BUFFER_SIZE	None	03	Sets the length of the data buffer used to fetch data from the database. Valid values range from 4 - 256 (each integer is 1KB; for example, 4 equals 4K, 256 equals 256K, etc.). The default value is 4 (4KB).
DSQEC_CC	None	01	Suppresses the carriage control characters in the report output format; values can be: **0** No carriage control character in column 1. **1** Carriage control is in effect; the report has a carriage control character in column 1.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_COLS_LDB2	None	31	View for retrieving column information for a table at the current location, if that location is Db2 for z/OS.
DSQEC_COLS_RDB2	None	31	View for retrieving column information for a table at a remote Db2 for z/OS location (if it is not the current location).
DSQEC_COLS_SQL	None	31	View for retrieving column information for a table in a DB2 for VSE and VM database.
DSQEC_CON_ACC_RES	None	01	Applies to executable SELECT queries that QMF submits to Db2 for z/OS. Use this variable to specify how you want the database to proceed when the data to be selected is locked by an insert, update, or delete operation. When you set this variable, QMF specifies the clause associated with the variable value on the concurrent-access-resolution attribute of the PREPARE statement for the SELECT query. Executable SELECT queries can result not only from QMF queries (such as SQL SELECT queries, prompted queries, or QBE P. queries), but also from other QMF operations such as DISPLAY TABLE. Possible values are: **0** QMF specifies no concurrent access resolution options on the PREPARE statement associated with the pending SQL SELECT statement. This value is the default. **1** SKIP LOCKED DATA This value can be specified for executable SELECT statements directed to Db2 for z/OS Version 9 (New Function Mode), or later. **2** USE CURRENTLY COMMITTED This value can be specified for executable SELECT statements directed to Db2 for z/OS Version 10 (New Function Mode), or later. **3** WAIT FOR OUTCOME This value can be specified for executable SELECT statements directed to Db2 for z/OS Version 10 (New Function Mode), or later.
DSQEC_CON_CSWL	None	01	This global variable enables the use of the DB2 for z/OS statement concentration with literals feature. It applies to dynamic SQL SELECT statements submitted to DB2 for z/OS through QMF commands such as RUN QUERY and DISPLAY, EXPORT and PRINT TABLE. When you set this variable, QMF specifies support through the DB2 for z/OS CONCENTRATE STATEMENTS WITH LITERALS prepare attribute: 0 = Do not enable DB2 for z/OS statement concentration with literals. This is the default. 1 = Enable DB2 for z/OS statement concentration with literals.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_CURR_FOLDER	None	128	Specifies the name of the current folder to be used for QMF commands that allow folder processing (SAVE, LIST, and ERASE). The default is blank. When a folder name is identified in this global variable, that folder is used when any QMF command that uses QMF folder objects is processed. For example, when DSQEC_CURR_FOLDER is set and the SAVE QUERY AS Q1 command is executed, the query will be saved and the query object will be included in the folder that is identified in the global variable. You can override this global variable by specifying a folder name with the FOLDER keyword with the QMF command. In this case, the folder name that is specified with the FOLDER keyword overrides the folder name that is specified in the DSQEC_CURR_FOLDER global variable. If this global variable is blank and the FOLDER keyword is not specified, folder processing is not used. **Restriction:** This global variable is not supported when QMF is connected to DB2 Server for VSE and VM.
DSQEC_DISABLEADM	None	01	Suppression of QMF administrator authority. When the value of this global variable is changed, the effect is immediate. Possible values can be: **0** QMF administrator authority is available (if the authorization ID has QMF administrator authority). **1** QMF administrator authority is suppressed (regardless of the authority of the authorization ID). The initial default value for this global variable can be overridden by the DSQUOPTS initialization exit routine. Alternately, QMF administrator authority can be controlled by the user's profile MODEL setting.
DSQEC_DSALLOC_DIR	None	03	Specifies the number of directory blocks to be used when exporting a member of a new PDS data set in TSO. The value must be greater than zero for PDS data sets. If you are using the site default type of data set or PDSE data sets, QMF ignores the value of this global variable. To use the site default type of data set, set DSQEC_PO to 0. To use PDSE data sets, set DSQEC_PO to 2. If your site uses sequential data sets, set this global variable to zero.
DSQEC_DSALLOC_PRI	None	08	QMF allocates data sets in tracks. This global variable specifies the primary quantity of tracks for the TSO data set that is used to store the results of the QMF EXPORT command. Values can be from 1 to the maximum size allowed by the storage device and operating system. The default value is 15. A value of zero is not allowed. PS, PDS, and PDSE data sets can have a maximum value of 16777215 tracks.
DSQEC_DSALLOC_SEC	None	08	QMF allocates data sets in tracks. This global variable specifies the secondary quantity of tracks for the TSO data set that is used to store the results of the QMF EXPORT command. Values can be from zero to the maximum size allowed by the storage device and operating system. The default value is 105 tracks. PS and PDS data sets can have a maximum value of 65535 tracks; PDSE data sets can have a maximum value of 16777215 tracks.
DSQEC_DSLRECL1	None	05	Specifies the logical record length (LRECL) that is to be used when an SQL query or QMF procedure is exported to a new data set. Valid values are 79 - 32760. The default value is 79.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_DSQSFISO	None	01	Specifies the format of CHAR(*datetime-expression*) data within a QMF report. The following values are used: **0** The result of CHAR(*datetime-expression*) data is in the format specified in the DATE FORMAT and TIME FORMAT fields on Db2 installation panel DSNTIP4. The current Db2 DATE and TIME format values can be found by referencing global variables DSQAO_DATE_FORMAT and DSQAO_TIME_FORMAT. **1** The result of CHAR(*datetime-expression*) data is in ISO format. DSQEC_DSQSFISO takes its default value from the value of program parameter DSQSFISO. The DSQSFISO program parameter setting may be seen in state global variable DSQAO_DSQSFISO. Note that if DSQEC_DSQSFISO is modified, the value of DSQAO_DSQSFISO will not change. DSQEC_DSQSFISO should be referenced for the current behavior settings.
DSQEC_DS_SUPPORT	None	01	Provides support for QMF Data Service (QDS) **0** Do not allow access to QMF Data Service (default). **1** Allow access to QMF Data Service. This global variable controls whether RUN QUERY (SQL, PQ or QBE), DISPLAY TABLE, DRAW, EXPORT and PRINT TABLE commands should be analyzed by the QMF Data Service component. If an object that is referenced in the command is defined to the QMF Data Service component, then the entire command is executed by QMF Data Service. If none of the objects referenced in the command access an object defined to QMF Data Service, then the command is executed by the current Db2 connection. If the QDS service could not be loaded or is not available, then this value is ignored and all requests are routed to Db2.
DSQEC_DS_NOPAR	None	01	Indicates whether Parallelism is currently in use. **0** Parallelism is currently in use (default). **1** Parallelism is not currently in use.
DSQEC_DS_PAR	None	02	The valid values: **-1** No restrictions are placed on QDS (default). **0** QDS will advise DVS that Map Reduce may be used, but Map Reduce Client may not be used. **1** Neither Map Reduce nor Map Reduce Client are allowed. **2-10** Both Map Reduce and Map Reduce Client can be used, but the degree of Map Reduce Client parallelism is limited to the number specified. (For example, 2 means that 2 parallel paths can be used, 3 means 3 can be used, and so on.) **Note:** If DSQEC_DS_NOPAR is set to 1 then the value of DSQEC_DS_PAR is ignored and no parallelism is in use.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_EDITOR	None	18	Specifies the value to use for the EDITOR keyword on the EDIT command when the EDITOR keyword is not specified. The valid values for this global variable are: **PDF** The ISPF/PDF editor is used to edit the procedure or query. To use the PDF editor to edit a query or procedure, start QMF as an ISPF dialog. **EE** The SQL QUERY or PROC enhanced editor is used to edit the procedure or query. **editorname** The name of any other editor that is available to you. You can also specify the name of a CLIST that starts an editor. For more information about available editors, see your QMF administrator. The default value is blank.
DSQEC_EDITOR_PVIEW	None	1	Controls the QMF Enhanced Editor preview command. The preview command is available when you edit an SQL query to preview the results of a SELECT query. **0** Do not allow the preview command to run. Message DYQE069 is issued to warn the user that the command is inactive. **1** Allow the preview command to run. This is the default.
DSQEC_EXPL_MODE	None	07	Specifies the setting that is to be used for the Db2 special register CURRENT EXPLAIN MODE when the RUN QUERY command is issued. The special register controls the behavior of the EXPLAIN facility for eligible dynamic SQL statements. Before a query is run, QMF sets the CURRENT EXPLAIN MODE special register to the value that is specified by this global variable. The valid values for this global variable are: **NO** The EXPLAIN facility is disabled and no EXPLAIN information is captured when explainable dynamic statements are run. This is the default value. **YES** The EXPLAIN facility is enabled and EXPLAIN information is inserted into the EXPLAIN tables for eligible dynamic SQL statements after the statement is prepared and run. All dynamic SQL statements are compiled and run. **EXPLAIN** The EXPLAIN facility is enabled and EXPLAIN information is inserted into the EXPLAIN tables for eligible dynamic SQL statements after the statement is prepared. Dynamic statements, except for SET statements, are not run. For servers other than Db2 for Linux, UNIX, and Windows or DB2 10 for z/OS (New Function Mode) or later, the only valid value is NO.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_EXTND_STG	None	31	Specifies the number of megabytes of extended storage that QMF acquires on each request to the extended storage manager when the DSQSPTYP program parameter is set to 64BIT. This program parameter is available in QMF for TSO only. When an operation requires extended storage, QMF requests the specified amount until the operation is complete or extended storage is exhausted. When setting this global variable, consider the average size of DATA objects with which your QMF users work. If the average size is large and you set the value low, QMF issues many calls to the extended storage manager to complete the DATA object. These repeated calls might affect performance. Values can be from 1 to 1000. The default value is 25, indicating that QMF requests 25 MB of storage on each request.
DSQEC_FORM_LANG	None	01	Establishes the default NLF language in a saved, exported, or imported form; values can be: **0** The form uses the presiding NLF language. **1** The form uses English. This value is the default.
DSQEC_ISOLATION	None	01	Default query isolation level. Values can be: **0** Isolation level UR (uncommitted read) Uncommitted read can be useful in a distributed environment. However, if you are using uncommitted read, any reports that users view might contain data that was deleted from the database after the report was displayed. **1** Isolation level CS (cursor stability) This value is the default. When using cursor stability, QMF does not display the report until all database commands that affects the data in the report are complete.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_KEEP_THREAD	None	01	Specifies whether a thread is released or kept active at the end of a query. This global variable does not affect threads that are created for procedures that run in batch mode or threads that are created when QMF is connected to a remote database through the CONNECT command. When procedures are run in batch mode, threads persist until the procedure completes. When QMF is connected to a remote database, threads persist until the connection ends. The valid values for this global variable are: **0** The thread is released at the end of the query. This is the default value. If this setting is used, the SET *DB2 global variable* statement fails unless it is run in one of the following situations: • The statement is included in a procedure that is run in batch mode. The Db2 global variable is reset to its default value after the procedure completes. • The QMF CONNECT command is issued to connect to a remote database and the SET *DB2 global variable* statement is run on the remote database. • The SET *DB2 global variable* statement is included in a multistatement query and the QMF DSQEC_RUN_MQ global variable is set to 1. The Db2 global variable is reset to its default value after the query completes. **1** The thread is kept active until the end of the QMF session or the DSQEC_KEEP_THREAD global variable is set to 0. This setting allows users to run the SET *DB2 global variable* statement to set Db2 global variables. If you set any Db2 global variables while DSQEC_KEEP_THREAD is set to 1 and then change DSQEC_KEEP_THREAD to 0, those Db2 global variables revert to their default values.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_LAST_RUN	None	01	Specifies the set of commands that cause the LAST_USED field on QMF object lists to be updated. This field is based on the LAST_USED column of the Q.OBJECT_DIRECTORY control table. The value in the LAST_USED column is updated regardless of whether the issued command is successful. However, in some cases, the LAST_USED column is not updated immediately, and if QMF is terminated abnormally, the column might not be updated. Possible values are: **0** QMF updates the LAST_USED timestamp whenever any of the following commands is issued: • CONVERT • DISPLAY • EXPORT • IMPORT • LAYOUT • PRINT • RUN • SAVE This value is the default. **1** QMF restricts updates of the LAST_USED timestamp to RUN, SAVE, and IMPORT commands only. **2** QMF restricts updates of the LAST_USED timestamp to the RUN command only.

DSQEC_LIST_OWNER	None	128	Provides the default value for the OWNER parameter of the LIST command. Specify an authorization ID up to 128 characters long. This variable is blank by default, resulting in a list of objects owned by the current authorization ID.
			You can use selection symbols in the variable value. Use an underscore (_) in place of a single character and a percent sign (%) in place of zero or more characters. For example, the following command followed by a LIST command instructs QMF to list only objects that are owned by user IDs that begin with the characters RO:
			`SET GLOBAL (DSQEC_LIST_OWNER=RO%`
			The following command sets the default owner to any user IDs that begin with I, have any character in the second position, and any characters in the remaining positions:
			`SET GLOBAL (DSQEC_LIST_OWNER=I_%`
			The value you set with this global variable does not apply to lists displayed when you press the List key on QMF panels other than the home panel.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_LOB_COLMAX	None	10	Specifies the maximum data size of a LOB column that is to be retrieved, in bytes, up to the maximum LOB size of 2147483637, or 2 GB. A value of 0 specifies no maximum. By default, LOB metadata is retrieved instead of LOB data. However, if an edit code other than M is specified or if the DSQEC_LOB_RETRV global variable is set to 3, LOB data is retrieved instead of metadata. In this case, if a user queries a table that contains LOB data that is larger than the maximum, an error is issued and no report data is displayed. If a user issues an EXPORT TABLE, PRINT TABLE, SAVE DATA, or EXPORT DATA command for a table or data object that contains LOB data that is larger than the maximum, an error is issued and the command is terminated. The default is 32767.
DSQEC_LOB_RETRV	None	01	Specifies how LOB data or metadata is retrieved. The valid values are: **1** Displays LOB metadata in results. To display actual LOB data, you can change the M edit code to another edit code. When this value is specified, QMF uses LOB locators to access LOB data. This is the default setting. **2** Displays LOB metadata only in results. The M edit code is the only valid edit code for LOB data. When this value is specified, QMF does not use LOB locators. **3** Retrieves and displays actual LOB data in results. When this value is specified, QMF does not use LOB locators to access LOB data.
DSQEC_LOB_SAVE	None	01	Specifies whether users can save LOB data to a table in the database using the QMF SAVE DATA or IMPORT TABLE command. The valid values are: **0 - Disable LOB Save** Specifies that users cannot issue the QMF SAVE DATA or IMPORT TABLE commands to save data to a table in the database if any column contains LOB data. An error message is displayed and no data is saved if a LOB column exists. **1 - Enable LOB Save** Specifies that users can save LOB data to a table in the database using the QMF SAVE DATA or IMPORT TABLE commands. This is the default value.
DSQEC_NLFCMD_LANG	None	01	Sets expected NLF language for commands. Values can be: **0** Commands must be in the presiding NLF language. This value is the default. **1** Commands must be in English.
DSQEC_PO	None	01	Specifies the type of partitioned (PO) data set to create when exporting a QMF object to a new TSO data set. Values can be: **0** Allocates a data set of the type listed as the default for your site. This type is specified in the IGDSMSxx member of the SYS1.PARMLIB. This value is the default value. **1** Allocates a PDS data set for the exported data. **2** Allocates a PDSE data set for the exported data.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_PRO_ENABLE	None	01	Controls whether a confirmation panel is displayed before QMF overwrites or discards the contents of the QUERY, FORM, PROC, or PROFILE temporary storage areas. Possible values are: **0** No confirmation panel is displayed before the contents of the supported temporary storage areas are overwritten. This value is the default. **1** A confirmation panel is displayed if the global variable that corresponds to the temporary storage area in question is also set to 1. The following global variables individually control overwrites in each of the supported temporary storage areas: • DSQEC_PRO_FORM controls overwrites of the FORM temporary storage area, which stores current QMF report formatting specifications. • DSQEC_PRO_PROC controls overwrites of the PROC temporary storage area, which stores current QMF procedures. • DSQEC_PRO_PROF controls overwrites of the PROFILE temporary storage area, which stores current QMF profile settings. • DSQEC_PRO_QUERY controls overwrites of the QUERY temporary storage area, which stores the current QMF query.
DSQEC_PRO_FORM	None	01	This variable controls whether a confirmation panel is displayed before QMF overwrites or discards the contents of the FORM temporary storage area. The DSQEC_PRO_ENABLE global variable must be set to 1. Possible values are: **0** No confirmation panel is displayed before the contents of the temporary storage area are discarded. **1** A confirmation panel is displayed, giving the user the opportunity to proceed or cancel the command that caused the pending discard. The contents of the temporary storage area can then be saved with the SAVE command.
DSQEC_PRO_PROC	None	01	This variable controls whether a confirmation panel is displayed before QMF overwrites or discards the contents of the PROC temporary storage area. The DSQEC_PRO_ENABLE global variable must be set to 1. Possible values are: **0** No confirmation panel is displayed before the contents of the temporary storage area are discarded. **1** A confirmation panel is displayed before the contents of the temporary storage area are discarded. The user can proceed or cancel the command that caused the pending discard. The contents of the temporary storage area can then be saved with the SAVE command.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_PRO_PROF	None	01	This variable controls whether a confirmation panel is displayed before QMF overwrites or discards the contents of the PROFILE temporary storage area. The DSQEC_PRO_ENABLE global variable must be set to 1. Possible values are: **0** No confirmation panel is displayed before the contents of the temporary storage area are discarded. **1** A confirmation panel is displayed before the contents of the temporary storage area are discarded. The user can proceed or cancel the command that caused the pending discard. The contents of the temporary storage area can then be saved with the SAVE command.
DSQEC_PRO_QUERY	None	01	This variable controls whether a confirmation panel is displayed before QMF overwrites or discards the contents of the QUERY temporary storage area. The DSQEC_PRO_ENABLE global variable must be set to 1. Possible values are: **0** No confirmation panel is displayed before the contents of the temporary storage area are discarded. **1** A confirmation panel is displayed before the contents of the temporary storage area are discarded. The user can proceed or cancel the command that caused the pending discard. The contents of the temporary storage area can then be saved with the SAVE command.
DSQEC_RERUN_IPROC	None	01	Reruns the invocation procedure after the END command; values can be: **0** Suppresses rerun of the invocation procedure after the END command. **1** Reruns the invocation procedure after the END command. This value is the default. If you start QMF with an invocation procedure, set this variable to '0'; QMF terminates instead of rerunning the procedure.
DSQEC_RESET_RPT	None	31	Determines whether QMF prompts you when an incomplete DATA object in temporary storage might be affecting performance; possible values are: **0** Reset Report prompt panel is not displayed and QMF completes the running report. This value is the default value. **1** Reset Report prompt panel is displayed; this panel prompts you to complete or reset the currently running report before starting the new command. **2** Reset Report prompt panel is not displayed and QMF resets the currently running report.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_RUN_MQ	None	01	Specifies whether the RUN QUERY command supports multiple statements in an SQL query. Possible values are: **0** Multiple SQL statements are not supported. If you set this variable to 0 and run an SQL query that contains multiple statements, QMF ignores all statements after encountering the first semicolon. This value is the default. **1** Multiple SQL statements are supported. A semicolon must be placed at the end of each statement except the last. **Restrictions:** Although a SELECT statement can be included with other statements in a query, only one SELECT statement can be included per query. CALL and CREATE PROCEDURE statements must be used alone in an SQL query.
DSQEC_SAV_ACCELNM	None	128	Specifies the name of the default accelerator to be used when creating accelerator-only tables from SAVE DATA, IMPORT TABLE and RUN QUERY to TABLE commands. This variable is referenced only if the ACCELERATOR keyword is not specified. Although you can set this global variable to a blank, do not set it to blank if the DSQEC_SAV_ALLOWED global variable is set to '4'.
DSQEC_SAV_ACCELDB	None	08	Contains a data base name to be used on creation of new accelerator only tables in Db2 for z/OS data bases. This variable is referenced only when an accelerator only table is being created from the SAVE DATA, IMPORT TABLE and RUN QUERY with TABLE keyword commands. When this variable is not blank, the IN DATABASE clause will be specified on the CREATE TABLE statement and accelerator only tables will be created in the specified database. The default for this variable is blank. Note that when creating accelerator only tables via the SAVE DATA, IMPORT TABLE and RUN QUERY with TABLE keyword commands, QMF does not reference the user's profile SPACE value.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_SAV_ALLOWED	None	01	Controls whether users save data to a new table in the database or in an accelerator using the QMF SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands. Except for option 0, this field does not influence the location of existing tables that the replaced data is in or teh data is appended to. Existing tables are replaced or appended to in the database or accelerator regardless of the setting of this variable. Valid values for this global variable are: **0 - Disable Save Data** Users cannot issue the QMF SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands to save data to a table in the database or accelerator. An error message will be displayed and no data will be saved. **1 - Enable Save Data to database tables only** Users can save data to a table in the database by using the QMF SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands. Users cannot save data to accelerator-only tables. This setting is the default. **2 - Enable Save Data to accelerator only tables only** Users can save data to an accelerator-only table by using the QMF SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands. Users cannot save data to database tables. The DSQEC_SAV_ACCELNM global variable contains the default name of the accelerator but can be overridden by the ACCELERATOR keyword. **3 - Enable Save Data to either database or accelerator only tables (database default)** Users can save data either to a table in the database or to an accelerator-only table by using the QMF SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands. If no command keyword overrides are present, such as SPACE or ACCEL, tables are saved in the database. **4 - Enable Save Data to either database or accelerator only tables (accelerator default)** Users can save data either to a table in the database or to an accelerator-only table by using the QMF SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands. If no command keyword overrides are present, such as SPACE or ACCELERATOR, tables are saved in the accelerator. When this option is chosen, the DSQEC_SAV_ACCELNM global variable must contain the name of the accelerator.
DSQEC_SAV_LOADER	None	01	Allows the Db2 LOAD utility (cross-loader feature) to be used when using the RUN QUERY with TABLE keyword. **0** Run Query with TABLE keyword will not use the Db2 LOAD utility (cross-loader feature) to save the data. (Default) **1** Run Query with TABLE keyword will use the Db2 LOAD utility (cross-loader feature) to save the data.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_SAV_LOGCTL	None	02	The Db2 Load Utility cross-loader feature returns errors in a result set. DSQEC_SAV_LOGCTL controls the amount of output returned from the cross-loader that is saved by QMF. **-1** QMF will not save any results. **0** QMF will save all results. **1-16** QMF will save results with a return code greater than what you entered or higher. Examples: • DSQEC_SAV_LOGCTL is set to 4 and the LOADER returns a RC of 8. The result set will be saved. • DSQEC_SAV_LOGCTL is set to 8 and the LOADER returns a RC of 4. The result set will not be saved.
DSQEC_SAV_LOGTABLE	None		The name of the table to which QMF saves result sets returned from the cross-loader. *Q.ERROR_LOG* is the default name and should be created when QMF is installed. This is the QMF message error log. The name can be a one or two-part name in the form of: *USERID.TABLENAME* If left blank the result set will not be saved. If the user enters a name other than Q.ERROR_LOG, the table must exist. QMF will not create the table. No save will be done. An entry will be made in the QMF trace indicating the result set was not saved. It is also recommended that the error log be in a different table space than the one the data is being saved it otherwise QMF may not be able to have the result set if the utility is terminated.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_SESSGLV_SAV	None	01	Controls whether user input in some data entry fields on some panels is saved within and across QMF sessions. User input is saved as session variables that are stored in the Q.GLOBAL_VARS table as global variables that are named with a DXY prefix. The DSQEC_SESSGLV_SAV global variable is checked throughout the session, as well as when QMF starts and exits. The valid values are: **0** If this setting is specified when QMF starts, all session variables are deleted from the Q.GLOBAL_VARS table. If this setting is specified during a QMF session, all session variables are deleted from storage. No session variables are saved for the remainder of the current session unless this setting is changed to 1 or 2. If this setting is specified when QMF exits, all session variables are deleted from the Q.GLOBAL_VARS table, which means that no user input persists to the next QMF session. This is the default value. **1** If this setting is specified when QMF starts, all session variables for the user are restored from the Q.GLOBAL_VARS table. If this setting is specified during a QMF session, session variables are saved for the remainder of the current session. For example, if you enter values in the LIST Command Prompt panel, exit the LIST panel, and return to that panel within the same session, those fields are populated with the values that you previously entered. If this setting is specified when QMF exits, all session variables that were created or changed by the user during the current session are discarded and not saved to the Q.GLOBAL_VARS table. All session variable values that existed in the Q.GLOBAL_VARS table before the current session remain unchanged. You can use this option, for example, to reinitialize the same session variable values at the start of each QMF session. When the next QMF session is started, the value reverts to 0 unless it is overridden by an initial global variable that set by an administrator. **2** If this setting is specified when QMF starts, all session variables for the user are restored from the Q.GLOBAL_VARS table. If this setting is specified during a QMF session, session variables are saved for the remainder of the current session unless this setting is changed to 0. For example, if you enter values in the LIST Command Prompt panel, exit the LIST panel, and return to that panel within the same session, those fields are populated with the values that you previously entered. If this setting is specified when QMF exits, all session variables are saved to the Q.GLOBAL_VARS table, which means that any user input that was saved during the session also persists to the next QMF session. This parameter applies to most fields on command prompt panels that are accessed through the following commands: CONNECT, CONVERT, DISPLAY, DRAW, EDIT, ERASE, EXPORT, IMPORT, LIST, PRINT, RESET, RUN, SAVE, SET, and SHOW.
DSQEC_SHARE	None	31	Specifies the default value for the SHARE parameter; possible values are: **0** Do not share data with other users. **1** Share data with other users.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_SP_RS_NUM	None	04	Indicates which result set returned by a stored procedure is used to create the report. Possible values are: **0** Ignores result sets. **1** Returns the first result set. **2** Returns the second result set. ***n*** Returns the *n*th result set. The maximum value for *n* is 32.
DSQEC_SPAC_OVRIDE	None	01	Specifies whether users can override the default table space that is specified in the QMF profile. Valid values for this global variable are: **0 - Disable Space Keyword Option** Users cannot issue the SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands with the SPACE keyword option. **1 - Enable Space Keyword Option** Users can issue the SAVE DATA, RUN QUERY to TABLE, or IMPORT TABLE commands with the space keyword option. This setting is the default.
DSQEC_SQLQRYSZ_2M	None	01	Controls whether SQL queries greater than 32,767 bytes (32 KB) in length are supported by the RUN QUERY command. **0** SQL queries directed to Db2 for z/OS, DB2 for iSeries, and Db2 for Linux, UNIX, and Windows databases are limited to 32,767 bytes (32 KB). This value is the default. **1** SQL queries can be greater than 32 KB. The maximum supported query size varies depending on the type of database to which the query is directed: • Queries directed to Db2 for z/OS can be up to 2 MB in length. • Queries directed to DB2 for iSeries or Db2 for Linux, UNIX, and Windows can be up to 65 KB in length. These maximums assume that the version of the database to which the RUN QUERY command is directed supports queries of this size. SQL queries directed to DB2 for VSE and VM are limited to 8 KB. Additional customization might be required to run queries larger than 32 KB from QMF for CICS.
DSQEC_TABS_LDB2	None	31	View for retrieving lists of tables and views at the current server, if it is Db2 for z/OS or Db2 for Linux, UNIX, and Windows
DSQEC_TABS_RDB2	None	31	View for retrieving lists of tables and views at remote Db2 subsystems.
DSQEC_TABS_SQL	None	31	View for retrieving lists of tables and views for a DB2 for VSE and VM database.
DSQEC_TRACE_LIMIT	None	31	Limits the amount of trace output to the specified number of bytes. The valid range is 0 - 2147483647. This variable can be used to reduce the size of QMF trace output. This global variable is typically set as directed by IBM Software Support.

Table 57. Global variables that control how commands and procedures are executed (continued)

Callable interface variable name	Command interface variable name	Length	Description
DSQEC_TRACE_MODULE	None	54	Contains the names of QMF modules to be traced. Up to 6 modules can be specified, separated by commas. After module names are specified in the global variable, initiate the trace by issuing the SET PROFILE command with the TRACE keyword to set to ALL. Example: SET PROFILE (TRACE=ALL **Note:** If modules are specified via the SET GLOBAL command from the command line, the module names must be enclosed in single quotes.
DSQEC_TWO_GB_ROW	None	01	Controls the length of rows returned in QMF reports. Use one of the following values: **0** Limits the length of a data row in a QMF report to 32 KB, unless the report contains an XML or LOB column. **1** Allows the length of a data row to be greater than 32 KB, up to a maximum length of 2 GB. **Important:** • Regardless of the DSQEC_TWO_GB_ROW global variable setting, up to 2 GB of XML, CLOB, or BLOB data, and up to 1 GB of DBCLOB data can be displayed by default. However, the maximum length of a LOB row can be restricted by the DSQEC_LOB_COLMAX global variable. • Regardless of the DSQEC_TWO_GB_ROW global variable setting, a single table cannot have a maximum record size that is greater than the page size. Db2 stores records within pages that are 4 KB, 8 KB, 16 KB, or 32 KB in size. So, the maximum length of a data row that can be displayed remains at 32 KB when you display or select data from a single table. If you display or select data from a view that joins two or more tables, the row length can be up to 2 GB. Because of these page size considerations, the length of a data row in a QMF report that can be saved with the SAVE DATA command is also limited to 32 KB. The ability to save LOB data is controlled by the DSQEC_LOB_SAVE global variable.

Table 57. Global variables that control how commands and procedures are executed (continued)			
Callable interface variable name	**Command interface variable name**	**Length**	**Description**
DSQEC_USERGLV_SAV	None	01	Determines whether global variables that were created or changed by the user, including those that start with "DSQ," are saved when the QMF session ends. Values that are to be saved are stored in the Q.GLOBAL_VARS table and associated with the user ID of the session. If the values are saved, they are restored at the start of the user's next QMF session. The valid values are: **0** When QMF exits, all global variables are deleted from the Q.GLOBAL_VARS table, and no global variables from the current session are saved to the Q.GLOBAL_VARS table. This is the default value. **1** When QMF exits, all global variables that were created or changed by the user during the current session are discarded and not saved to the Q.GLOBAL_VARS table. All global variable values that were already in the Q.GLOBAL_VARS table remain as they were prior to the current QMF session. You can use this option, for example, to re-initialize the same global variable values at the start of each QMF session. When the next QMF session is started, the value reverts to 0 unless it is overridden by an initial global variable that set by an administrator. **2** When QMF exits, all global variables that were created or changed by the user are saved to the Q.GLOBAL_VARS table. When the user starts QMF again, global variables that were saved from the user's previous session are restored. Any values that were defined by an administrator in the Q.GLOBAL_VARS table are superseded by the user's values unless the variable was defined as read-only.

Global variables that store results of CONVERT QUERY

DSQQC global variables reflect the results of a CONVERT QUERY command. None of these global variables can be modified by the SET GLOBAL command.

Table 58. Global variables that reflect the results of a CONVERT QUERY command			
Callable interface variable name	**Command interface variable name**	**Length**	**Description**
DSQQC_LENGTH_*nnn*	DSQCL*nnn*	05	Length of converted result *nnn*.
DSQQC_QRY_COUNT	DSQCQCNT	03	Number of queries in converted result; value must always be '1' unless the original query is a QBE I. or U. query.
DSQQC_QRY_LANG	DSQCQLNG	01	Language of converted query; values can be: **1** for SQL **2** for QBE **3** for Prompted
DSQQC_QRY_TYPE	DSQCQTYP	Not specified	First word in converted results.
DSQQC_RESULT_*nnn*	DSQCQ*nnn*	Not specified	*nnn*

Global variables that show RUN QUERY error message information

DSQQM global variables store the results of a RUN QUERY command. None of these global variables can be modified by the SET GLOBAL command.

Table 59. Global variables that store the results of a RUN QUERY command

Callable interface variable name	Command interface variable name	Length	Description
DSQQM_MESSAGE	DSQCIQMG	80	Text of query message.
DSQQM_MESSAGE_ALL	DSQCIQMA	360	Complete query message text.
DSQQM_MSG_HELP	DSQCIQID	08	ID of message help panel.
DSQQM_MSG_NUMBER	DSQCIQNO	08	Message number.
DSQQM_SQL_RC	DSQCISQL	16	The SQLCODE from the last command or query.
DSQQM_SQL_STATE	None	05	The SQLSTATE associated with the SQLCODE in DSQQM_SQL_RC, if SQLSTATE is returned by the database manager.
DSQQM_SUB_TXT_*nn*	DSQCIQ*nn*	20	Substitution value *nn*.
DSQQM_SUBST_VARS	DSQCIQ00	04	Number of substitution variables.

Global variables that store panel input values

DXY global variables store the values that users enter in data entry fields if the DSQEC_SESSGLV_SAV global variable is set to 1 or 2. Input in only some data entry fields on some panels is saved. User input for fields that are not listed in the following table are not saved, regardless of the DSQEC_SESSGLV_SAV global variable setting.

All of these global variables can be modified by the SET GLOBAL command. However, use caution when changing or deleting these variables because doing so changes the values that are generated on command prompt panels.

Table 60. Mapping between DXY global variables and panel field names

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PCO1_*ln*	01 - 03	CONNECT	User
DXY*n*PCO1_05	–	CONNECT	Location
DXY*n*PC03_01	–	CONNECT (CICS)	Location
DXY*n*PCNV_*ln*	02 - 07	CONVERT	Name
DXY*n*PDSP_*ln*	02 - 07	DISPLAY	Name
DXY*n*PDSP_*ln*_01	02 - 07	DISPLAY QUERY	Name
DXY*n*PDSP_*ln*_02	02 - 07	DISPLAY PROC	Name
DXY*n*PDSP_*ln*_03	02 - 07	DISPLAY FORM	Name
DXY*n*PDSP_*ln*_05	02 - 07	DISPLAY REPORT	Name
DXY*n*PDSP_*ln*_07	02 - 07	DISPLAY CHART	Name
DXY*n*PDSP_*ln*_08	02 - 07	DISPLAY TABLE	Name

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PDRS_*ln*	01 - 06	DRAW	Name
DXY*n*PDRS_07	–	DRAW	Type
DXY*n*PDRS_08	–	DRAW	Identifier
DXY*n*PEDT_01	–	EDIT	Type
DXY*n*PED1_*ln*	01 - 06	EDIT (QUERY or PROC)	Name
DXY*n*PED2_*ln*	01 - 06	EDIT TABLE	Name
DXY*n*PED2_07	–	EDIT TABLE	Mode
DXY*n*PED3_*ln*	01 - 06	EDIT (QUERY or PROC), then make changes and exit without saving.	Name
DXY*n*PED3_09	–	EDIT (QUERY or PROC), then make changes and exit without saving.	Comment
DXY*n*PED3_*ln*	10 - 12	EDIT (QUERY or PROC), then make changes and exit without saving.	Folder
DXY*n*PERA_*ln*	02 - 07	ERASE	Name
DXY*n*PERA_*ln*_01	02 - 07	ERASE QUERY	Name
DXY*n*PERA_*ln*_02	02 - 07	ERASE PROC	Name
DXY*n*PERA_*ln*_03	02 - 07	ERASE FORM	Name
DXY*n*PERA_*ln*_08	02 - 07	ERASE TABLE	Name
DXY*n*PEXM_*ln*	02 - 07	EXPORT	Name
DXY*n*PEXM_*ln*_01	02 - 07	EXPORT QUERY	Name
DXY*n*PEXM_*ln*_02	02 - 07	EXPORT PROC	Name
DXY*n*PEXM_*ln*_03	02 - 07	EXPORT FORM	Name
DXY*n*PEXM_*ln*_05	02 - 07	EXPORT REPORT	Name
DXY*n*PEXM_*ln*_06	02 - 07	EXPORT DATA	Name
DXY*n*PEXM_*ln*_07	02 - 07	EXPORT CHART	Name
DXY*n*PEXM_*ln*_08	02 - 07	EXPORT TABLE	Name
DXY*n*PXM1_*ln*	01 - 05	EXPORT, then Enter (in TSO)	To
DXY*n*PXM1_*ln*_01	01 - 05	EXPORT QUERY, then Enter (in TSO)	To

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PXM1_*ln*_02	01 - 05	EXPORT PROC, then Enter (in TSO)	To
DXY*n*PXM1_06	–	EXPORT, then Enter (in TSO)	Member
DXY*n*PXM1_06_01	–	EXPORT QUERY, then Enter (in TSO)	Member
DXY*n*PXM1_06_02	–	EXPORT PROC, then Enter (in TSO)	Member
DXY*n*PXM2_01_07	–	EXPORT CHART, then Enter (in TSO)	Member
DXY*n*PXM3_*ln*_05	01 - 05	EXPORT REPORT, then Enter (in TSO)	To
DXY*n*PXM3_06_05	–	EXPORT REPORT, then Enter (in TSO)	Member
DXY*n*PXM3_08_05	–	EXPORT REPORT, then Enter (in TSO)	Dataformat
DXY*n*PXM4_*ln*_06	01 - 05	EXPORT DATA, then Enter (in TSO)	To
DXY*n*PXM4_06_06	–	EXPORT DATA, then Enter (in TSO)	Member
DXY*n*PXM4_08_06	–	EXPORT DATA, then Enter (in TSO)	Dataformat
DXY*n*PXM4_09_06	–	EXPORT DATA, then Enter (in TSO)	Outputmode
DXY*n*PXM4_10_06	–	EXPORT DATA, then Enter (in TSO)	Header
DXY*n*PXM4_*ln*_08	01-05	EXPORT TABLE, then Enter (in TSO)	To
DXY*n*PXM4_06_08	-	EXPORT TABLE, then Enter (in TSO)	Member
DXY*n*PXM4_08_08	-	EXPORT TABLE, then Enter (in TSO)	Dataformat
DXY*n*PXM4_09_08	-	EXPORT TABLE, then Enter (in TSO)	Outputmode
DXY*n*PXM4_10_08	-	EXPORT TABLE, then Enter (in TSO)	Header
DXY*n*PXM5_*ln*_03	01 - 05	EXPORT FORM, then Enter (in TSO)	To

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PXM5_06_03	–	EXPORT FORM, then Enter (in TSO)	Member
DXY*n*PXM5_08_03	–	EXPORT FORM, then Enter (in TSO)	Language
DXY*n*PXC1_01	–	EXPORT, then Enter (in CICS)	Queue Name
DXY*n*PXC1_01_01	–	EXPORT QUERY, then Enter (in CICS)	Queue Name
DXY*n*PXC1_01_02	–	EXPORT PROC, then Enter (in CICS)	Queue Name
DXY*n*PXC1_02	–	EXPORT, then Enter (in CICS)	Queue Type
DXY*n*PXC1_02_01	–	EXPORT QUERY, then Enter (in CICS)	Queue Type
DXY*n*PXC1_02_02	–	EXPORT PROC, then Enter (in CICS)	Queue Type
DXY*n*PXC1_04	–	EXPORT, then Enter (in CICS)	Suspend
DXY*n*PXC1_04_01	–	EXPORT QUERY, then Enter (in CICS)	Suspend
DXY*n*PXC1_04_02	–	EXPORT PROC, then Enter (in CICS)	Suspend
DXY*n*PXC3_01_05	–	EXPORT REPORT, then Enter (in CICS)	Queue Name
DXY*n*PXC3_02_05	–	EXPORT REPORT, then Enter (in CICS)	Queue Type
DXY*n*PXC3_04_05	–	EXPORT REPORT, then Enter (in CICS)	Suspend
DXY*n*PXC3_05_05	–	EXPORT REPORT, then Enter (in CICS)	Dataformat
DXY*n*PXC4_01_06	–	EXPORT DATA, then Enter (in CICS)	Queue Name
DXY*n*PXC4_02_06	–	EXPORT DATA, then Enter (in CICS)	Queue Type
DXY*n*PXC4_04_06	–	EXPORT DATA, then Enter (in CICS)	Suspend
DXY*n*PXC4_05_06	–	EXPORT DATA, then Enter (in CICS)	Dataformat

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PXC4_06_06	–	EXPORT DATA, then Enter (in CICS)	Outputmode
DXY*n*PXC4_07_06	–	EXPORT DATA, then Enter (in CICS)	Header
DXY*n*PXC5_01_03	–	EXPORT FORM, then Enter (in CICS)	Queue Name
DXY*n*PXC5_02_03	–	EXPORT FORM, then Enter (in CICS)	Queue Type
DXY*n*PXC5_04_03	–	EXPORT FORM, then Enter (in CICS)	Suspend
DXY*n*PXC5_05_03	–	EXPORT FORM, then Enter (in CICS)	Language
DXY*n*PIMM_*ln*	02 - 07	IMPORT (in TSO)	Name
DXY*n*PIMM_*ln*_01	02 - 07	IMPORT QUERY (in TSO)	Name
DXY*n*PIMM_*ln*_02	02 - 07	IMPORT PROC (in TSO)	Name
DXY*n*PIMM_*ln*_03	02 - 07	IMPORT FORM (in TSO)	Name
DXY*n*PIMM_*ln*_06	02 - 07	IMPORT DATA (in TSO)	Name
DXY*n*PIMM_*ln*_08	02 - 07	IMPORT TABLE (in TSO)	Name
DXY*n*PIMM_*ln*	08 - 12	IMPORT (in TSO)	From
DXY*n*PIMM_*ln*_01	08 - 12	IMPORT QUERY (in TSO)	From
DXY*n*PIMM_*ln*_02	08 - 12	IMPORT PROC (in TSO)	From
DXY*n*PIMM_*ln*_03	08 - 12	IMPORT FORM (in TSO)	From
DXY*n*PIMM_*ln*_06	08 - 12	IMPORT DATA (in TSO)	From
DXY*n*PIMM_*ln*_08	08 - 12	IMPORT TABLE (in TSO)	From
DXY*n*PIMM_13	–	IMPORT (in TSO)	Member
DXY*n*PIMM_13_01	–	IMPORT QUERY (in TSO)	Member
DXY*n*PIMM_13_02	–	IMPORT PROC (in TSO)	Member
DXY*n*PIMM_13_03	–	IMPORT FORM (in TSO)	Member
DXY*n*PIMM_13_06	–	IMPORT DATA (in TSO)	Member
DXY*n*PIMM_13_08	–	IMPORT TABLE (in TSO)	Member
DXY*n*PIQF_03	–	IMPORT, then Enter (in TSO)	Comment
DXY*n*PIQF_03_01	–	IMPORT QUERY, then Enter (in TSO)	Comment

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PIQF_03_02	–	IMPORT PROC, then Enter (in TSO)	Comment
DXY*n*PIQL_03_03	–	IMPORT FORM, then Enter (in TSO)	Comment
DXY*n*PIQL_04_03	–	IMPORT FORM, then Enter (in TSO)	Language
DXY*n*PITB_02_08	–	IMPORT TABLE, then Enter (in TSO)	Comment
DXY*n*PITB_04_08	–	IMPORT TABLE, then Enter (in TSO)	Space
DXY*n*PITB_*ln*_08	05 - 07	IMPORT TABLE, then Enter (in TSO)	Accelerator
DXY*n*PIMC_*ln*	02 - 07	IMPORT (in CICS)	Name
DXY*n*PIMC_*ln*_01	02 - 07	IMPORT QUERY (in CICS)	Name
DXY*n*PIMC_*ln*_02	02 - 07	IMPORT PROC (in CICS)	Name
DXY*n*PIMC_*ln*_03	02 - 07	IMPORT FORM (in CICS)	Name
DXY*n*PIMC_*ln*_06	02 - 07	IMPORT DATA (in CICS)	Name
DXY*n*PIMC_*ln*_08	02 - 07	IMPORT TABLE (in CICS)	Name
DXY*n*PIMC_08	–	IMPORT (in CICS)	Queue Name
DXY*n*PIMC_08_01	–	IMPORT QUERY (in CICS)	Queue Name
DXY*n*PIMC_08_02	–	IMPORT PROC (in CICS)	Queue Name
DXY*n*PIMC_08_03	–	IMPORT FORM (in CICS)	Queue Name
DXY*n*PIMC_08_06	–	IMPORT DATA (in CICS)	Queue Name
DXY*n*PIMC_08_08	–	IMPORT TABLE (in CICS)	Queue Name
DXY*n*PIMC_09	–	IMPORT (in CICS)	Queue Type
DXY*n*PIMC_09_01	–	IMPORT QUERY (in CICS)	Queue Type
DXY*n*PIMC_09_02	–	IMPORT PROC (in CICS)	Queue Type
DXY*n*PIMC_09_03	–	IMPORT FORM (in CICS)	Queue Type
DXY*n*PIMC_09_06	–	IMPORT DATA (in CICS)	Queue Type
DXY*n*PIMC_09_08	–	IMPORT TABLE (in CICS)	Queue Type
DXY*n*PIMC_10	–	IMPORT (in CICS)	Suspend

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PIMC_10_01	–	IMPORT QUERY (in CICS)	Suspend
DXY*n*PIMC_10_02	–	IMPORT PROC (in CICS)	Suspend
DXY*n*PIMC_10_03	–	IMPORT FORM (in CICS)	Suspend
DXY*n*PIMC_10_06	–	IMPORT DATA (in CICS)	Suspend
DXY*n*PIMC_10_08	–	IMPORT TABLE (in CICS)	Suspend
DXY*n*PLST_01	–	LIST (QUERIES, PROCS, FORMS, ANALYTICS, QMF, TABLES, or ALL)	Type
DXY*n*PLST_*ln*	02 - 04	LIST (QUERIES, PROCS, FORMS, ANALYTICS, QMF, TABLES, or ALL)	Owner
DXY*n*PLST_*ln*	05 - 07	LIST (QUERIES, PROCS, FORMS, ANALYTICS, QMF, TABLES, or ALL)	Name
DXY*n*PLST_08	–	LIST (QUERIES, PROCS, FORMS, ANALYTICS, QMF, TABLES, or ALL)	Location
DXY*n*PPRT_*ln*	02 - 07	PRINT (in TSO)	Name
DXY*n*PPRT_*ln*_01	02 - 07	PRINT QUERY (in TSO)	Name
DXY*n*PPRT_*ln*_02	02 - 07	PRINT PROC (in TSO)	Name
DXY*n*PPRT_*ln*_03	02 - 07	PRINT FORM (in TSO)	Name
DXY*n*PPRT_*ln*_04	02 - 07	PRINT PROFILE (in TSO)	Name
DXY*n*PPRT_*ln*_05	02 - 07	PRINT REPORT (in TSO)	Name
DXY*n*PPRT_*ln*_07	02 - 07	PRINT CHART (in TSO)	Name
DXY*n*PPRT_*ln*_08	02 - 07	PRINT TABLE (in TSO)	Name
DXY*n*PPR2_01_07	–	PRINT CHART, then Enter (in TSO)	Printer
DXY*n*PPR3_01_01	–	PRINT QUERY, then Enter (in TSO)	Printer
DXY*n*PPR3_01_02	–	PRINT PROC, then Enter (in TSO)	Printer
DXY*n*PPR3_01_03	–	PRINT FORM, then Enter (in TSO)	Printer
DXY*n*PPR3_01_04	–	PRINT PROFILE, then Enter (in TSO)	Printer

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PPR3_01_08	–	PRINT TABLE, then Enter (in TSO)	Printer
DXY*n*PPR4_01_05	–	PRINT REPORT, then Enter (in TSO)	Printer
DXY*n*PPR5_*ln*	02 - 07	PRINT (in CICS)	Name
DXY*n*PPR5_*ln*_01	02 - 07	PRINT QUERY (in CICS)	Name
DXY*n*PPR5_*ln*_02	02 - 07	PRINT PROC (in CICS)	Name
DXY*n*PPR5_*ln*_03	02 - 07	PRINT FORM (in CICS)	Name
DXY*n*PPR5_*ln*_04	02 - 07	PRINT PROFILE (in CICS)	Name
DXY*n*PPR5_*ln*_05	02 - 07	PRINT REPORT (in CICS)	Name
DXY*n*PPR5_*ln*_07	02 - 07	PRINT CHART (in CICS)	Name
DXY*n*PPR5_*ln*_08	02 - 07	PRINT TABLE (in CICS)	Name
DXY*n*PPR5_08	–	PRINT (in CICS)	Queue Name
DXY*n*PPR5_08_01	–	PRINT QUERY (in CICS)	Queue Name
DXY*n*PPR5_08_02	–	PRINT PROC (in CICS)	Queue Name
DXY*n*PPR5_08_03	–	PRINT FORM (in CICS)	Queue Name
DXY*n*PPR5_08_04	–	PRINT PROFILE (in CICS)	Queue Name
DXY*n*PPR5_08_05	–	PRINT REPORT (in CICS)	Queue Name
DXY*n*PPR5_08_07	–	PRINT CHART (in CICS)	Queue Name
DXY*n*PPR5_08_08	–	PRINT TABLE (in CICS)	Queue Name
DXY*n*PPR5_09	–	PRINT (in CICS)	Queue Type
DXY*n*PPR5_09_01	–	PRINT QUERY (in CICS)	Queue Type
DXY*n*PPR5_09_02	–	PRINT PROC (in CICS)	Queue Type
DXY*n*PPR5_09_03	–	PRINT FORM (in CICS)	Queue Type
DXY*n*PPR5_09_04	–	PRINT PROFILE (in CICS)	Queue Type
DXY*n*PPR5_09_05	–	PRINT REPORT (in CICS)	Queue Type
DXY*n*PPR5_09_07	–	PRINT CHART (in CICS)	Queue Type
DXY*n*PPR5_09_08	–	PRINT TABLE (in CICS)	Queue Type
DXY*n*PPR5_10	–	PRINT (in CICS)	Suspend
DXY*n*PPR5_10_01	–	PRINT QUERY (in CICS)	Suspend

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PPR5_10_02	–	PRINT PROC (in CICS)	Suspend
DXY*n*PPR5_10_03	–	PRINT FORM (in CICS)	Suspend
DXY*n*PPR5_10_04	–	PRINT PROFILE (in CICS)	Suspend
DXY*n*PPR5_10_05	–	PRINT REPORT (in CICS)	Suspend
DXY*n*PPR5_10_07	–	PRINT CHART (in CICS)	Suspend
DXY*n*PPR5_10_08	–	PRINT TABLE (in CICS)	Suspend
DXY*n*PRNM_*ln*	02 - 07	RENAME	Old Name
DXY*n*PRNM_*ln*	08 - 10	RENAME	New Name
DXY*n*PRST_01	–	RESET	Type
DXY*n*PRSG_01	–	RESET GLOBAL	Enter ALL ...
DXY*n*PRSG_*ln*	02 - 11	RESET GLOBAL	Global variable name
DXY*n*PRUN_*ln*	02 - 07	RUN	Name
DXY*n*PRUN_*ln*_01	02 - 07	RUN QUERY	Name
DXY*n*PRUN_*ln*_02	02 - 07	RUN PROC	Name
DXY*n*PRU3_*ln*	01 - 06	RUN QUERY, then Enter	Form
DXY*n*PRU3_08	–	RUN QUERY, then Enter	Rowlimit
DXY*n*PRU3_*ln*	09 - 14	RUN QUERY, then Enter	Analytic
DXY*n*PRU3_*ln*	15 - 20	RUN QUERY, then Enter	Table
DXY*n*PRU3_22	–	RUN QUERY, then Enter	Comment
DXY*n*PRU3_23	–	RUN QUERY, then Enter	Space
DXY*n*PRU3_*ln*	24 - 26	RUN QUERY, then Enter	Accelerator
DXY*n*PRU4_01	–	RUN PROC, then Enter	Arg
DXY*n*PSAV_01	–	SAVE	Type
DXY*n*PSA2_*ln*	01 - 06	SAVE DATA	Name
DXY*n*PSA2_08	–	SAVE DATA	Comment
DXY*n*PSA2_10	–	SAVE DATA	Space
DXY*n*PSA2_*ln*	11 - 13	SAVE DATA	Accelerator
DXY*n*PSA3_*ln*_01	01 - 06	SAVE QUERY	Name
DXY*n*PSA3_*ln*_02	01 - 06	SAVE PROC	Name
DXY*n*PSA3_09_01	–	SAVE QUERY	Comment

Table 60. Mapping between DXY global variables and panel field names (continued)

Global variable name (where *n* is a national language identifier and *ln* is an ID associated with a line of a multiline field)	**Range of *ln* values**	**Command**	**Field name**
DXY*n*PSA3_09_02	–	SAVE PROC	Comment
DXY*n*PSA3_*ln*_01	10 - 12	SAVE QUERY	Folder
DXY*n*PSA3_*ln*_02	10 - 12	SAVE PROC	Folder
DXY*n*PSA4_*ln*	01 - 06	SAVE FORM	Name
DXY*n*PSA4_09	–	SAVE FORM	Comment
DXY*n*PSA4_*ln*	11 - 13	SAVE FORM	Folder
DXY*n*PSET_01	–	SET	Type
DXY*n*PSGL_*ln*	01 - 19 (even numbers)	SET GLOBAL	Var
DXY*n*PSGL_*ln*	02 - 20 (odd numbers)	SET GLOBAL	Value
DXY*n*PSHO_01	–	SHOW	Enter the name ...

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Glossary of terms and acronyms

abnormal end of task (abend)
The termination of a task, job, or subsystem because of an error condition that recovery facilities cannot resolve during execution.

address space
The range of addresses available to a computer program or process. Address space can refer to physical storage, virtual storage, or both.

Advanced Program-to-Program Communication
See *APPC*.

aggregate function
Any of a group of functions that summarizes data in a column. They are requested with these usage codes on the form panels: AVERAGE, CALC, COUNT, FIRST, LAST, MAXIMUM, MINIMUM, STDEV, SUM, CSUM, PCT, CPCT, TPCT, TCPCT.

aggregation variable
An aggregation function that is placed in a report using the FORM.BREAK, FORM.CALC, FORM.DETAIL, or FORM.FINAL panels. Its value appears as part of the break footing, detail block text, or final text when the report is produced.

alias
An alternative name used to identify a table, view, database, or nickname. An alias can be used in SQL statements to refer to a table, view, or database in the same DB2 system or subsystem or in a remote DB2 system or subsystem.

APAR (Authorized Program Analysis Report)
A request for correction of a defect in a supported release of an program supplied by IBM.

APF (authorized program facility)
In a z/OS environment, a facility that permits the identification of programs that are authorized to use restricted functions.

API (application programming interface)
An interface that allows an application program that is written in a high-level language to use specific data or functions of the operating system or another program.

application
One or more computer programs or software components that use QMF services to provide functionality in direct support of a specific business process or processes.

APPC (Advanced Program-to-Program Communication)
An implementation of the SNA LU 6.2 protocol that allows interconnected systems to communicate and share the processing of programs.

application plan
The control structure that is produced during the bind process. The default name for the QMF Version 13 Release 1 application plan is QMF1310.

application programming interface
See *API*.

application requester
The source of a request to a remote DRDA-enabled relational database management system (RDBMS). Only Db2 for z/OS databases can function as application requesters because this is the only type of database in which QMF can be started.

application server
The target of a request from an application requester. The database management system (DBMS) at the application server site services the request. Connectivity with remote servers is not supported when QMF for TSO is running as a Db2 for z/OS stored procedure.

argument
A value passed to or returned from a function or procedure at run time.

authorization identifier (authorization ID)
A character string that designates a set of privileges and can be used to verify authority. An authorization ID can represent an object, an individual user, an organizational group, a function, or a database role. QMF authenticates either the database authorization ID or, optionally, the QMF TSO logon ID, against the CREATOR column of the Q.PROFILES table during QMF initialization.

Authorized Program Analysis Report
See *APAR*.

Authorized program facility
See *APF*.

auxiliary table
A table that stores columns outside the table in which they are defined. See also *base table*.

base product
The English-language version of QMF, established when QMF is installed. Any other language environment is established after installation by installing the National Language Feature (NLF) associated with that language.

base table
A table that is created by the SQL CREATE TABLE statement and that holds persistent data.

binary string
A sequence of bytes that is not associated with a coded character set and therefore is never converted. For example, the BLOB data type is a binary string. See also *CCSID*.

bind
To convert the output from the DBMS precompiler to a usable control structure, such as an access plan, an application plan, or a package.

bit data
Data with a data type of CHAR or VARCHAR that is not associated with a coded character set and therefore is never converted.

buffer pool
An area of memory into which data pages are read and in which they are modified and held during processing. See also *address space*.

built-in function
A strongly typed, high-performance function that is integral to the DB2 database. A built-in function can be referenced in SQL statements anywhere that an expression is valid.

CAF (call attachment facility)
A Db2 for z/OS attachment facility for application programs that run in TSO or z/OS batch. The CAF is an alternative to the DSN command processor and provides greater control over the execution environment.

call attachment facility
See *CAF*.

callable interface
A programming interface that provides access to QMF objects and services.

cascade delete
A process by which the DB2 database manager enforces referential constraints by deleting all descendent rows of a deleted parent row.

catalog
A collection of tables and views that contains descriptions of objects such as tables, views, and indexes. See also *QMF object catalog*.

CCSID (coded character set identifier)
A 16-bit number that includes a specific set of encoding scheme identifiers, character set identifiers, code page identifiers, and other information that uniquely identifies the coded graphic-character

representation. Because QMF uses display services provided by GDDM, the GDDM application code page must agree with the CCSIDs in use for the database. See also *binary string*.

character string
A sequence of bytes that represents bit data, single-byte characters, or a mixture of single-byte and multibyte characters.

check constraint
A user-defined constraint that specifies the values that specific columns of a base table can contain. See also *constraint*.

CICS (Customer Information Control System)
An IBM licensed program that provides online transaction-processing services and management for business applications.

clause
In SQL, a distinct part of a statement in the language structure, such as a SELECT clause or a WHERE clause.

CM (Compatibility Mode)
An installation mode of QMF Version 8.1 and QMF Version 9.1 that limited owner and object names in the QMF object catalog to eight and 18 characters, respectively. See also *NFM*.

code page
A particular assignment of code points to graphic characters. Within a given code page, a code point can have only one specific meaning. A code page also identifies how undefined code points are handled.

coded character set identifier
See *CCSID*.

coexistence
The state during which two QMF releases exist in the same DB2 subsystem. QMF Version 13.1 can coexist with QMF Version 9.1 New Function Mode or QMF Version 8.1 New Function Mode only.

column
The vertical component of a database table. A column has a name and a particular data type (for example, character, decimal, or integer).

column function
See *aggregate function*.

column wrapping
The value formatting in a report where the values occupy several lines within a column. Column wrapping is often used when a column contains values whose length exceeds the column width, such as cases requiring the display of XML data.

command interface
An interface for issuing QMF commands. The command interface allows you to issue QMF commands from an ISPF dialog running under QMF. Using this interface, QMF communicates with the dialog through the ISPF variable pool.

command synonym
The verb or verb/object part of a site-defined command. After command synonyms are defined and activated in the QMF profile, users can enter the synonyms on the QMF command line as they do with regular QMF commands.

command synonym table
A table that stores one site-defined command in each row. You assign a set of command synonyms to a user by storing the name of this table in the user's profile.

comparison operator
In SQL, a symbol used in comparison expressions to specify a relationship between two values. Comparison operators are = (equal to), <> (not equal to), < (less than), > (greater than), <= (less than or equal to), and >= (greater than or equal to).

Compatibility Mode
See *CM*.

commit
To end a unit of work by releasing locks so that the database changes made by that unit of work can be perceived by other processes. This operation makes the data changes permanent.

concatenation
Joining two characters or strings to form one string.

connection
In data communication, an association established between entities for conveying information. See also *SQL connection*. Connectivity with remote servers is not supported when QMF for TSO is running as a Db2 for z/OS stored procedure.

constant
A language element that specifies an unchanging value. Constants are classified as string constants or numeric constants.

constraint
A rule that limits the values that can be inserted, deleted, or updated in a table.

control section
See *CSECT*.

control tables
A set of tables that QMF uses to store information about QMF objects and manage QMF operations. See also *QMF object catalog*.

correlated reference
A reference to a column of a table or view that is outside a subquery.

correlation name
An identifier specified and used within a single SQL statement as the exposed name for objects such as a table, view, table function reference, nested table expression, or data change table reference. Correlation names are useful in an SQL statement to allow two distinct references to the same base table and to allow an alternative name to be used to represent an object.

CSECT (control section)
The part of a program specified by the programmer to be a relocatable unit, all elements of which are to be loaded into adjoining main storage locations.

current location
The application server to which the QMF session is currently connected. After the connection is made, this server processes all SQL statements. When initializing QMF, the current location can be indicated using the DSQSDBNM startup parameter. Connectivity with remote servers is not supported when QMF for TSO is running as a Db2 for z/OS stored procedure.

current object
A QMF object that is held in temporary storage so that, with each use, it can be readily accessed without requiring database retrieval. There are seven temporary storage areas: QUERY, FORM, PROC, PROFILE, REPORT, DATA, and CHART. Users can navigate to all areas but the DATA area using the SHOW and DISPLAY commands. See also *temporary storage*.

cursor
A named control structure used by an application program to point to and select a row of data from a set.

Customer Information Control System
See *CICS*.

data type
A classification identifying one of various kinds of data. In SQL, the data type is an attribute of columns, literals, host variables, special registers, parameters, and the results of functions and expressions.

database
A collection of interrelated or independent data items that are stored together to serve one or more applications.

database administrator
A person who is responsible for the design, development, operation, security, maintenance, and use of a database.

database management system
See *DBMS*.

database manager
A program that manages data by providing centralized control, data independence, and complex physical structures for efficient access, integrity, recovery, concurrency control, privacy, and security.

database server
A software program that uses a database manager to provide database services to other software programs or computers.

DBCS (double-byte character set)
A set of characters in which each character is represented by two bytes. These character sets are commonly used by national languages such as Japanese and Chinese, which have more symbols than can be represented by a single byte. See also *SBCS*.

DBMS (database management system)
A software system that controls the creation, organization, and modification of a database and the access to the data that is stored within it.

DCT (destination control table)
A table describing each of the transient data destinations used in CICS. This table contains an entry for each extrapartition, intrapartition, and indirect destination.

default form
The QMF form created when a saved form is not specified on the RUN QUERY command.

default value
A predetermined value, attribute, or option that is assumed when no other value is specified. A default value can be defined for column data in DB2 tables by specifying the DEFAULT keyword in an SQL statement that changes data (such as INSERT, UPDATE, and MERGE).

dependent row
A row that contains a foreign key that matches the value of a parent key in the parent row. The foreign key value represents a reference from the dependent row to the parent row.

dependent table
A table that is a dependent of an object. For example, a table with a foreign key is a dependent of the table containing the corresponding primary key.

destination control table
See *DCT*.

detail block text
The text in the body of a report that is associated with a particular row of data.

detail heading text
The text in the heading of a report.

detail variation
A data formatting definition specified on a FORM.DETAIL panel that can be used to conditionally format a report or part of a report.

distinct type
A user-defined data type that shares a common representation with built-in data types.

distributed data
Data that is stored on more than one system and is available to remote users and application programs.

distributed database
A database that appears to users as a logical whole, locally accessible database, but consists of databases in multiple locations that are connected by a data communications network.

Distributed Relational Database Architecture™
See *DRDA*.

distributed unit of work
A form of distributed relational database processing that enables a user or application program to read or update data at multiple locations within a unit of work. Within one unit of work, an application, such as QMF, running in one system can direct SQL requests to multiple remote database management systems using the SQL supported by those systems. The request is made through a QMF command that includes a three-part table or view name. QMF commands with three-part names cannot be directed to DB2 for VM or VSE databases or used when QMF for TSOhas been started as a Db2 for z/OS stored procedure. Three-part names in QMF commands also cannot refer to a table that contains large object (LOB) data types.

double-byte character set
See *DBCS*.

double-precision floating-point number
A 64-bit approximate representation of a real number.

DRDA (Distributed Relational Database Architecture)
The architecture that defines formats and protocols for providing transparent access to remote data. DRDA defines two types of functions: the application requester function and the application server function.

environment
A named collection of logical and physical resources used to support the performance of a function.

exit routine
A program that receives control from another program to perform specific functions.

Extensible Markup Language
See *XML*.

extended syntax
Syntax that is used for the QMF SET GLOBAL and GET GLOBAL commands and certain function calls. Extended syntax defines parameters used by QMF callable interface applications written in Assembler, C, COBOL, Fortran, or PL/I.

fallback
The process of returning to a prior release of a software program after attempting or completing migration to a current release.

fetch
The process of retrieving rows from the database or a file to create a QMF DATA object. QMF supports multirow fetch through the use of the DSQSMRFI parameter.

foreign key
In a relational database, a key in one table that references the primary key in another table.

GDDM (Graphical Data Display Manager)
Graphics software that defines and displays text and graphics for output on a display device or printer.

global variable
A named entity whose value persists for the duration of a QMF session. QMF uses global variables to manage both session and database activity. Some global variables can be set with the SET GLOBAL command, while others record information about the state of the current QMF session and therefore cannot be set.

graphic string
A sequence of double-byte character set (DBCS) characters.

Graphical Data Display Manager
See *GDDM*.

host
The controlling or highest-level system in a data communications configuration.

HTML (hypertext markup language)
A markup language that conforms to the Standard Generalized Markup Language (SGML) standard and was designed primarily to support the online display of textual and graphical information, including hypertext links.

hypertext markup language
See *HTML*.

ICU (Interactive Chart Utility)
A menu-driven component of IBM's Graphical Data Display Manager (GDDM) product that allows non-programmers to display, print, or plot charts, graphs, and diagrams.

identity column
A column that provides a way for the DB2 database manager to automatically generate a numeric value for each row that is inserted into a table. Identity columns are defined with the AS IDENTITY clause. A table can have no more than one identity column.

index
A set of pointers that is logically ordered by the values of a key. Indexes provide quick access to data and can enforce uniqueness of the key values for the rows in the table.

inner join
The result of a join operation that includes only the matched rows of both tables that are being joined. See also *outer join*.

installation verification procedure
See *IVP*.

Integrated Exchange Format
See *IXF*.

Interactive Chart Utility
See *ICU*.

Interactive System Productivity Facility
See *ISPF*.

ISPF (Interactive System Productivity Facility)
An IBM licensed program that serves as a full-screen editor and dialog manager. Used for writing application programs, it provides a means of generating standard screen panels and interactive dialogs between the application programmer and terminal user.

IVP (installation verification procedure)
A procedure or program whose purpose is to verify that a product has been correctly installed.

IXF (Integrated Exchange Format)
A protocol for transferring tabular data among various software products.

JCL (job control language)
A command language that identifies a job to an operating system and describes the job's requirements.

job control language
See *JCL*.

join
An SQL relational operation that allows retrieval of data from two or more tables based on matching column values.

key
A column or an ordered collection of columns that is identified in the description of a table, index, or referential constraint. The same column can be part of more than one key.

keyword
One of the predefined words of a programming language, artificial language, application, or command.

keyword parameter
A parameter that consists of a keyword followed by one or more values. See also *positional parameter*.

large object
See *LOB*.

link-edit
To create a loadable computer program by means of a linkage editor.

linkage editor
A computer program for creating load modules from one or more object modules or load modules by resolving cross-references among the modules and, if necessary, adjusting addresses.

literal
A character string whose value is defined by the characters themselves. For example, the numeric constant 7 has the value 7, and the character constant 'CHARACTERS' has the value CHARACTERS.

linear procedure
A sequenced set of QMF commands or command synonyms that can be used to perform several operations at once. See also *procedure with logic*.

linear syntax
QMF command syntax that is entered in one statement of a program or procedure, or that can be entered on the QMF command line.

load module
A program in a form suitable for loading into main storage for execution.

LOB (large object)
A sequence of bytes with a size ranging from 0 bytes to 2 gigabytes (less 1 byte). There are three LOB data types: binary large object (BLOB), character large object (CLOB, which can include single-byte characters only or a mixture of single-byte and double-byte characters), and double-byte character large object (DBCLOB). QMF supports a LOB column size of up to 32 KB.

local
Pertaining to databases, objects, or applications that are installed or stored in the system in which QMF is currently running.

location
A specific relational database server in a distributed relational database system. Each location has a unique location name.

location name
The unique name of a database server. An application uses the location name to access a DB2 database server.

lock
A means of serializing a sequence of events or serializing access to data.

log
A collection of records that sequentially describes the events that occur in a system.

LUW
An abbreviation for Linux, UNIX, and Windows.

National Language Feature
See *NLF*.

New Function Mode
See *NFM*.

NFM (New Function Mode)
An installation mode of QMF Version 8.1 and QMF Version 9.1 that allowed owner and object names in the QMF object catalog to be the maximum length allowed by the database. QMF Version 13 Release 1 allows owner and object names to be as long as the database allows as well. See also *CM*.

NLF (National Language Feature)
Any of several optional features available with QMF. NLFs allow users to interact with QMF in specific native languages.

object
A named storage space that consists of a set of characteristics that describe the space and, in some cases, data. An object is anything that occupies space in storage, can be located in a library or directory, can be secured, and on which defined operations can be performed. See also *QMF object*.

outer join
The result of a join operation that includes the matched rows of both tables that are being joined and preserves some or all of the unmatched rows of the tables that are being joined. See also *inner join*.

package
A control-structure database object produced during program preparation that can contain both executable forms of static SQL statements or XQuery expressions and placement holders for executable forms of dynamic SQL statements.

panel
A formatted display of information on a screen that can also include entry fields.

parameter
A value or reference passed to a function, command, or program that serves as input or controls actions. The value is supplied by a user or by another program or process.

partition
A portion of a page set. Each partition corresponds to a single, independently extendable data set. Partitions can be extended to a maximum size of 1, 2, or 4 gigabytes, depending on the number of partitions in the partitioned page set. All partitions of a given page set have the same maximum size.

plan
See *application plan*.

positional parameter
A parameter that must appear in a specified location, relative to other parameters. See also *keyword parameter*.

precision
An attribute of a number that describes the total number of significant digits.

predicate
An element of a search condition that expresses or implies a comparison operation.

primary authorization ID
The authorization identifier used to identify an application process to DB2 for z/OS.

primary key
In a relational database, a key that uniquely identifies one row of a database table.

privilege
In SQL, a capability given to a user by the processing of a GRANT statement.

procedure
A sequenced set of statements or commands used to perform one or more tasks. See also *linear procedure* and *procedure with logic*.

procedure with logic
A set of statements that performs one or more tasks. A procedure with logic begins with a REXX comment and allows conditional logic (which uses REXX), calculations, build strings, and TSO or CICS commands. See also *linear procedure*.

profile
An object that contains information about the characteristics of the user's session.

program temporary fix
See *PTF*.

prompted query
A menu-driven query controlled by user-provided parameters.

PTF (program temporary fix)
For System i®,System p, and System z®, products, a fix that is tested by IBM and is made available to all customers.

QBE (Query-by-Example)
A component of QMF that allows users to create queries graphically.

QMF administrator authority
Authority that allows a user to insert or delete rows in the Q.PROFILES control table. Users with this authority can perform the following commands on QMF queries, forms, and procedures that are owned by other users without forcing the owners to share these objects with all users: SAVE, ERASE, IMPORT, EXPORT, and DISPLAY. QMF checks each user ID for administrator authority during

initialization; you can disable this checking by setting the DSQEC_DISABLEADM variable in the DSQUOPTS exit routine or in another program of your choice.

QMF administrator
A user who has QMF administrator authority.

Query-by-Example
See *QBE*.

QMF object
An object used by QMF users to query, format, and present data or otherwise manage interaction between QMF and the database. QMF objects include queries and query result data, forms, procedures, reports, charts, and the QMF profile. Each QMF object has a named temporary storage area that is used to display the object. All objects except reports and charts can be saved in the database; reports and charts are created dynamically upon user request by applying the formatting specifications of a particular QMF form to result data that has been returned from the database. See also *temporary storage*.

QMF object catalog
A set of control tables that stores information about QMF queries, procedures, and forms. These control tables include Q.OBJECT_DIRECTORY, Q.OBJECT_DATA, and Q.OBJECT_REMARKS.

qualifier
When referring to a QMF object, the part of the name that identifies the owner or the location of an object. When referring to a TSO data set, any part of the name that is separated from the rest of the name by periods. For example, 'TCK', 'XYZ', and 'QUERY' are all qualifiers in the data set name 'TCK.XYZ.QUERY'.

query
A request for information from a database based on specific conditions: for example, a request for a list of all customers in a customer table whose balances are greater than $1000. In QMF, a query also refers to SQL statements submitted from the Prompted Query, QBE, or SQL query panel, even if these statements are not requests for information (SELECT statements).

RCT (resource control table)
A DB2 control table that defines the relationship between CICS transactions and DB2 resources.

RDBMS (relational database management system)
A collection of hardware and software that organizes and provides access to a relational database.

RDO (resource definition online)
In CICS, a facility that allows the user to define certain CICS resources interactively while CICS is running. Specifically, RDO allows the user to define terminals, programs, and transactions interactively.

record
The storage representation of a row or other data.

record length
The length of storage that represents a row or other data.

reentrant
Executable code that can reside in storage as one shared copy for all database threads. Reentrant code is not self-modifying and provides separate storage areas for each thread.

referential constraint
The requirement that the nonnull values of a designated foreign key are valid only if they also appear as values of the primary key of the parent table. The referential constraint is always defined from the perspective of the dependent file.

relational database
A database that can be perceived as a set of tables and manipulated in accordance with the relational model of data. Each database includes a set of system catalog tables that describe the logical and physical structure of the data, a configuration file containing the parameter values allocated for the database, and a recovery log with ongoing transactions and archivable transactions.

relational database management system
See *RDBMS*.

remote
Pertaining to databases, objects, or applications that are installed or stored on a system other than the system where QMF is currently executing. You can access objects (including QMF queries, forms, and procedures) at a remote server by using the QMF CONNECT command. You can also use a QMF command with a three-part table or view name if you want to access just tables or views at a remote location. Remote access is not permitted when QMF for TSO is running as a Db2 for z/OS stored procedure.

remote unit of work
A form of distributed relational database processing in which an application program, such as QMF, can access data on a remote database within a unit of work. The connection is established by the QMF CONNECT command. The CONNECT command cannot be used when QMF for TSO is running as a Db2 for z/OS stored procedure.

requester
See *application requester.*

resource
The object of a lock or claim, which could be a table space, an index space, a data partition, an index partition, or a logical partition.

resource control table
See *RCT*.

resource definition online
See *RDO*.

Restructured Extended Executor
See *REXX*.

REXX (Restructured Extended Executor)
A general-purpose, high-level programming language, particularly suitable for EXEC procedures or programs for personal computing.

roll back
To restore data that is changed by an SQL statement to the state at its last commit point. Changes made by all SQL statements in a multistatement query, except those that affect the QMF session (such as SET), are rolled back in the event of a failure.

routine
A program or sequence of instructions called by a program. Typically, a routine has a general purpose and is frequently used.

row
The horizontal component of a table, consisting of a sequence of values, one for each column of the table.

runtime variable
A variable in a procedure or query whose value is specified by the user when the procedure or query is run. The value of a runtime variable is only available in the current procedure or query. See also *global variable*.

SBCS (single-byte character set)
A coded character set in which each character is represented by a 1-byte code. A 1-byte code point allows representation of up to 256 characters. See also *double-byte character set*.

scalar function
An SQL function that optionally accepts arguments and that returns a single scalar value each time that it is invoked. A scalar function can be referenced in an SQL statement wherever an expression is valid.

scratchpad area
A work area used in conversational processing to retain information from an application program across executions of the program.

search condition
A criterion for selecting rows from a table. A search condition consists of one or more predicates.

secondary authorization ID
In DB2 for z/OS, an authorization identifier that is associated with a primary authorization ID by an authorization exit routine. See also *primary authorization ID*.

segmented table space
A table space that is divided into equal-sized groups of pages called segments. Segments are assigned to tables so that rows of different tables are never stored in the same segment. See also *table space*.

server
See *application server*.

session
All interactions between the user and QMF from the time the user invokes QMF until the EXIT command is issued.

shift-in character
A control character (X'0F') that is used in EBCDIC systems to denote that the subsequent bytes represent SBCS characters. See also *shift-out character.*

shift-out character
A control character (X'0E') that is used in EBCDIC systems to denote that the subsequent bytes, up to the next shift-in control character, represent DBCS characters. See also *shift-in character.*

single-byte character set
See *SBCS*.

single-precision floating-point number
A 32-bit approximate representation of a real number.

SQL (Structured Query Language)
A standardized language for defining and manipulating data in a relational database.

SQL authorization ID
See *SQLID*.

SQL connection
An association between an application process and a local or remote application server or database server. See also *remote unit of work*, *distributed unit of work*.

SQL function
A function that is implemented entirely by using a subset of SQL statements and SQL PL statements.

SQL ID (SQL authorization ID)
In DB2 for z/OS, the ID that is used for checking the authorization of dynamic SQL statements in some situations.

SQL return code
The SQLSTATE or SQLCODE that indicates whether the previously run SQL statement completed successfully, with one or more warnings, or with an error.

SQLCA (Structured Query Language Communication Area)
A set of variables that provides an application program with information about the execution of its SQL statements or requests from the database manager. When an error is associated with an SQL code, the QMF message help (available by pressing the Help key) displays the contents of the SQLCA.

stored procedure
A routine that can be invoked using the SQL CALL statement to perform operations that can include both host language statements and SQL statements.

stored procedure interface
An interface to QMF for TSO that allows you to start QMF as a Db2 for z/OS stored procedure, pass the name of a QMF query or procedure that performs the work you require, and receive up to 21 result sets back, including a result set for trace output. QMF for TSO can be started in this manner from any product that can run a Db2 for z/OS stored procedure.

Structured Query Language
See *SQL*.

Structured Query Language Communication Area
See *SQLCA*.

subquery
A complete SQL query that appears in a WHERE or HAVING clause of another query.

substitution variable
(1) A variable in a procedure or query whose value is specified either by a global variable or by a runtime variable. (2) A variable in a QMF form whose value is specified by a global variable.

substring
A part of a character string.

subsystem
In DB2 for z/OS, a distinct instance of a relational database management system (RDBMS).

table
In a relational database, a database object that consists of a specific number of columns and is used to store an unordered set of rows. See also *base table*.

table space
A logical unit of storage in a database. In DB2 for z/OS, a table space is a page set and can contain one or more tables. In Db2 for Linux, UNIX, and Windows, a table space is a collection of containers, and the data, index, long field, and LOB portions of a table can be stored in the same table space or in separate table spaces.

temporary storage
An area used to store a QMF object temporarily while the user is working on it so that, with each use, it can be readily accessed without further database retrieval. There are seven temporary storage areas: QUERY, DATA, FORM, PROC, REPORT, CHART, or PROFILE. With the exception of query result data (the DATA object), the QMF objects in these areas can be displayed using the SHOW command followed by the name of the storage area. Though the contents of the DATA area cannot be directly displayed, users can issue the SHOW REPORT or SHOW CHART commands to see the query result data formatted with the specifications of the form currently in the FORM area. See also *QMF object*, *current object*.

temporary storage queue
In CICS, a queue of data items which can be read and reread, in any sequence. The queue is created by a task, and persists until the same task or a another task deletes it. See also *transient data queue*.

thread
The DB2 structure that describes an application's connection, traces its progress, processes resource functions, and delimits its accessibility to DB2 resources and services. Most DB2 functions execute under a thread structure.

three-part name
The full name of a table, view, or alias that consists of a location name, an authorization identifier, and an object name, separated by periods. QMF commands that include three-part names can be initiated only from Db2 for z/OS databases and can be directed to all databases except DB2 for VM or VSE. When QMF for TSO has been started as a Db2 for z/OS stored procedure, QMF commands with three-part names are not supported.

Time Sharing Option
See *TSO*.

trace
A record of the processing of a computer program or transaction. The information collected from a trace can be used to assess problems and performance.

transaction
A unit of processing consisting of one or more application programs, affecting one or more objects, that is initiated by a single request.

transient data queue
A CICS storage area where objects are stored for subsequent internal or external processing. See also *temporary storage queue*.

trigger
A database object that is associated with a single base table or view and that defines a rule. The rule consists of a set of SQL statements that runs when an insert, update, or delete database operation occurs on the associated base table or view.

TSO (Time Sharing Option)
A base element of the z/OS operating system that allows users to work interactively with the system.

two-phase commit
A two-step process by which recoverable resources in an external subsystem are committed. During the first step, the database manager subsystems are polled to ensure that they are ready to commit. If all subsystems respond positively, the database manager instructs them to commit.

UDF (user-defined function)
A function that is defined to the DB2 database system by using the CREATE FUNCTION statement and that can be referenced thereafter in SQL statements. A UDF can be an external function or an SQL function.

Unicode
A character encoding standard that supports the interchange, processing, and display of text that is written in the common languages around the world, plus some classical and historical texts. The Unicode standard has a 16-bit character set defined by ISO 10646.

unit of work
A recoverable sequence of operations within an application process. At any time, an application process is a single UOW, but the life of an application process can involve many UOWs as a result of commit or rollback operations. In a multisite update operation, a single UOW can include several units of recovery. In QMF SQL queries that include multiple statements, all statements comprise a single unit of work, so all statements except those that affect the session (such as SET) are rolled back in the event of a failure.

user-defined function
See *UDF*.

view
A logical table that is based on data stored in an underlying set of tables. The data returned by a view is determined by a SELECT statement that is run on the underlying tables.

XML (Extensible Markup Language)
A standard metalanguage for defining markup languages that is based on Standard Generalized Markup Language (SGML).

z/OS
An IBM mainframe operating system that uses 64-bit real storage.

Index

Special Characters

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Product Number: 5698-DB2
5698-DB2
5698-DB2

SC28-2793-00