

WANG

VS

EZQUERY Reference

VS **EZQUERY Reference**

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This manual replaces and makes obsolete the second edition of the *VS EZQUERY Reference* (800-1129-02).

PREFACE

This document is a reference guide to the Wang VS EZQUERY facility. EZQUERY provides both the nonprogramming professional and the data processing programmer/analyst with an easy-to-use, interactive method of retrieving and updating data on the VS. EZQUERY enables you to define data bases that consist of one or more DMS (Data Management System) data files and to process queries against those data bases.

This manual is organized in the following way:

- Chapter 1 provides a brief introduction to the EZQUERY facility.
- Chapter 2 presents an overview of EZQUERY processing. It also provides details about data base specification and function selection in EZQUERY.
- Chapter 3 describes query formulation.
- Chapter 4 describes query execution.
- Chapter 5 discusses the characteristics of EZQUERY data bases and describes the process of defining a data base or modifying an existing one.
- Chapter 6 presents the characteristics of EZQUERY record description files. It describes in detail the process of defining a record description file or modifying an existing one.
- Chapter 7 provides a detailed reference to the screen objects, components, and syntax rules of the EZQUERY language.
- Appendix A gives an overview of GETPARM processing and lists EZQUERY GETPARMs.
- Appendix B describes the sample data base included with EZQUERY.
- Appendix C lists the EZQUERY error codes and messages.
- Appendix D describes the record formats of record description files.
- Appendix E discusses the Replace Query utility. It generates a procedure that converts queries created by previous versions of EZQUERY to validated queries.

This manual is intended for all levels of users. You should be familiar with the VS environment, as described in the VS Programmer's Introduction (800-1101). The VS Introduction to EZQUERY (800-1337) provides an introduction to the basic features and facilities of EZQUERY and to the types of data retrieval it makes available. In addition, topics treated in the following manuals may be helpful to the discussion of particular EZQUERY functions:

<u>VS VS/Report User's Manual</u>	800-1319
Describes the use of the VS/Report facility	
<u>VS File Management Utilities Reference</u>	800-1308
Describes the use of the VS File Management Utilities (e.g., CONTROL, DATENTRY, REPORT)	
<u>VS Procedure Language Reference</u>	800-1205
Describes the syntax of the VS Procedure language and the use of the Procedure Interpreter	
<u>VS Program Development Tools Reference</u>	800-1307
Describes the use of the VS Program Development Tools (e.g., EDITOR, LINKER, DEBUGGER)	
<u>VS Operating System Services Reference</u>	800-1107
Describes the VS Operating System and the Data Management System (DMS)	
<u>VS Programmer's Guide to VS/IIS</u>	800-1304PW
Describes the VS/IIS Document Access subroutines and the VS/IIS utilities	

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CHAPTER 1 INTRODUCTION TO EZQUERY

1.1 OVERVIEW

EZQUERY is a Wang VS facility that provides an easy-to-use, interactive method of retrieving and updating data without using a programming language. The EZQUERY language is a powerful relational query language that allows both the nonprogramming professional and the data processing programmer/analyst to access information easily.

Through EZQUERY, you perceive data as a collection of tables. Each table corresponds to a record description file and associated data file. The record description file defines the attributes of the data file. The columns of the table correspond to the fields in the data file, and the rows represent the actual records in the data file. A particular collection of tables is a data base. This relational data model frees you from the need to understand the physical structure of the data base. EZQUERY provides a function that enables you to define new EZQUERY data bases or modify existing ones.

Retrieving data by formulating and executing queries is the heart of the EZQUERY facility. A query is a request for information from one or more data base tables. You formulate a query by entering the conditions for data retrieval in tables displayed on the screen. When a query is executed, EZQUERY displays the requested data in an answer table. From the answer table, you can edit the query results, select the type of output for the answer, or update the information in the data base table.

Two methods of query definition, the menu method and the syntax method, enable EZQUERY to accommodate users with a wide range of experience. The menu method furnishes the nonprogramming professional with a simple, yet powerful, means of defining conditions for data retrieval. The syntax method provides the programmer/analyst with a fast and easy way to request information, without the need for lengthy application code or knowledge of the data base's internal structure.

1.2 SUMMARY OF EZQUERY FEATURES

A summary of the significant features of EZQUERY follows.

- Data Inquiry You can select and retrieve information down to the individual data item level by formulating and executing queries.

- **Data Update** EZQUERY allows unambiguous update of the data base at the record level. Data update can involve modifying records, deleting records, or inserting new records into the data base. You modify the data in a table displayed on the screen and update the data base from the modified table.

- **Data Base Definition** Through EZQUERY, you can interactively define and manage data bases that consist of one or more record description files and associated data files.

- **Multiple Question Queries** A query consists of 1 to 16 individually defined questions. Each question is a request for information from the data base. The results of one question can serve as the basis for subsequent questions within the same query. EZQUERY thus provides the ability to narrow the scope of an inquiry to progressively smaller subsets of the data base.

- **Stored Queries** EZQUERY allows you to store queries for future execution or editing. The ability to store queries reduces data access time and brings the full power of EZQUERY to all users.

- **Editing of Query Results** EZQUERY allows you to select and sort columns from one or more data base tables to provide the answer to a query. You can thus customize EZQUERY output to meet the needs of a particular application, without affecting the contents of the data base tables.

- **Output Selection** EZQUERY displays the results of a query on the screen. You also have the option to perform one or more of the following:
 - Store the query results in a DMS (Data Management System) file
 - Print the query or the query and answer
 - Create a word processing document or a word processing merge document from the query results

- Enter the VS/Report facility (if your system includes it) or the REPORT utility to report on the query results

- EZQUERY HELP
EZQUERY HELP is available at almost any point in EZQUERY processing. Through EZQUERY HELP, you can review the attributes of the tables and the stored queries associated with the data base.
- EZQUERY through a Procedure
The VS Procedure language allows the procedure writer to specify the information needed to initiate an EZQUERY session. The ability to run stored queries through a procedure is particularly valuable because it reduces input required from the user to a minimum.

1.3 OPERATING ENVIRONMENT

The EZQUERY facility runs on Release 5.1 and all subsequent releases of the VS Operating System. No additional hardware is required for EZQUERY operations.

EZQUERY is fully compatible with indexed or consecutive DMS files. A data file can contain single or multiple record types. Chapter 6 discusses the definition and interpretation of data files in EZQUERY.

1.4 EXECUTING EZQUERY FROM A PROCEDURE

EZQUERY is particularly well suited to execution from a procedure. The VS Procedure language enables the procedure writer to automate a sequence of EZQUERY operations and to supply required parameters. Thus, the interaction of the user with EZQUERY can be controlled precisely. When executing a stored query from a procedure, for example, you need not see any screen before the one on which EZQUERY displays the query results.

A sample procedure that runs EZQUERY in background follows. This procedure enters EZQUERY, specifies the data base and volume names, modifies the data base access, executes a stored query, prints the query results, and exits EZQUERY.

```
PROCEDURE
RUN EZQUERY
ENTER DATABASE DATABASE = DEMO, VOLUME = SYSTEM
ENTER FUNCTION 6
ENTER ACCESS ACCESS = PRIVATE
ENTER FUNCTION 4
ENTER QUERY QUERY = QOSTOCK, DISPLAY = NO, PRINTANS = YES
ENTER OPTIONS
ENTER FUNCTION 16
RETURN
```

Appendix A lists all EZQUERY GETPARMs. For further information about the VS Procedure language and the use of GETPARM requests, refer to the VS Procedure Language Reference.

1.5 EZQUERY EXAMPLE

To provide you with practice in formulating and executing queries, EZQUERY includes a sample data base named DEMO. The examples that appear throughout this manual are drawn from this data base.

DEMO contains information about a hypothetical brokerage firm, and it consists of the following tables and columns:

<u>Table Name</u>	<u>Column Name</u>	<u>Contents</u>
BROKER	BROKER	Identification number of broker
	FIRST	First name
	LAST	Last name
	SALARY	Salary
	MANAGER	Identification number of manager
CLIENT	ACCOUNT	Identification number of client
	FIRST	First name
	LAST	Last name
	CITY	City
	STATE	State
	BROKER	Identification number of broker
HOLDINGS	ACCOUNT	Identification number of client
	SYMBOL	Unique trading symbol of stock owned by client
	QUANTITY	Number of shares owned
	BUY-DATE	Purchase date
	BUY-PRICE	Purchase price
STOCKS	SYMBOL	Unique trading symbol of stock
	NAME	Full name of stock
	PRICE	Current price of stock
	DIVIDEND	Dividend of stock

The BROKER and CLIENT tables contain personal information about the brokers and their clients. If a broker is also a client, the same number identifies the broker and the broker's account.

The HOLDINGS table describes the stock portfolios of the clients. Each row represents a stock that a particular client owns. A client purchases all shares of a particular stock on one day at one price.

The STOCKS table contains current price and dividend information about the stocks owned by the firm's clients.

Appendix B describes these tables and displays the actual data in tabular format.

CHAPTER 2 RUNNING EZQUERY

2.1 INTRODUCTION

The EZQUERY facility consists of two major functions, the Manage Data Base function and the Query function. The Manage Data Base function enables you to define and manage data bases that consist of one or more DMS files. The Query function enables you to retrieve and update the information in those data bases.

This chapter provides an overview of the Query function. Chapters 3 and 4 describe in detail query formulation and execution. For a detailed discussion of the Manage Data Base function, refer to Chapters 5 and 6.

2.2 THE SPECIFY DATA BASE SCREEN

When you enter the EZQUERY facility, the Specify Data Base screen prompts you to specify the names of a data base and its volume and to select the action that you want to perform on the data base. Figure 2-1 illustrates the Specify Data Base screen. The functions available from the Specify Data Base screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
ENTER	Query	Allows you to retrieve and update the information in the specified data base.
1	Manage	Allows you to define a data base or to manage an existing data base.
16	Exit	Ends EZQUERY processing.

*** MESSAGE 0001 BY QUERY

INFORMATION REQUIRED BY PROGRAM EZQUERY
TO DEFINE DATABASE

*** EZQUERY - WANG VS Integrated Data Base Query Product ***

The WANG VS Integrated Data Base Query Product (EZQUERY) enables a user to define data bases that consist of one or more DMS files, and to retrieve and update information in these data bases.

Please specify the name and volume of the data base:

DATABASE = DEMO** on VOLUME = ZENITH

select a function and press the appropriate PF key:

(ENTER) QUERY - process a query
(1) MANAGE - manage data base definition
(16) EXIT - end EZQUERY processing

Figure 2-1. The Specify Data Base Screen

To retrieve and update the information in a data base, specify the names of the data base and its volume and press ENTER. The name and volume that you specify must correspond to a defined data base. The Specify Data Base screen displays default values for the data base and volume names under the following circumstances:

- If, before entering the Query function, you managed the definition of a data base, the Specify Data Base screen displays the names of that data base and its volume as default values.
- If a default input volume has been defined through the Set Usage Constants command, the Specify Data Base screen displays its name as the default value for the data base's volume. For example, in Figure 2-1, ZENITH is the default input volume.

You can accept the default values or enter new values in the pseudoblanks. If you press ENTER from the Specify Data Base screen, EZQUERY establishes access to the specified data base by retrieving its definition.

2.3 OVERVIEW OF EZQUERY PROCESSING

EZQUERY allows you to retrieve and update the information in one data base at a time. After specifying the data base, you can formulate a new query, reformulate or run a stored query, create a data file, modify the access to the data base tables, rename or delete a stored query, or enter the EZQUERY HELP facility to examine the tables and queries associated with the data base.

Figure 2-2 gives an overview of EZQUERY processing. The actual flow of EZQUERY processing, from screen to screen according to the options selected, is shown in Figure 2-3.

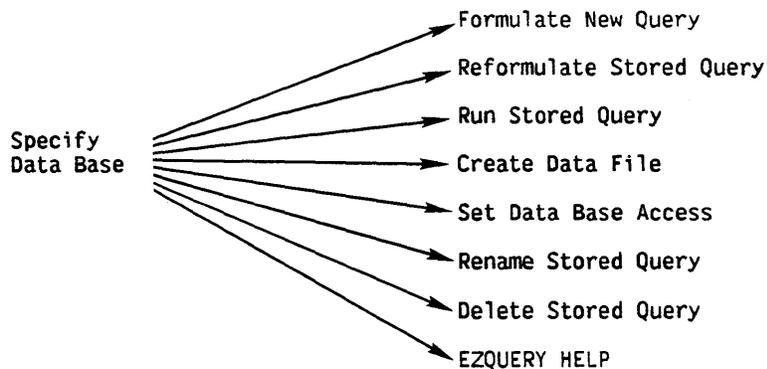


Figure 2-2. Logical Sequence in EZQUERY Processing

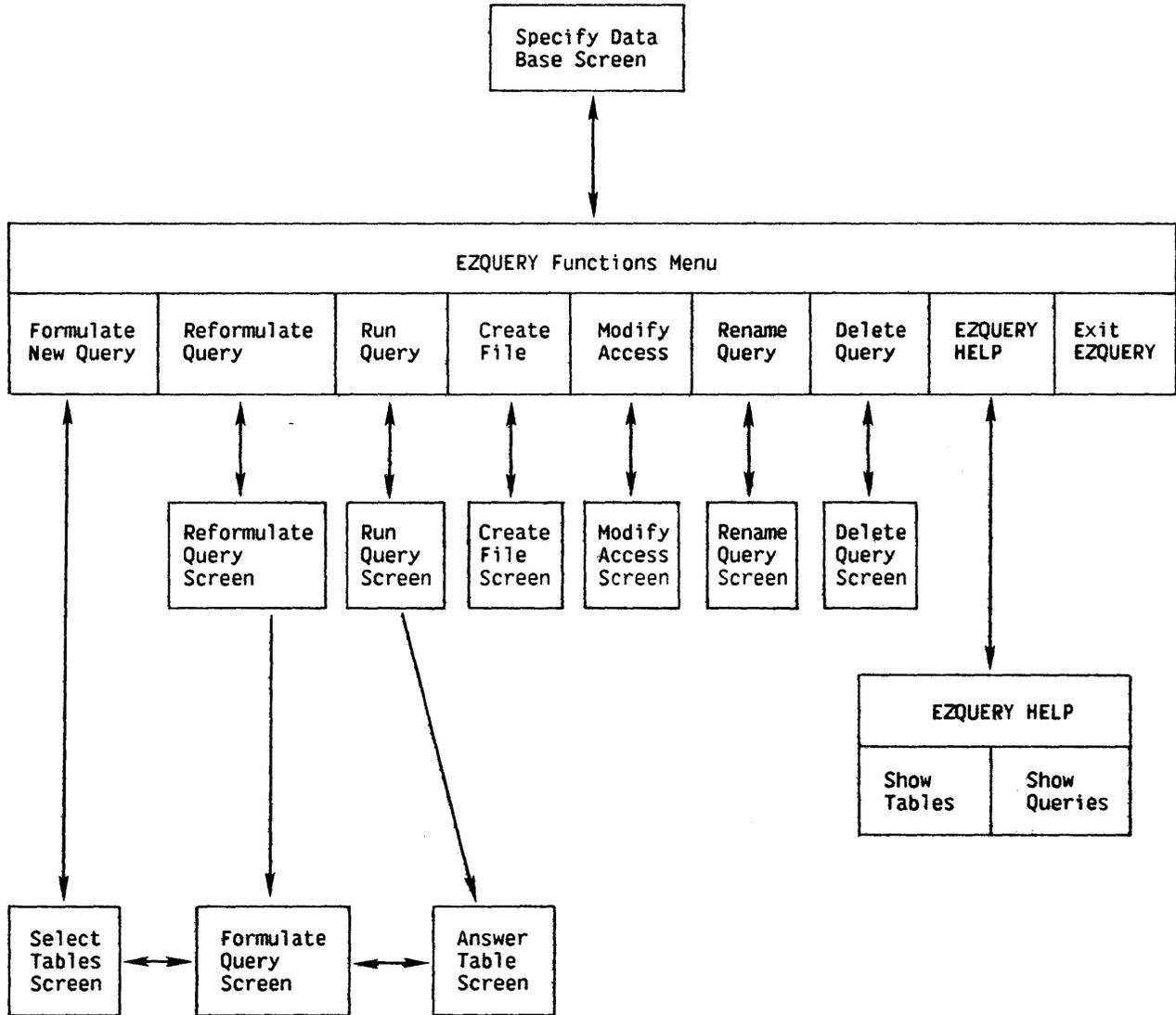


Figure 2-3. Screen Display Sequence in EZQUERY Processing

2.4 THE EZQUERY FUNCTIONS MENU

After specifying a data base, you select a function from the EZQUERY Functions menu. Figure 2-4 illustrates the EZQUERY Functions menu.

*** MESSAGE 0002 BY QUERY

INFORMATION REQUIRED BY PROGRAM EZQUERY
TO DEFINE FUNCTION

DATA BASE: DEMO VOLUME: ZENITH ACCESS: SHARED - I and others can update

Please select a function and press the appropriate PF key:

- (1) RETURN - return to respecify data base name
- (2) FORMULATE - define a new query
- (3) REFORMULATE - review and make changes to an existing query
- (4) RUN - execute an existing query
- (5) CREATE - create the file for a data base table
- (6) SET ACCESS - set data base access
- (7) RENAME - rename an existing query
- (8) DELETE - delete an existing query
- (13) HELP - summon EZQUERY HELP
- (16) EXIT - end EZQUERY processing

Figure 2-4. The EZQUERY Functions Menu

The functions available from the EZQUERY Functions menu are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Specify Data Base screen. EZQUERY relinquishes control of the data base at this point.
2	Formulate	Allows you to formulate a new query. For more information, refer to Section 2.5.
3	Reformulate	Allows you to review and modify a stored query. For more information, refer to Section 2.7.
4	Run	Allows you to execute a stored query. For more information, refer to Section 2.8.
5	Create	Allows you to create an empty DMS file that corresponds to a table in the data base. For more information, refer to Section 2.9.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
6	Set Access	Allows you to specify the access to all data base tables during the execution of a query. For more information, refer to Section 2.10.
7	Rename	Allows you to rename a stored query. For more information, refer to Section 2.11.
8	Delete	Allows you to delete a stored query. For more information, refer to Section 2.12.
13	EZQUERY HELP	Enters the EZQUERY HELP facility. Through EZQUERY HELP, you can review the attributes of the tables and the stored queries associated with the data base. For more information, refer to Section 2.13.
16	Exit	Ends EZQUERY processing. EZQUERY relinquishes control of the data base at this point.

While formulating or executing a query, you can return to the EZQUERY Functions menu by pressing PF16 from the Question menu or the Answer menu. (Section 3.11 discusses the Question menu; Section 4.7 discusses the Answer menu.) EZQUERY then ends that query, and you can select another function, specify another data base, or end EZQUERY processing.

2.5 FORMULATING A NEW QUERY

To formulate a new query, press PF2 from the EZQUERY Functions menu. EZQUERY then displays the Select Tables screen for the first question in the query, and you can begin to define that question. You formulate a new query by defining its questions one at a time. For detailed information about table selection and question definition in EZQUERY, refer to Chapter 3.

2.6 STORED QUERIES

EZQUERY allows you to store queries for future execution or editing. By storing queries, you can formulate a routine query once and execute it whenever you need the information. For example, you might want to formulate a query that retrieves the name, number of shares, and current price of the stocks owned by a broker's clients and then execute that query on a monthly basis. The ability to store queries also reduces data access time and brings the full power of EZQUERY to all users. To execute a stored query, you need to know only its name.

A stored query corresponds to a file in the library @dbnameQ, where dbname is the data base name (e.g., @DEMOQ). A stored query can have two other files associated with it: a file in the library @dbnameC and a file in the library @dbnameL. The file in the library @dbnameC contains a record description file for the answer to the query. VS/Report uses this file to create a COBOL Copylib file in the library @dbnameL. (For more information about VS/Report, refer to the VS VS/Report User's Manual.) The files have the same name as the stored query.

A validated query is a query for which EZQUERY creates files in the libraries @dbnameQ and @dbnameC. The Replace Query utility (REPLACEQ) generates a procedure that converts queries created by previous versions of EZQUERY to validated queries. Appendix E describes the Replace Query utility.

2.7 REFORMULATING A STORED QUERY

To reformulate a stored query, press PF3 from the EZQUERY Functions menu. The Reformulate Query screen then prompts you to specify the name of the query that you want to reformulate. Through EZQUERY HELP, you can obtain a list of the stored queries available to a data base. Figure 2-5 illustrates the Reformulate Query screen.

```
*** MESSAGE 0002 BY QUERY

                INFORMATION REQUIRED BY PROGRAM EZQUERY
                TO DEFINE QUERY

DATA BASE: DEMO      VOLUME: ZENITH      ACCESS: SHARED - I and others can update

Please specify the name of the query you wish to review and optionally modify,
and press ENTER:

                QUERY      = *****

Please specify YES or NO for each question.
Display Answer Table?   DISPLAY = YES
Print Answer Table?     PRINTANS = NO*   (Includes stored Query)
Print stored Query?     PRINTQRY = NO*   (Excludes Answer Table)

Or select an alternate function and press the appropriate PF key:
(1) RETURN - return to select EZQUERY function
(13) HELP  - summon EZQUERY HELP
(16) EXIT  - end EZQUERY processing
```

Figure 2-5. The Reformulate Query Screen

The Reformulate Query screen allows you to specify the output for the query that you are reformulating. You can direct EZQUERY to display the query results on the screen, to print the query and answer, or to print only the query. The three questions that you must answer to define the query output are summarized below.

<u>Question</u>	<u>YES Answer</u>
Display answer table?	Directs EZQUERY to display the query results on the screen when you execute the query. The default answer is YES.
Print answer table?	Directs EZQUERY to print the query and answer. First execute the query and press PF16 from the Answer menu to end the query. The Print Options screen then prompts you to specify the print file for the query and answer. The default answer is NO.
Print stored query?	Directs EZQUERY to print the query. When you execute the query, the Print Options screen prompts you to specify its print file. The default answer is NO.

If you answer YES to both the second and third questions, EZQUERY prints the query as well as the query and answer. Thus, the Print Options screen appears twice -- first to define the print file for the query and then to define the print file for the query and answer.

If you press ENTER from the Reformulate Query screen, EZQUERY displays the first question of the specified query on the Formulate Query screen. You can then review and modify that question, or you can use the Manage Questions function to navigate through the query. The other functions available from the Reformulate Query screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the EZQUERY Functions menu.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.
16	Exit	Ends EZQUERY processing. EZQUERY relinquishes control of the data base at this point.

2.7.1 The Print Options Screen

If you choose to print the query or the query and answer, the Print Options screen prompts you to specify the names of the file, library, and volume for the print file and to define its format. Figure 2-6 illustrates the Print Options screen.

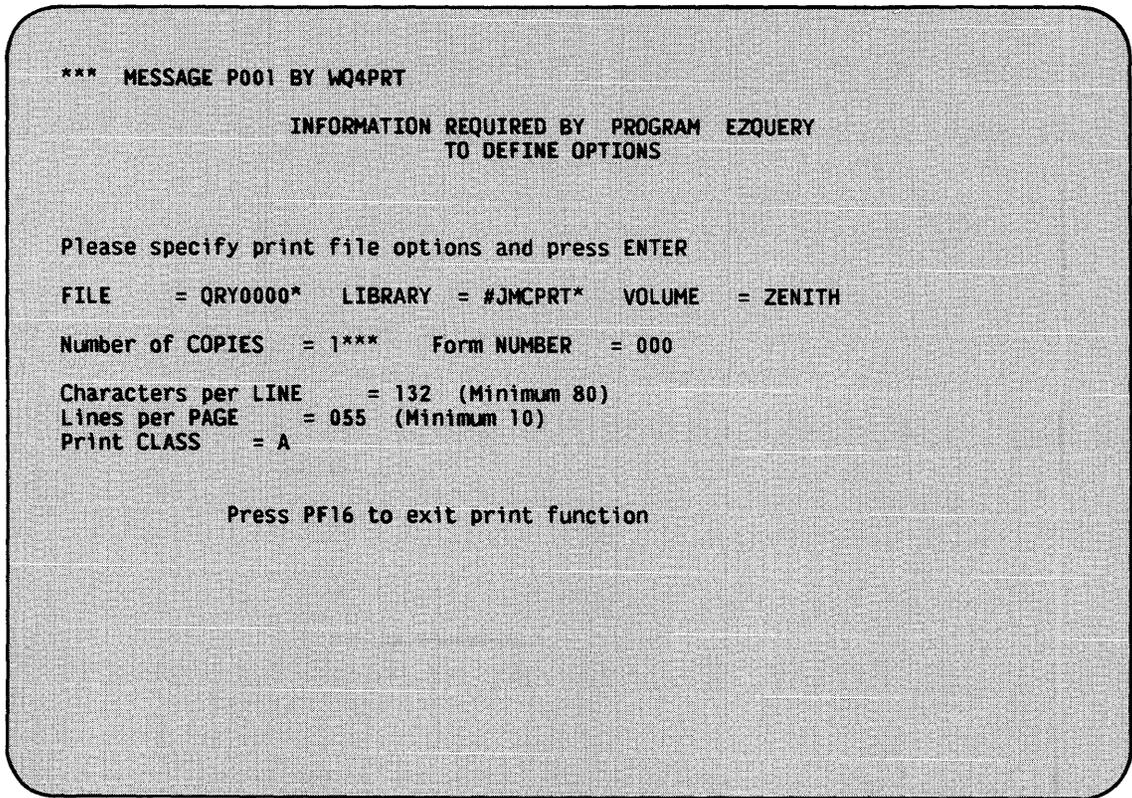


Figure 2-6. The Print Options Screen

The Print Options screen displays the following default values for the name, library, and volume of the print file:

<u>Name</u>	<u>Default Value</u>
File	The query name if you are printing a stored query; a unique name generated by EZQUERY if you are printing a new query.
Library	The value defined for SPOOLIB through the Set Usage Constants command.
Volume	The value defined for SPOOLVOL through the Set Usage Constants command.

You can accept these defaults or enter new values in the pseudoblanks. A file or library name consists of one to eight characters; the volume that you specify must be mounted on the system.

To define the format of the print file, you specify the following characteristics:

<u>Characteristic</u>	<u>Description</u>
Number of Copies	The number of copies to be printed. You can print a minimum of 1 and a maximum of 9999 copies. The default is 1.
Form Number	The form type used to print the file. The possible form numbers are 000 through 254. The default is the value defined for FORM# through the Set Usage Constants command.
Characters per Line	The number of characters to be printed on a line. The minimum number of characters per line is 80, and the maximum is 999. The default is 132.
Lines per Page	The number of lines to be printed on each page. The minimum number of lines per page is 10, and the maximum is 999. The default is the value defined for LINES through the Set Usage Constants command.
Print Class	The print class of the print file. The print class determines which printers can print the file. The possible print classes are A through Z. The default is the value defined for PRTCLASS through the Set Usage Constants command.

For more information about the Set Usage Constants command, refer to the VS Programmer's Introduction.

After specifying the print file and its format, press ENTER. EZQUERY then prints the query or the query and answer. Figure 3-23 gives an example of a printed query; Figures 4-19 and 4-20 give an example of a printed query and answer. To exit the Print Options screen without printing the query or the query and answer, press PF16.

While formulating or executing a query, you can also access the Print Options screen. To print the query, press PF15 from the Question menu; refer to Section 3.11.3 for more information. To print the query and answer, press PF15 from the Answer menu; refer to Section 4.7.7 for more information.

2.8 EXECUTING A STORED QUERY

To execute a stored query, press PF4 from the EZQUERY Functions menu. The Run Query screen then prompts you to specify the name and output of the query that you want to execute. Through EZQUERY HELP, you can obtain a list of the stored queries available to a data base. The types of output available from the Run Query screen are identical to those available from the Reformulate Query screen. Figure 2-7 illustrates the Run Query screen.

```
*** MESSAGE 0002 BY QUERY

                INFORMATION REQUIRED BY PROGRAM EZQUERY
                TO DEFINE QUERY

DATA BASE: DEMO      VOLUME: ZENITH    ACCESS: SHARED - I and others can update

Please specify the name of the query you wish to execute,
and press ENTER:

                QUERY = *****

Please specify YES or NO for each question.
Display Answer Table?  DISPLAY = YES
Print Answer Table?   PRINTANS = NO* (Includes stored Query)
Print stored Query?   PRINTQRY = NO* (Excludes Answer Table)

Or select an alternate function and press the appropriate PF key:
(1) RETURN - return to select EZQUERY function
(13) HELP  - summon EZQUERY HELP
(16) EXIT  - end EZQUERY processing
```

Figure 2-7. The Run Query Screen

If you press ENTER from the Run Query screen, EZQUERY executes the specified query and produces the output that you specify. The other functions available from the Run Query screen are identical to those available from the Reformulate Query screen.

2.9 CREATING A DATA FILE

The Create File screen enables you to create an empty data file that corresponds to a data base table. After creating such a file, you can update the data base to enter data into the file; Section 4.5 explains how to update the data base. To access the Create File screen, press PF5 from the EZQUERY Functions menu. Figure 2-8 illustrates the Create File screen.

*** MESSAGE 0002 BY QUERY

INFORMATION REQUIRED BY PROGRAM EZQUERY
TO DEFINE QUERY

DATA BASE: DEMO VOLUME: ZENITH ACCESS: SHARED - I and others can update

Please specify the table for which you want to create the data base file,
and press ENTER:

TABLE = *****

Or select an alternate function and press the appropriate PF key:

- (1) RETURN - return to select EZQUERY function
- (13) HELP - summon EZQUERY HELP
- (16) EXIT - end EZQUERY processing

Figure 2-8. The Create File Screen

The Create File screen prompts you to specify the name of the data base table. The table that you specify must belong to the data base. A data file must also be associated with the data base table. Through EZQUERY HELP, you can review the names and data file associations of the data base tables.

If you then press ENTER, EZQUERY creates an empty data file with the name, library, and volume specified for the data file. If such a file already exists, EZQUERY displays a screen that prompts you to respecify the file name or to press PF3 to scratch the existing file. After creating the data file, EZQUERY returns you to the EZQUERY Functions menu.

NOTE

If you choose to respecify the file name rather than scratch the existing data file, EZQUERY continues to associate the original data file with the data base table. To associate the new, empty data file with that table, you must modify the data base contents list through the Manage Data Base function.

The other functions available from the Create File screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns you to the EZQUERY Functions menu without creating a file.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.
16	Exit	Ends EZQUERY processing. EZQUERY relinquishes control of the data base at this point.

2.10 DATA BASE ACCESS

EZQUERY allows you to specify the type of access to all data base tables during the execution of a query. A data base table corresponds to a DMS data file (or a record type in a multiple record type data file). The organization of a data file is indexed or consecutive. The operations that you and other users can perform on a particular data base table are determined by the type of access and the organization of the corresponding data file.

EZQUERY supports the following types of data base access:

<u>Data Base Access</u>	<u>Description</u>
Shared	You and other users can update. Shared access maximizes concurrent write and read access to the data base. You can read all data base tables, update tables (i.e., modify, append, and delete records) if the corresponding data files are indexed, and append records if the corresponding data files are consecutive. Other users can read tables if the corresponding data files are indexed and if their access is Limited or Shared; the access must be Shared to allow them to update the tables. Other users cannot access the tables if the corresponding data files are consecutive.

Data Base Access

Description

Private

You can update. Other users cannot read or update.

Private access maximizes the efficient access of one user to the data base. You can read all data base tables, update tables if the corresponding data files are indexed, and append records if the corresponding data files are consecutive. Other users cannot access the data base tables.

Limited

You cannot update, but other users can.

Limited access maximizes concurrent read and write access to the data base, but prevents the current user from updating the data base. You can read but not update all data base tables. Other users can read tables under the following conditions:

- The corresponding data files are indexed, and their access is Limited or Shared.
- The corresponding data files are consecutive, and their access is Limited or Readonly.

Other users can update tables if the corresponding data files are indexed and if their access is Shared. Other users cannot update tables if the corresponding data files are consecutive.

Readonly

You and other users cannot update.

Readonly access maximizes concurrent and efficient read only access to the data base. You can read all data base tables. Other users can read tables under the following conditions:

- The corresponding data files are indexed, and their access is Readonly.
- The corresponding data files are consecutive, and their access is Limited or Readonly.

No one can update the data base tables.

Table 2-1 summarizes the relationship between the access that you specify, the data file organization, and the EZQUERY operations of retrieval and update.

Table 2-1. EZQUERY Access to Data Files

Access	Data Retrieval		Data Update	
	Consecutive Files	Indexed Files	Consecutive Files*	Indexed Files
Shared	X	X	X	X
Private	X	X	X	X
Limited	X	X		
Readonly	X	X		
* You can append, but not modify or delete, records in consecutive files.				

2.10.1 Data Base Access and DMS Open Modes

The specified access, in conjunction with the file organization, determines the DMS Open mode of a particular data file. (For more information about DMS Open modes, refer to the VS Operating System Services Reference.) Table 2-2 summarizes the relationship between the data base access and the DMS Open modes of the associated data files.

Table 2-2. Data Base Access and DMS Open Modes

Data Base Access	Indexed Files	Consecutive Files
Shared	Shared	Extend
Private	I0	Extend
Limited	Shared	Input
Readonly	Input	Input

A data file is not opened until you execute a query that uses the associated data base table. If a query consists of more than one question, the file is not opened until the first question that uses the associated data base table is executed. If another user already has a file open in an incompatible DMS Open mode, EZQUERY informs you that there is a possession conflict.

After a file is opened, it remains open until one of the following conditions occurs:

- You exit EZQUERY. All data files are closed.
- You return to the Specify Data Base screen. All data files are closed.
- You change the access to the data base. The files that are currently open remain open in their current DMS Open mode. When you next execute a query that uses a table associated with an open data file, the file is first closed and then opened according to the current access.

The number of files that you can open is limited by the Segment 2 size and an Operating System parameter. The maximum number of open files defaults to 25 files.

2.10.2 Modifying the Data Base Access

To modify the data base access (if modification is allowed), press PF6 from the EZQUERY Functions menu. The Modify Access screen then prompts you to specify the data base access and to press ENTER. Through the Manage Data Base function, you can set the default access for a data base and specify whether individual users can modify the access; refer to Section 5.3.4 for more information. To return to the EZQUERY Functions menu without modifying the access, press PF16. Figure 2-9 illustrates the Modify Access screen.

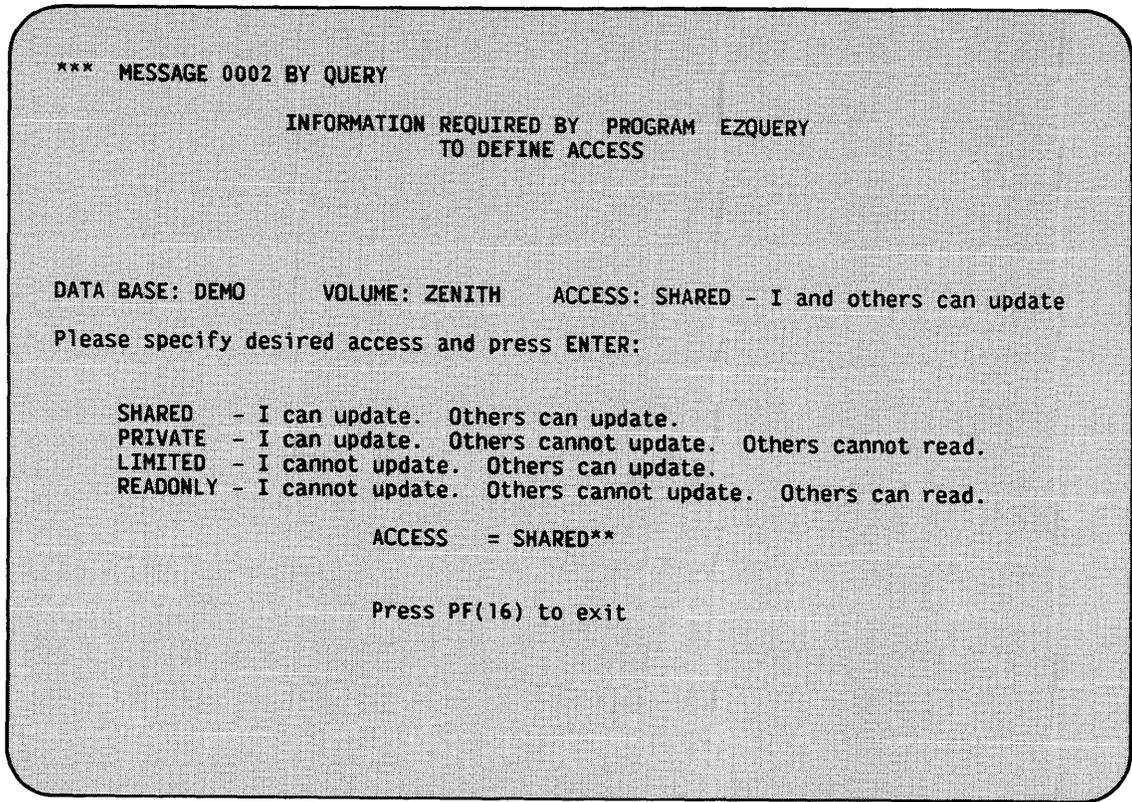


Figure 2-9. The Modify Access Screen

2.11 RENAMING A STORED QUERY

To rename a stored query, press PF7 from the EZQUERY Functions menu. The Rename Query screen then prompts you to enter the name of the query you want to rename and its new name. Figure 2-10 illustrates the Rename Query screen.

If you press ENTER from the Rename Query screen, EZQUERY first copies the files associated with the query in the libraries @dbnameQ, @dbnameC, and @dbnameL (if they exist) to files with the new query name. After copying the files, EZQUERY deletes the files associated with the old query name. For example, if, as in Figure 2-10, you rename the query LT1000 to BROKERS, EZQUERY replaces the files named LT1000 in the libraries @DEMOQ, @DEMOC, and @DEMOL (if they exist) with files named BROKERS. EZQUERY displays a message if it is unable to complete the renaming process.

*** MESSAGE 0002 BY QUERY

INFORMATION REQUIRED BY PROGRAM EZQUERY
TO DEFINE RENAME

DATA BASE: DEMO VOLUME: ZENITH ACCESS: SHARED - I and others can update

Please specify the old and new name of the query you wish to rename,
and press ENTER:

OLDNAME = LT1000**
NEWNAME = BROKERS*

Or select an alternate function and press the appropriate PF key:

- (1) RETURN - return to select EZQUERY function
- (13) HELP - summon EZQUERY HELP
- (16) EXIT - end EZQUERY processing

Figure 2-10. The Rename Query Screen

The other functions available from the Rename Query screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the EZQUERY Functions menu.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.
16	Exit	Ends EZQUERY processing. EZQUERY relinquishes control of the data base at this point.

2.12 DELETING A STORED QUERY

To delete a stored query, press PF8 from the EZQUERY Functions menu. The Delete Query screen then prompts you to enter the name of the query you want to delete and to press ENTER. The other functions available from the Delete Query screen are identical to those available from the Rename Query screen. Figure 2-11 illustrates the Delete Query screen.

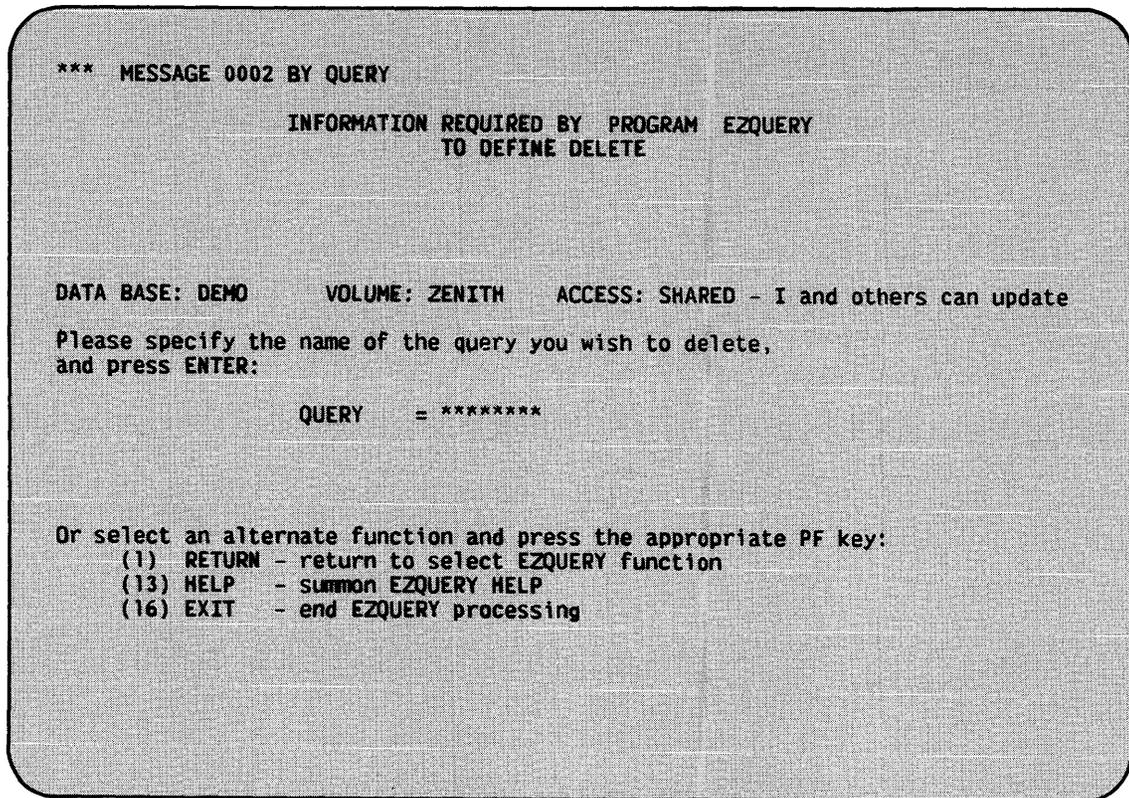


Figure 2-11. The Delete Query Screen

If you press ENTER from the Delete Query screen, EZQUERY first attempts to delete the file associated with the query in the library @dbnameQ, where dbname is the data base name (e.g., @DEMOQ). If it cannot delete the file, EZQUERY does not attempt to delete any other files. If it does delete the file, EZQUERY proceeds to delete the files associated with the query in the libraries @dbnameC and @dbnameL (if they exist). EZQUERY displays a message if it is unable to delete one or more files.

2.13 THE EZQUERY HELP FACILITY

The EZQUERY HELP facility enables you to review the attributes of the tables and the stored queries associated with the data base. EZQUERY HELP is available at almost any point in EZQUERY processing. Figure 2-12 gives an overview of the EZQUERY HELP facility and the relationship between its screens.

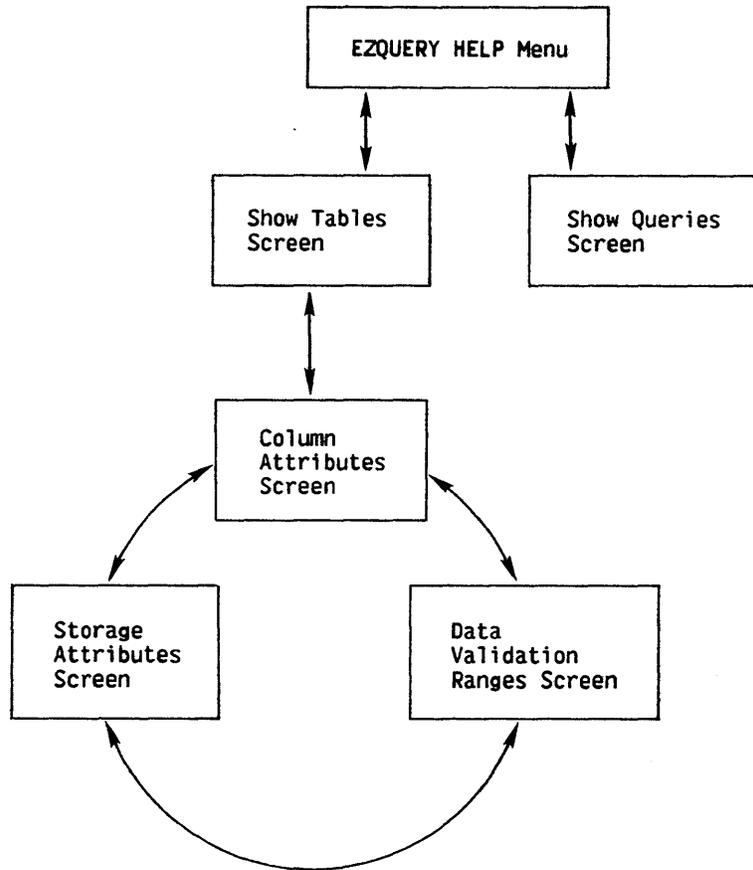


Figure 2-12. Overview of the EZQUERY HELP Facility

The EZQUERY HELP menu and all subsequent EZQUERY HELP screens display the following information for easy reference: the name of the data base, its volume, the name of the query (if you are formulating or executing a stored query), and the data base access.

To access the EZQUERY HELP menu, press PF13 from any screen where that option appears (e.g., the EZQUERY Functions menu). Figure 2-13 illustrates the EZQUERY HELP menu.

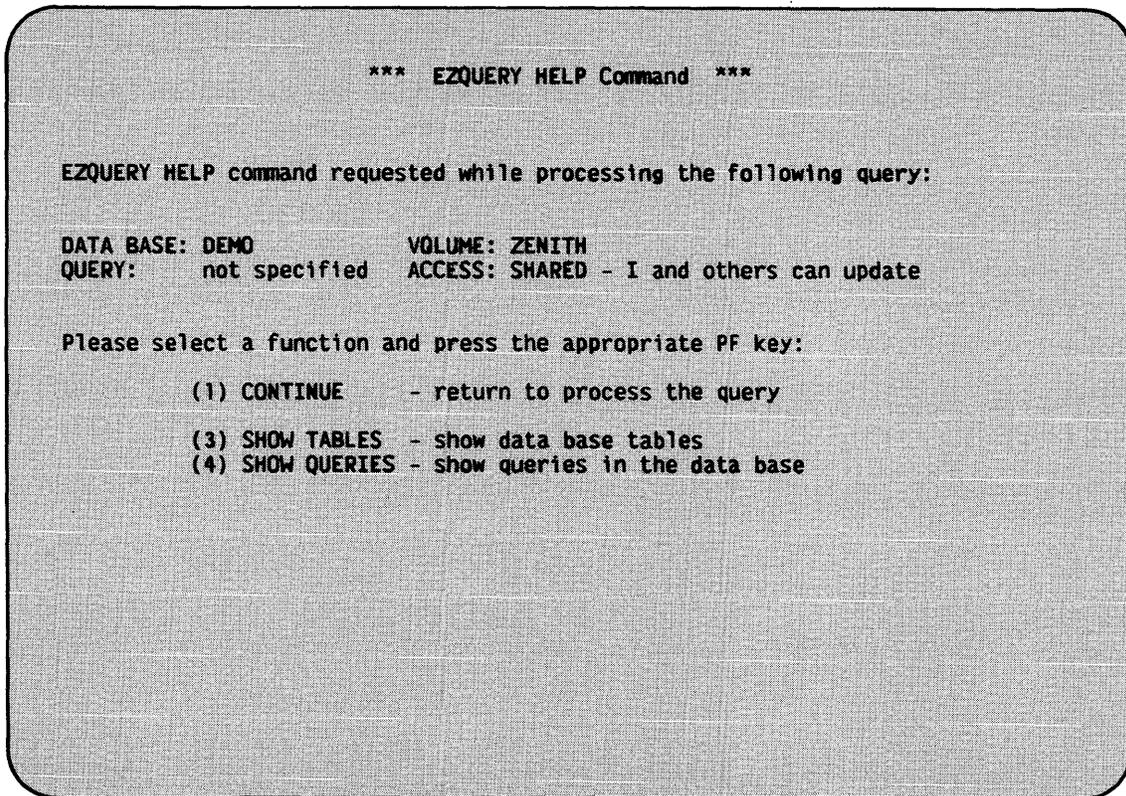


Figure 2-13. The EZQUERY HELP Menu

The functions available from the EZQUERY HELP menu are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Continue	Returns to the screen from which you accessed EZQUERY HELP.
3	Show Tables	Allows you to review the definitions of the tables in the data base.
4	Show Queries	Allows you to review the stored queries associated with the data base.

2.13.1 The Show Tables Screen

The Show Tables screen enables you to review the definitions of the tables in the data base. To access the Show Tables screen, press PF3 from the EZQUERY HELP menu. Figure 2-14 illustrates the Show Tables screen.

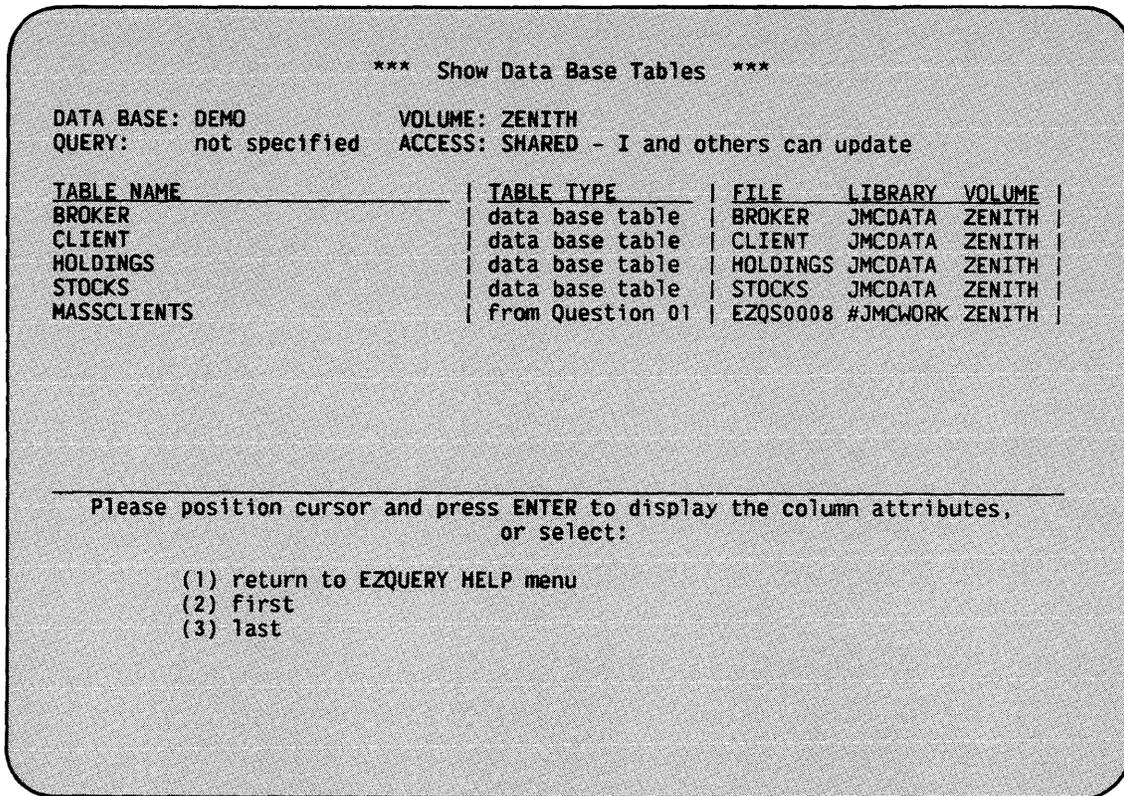


Figure 2-14. The Show Tables Screen

The Show Tables screen displays the following information about each table: the table name, the table type, and the name, library, and volume of the associated data file. There are two types of tables: data base tables and saved answer tables. Data base tables are the tables that make up the data base (e.g., BROKER, CLIENT, HOLDINGS, and STOCKS in Figure 2-14). Saved answer tables are tables that contain the answers to previous questions in the current query; these tables are scratched when you end the query. (For a detailed discussion of saved answer tables, refer to Section 4.3.) In the case of a saved answer table, the Table Type column lists the number of the corresponding question; thus, for example, in Figure 2-14, the saved answer table MASSCLIENTS contains the answer to the first question in the query.

To review the attributes of the columns in a table, position the cursor in the appropriate row of the Show Tables screen and press ENTER. The other functions available from the Show Tables screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the EZQUERY HELP menu.
2	First	Displays the first screen of tables.
3	Last	Displays the last screen of tables.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
4	Previous	Displays the previous screen of tables.
5	Next	Displays the next screen of tables.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more tables than can be listed on a single screen. In Figure 2-14, PF keys 4 and 5 do not appear because the entire list of tables fits on one screen.

The Column Attributes Screen

The Column Attributes screen enables you to review the attributes of the columns in a particular table. Figure 2-15 illustrates the Column Attributes screen for the HOLDINGS table. To access this screen from the Show Tables screen, position the cursor in the row that contains the HOLDINGS table definition and press ENTER. You can also access the Column Attributes screen by pressing PF8 from the Storage Attributes screen or from the Data Validation Ranges screen.

*** Table HOLDINGS Column Attributes ***

DATA BASE: DEMO VOLUME: ZENITH
QUERY: not specified ACCESS: SHARED - I and others can update

COLUMN NAME	DATA TYPE	DATA LENGTH	DATA SCALE
ACCOUNT	character	4	
SYMBOL	character	4	
QUANTITY	signed number	5	0
BUY-DATE	character	6	
BUY-PRICE	unsigned number	7	3

Please select a function and press the appropriate PF key:

(1) return to Show Data Base Table menu	
(2) first	
(3) last	(9) show storage attributes
	(10) show data validation ranges

Figure 2-15. The Column Attributes Screen

The Column Attributes screen displays the following information about each column: the column name, the data type, the data length, and the data scale. The possible data types are CHARACTER, SIGNED NUMBER, and UNSIGNED NUMBER. The data length is the maximum number of characters or digits in the column; the data scale is the number of decimal positions specified for data in the column.

The functions available from the Column Attributes screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Show Tables screen.
2	First	Displays the first screen of columns.
3	Last	Displays the last screen of columns.
4	Previous	Displays the previous screen of columns.
5	Next	Displays the next screen of columns.
9	Show Storage	Allows you to review the storage structure of the columns in the specified table.
10	Show Data Validation Ranges	Allows you to review the data validation ranges of the columns in the specified table.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more columns than can be listed on a single screen. In Figure 2-15, PF keys 4 and 5 do not appear because the entire list of columns fits on one screen.

The Storage Attributes Screen

The Storage Attributes screen enables you to review the storage attributes of the columns in a particular table. To access the Storage Attributes screen, press PF9 from the Column Attributes screen or from the Data Validation Ranges screen. Figure 2-16 illustrates the Storage Attributes screen for the HOLDINGS table.

PF keys 1 through 5 perform the same functions on the Storage Attributes screen as on the Column Attributes screen. To access the Column Attributes screen, press PF8. To access the Data Validation Ranges screen, press PF10.

*** Table HOLDINGS Storage Attributes ***

DATA BASE: DEMO VOLUME: ZENITH
 QUERY: not specified ACCESS: SHARED - I and others can update

COLUMN NAME	STORAGE TYPE/SIZE/POSITION	KEY TYPE
ACCOUNT	ASCII 4 1	compound
SYMBOL	ASCII 4 5	complex
QUANTITY	binary 2 9	
BUY-DATE	ASCII 6 11	
BUY-PRICE	decimal 4 17	

Please select a function and press the appropriate PF key:

(1) return to Show Data Base Table menu	(8) show column attributes
(2) first	
(3) last	(10) show data validation ranges

Figure 2-16. The Storage Attributes Screen

The Storage Attributes screen displays the following information about each column: the column name, the storage type, the storage size, the storage position, and the key type (if the column is a key). The storage type defines the physical representation of the corresponding field; the possible storage types are ASCII, binary, decimal, zoned, and numeric. The storage size is the number of bytes in the field; the storage position is the byte number within the data record at which the field begins. The following terms in the Key Type column designate the types of keys:

<u>Term</u>	<u>Type of Key</u>
Primary	Primary key
Alternate	Alternate key that does not allow duplicate data values
Alternate, Dup	Alternate key that allows duplicate data values
Compound	Column that is part of a compound key (i.e., a primary or alternate key that aligns with one or more contiguous columns)

<u>Term</u>	<u>Type of Key</u>
Complex	Column that is part of more than one key (e.g., a column that is part of more than one compound key or an alternate key that is also part of a compound primary key)

If a table contains one or more key columns, the corresponding data file is indexed; if not, the corresponding data file is consecutive.

The Data Validation Ranges Screen

The Data Validation Ranges screen enables you to review the data validation ranges of the columns in a particular table. To access the Data Validation Ranges screen, press PF10 from the Column Attributes screen or from the Storage Attributes screen. Figure 2-17 illustrates the Data Validation Ranges screen for the HOLDINGS table.

*** Table HOLDINGS Data Validation Ranges ***		
DATA BASE: DEMO	VOLUME: ZENITH	
QUERY: not specified	ACCESS: SHARED - I and others can update	
<u>COLUMN NAME</u>	<u>DATA LOWER LIMIT</u>	<u>DATA UPPER LIMIT</u>
ACCOUNT		
SYMBOL		
QUANTITY		
BUY-DATE		
BUY-PRICE	0.000	9999.999

Please select a function and press the appropriate PF key:

(1) return to Show Data Base Table menu	(8) show column attributes
(2) first	(9) show storage attributes
(3) last	

Figure 2-17. The Data Validation Ranges Screen

If a data validation range is defined for a column, the Data Validation Ranges screen displays the lower and upper limits of that range. In Figure 2-17, for example, all data in the BUY-PRICE column must be within the lower limit of 0.000 and the upper limit of 9999.99.

PF keys 1 through 5 perform the same functions on the Data Validation Ranges screen as on the Column Attributes screen. To access the Column Attributes screen, press PF8. To access the Storage Attributes screen, press PF9.

2.13.2 The Show Queries Screen

The Show Queries screen enables you to review the stored queries associated with the data base. To access the Show Queries screen, press PF4 from the EZQUERY HELP menu. Figure 2-18 illustrates the Show Queries screen.

```
*** Show Queries in Data Base ***  
DATA BASE: DEMO          VOLUME: ZENITH  
QUERY: not specified    ACCESS: SHARED - I and others can update  
  
QUERY_NAME | OWNER | PROTECTION CLASS | CREATION DATE |  
QOSTOCK   | KOR  |                   | 8/11/83       |  
LT35      | GSM  |                   | 8/11/83       |  
LT1000    | JMC  | $                 | 8/08/83       |  
MACLIENT  | MBC  |                   | 8/11/83       |  
BUYNCRY   | LLB  | @                 | 8/11/83       |  
  
-----  
Please select a function and press the appropriate PF key:  
  
  (1) return to EZQUERY HELP menu  
  (2) first  
  (3) last
```

Figure 2-18. The Show Queries Screen

The Show Queries screen displays the following information about each stored query: the query name, the owner of record, the protection class, and the creation date. The protection class determines which users have access to a stored query. The possible protection classes are #, \$, @, blank, and A through Z. Through the Manage Files/Libraries command, you can modify the owner and protection class assigned to a stored query. (For more information, refer to the VS Programmer's Introduction.)

In Figure 2-18, for example, the query LT1000 was created by JMC on 8/08/83, and its protection class is \$; this protection class allows all users to read and execute the query, but only the owner of record and system security administrators to modify it.

The functions available from the Show Queries screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the EZQUERY HELP menu.
2	First	Displays the first screen of stored queries.
3	Last	Displays the last screen of stored queries.
4	Previous	Displays the previous screen of stored queries.
5	Next	Displays the next screen of stored queries.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more stored queries than can be listed on a single screen. In Figure 2-18, PF keys 4 and 5 do not appear because the entire list of stored queries fits on one screen.

CHAPTER 3
FORMULATING A QUERY

3.1 INTRODUCTION

To retrieve information from a data base, you must specify the conditions for data retrieval in a query. In EZQUERY, a query consists of 1 to 16 individually defined questions. Each question is a request for information from a data base. You create a new query by defining its questions one at a time. The results of one question form the basis for subsequent questions within the same query.

This chapter provides a detailed description of query formulation in EZQUERY. For information about query execution, refer to Chapter 4.

3.1.1 Overview of Question Definition

To define a question, you first select the tables and columns that you want to include in the question. After selecting the tables and columns, you then define the question by specifying the conditions for data retrieval. The execution of the question is the final step in the process. After examining the question results, you can save them and define a new question, or you can end the current query. The process of formulating a question is illustrated in Figure 3-1. The actual flow of question definition, from screen to screen according to the options selected, is shown in Figure 3-2.

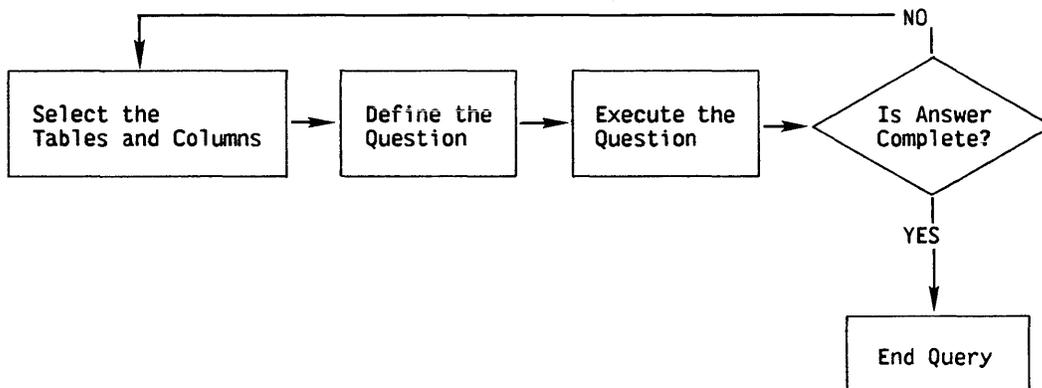


Figure 3-1. Logical Sequence in Question Definition

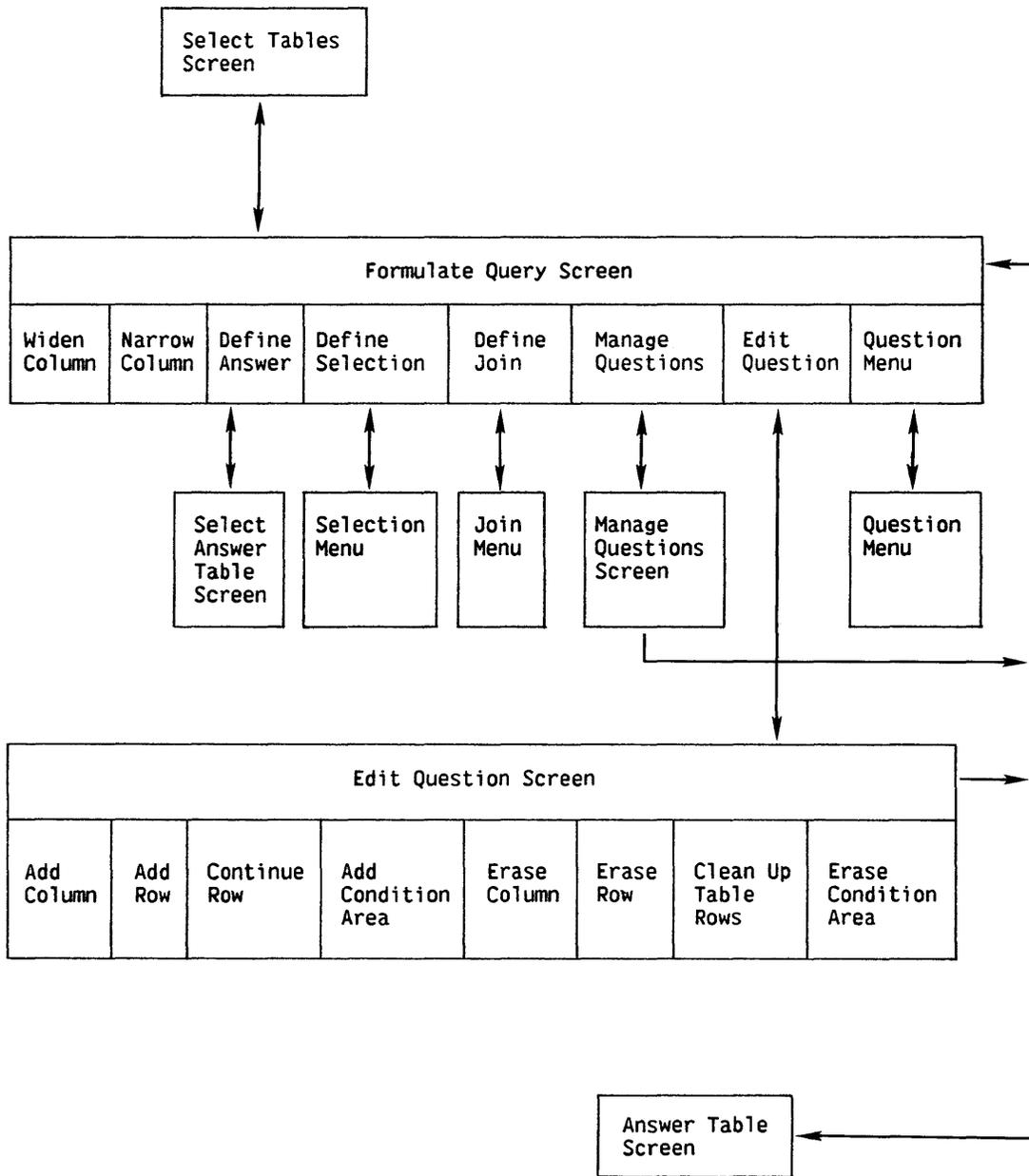


Figure 3-2. Screen Display Sequence in Question Definition

3.1.2 Multiple Question Queries

By formulating multiple question queries, you can construct a complex query as a sequence of simpler questions. For example, the complex query, "Retrieve the first name, last name, and broker of all clients who live in Massachusetts and who own stock in the Word Processing Corporation (WPCO) and in Scanners Incorporated (SC)," can be broken down into the following questions:

1. Retrieve the account number, first name, last name, and broker of all clients who live in Massachusetts. Save the answer to this question in the answer table MASSCLIENTS. Section 4.3 explains how you can save the answer table.
2. Using the saved answer table MASSCLIENTS, retrieve the account number, first name, last name, and broker of all clients who own WPCO stock. To formulate this question, you must join the MASSCLIENTS table to the HOLDINGS table that contains the information about a client's stocks. Save the answer to this question in the answer table WPCOSTOCK.
3. Using the saved answer table WPCOSTOCK, retrieve the first name, last name, and broker of all clients who own SC stock. To formulate this question, you must join the WPCOSTOCK table to the HOLDINGS table.

You can thus narrow the scope of a query to progressively smaller subsets of the data base by defining a series of questions that build on each other.

NOTE

You could instead use one question to formulate the above query. For improved performance on large data bases, try to minimize the number of questions per query.

3.2 SELECTING TABLES AND COLUMNS

To begin a new question, you must first select the tables and columns needed to define the conditions for data retrieval. The Select Tables screen shows all tables available for that question and their respective columns. The screen first lists the data base tables in alphabetical order, and then it lists the answer tables saved from any previous questions.

To select a column, place a nonblank character (e.g., X) in the pseudoblock preceding that column. In Figure 3-3, the columns ACCOUNT, FIRST, LAST, and BROKER have been selected from the CLIENT table, and the columns ACCOUNT and SYMBOL have been selected from the HOLDINGS table.

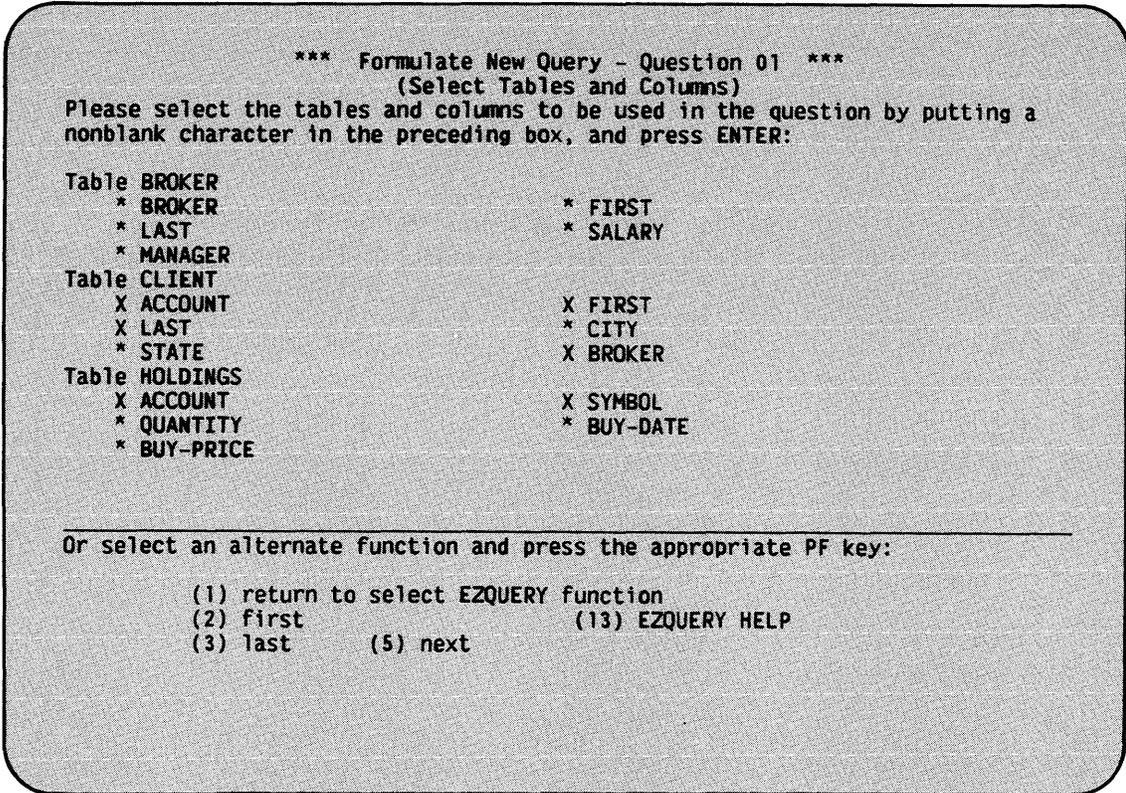


Figure 3-3. The Select Tables Screen

To define the question with the selected tables and columns, press ENTER from the Select Tables screen. The other functions available from the Select Tables screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns you to the EZQUERY Functions menu without selecting tables and columns.
2	First	Displays the first screen of tables.
3	Last	Displays the last screen of tables.
4	Previous	Displays the previous screen of tables.
5	Next	Displays the next screen of tables.
13	EZQUERY HELP	Enters the EZQUERY HELP facility. Through EZQUERY HELP, you can review the attributes of the tables and the stored queries associated with the data base.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more tables and columns than can be listed on a single screen. In Figure 3-3, PF key 4 does not appear because EZQUERY displays the first screen of tables.

While defining a question, you can return to the Select Tables screen to modify the tables and columns selected for the question. To eliminate a column from the question, place a blank in the pseudoblank preceding the column and press ENTER. To select a new column, place a nonblank character in the pseudoblank and press ENTER. All PF key functions are the same with the exception of PF1, which returns you to the Formulate Query screen to proceed with question definition.

3.3 THE FORMULATE QUERY SCREEN

To define a question, you specify conditions for data retrieval in table skeletons displayed on the screen. EZQUERY constructs a table skeleton for each selected table and displays only the columns selected from that table in its skeleton.

To specify data retrieval conditions, you enter components of the EZQUERY language in the highlighted areas on the screen. A menu method of question definition enables a user who is unfamiliar with the EZQUERY language to specify conditional criteria and to join data from two tables as the basis for a question.

The Formulate Query screen provides several functions that facilitate question definition. Through PF key selection, you can manipulate the size of the table skeletons, combine columns of existing tables to create a new table, add a condition area to define complex conditional criteria, manage questions in the current query, or store the query for future execution. These functions are described in detail below.

Figure 3-4 illustrates the definition of a question on the Formulate Query screen. This question requests the account number, first name, last name, and broker of all clients who own Quick Quotes Corporation (QQ) stock. Because the information about a client's stocks is contained in the HOLDINGS table and the other information is contained in the CLIENT table, you must join these tables to formulate the question.

In Figure 3-4, the example element #SAMENO links the two table skeletons through the ACCOUNT columns. An example element consists of the pound sign (#) followed by one to eight alphanumeric characters. The data in the columns -- the actual account numbers -- must be identical to link particular rows in the two tables. The condition for retrieval, QQ, appears in the SYMBOL column. The row operator DISPLAY directs EZQUERY to retrieve data from the CLIENT table as the answer to the question.

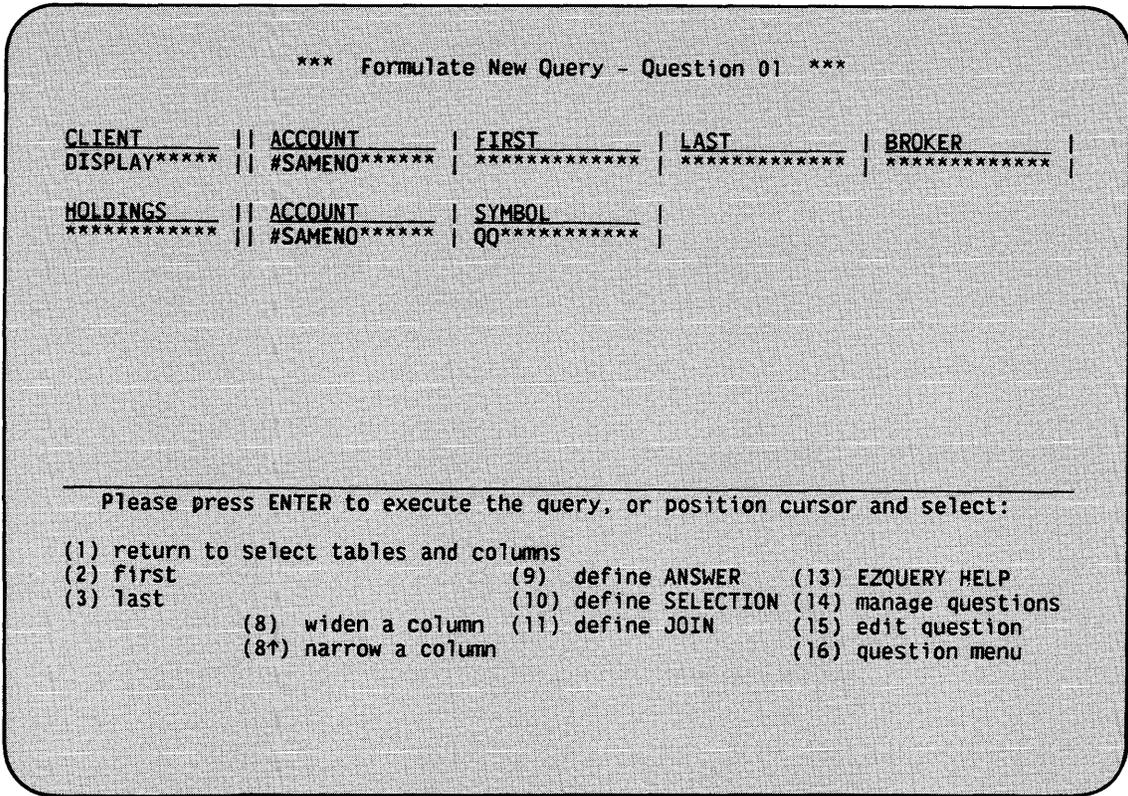


Figure 3-4. The Formulate Query Screen

To execute a query, press ENTER from the Formulate Query screen. The other functions available from the Formulate Query screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns you to the Select Tables screen so that you can modify the tables and columns selected for the question.
2	First	Displays the first screen of tables.
3	Last	Displays the last screen of tables.
4	Previous	Displays the previous screen of tables.
5	Next	Displays the next screen of tables.
6	Left	Moves the screen of tables being displayed to the left.
7	Right	Moves the screen of tables being displayed to the right.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
8	Widen a Column	Widens a column in a table skeleton. For more information, refer to Section 3.4.
8↑ (24)	Narrow a Column	Narrows a column in a table skeleton. For more information, refer to Section 3.4.
9	Define Answer	Allows you to combine columns of existing tables to create a new table that can provide the answer to the question. For more information, refer to Section 3.5.
10	Define Selection	Provides a predefined screen that prompts you to specify simple conditional criteria for data retrieval. For more information, refer to Section 3.7.
11	Define Join	Provides a predefined screen that prompts you to join two tables as the basis for a question. For more information, refer to Section 3.8.
13	EZQUERY HELP	Enters the EZQUERY HELP facility. Through EZQUERY HELP, you can review the attributes of the tables and the stored queries associated with the data base.
14	Manage Questions	Allows you to examine other questions in the current query or to delete the current question. For more information, refer to Section 3.9.
15	Edit Question	Allows you to modify the current question. You can add and erase columns, rows, and the condition area on the screen. For more information, refer to Section 3.10.
16	Question Menu	Allows you to store the current query, to print it, or to end it and return to the EZQUERY Functions menu. For more information, refer to Section 3.11.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more table skeletons than can be contained on a single screen. PF keys 6 and 7 move the contents of the screen to the left and right when there are more columns than can be contained on one screen. In Figure 3-4, PF keys 4 through 7 do not appear because the entire question fits on one screen.

3.4 MANIPULATING THE COLUMN SIZE

To facilitate question definition, you can manipulate the size of the columns in the table skeletons. The initial column size is 13 characters. Because this may not provide enough room for a particular data retrieval condition, you can widen a column to a maximum of 61 characters (or 28 characters for a column containing a table name).

To widen a column by increments of 16 characters, position the cursor in the column and press PF8. By continuing to press PF8, you can widen the column to its maximum width.

To narrow a column by increments of 16 characters, position the cursor in the column and press PF8↑ (PF24). By continuing to press PF8↑, you can narrow the column to its minimum width of 13 characters. Note that, by narrowing a column, you may truncate or erase its current contents. The Select Tables screen allows you to eliminate a column from a table skeleton.

Figure 3-5 illustrates the manipulation of the column size. The LAST column has been widened to accommodate the range expression, SHENNAN, TOUSSAINT, LAFRENAYE. Upon execution of the query, EZQUERY displays the account number, first name, and last name of clients with the last name of Shennan, Toussaint, or Lafrenaye.

```
*** Formulate New Query - Question 01 ***

CLIENT_____ || ACCOUNT_____ | FIRST_____ | LAST_____ |
DISPLAY***** || ***** | ***** | SHENNAN, TOUSSAINT, LAFRENAYE |

Please press ENTER to execute the query, or position cursor and select:

(1) return to select tables and columns
(2) first
(3) last
    (8) widen a column
    (8↑) narrow a column
    (9) define ANSWER
    (10) define SELECTION
    (13) EZQUERY HELP
    (14) manage questions
    (15) edit question
    (16) question menu
```

Figure 3-5. Manipulating the Column Size

If the maximum column width of 61 characters does not provide enough room for a data retrieval condition, you can continue the column's row through the Edit Question screen. You can then continue to specify the condition in the continued row.

3.5 DEFINING THE ANSWER TABLE

EZQUERY allows you to combine columns from one or more tables to create a new table that can provide the answer to a question. By defining the answer table, you can, for example, include columns from several tables in the answer, or you can modify the names and sequence of the answer table columns. Thus, you can customize the answer to meet the requirements of a question without changing the structure of the data base. Note that you can include only one such answer table in a question.

3.5.1 Creating the Answer Table

To create the answer table, press PF9 from the Formulate Query screen. EZQUERY then displays a screen that lists all tables and columns selected for the question. To include a column in the answer table, place a nonblank character (e.g., X) in the pseudoblock preceding the column. You cannot include in the answer table two columns with the same name. Figure 3-6 shows how to select the columns ACCOUNT and QUANTITY from the HOLDINGS table and the columns NAME and PRICE from the STOCKS table.

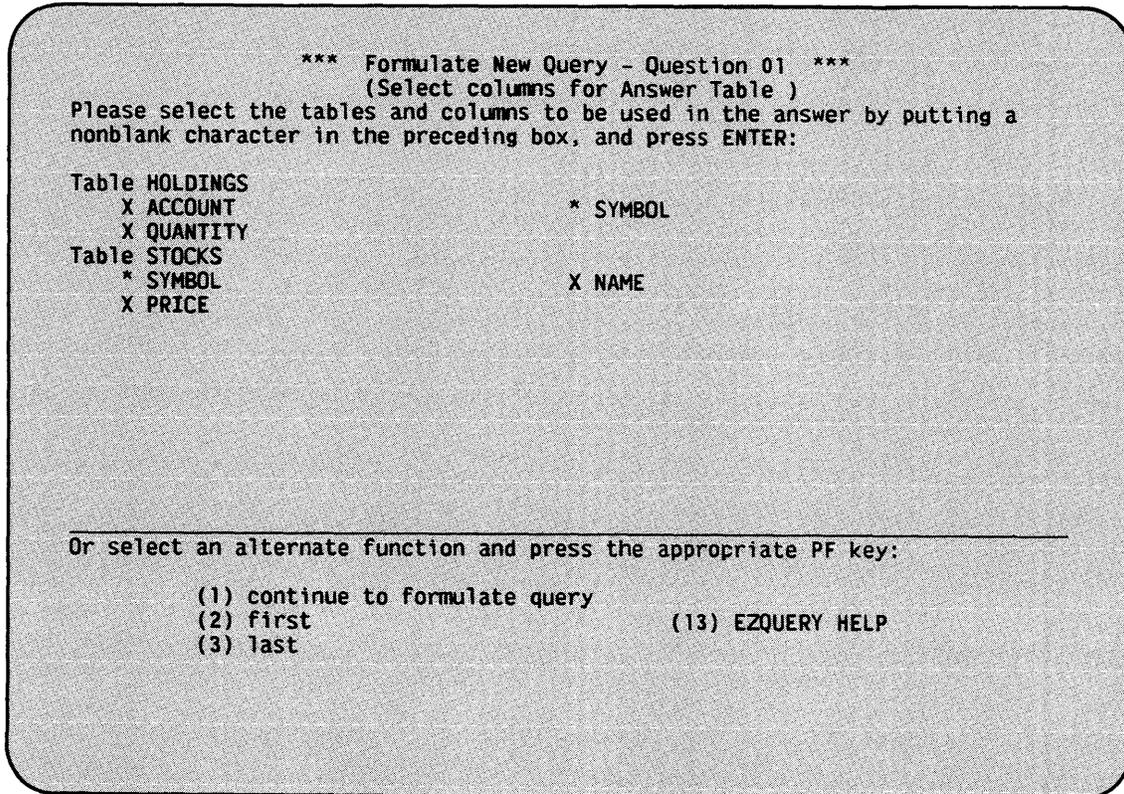


Figure 3-6. The Select Answer Table Screen

To return to the Formulate Query screen with the selected columns in the answer table, press ENTER. The other functions available from the Select Answer Table screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Continue	Returns you to the Formulate Query screen without defining the answer table.
2	First	Displays the first screen of tables.
3	Last	Displays the last screen of tables.
4	Previous	Displays the previous screen of tables.
5	Next	Displays the next screen of tables.
9	Erase	Deletes the answer table. This function is available when a question contains the answer table.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more tables and columns than can be listed on a single screen. In Figure 3-6, PF keys 4 and 5 do not appear because the entire list of columns available for the answer table fits on one screen.

You can return to the Select Answer Table screen if you want to modify the columns selected for the answer table.

3.5.2 The Answer Table Skeleton

After you select columns for the answer table, EZQUERY displays a table skeleton that contains those columns. The answer table skeleton appears on the Formulate Query screen after all other table skeletons. The order of the columns in the answer table corresponds to the order in which the Select Answer Table screen lists them. Section 3.5.3 describes how you can modify that order to meet the needs of the question.

Figure 3-7 illustrates the use of the answer table skeleton in a question. For clients with an account number of less than 1000, the question requests the full name, number of shares, and price of their stocks. Because two tables, HOLDINGS and STOCKS, contain the data desired in the answer, the answer table has been defined to include the columns ACCOUNT, QUANTITY, NAME, and PRICE. (Figure 3-6 shows how you can create this answer table.)

```

*** Formulate New Query - Question 01 ***

HOLDINGS || ACCOUNT | SYMBOL | QUANTITY |
***** || LT '1000'**** | #HOOKUP***** | ***** |

STOCKS || SYMBOL | NAME | PRICE |
***** || #HOOKUP***** | ***** | ***** |

ANSWER-01*** || ACCOUNT***** | QUANTITY***** | NAME***** | PRICE***** |
DISPLAY***** || ***** | ***** | ***** | ***** |

-----
Please press ENTER to execute the query, or position cursor and select:

(1) return to select tables and columns
(2) first
(3) last
(8) widen a column
(8↑) narrow a column

(9) define ANSWER
(10) define SELECTION
(11) define JOIN

(13) EZQUERY HELP
(14) manage questions
(15) edit question
(16) question menu

```

Figure 3-7. The Answer Table Skeleton

If, as in Figure 3-7, the answer table includes columns from more than one table, an example element must link the corresponding table skeletons. In this figure, the example element #HOOKUP links the HOLDINGS and STOCKS table skeletons through the SYMBOL columns; the data in the columns -- the actual trading symbols of the stocks -- must be identical to link particular rows in the tables.

EZQUERY assigns default values to the names of the answer table and its columns. The answer table has the default name of ANSWER-#, where # is the number of the current question (e.g., ANSWER-01 in Figure 3-7). The columns in the answer table have the same names as the corresponding data base table columns. Section 3.5.3 describes how you can modify the table and column names.

The row operator DISPLAY appears by default in the first row of the answer table skeleton. To obtain the answer from another table, you can enter DISPLAY in the corresponding table skeleton. Because DISPLAY cannot appear in more than one table skeleton, you must replace it with blanks in the answer table skeleton. In Figure 3-7, for example, you would enter DISPLAY in the HOLDINGS table skeleton to retrieve the account number, stock trading symbol, and number of shares of all holdings that meet the specified condition.

The columns in the answer table skeleton cannot contain data retrieval conditions. Thus, in Figure 3-7, the condition for retrieval, LT '1000', appears in the ACCOUNT column of the HOLDINGS table skeleton, not in the corresponding column of the answer table skeleton.

3.5.3 Modifying the Answer Table

To change the name of the answer table, you enter the new name in the answer table skeleton. In Figure 3-7, for example, you can rename the answer table from ANSWER-01 to LT1000.

To change the name of a column in the answer table, you enter the new name in the answer table skeleton and use an example element to link the column to the corresponding column in another table skeleton. In Figure 3-7, for example, to rename the answer table column NAME to SECURITY, you replace NAME with SECURITY. The example element #SAMENAME can link that column to the NAME column in the STOCKS table skeleton.

An answer table name consists of a minimum of 1 and a maximum of 28 characters. A column name consists of a minimum of 1 and a maximum of 31 characters and must be unique in the answer table. Section 7.2.1 lists the rules that govern the naming of tables and columns in EZQUERY. You can widen a column, if necessary, by pressing PF8.

NOTE

EZQUERY must be able to map data to an answer table column. To make this mapping possible, a column in the answer table skeleton must have the same name as a column in another table skeleton. Or an example element must link that column to a column in another table skeleton. If columns from more than one table skeleton (or from more than one row in the same table skeleton) have the same name as an answer table column, EZQUERY maps data from the first column of that name (i.e., the column that appears first on the Formulate Query screen). To map data from another column of that name, you must link the answer table column to it with an example element. If the same example element appears alone (i.e., without a comparison operator other than EQ) in several columns and in an answer table column, EZQUERY maps data from one of those columns (usually the last column) to the answer table.

To change the order of the columns in the answer table, enter the column names in the desired sequence. In Figure 3-7, for example, you can change the column order from ACCOUNT, QUANTITY, NAME, PRICE to ACCOUNT, NAME, QUANTITY, PRICE. Figure 3-8 illustrates how the question shown in Figure 3-7 would appear if you make the name and sequence changes discussed so far in this section.

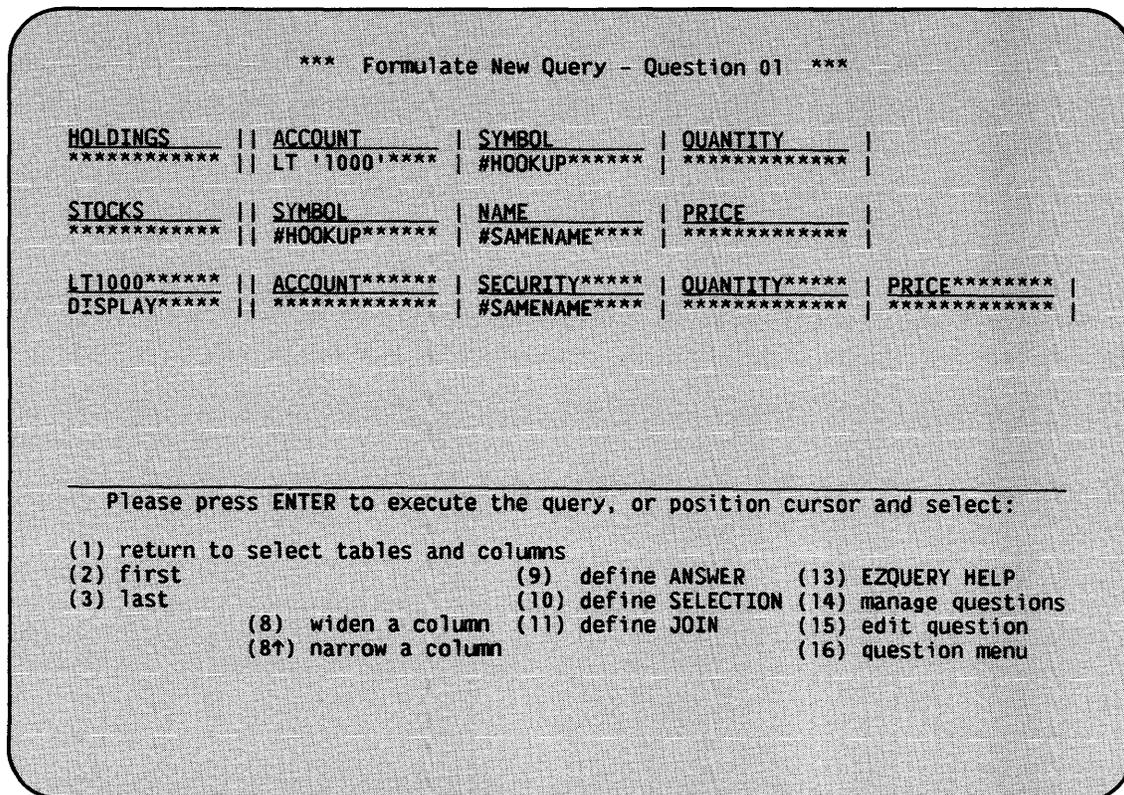


Figure 3-8. Modifying the Answer Table

To modify the columns selected for the answer table, press PF9 to return to the Select Answer Table screen. When a question contains the answer table, the Select Answer Table screen includes the answer table in its list of tables and columns, and you modify the currently selected columns from the answer table listing. In Figure 3-9, LT1000 is an answer table that contains the columns ACCOUNT, SECURITY, QUANTITY, and PRICE.

To select a new column, place a nonblank character in the pseudobank preceding the column and press ENTER. The new column appears in the answer table skeleton to the right of previously selected columns. In Figure 3-9, for example, if you place X before the SYMBOL column and press ENTER, the LT1000 answer table skeleton then contains the columns ACCOUNT, SECURITY, QUANTITY, PRICE, and SYMBOL. By continuing to add columns, you can arrange their order in the answer table skeleton.

If the answer table already includes a column, you cannot select that column again; nor can you select any other column with the same name. In Figure 3-9, for example, you cannot select the ACCOUNT or QUANTITY columns in the HOLDINGS table or the PRICE column in the STOCKS table; no pseudoblanks precede those columns on the Select Answer Table screen. If, however, you have renamed an answer table column, you can select the corresponding data base table column. Thus, in Figure 3-9, you can select the NAME column in the STOCKS table because the corresponding answer table column is SECURITY.

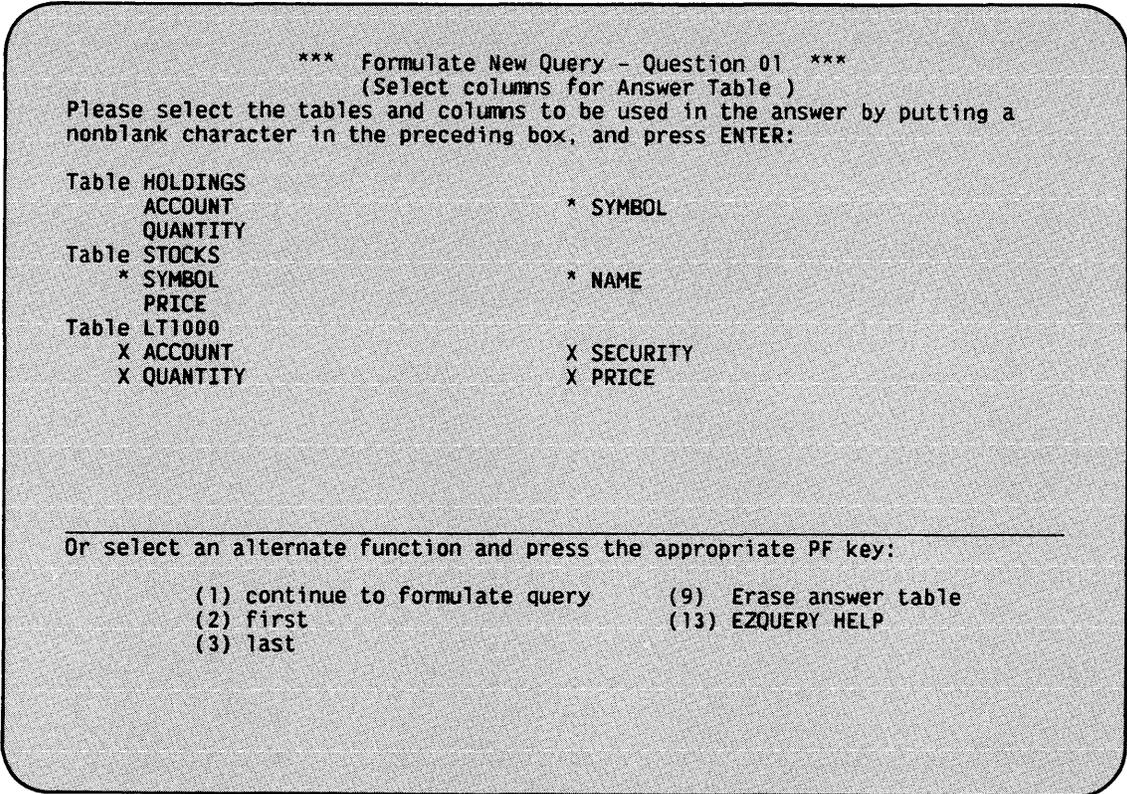


Figure 3-9. Modifying the Columns Selected for the Answer Table

To eliminate a column from the answer table, place a blank in the pseudobank preceding the column and press ENTER. To erase the answer table from the question, you can press PF9 from the Select Answer Table screen or eliminate all of the selected columns.

You can also add and erase columns in the answer table skeleton through the Edit Question screen.

3.5.4 Defining a Computed Field in the Answer Table Skeleton

EZQUERY allows you to define an answer table column that is equal to a calculable value. To define such a computed field, you enter a numeric expression in the answer table skeleton. (Section 7.4.2 discusses numeric expressions.) The numeric expression must contain at least one example element. This enables EZQUERY to use the data in one or more data base table columns to calculate the value of the answer table column. The answer table column that contains the computed field has a data type of SIGNED NUMBER, a data length of 15, and a data scale of 5.

Figure 3-10 gives an example of a question that defines a computed field in the answer table skeleton. For clients with an account number of less than 1000, the question requests the full name, number of shares, and value of their stocks, where value is equal to the number of shares multiplied by the current price. The numeric expression, #QTY * #PRICE, defines a computed field in the VALUE column. The example element #QTY also appears in the QUANTITY column of the HOLDINGS table skeleton, and the example element #PRICE appears in the PRICE column of the STOCKS table skeleton.

```

*** Formulate New Query - Question 01 ***

HOLDINGS || ACCOUNT | SYMBOL | QUANTITY |
***** || LT '1000'**** | #HOOKUP***** | #QTY***** |

STOCKS || SYMBOL | NAME | PRICE |
***** || #HOOKUP***** | ***** | #PRICE***** |

ANSWER-01*** || ACCOUNT***** | NAME***** | QUANTITY***** | VALUE***** |
DISPLAY***** || ***** | ***** | ***** | #QTY * #PRICE |

-----
Please press ENTER to execute the query, or position cursor and select:

(1) return to select tables and columns
(2) first
(3) last
(8) widen a column
(8↑) narrow a column
(9) define ANSWER
(10) define SELECTION
(11) define JOIN
(13) EZQUERY HELP
(14) manage questions
(15) edit question
(16) question menu

```

Figure 3-10. Defining a Computed Field in the Answer Table Skeleton

3.5.5 Multiple Rows in the Answer Table Skeleton

EZQUERY allows you to define conditions in multiple table skeleton rows and to retrieve data that meets any of the conditions defined. In this type of data retrieval, when defining the answer with the answer table skeleton, you must associate each table skeleton row that contains a condition with a row in the answer table skeleton. (Section 3.10.2 explains how to add rows to a table skeleton.) The row operator DISPLAY appears in each row of the answer table skeleton and directs EZQUERY to retrieve data if the associated condition is true.

To enable EZQUERY to map data to the answer table, you must use an example element to link the columns in all rows but the first to the corresponding columns of other table skeletons.

Figure 3-11 gives an example of a question that uses an answer table skeleton with multiple rows. The question requests the first name, last name, and broker of all clients whose broker has the identification number 0400 or who live in Massachusetts. The answer table has been defined to include the columns FIRST, LAST, and BROKER. The answer table skeleton contains two rows (i.e., one for each condition), and the row operator DISPLAY appears in both rows.

```

*** Formulate New Query - Question 01 ***

CLIENT      || FIRST      | LAST      | STATE      | BROKER      |
*****      || *****   | *****   | *****   | '0400'***** |
*****      || #FIRST***** | #LAST***** | MA*****   | #BROKER***** |

ANSWER-01*** || FIRST***** | LAST***** | BROKER***** |
DISPLAY***** || *****   | *****   | *****   | *****   |
DISPLAY***** || #FIRST***** | #LAST***** | #BROKER***** |

-----
Please press ENTER to execute the query, or position cursor and select:

(1) return to select tables and columns
(2) first
(3) last
    (8) widen a column
    (8↑) narrow a column
    (9) define ANSWER
    (10) define SELECTION
    (13) EZQUERY HELP
    (14) manage questions
    (15) edit question
    (16) question menu

```

Figure 3-11. Multiple Rows in the Answer Table Skeleton

In Figure 3-11, one condition, LT '0400', appears in the BROKER column in the first row of the CLIENT table skeleton; EZQUERY associates this condition by default with the first row of the answer table skeleton. The other condition, MA, appears in the STATE column in the second row of the CLIENT table skeleton. To associate this condition with the second row of the answer table skeleton, you place the example elements #FIRST, #LAST, and #BROKER in the corresponding columns of each row.

3.5.6 Defining a Union in the Answer Table Skeleton

You can map data from different columns into the same answer table column if those columns have the same data type, scale, and length. The answer table column that you define represents the union of the data in the columns. For example, Figure 3-12 shows you how to retrieve the trading symbol of all stocks that the client with account 1000 owns or that have a dividend greater than \$1. The answer table includes one column, TRADING-SYMBOL; this column will contain the trading symbols of stocks that meet either condition.

```

*** Formulate New Query - Question 01 ***

HOLDINGS || ACCOUNT | SYMBOL |
***** || '1000'***** | #1000***** |

STOCKS || SYMBOL | DIVIDEND |
***** || #BIGDIV***** | GT 1***** |

ANSWER-01*** || TRADING-SYMBOL***** |
DISPLAY***** || #1000***** |
DISPLAY***** || #BIGDIV***** |

-----
Please press ENTER to execute the query, or position cursor and select:

(1) return to select tables and columns
(2) first (9) define ANSWER (13) EZQUERY HELP
(3) last (10) define SELECTION (14) manage questions
(8) widen a column (11) define JOIN (15) edit question
(8↑) narrow a column (16) question menu

```

Figure 3-12. Defining a Union in the Answer Table Skeleton

In Figure 3-12, the answer table contains two rows (i.e., one for each condition), and the row operator DISPLAY appears in both rows. One condition, '1000', appears in the ACCOUNT column in the HOLDINGS table skeleton, and the other condition, GT 1, appears in the DIVIDEND column in the STOCKS table skeleton. The SYMBOL columns in the HOLDINGS table and in the STOCKS table contain the desired results, the trading symbols. Because both columns have a data type of CHARACTER and a data length of 4, you can map data from these two columns into a single answer table column, TRADING-SYMBOL. The example element #1000 appears in the SYMBOL column of the HOLDINGS table skeleton and in the first row of the TRADING-SYMBOL column. The example element #BIGDIV appears in the SYMBOL column of the STOCKS table skeleton and in the second row of the TRADING-SYMBOL column.

3.6 THE MENU METHOD OF QUESTION DEFINITION

The menu method of question definition allows you to define a question by means of predefined screens that prompt for input. Using the menu method, you can specify simple conditions for data retrieval or join data from two tables as the basis for a question.

The menu method can serve as an introduction to the EZQUERY language syntax for the less experienced user. After you define a question in the menu method, EZQUERY restates the question in the proper syntax on the Formulate Query screen. Thus, you can gradually learn the EZQUERY language and syntax by formulating questions with the menu method.

The following two sections describe the menu method operations of specifying data retrieval conditions and joining two tables.

3.7 THE SELECTION MENU

The Selection menu enables you to define simple conditional criteria for the data in a column. To access the Selection menu, position the cursor in a column and press PF10 from the Formulate Query screen. Figure 3-13 illustrates the Selection menu for the PRICE column in the STOCKS table. The names of the column and table appear at the top of the screen and are highlighted for easy reference.

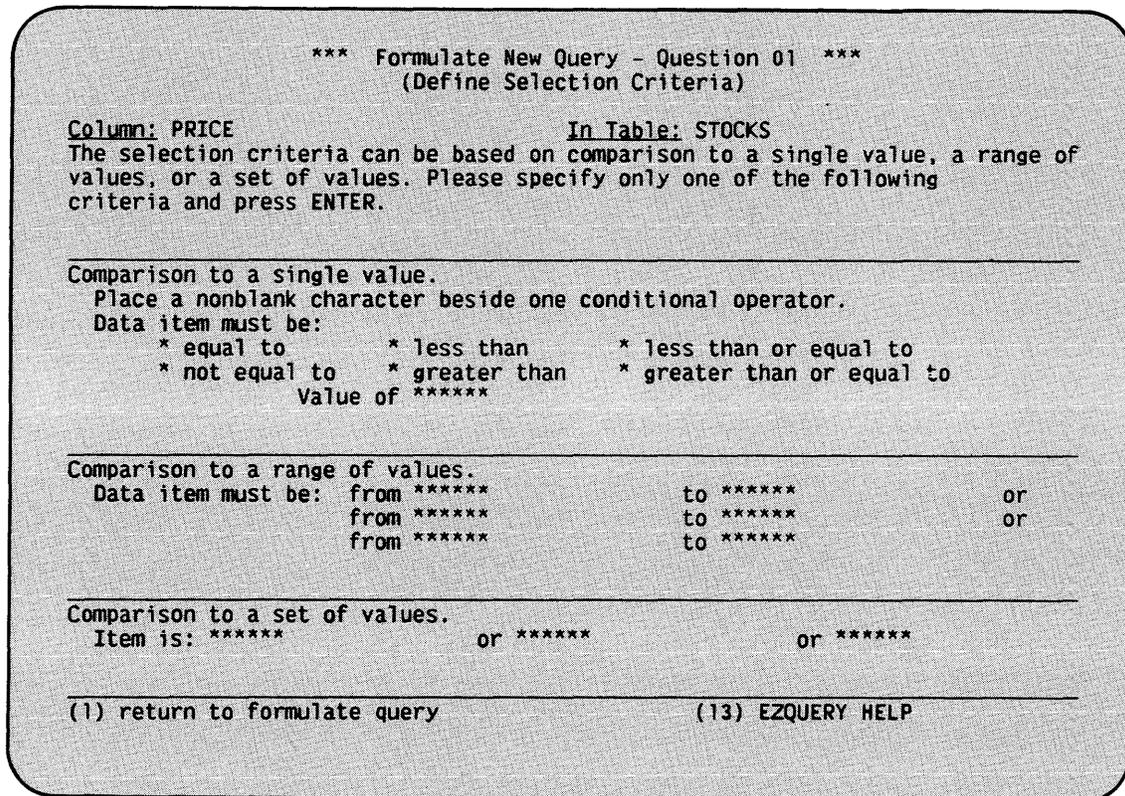


Figure 3-13. The Selection Menu

If the column already contains a language element or expression, EZQUERY attempts to convert it to the format of the Selection menu. If the Selection menu format does not allow that element or expression (e.g., an example element), EZQUERY issues a warning that the Selection function may erase the current contents of the column. You must press PF10 to acknowledge the warning and continue to the Selection menu.

A condition is defined in one of three ways: comparison to a single value, comparison to a range of values, or comparison to a set of specific values. You can only specify one type of comparison at a time.

To compare the column to a single value, place a nonblank character before one of the conditional operators and enter the value for comparison in the pseudoblanks. For example, in Figure 3-13, if you want to retrieve all stocks that have a current price greater than \$40, you place a nonblank character, e.g., X, before "greater than" and enter 40 in the pseudoblanks.

To compare the column to a range of values, enter the upper and lower limits of the range in the pseudoblanks. You can specify from one to three ranges of values for a column. For example, in Figure 3-13, if you want to retrieve all stocks that have a current price between \$10 and \$20 or between \$30 and \$40, you enter 10 and 20 in the first set of pseudoblanks and 30 and 40 in the second set of pseudoblanks.

To compare the column to a set of specific values, enter the values for comparison in the pseudoblanks. You can specify from one to three values for comparison. For example, in Figure 3-13, if you want to retrieve all stocks that have a current price of \$13.50, \$45, or \$70, you enter 13.50, 45, and 70 in the pseudoblanks.

The following restrictions apply to the Selection menu:

- You can access the Selection menu only from the first row of a table skeleton.
- The number of pseudoblanks displayed on the screen (up to a maximum of 20) corresponds to the data length of the column.
- The conditional criteria when converted to syntax form cannot exceed the maximum width of the column (i.e., 61 characters).

After defining the condition, press ENTER to return to the Formulate Query screen. The Formulate Query screen then displays the condition as it is expressed in the EZQUERY language. The Selection menu also enables you to return to the Formulate Query screen without specifying a selection condition (PF1) or to enter the EZQUERY HELP facility (PF13).

The Selection menu allows you to define a condition for only one column at a time. To define a condition for an additional column, position the cursor in the column and press PF10 to return to the Selection menu.

3.8 THE JOIN MENU

The Join menu enables you to join two tables as the basis for a question. To access the Join menu, position the cursor in a column of one table skeleton and press PF11. To obtain the screen shown in Figure 3-14, position the cursor in the SYMBOL column of the HOLDINGS table skeleton and press ENTER.

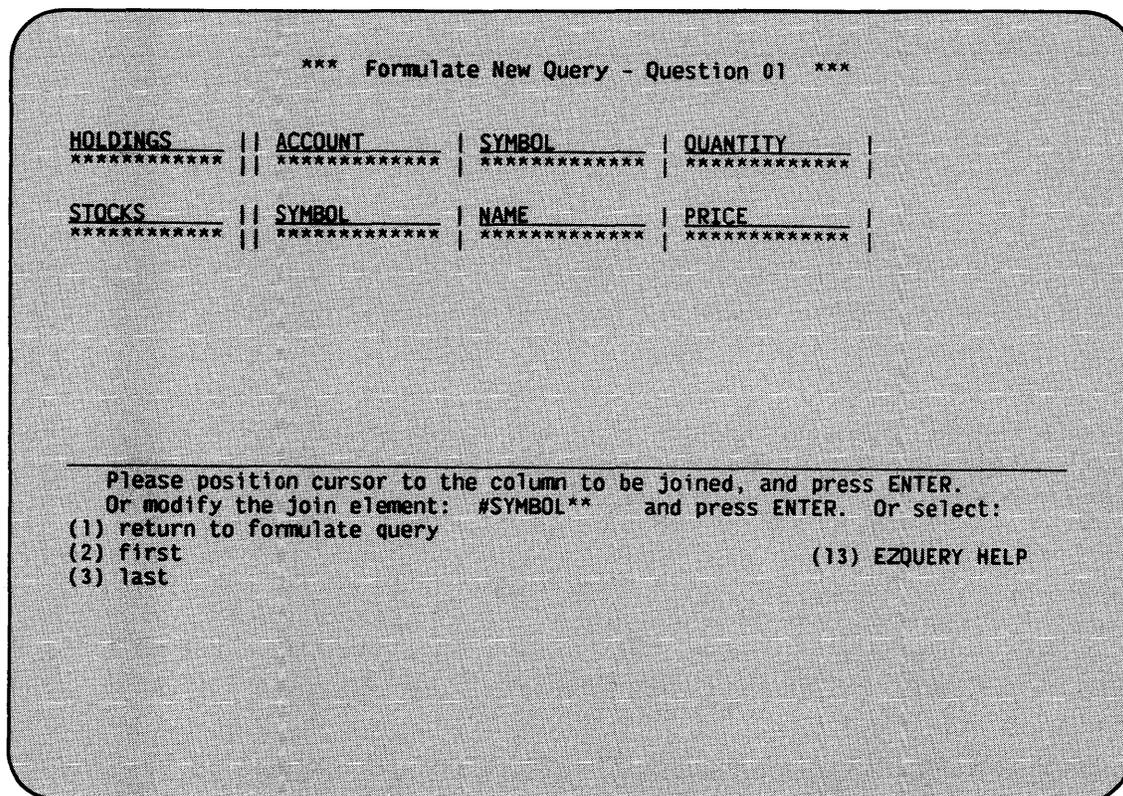


Figure 3-14. The Join Menu

If the column already contains a language element or expression, EZQUERY attempts to convert it to the format of the Join menu. If the Join menu format does not allow that element or expression (e.g., a constant element), EZQUERY issues a warning that the Join function may erase the current contents of the column. You must press PF11 to acknowledge the warning and continue to the Join menu.

To complete the join operation, position the cursor in a column of the second table skeleton that you want to join and press ENTER. In Figure 3-14, for example, you can position the cursor in the SYMBOL column of the STOCKS table skeleton to join the HOLDINGS and STOCKS tables through the SYMBOL columns. The data in the two columns must be of the same data type, e.g., CHARACTER or NUMBER (SIGNED or UNSIGNED), for the join to be completed.

The Join menu displays a default value for the join element (i.e., the example element) that will link the columns on the Formulate Query screen. The default value is based on the name of the first column and conforms to the rules that govern example elements. (Section 7.3.6 lists these rules.) You can modify the default value to any valid example element name, i.e., the pound sign character (#) followed by one to eight alphanumeric characters. In Figure 3-14, for example, you can rename the join element from #SYMBOL to #LINK by entering #LINK in the pseudoblanks.

The following restrictions apply to the Join menu:

- You can access the Join menu only from the first row of a table skeleton.
- You cannot use the Join menu to join rows within the same table skeleton.

After defining the join, press ENTER to return to the Formulate Query screen. EZQUERY then displays the join as it is expressed in the EZQUERY language. The Join menu also allows you to return to the Formulate Query screen without defining a join (PF1), to manipulate the contents of the screen (PF2 through PF7), or to enter the EZQUERY HELP facility (PF13).

The Join menu allows you to join only two tables at a time. To include additional tables in a join, position the cursor in a column that already contains the example element and press PF11 to return to the Join menu.

3.9 THE MANAGE QUESTIONS SCREEN

The Manage Questions screen enables you to review and edit other questions in the current query or to delete a question from the query. To access the Manage Questions screen, press PF14 from the Formulate Query screen. In Figure 3-15, the Manage Questions screen has been accessed during the third question of a query.

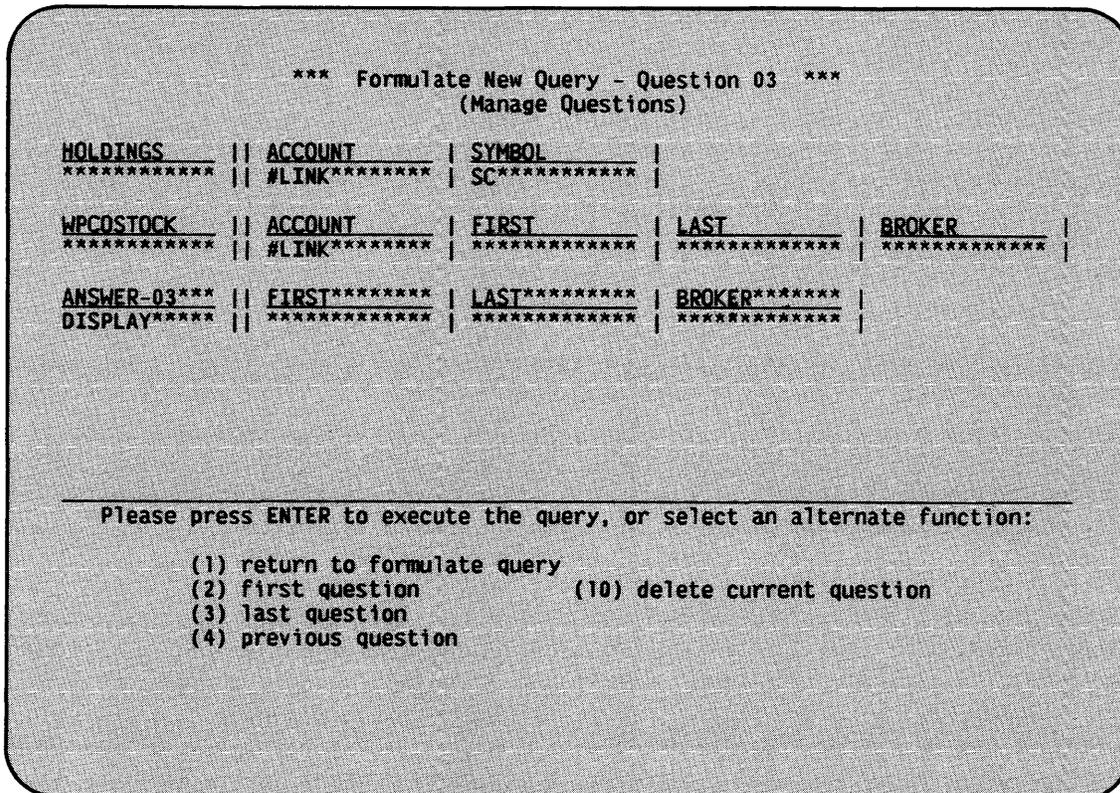


Figure 3-15. The Manage Questions Screen

The Manage Questions screen initially displays the current question in the query. To execute the query, press ENTER. The other functions available from the Manage Questions screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Formulate Query screen.
2	First Question	Displays the first question of the query.
3	Last Question	Displays the last question of the query.
4	Previous Question	Displays the previous question of the query.
5	Next Question	Displays the next question of the query.
10	Delete	Deletes the current question from the query.

PF keys 2 through 5 allow you to navigate through the query and to review and edit the individual questions as needed. EZQUERY changes the question displayed on the screen to the question that you indicate by PF key selection. In Figure 3-15, PF5 does not appear because the third question is the last question in the query.

3.9.1 Deleting the Current Question

To delete the question displayed on the Manage Questions screen, press PF10. To protect you from accidentally deleting a question, EZQUERY displays a screen that asks you to press ENTER to confirm the deletion. You can press PF1 to return to the Manage Questions screen without deleting the question.

After deleting a question, EZQUERY displays the next question in the query. If you have deleted the last question, EZQUERY then displays the previous question. If a query contains only one question, you cannot delete it.

3.10 THE EDIT QUESTION SCREEN

The Edit Question screen enables you to modify the current question. You can use the Edit Question screen to modify the table skeletons and to access the condition area. To access the Edit Question screen, press PF15 from the Formulate Query screen. Figure 3-16 shows the Edit Question screen for a question containing the answer table skeleton.

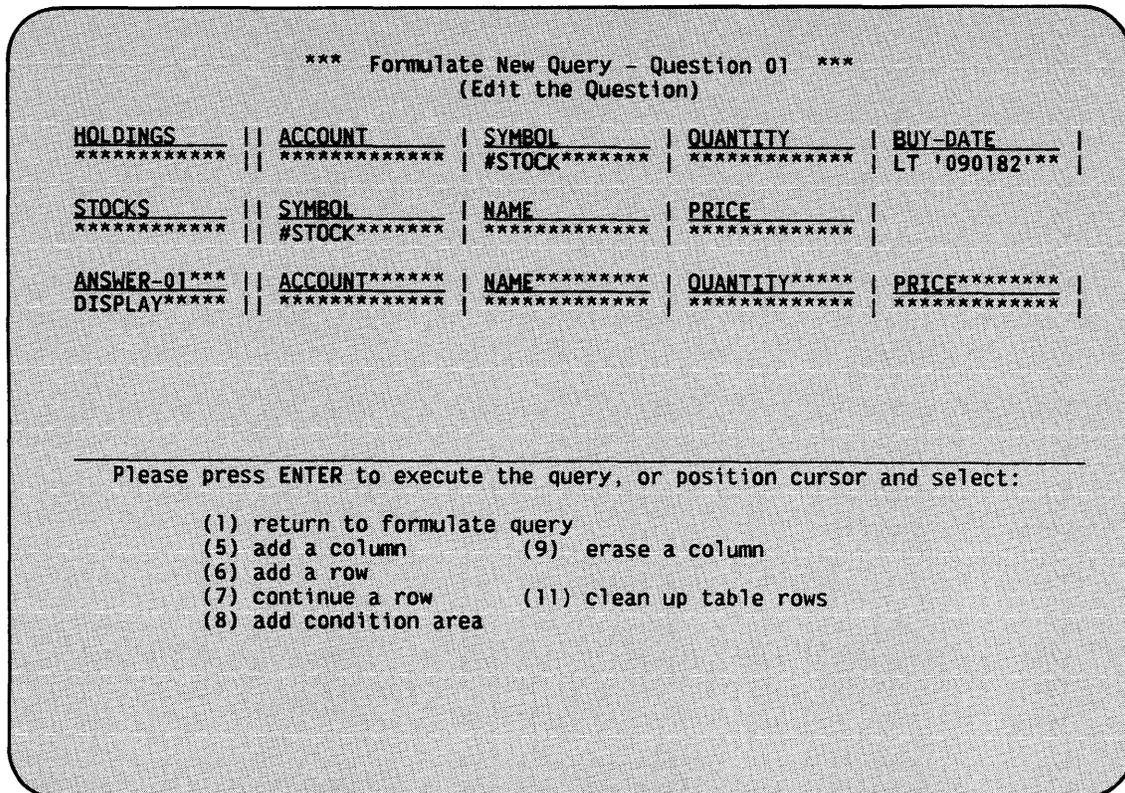


Figure 3-16. The Edit Question Screen

The Edit Question screen displays only the functions that are available at the time you access it. Thus, in Figure 3-16, the Erase Condition Area function (PF12) does not appear on the screen because the question does not contain the condition area. The functions available from the Edit Question screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Formulate Query screen.
5	Add a Column	Adds a column to the answer table skeleton.
6	Add a Row	Adds a row to a table skeleton or to the condition area.
7	Continue a Row	Continues a row (i.e., vertically increases the size of the row) in a table skeleton or the condition area.
8	Add Condition Area	Adds the condition area to the screen.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
9	Erase a Column	Erases a column from the answer table skeleton.
10	Erase a Row	Erases a continued or independent row from a table skeleton or the condition area.
11	Clean Up Table Rows	Contracts a table skeleton to one blank row or the condition area to two blank rows.
12	Erase Condition Area	Erases the condition area from the screen.

NOTE

Operations performed through the Edit Question screen affect only the table skeletons and condition area displayed on the screen. The actual tables in the data base remain unchanged.

You can perform several editing functions and continue with question definition on the Edit Question screen. To execute the query, press ENTER.

3.10.1 Adding and Erasing Answer Table Columns

If a question contains the answer table skeleton, you can modify its columns through the Edit Question screen. The Select Answer Table screen also allows you to modify the selected columns.

To add a column, position the cursor in the answer table skeleton and press PF5 from the Edit Question screen. EZQUERY then displays a blank column to the right of the cursor position. For example, in Figure 3-16, if you position the cursor in the NAME column of the answer table skeleton and press PF5, the blank column appears between the NAME and QUANTITY columns. You must then link the blank column to a column in another table skeleton by giving it the same name or by placing the same example element in both columns.

To erase a column, position the cursor in the column and press PF9. If the answer table skeleton contains only one column, you cannot erase it through the Edit Question screen; instead, you must use the Select Answer Table screen.

To add and erase the columns in other table skeletons, you must return to the Select Tables screen.

3.10.2 Adding and Erasing Rows

To add a row to a table skeleton, position the cursor in the table skeleton and press PF6 from the Edit Question screen. EZQUERY then displays the new row after the cursor position. A table skeleton contains a minimum of 1 and a maximum of 12 independent or continued rows so that its contents can always be displayed on one screen.

By adding rows to a table skeleton, you can, for example, join rows in the definition of a question. Each row represents a separate retrieval request to the table; an example element links the individual rows. For example, in Figure 3-17, the question requests the trading symbol, name, price, and dividend of all stocks that have a price greater than that of the Buy 'n Cry Corporation (BUYN). The vertical bars (i.e., ||) in the second and third rows of the STOCKS table skeleton indicate the creation of independent rows.

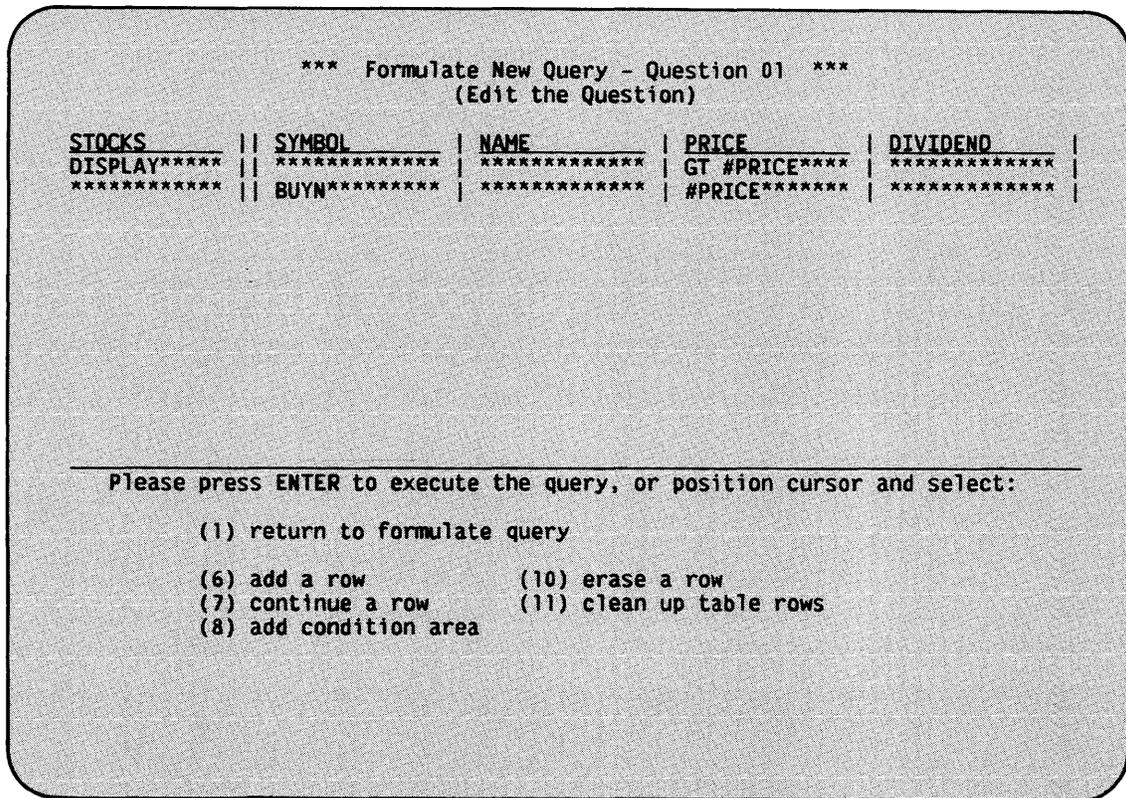


Figure 3-17. Adding a Row to the Table Skeleton

To erase a row from a table skeleton, position the cursor in the row and press PF10. A table skeleton must contain at least one row.

If the question contains the condition area, you can add and erase its rows in a similar fashion.

3.10.3 Continuing Rows

To continue a row in a table skeleton (i.e., to vertically increase the size of all columns in that row), position the cursor in the row and press PF7 from the Edit Question screen. By pressing PF7 again, you can further increase the vertical size of the row. A table skeleton contains a minimum of 1 and a maximum of 12 independent or continued rows so that its contents can always be displayed on one screen.

The continuation of a row provides you with additional room to specify data retrieval conditions for a column. The initial column width is 13 characters; you can widen the column to a maximum width of 61 characters or continue the column's row to accommodate a particular condition. For example, in Figure 3-18, the question requests the account number, first name, and last name of clients with the last name of Shennan, Toussaint, or Lafrenaye. The colons in the second and third rows of the CLIENT table skeleton indicate the continuation of an existing row rather than the creation of an independent row. In Figure 3-5, you defined the same question by widening the LAST column.

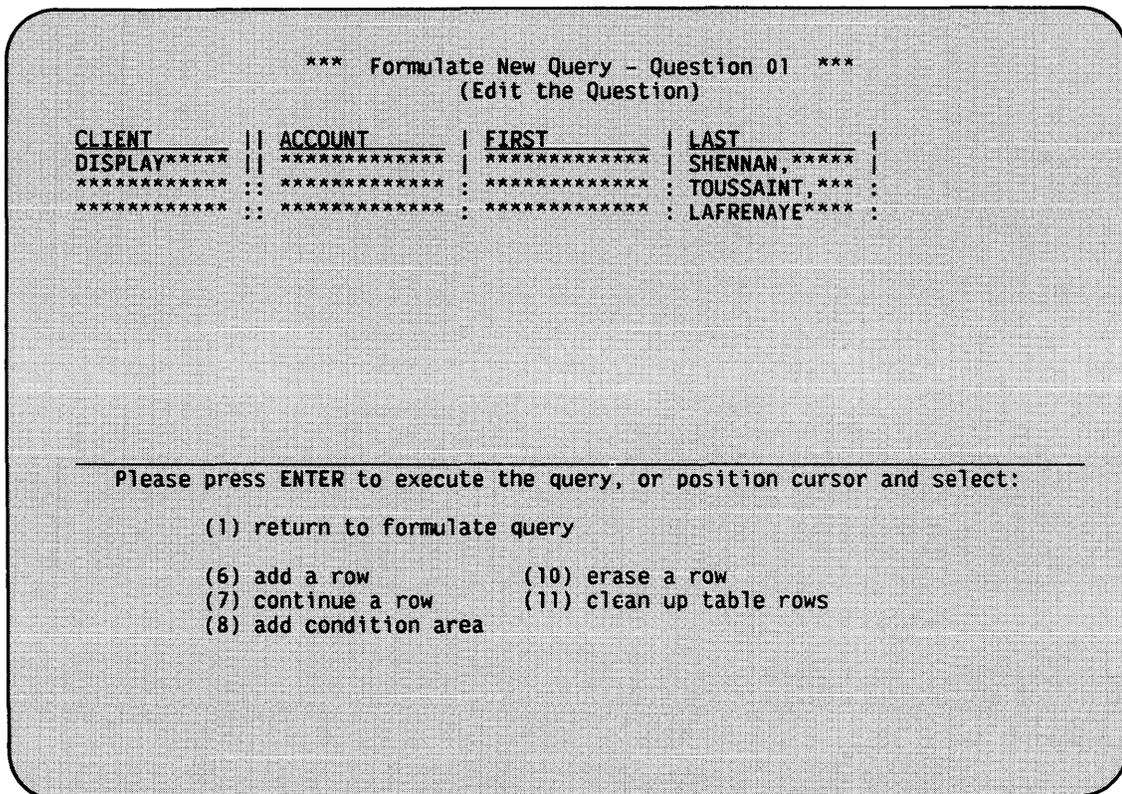


Figure 3-18. Continuing a Row in the Table Skeleton

To contract a continued row, position the cursor in the row and press PF10 from the Edit Question screen. If the row is not continued, you would erase it by pressing PF10.

If the question contains the condition area, you can continue its rows in a similar fashion.

3.10.4 Cleaning Up Table Rows

To contract a table skeleton to one blank row, position the cursor in the table skeleton and press PF11. For example, in Figure 3-19, if you position the cursor in the STOCKS table skeleton and press PF11, EZQUERY erases the second row and replaces LT #PR + #DIV with blanks in the first row.

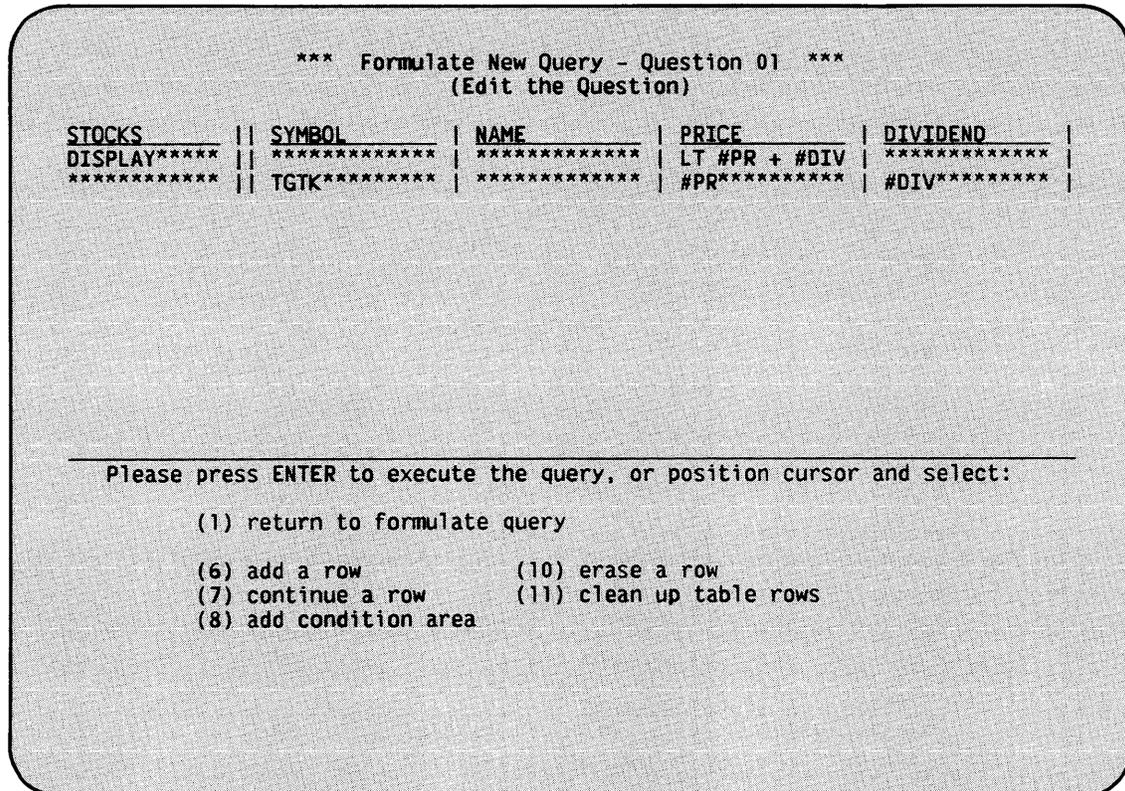


Figure 3-19. Cleaning Up Table Rows

If the question contains the condition area, you can clean up its rows in a similar fashion.

3.10.5 Adding and Erasing the Condition Area

To add the condition area, press PF8 from the Edit Question screen. You can define conditions for data retrieval in the condition area. Each row of the condition area contains conditions for the data in a particular column; an example element links the row to the corresponding table skeleton column.

The condition area initially contains two rows. To add a row to the condition area, position the cursor in the condition area and press PF6. EZQUERY then displays the new row below the row containing the cursor. A row is 77 characters wide; you can continue a row if necessary by pressing PF7. The condition area contains a minimum of 1 and a maximum of 12 continued or independent rows.

Figure 3-20 illustrates the use of the condition area in a question. This question requests the trading symbol, name, price, and dividend of all stocks that have a name greater than PACIFIC and a price greater than \$50 or less than \$30. The example elements #NAME and #PRICE link the conditions in the condition area with the associated columns.

```

*** Formulate New Query - Question 01 ***
      (Edit the Question)

STOCKS _____ || SYMBOL _____ | NAME _____ | PRICE _____ | DIVIDEND _____ |
DISPLAY***** || ***** | #NAME***** | #PRICE***** | ***** |

AREA FOR ADDITIONAL CONDITIONS
#NAME IS GT PACIFIC*****
#PRICE IS GT 50 OR LT 30*****

-----
Please press ENTER to execute the query, or position cursor and select:

(1) return to formulate query

(6) add a row           (10) erase a row
(7) continue a row     (11) clean up table rows
                       (12) erase condition area

```

Figure 3-20. Adding the Condition Area

To erase a continued or independent row in the condition area, position the cursor in that row and press PF10. The condition area contains a minimum of one row. To contract the condition area to two blank rows, position the cursor in the condition area and press PF11. To erase the condition area, press PF12 from the Edit Question screen.

3.11 THE QUESTION MENU

The Question menu enables you to create a stored query, to replace a stored query with a newly edited version, to print the query, or to end the current query and return to the EZQUERY Functions menu. To access the Question menu, press PF16 from the Formulate Query screen. Figure 3-21 illustrates the Question menu.

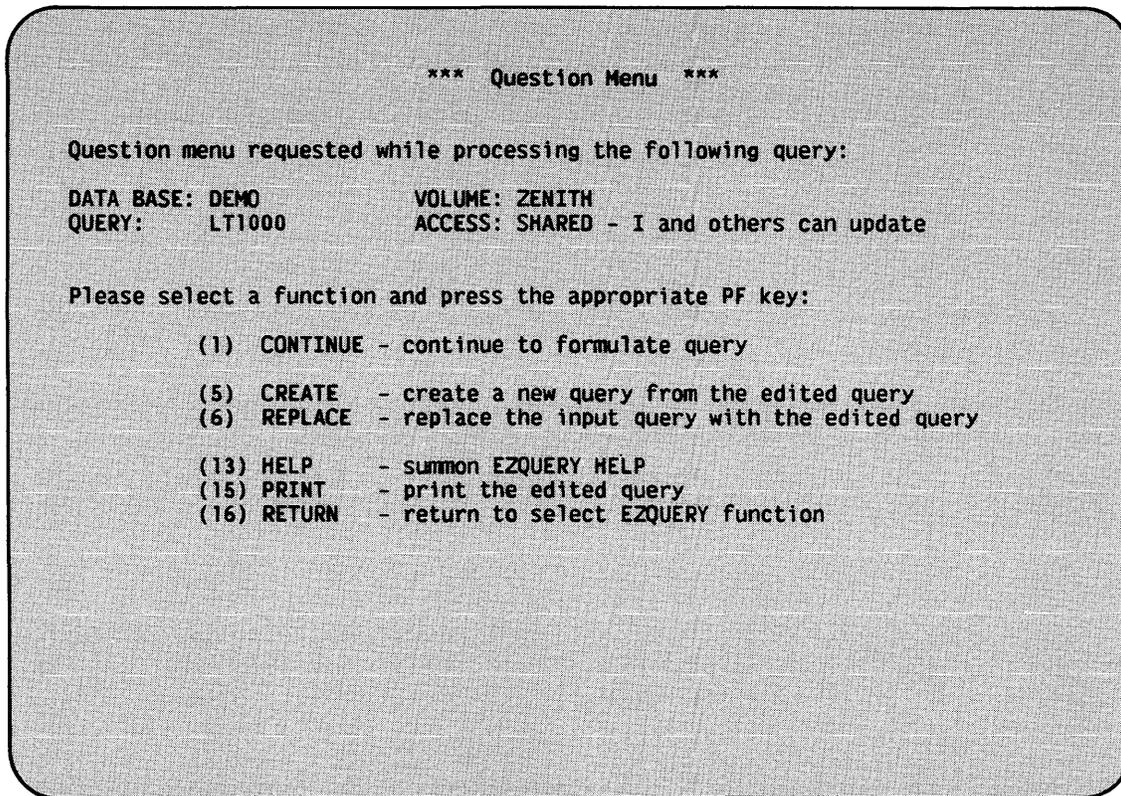


Figure 3-21. The Question Menu

The functions available from the Question menu are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Continue	Returns to the Formulate Query screen.
5	Create	Creates a stored query from the query that you are currently formulating or editing.
6	Replace	Replaces the existing stored query with the version that you are currently editing. This function is available when you are processing a stored query, as in Figure 3-21.
13	Help	Enters the EZQUERY HELP facility.
15	Print	Prints the query that you are currently formulating or editing.
16	Return	Ends the current query and returns you to the EZQUERY Functions menu to select another function.

3.11.1 Creating a Stored Query

To create a stored query, press PF5 from the Question menu. The Create Query screen then prompts you to specify a name for the query. A query name consists of one to eight alphanumeric characters; for example, B, TEST, and BROKERS are all possible query names.

If you then press ENTER, EZQUERY stores the query that you are currently formulating or editing in a file of that name in the library @dbnameQ, where dbname is the data base name (e.g., @DEMOQ). If you have executed the query and have not modified it subsequently, EZQUERY also creates a record description file for the answer to the query and stores the file in the library @dbnameC. If it cannot create the record description file, EZQUERY issues a warning that the query has not been validated. A validated query is a query for which EZQUERY creates both files. To return to the Question menu without creating a query, press PF1.

If a query with the name that you specify already exists in that library, EZQUERY displays a screen that prompts you to respecify the query name, to press PF3 to scratch the existing query, or to press PF1 to return to the Question menu.

3.11.2 Replacing a Stored Query

To replace a stored query, press PF6 from the Question menu. EZQUERY then displays a screen that prompts you to confirm the replacement. If you press ENTER, EZQUERY replaces the stored query with the version that you are currently editing. If you have executed the edited query and have not modified it subsequently, EZQUERY also creates a record description file for the answer to the query and stores the file in the library @dbnameC (e.g., @DEMOC). If it cannot create the record description file, EZQUERY issues a warning that the query has not been validated. To return to the Question menu without replacing the query, press PF1.

3.11.3 Printing the Query

To print the query that you are currently formulating or editing, press PF15 from the Question menu. The Print Options screen then prompts you to specify the names of the file, library, and volume for the print file and to define its format. Figure 3-22 illustrates the Print Options screen.

*** MESSAGE P001 BY WQ4PRT

INFORMATION REQUIRED BY PROGRAM EZQUERY
TO DEFINE OPTIONS

Please specify print file options and press ENTER

FILE = QRY0000* LIBRARY = #JMCPR* VOLUME = ZENITH

Number of COPIES = 1*** Form NUMBER = 000

Characters per LINE = 132 (Minimum 80)

Lines per PAGE = 055 (Minimum 10)

Print CLASS = A

Press PF16 to exit print function

Figure 3-22. The Print Options Screen

The Print Options screen displays the following default values for the name, library, and volume of the print file:

<u>Name</u>	<u>Default Value</u>
File	The query name if you are printing a stored query; a unique name generated by EZQUERY if you are printing a new query.
Library	The value defined for SPOOLIB through the Set Usage Constants command.
Volume	The value defined for SPOOLVOL through the Set Usage Constants command.

You can accept these defaults or enter new values in the pseudoblanks. A file or library name consists of one to eight characters; the volume that you specify must be mounted on the system.

To define the format of the print file, you specify the following characteristics:

<u>Characteristic</u>	<u>Description</u>
Number of Copies	The number of copies to be printed. You can print a minimum of 1 and a maximum of 9999 copies. The default is 1.
Form Number	The form type used to print the file. The possible form numbers are 000 through 254. The default is the value defined for FORM# through the Set Usage Constants command.
Characters per Line	The number of characters to be printed on a line. The minimum number of characters per line is 80, and the maximum is 999. The default is 132.
Lines per Page	The number of lines to be printed on each page. The minimum number of lines per page is 10, and the maximum is 999. The default is the value defined for LINES through the Set Usage Constants command.
Print Class	The print class of the print file. The print class determines which printers can print the file. The possible print classes are A through Z. The default is the value defined for PRTCLASS through the Set Usage Constants command.

For more information about the Set Usage Constants command, refer to the VS Programmer's Introduction.

After specifying the print file and its format, press ENTER. EZQUERY then prints the query and returns you to the Question menu. To return to the Question menu without printing the query, press PF16.

Each page of the printed query contains the following information: the data base name and volume, the date, and the page number. EZQUERY prints the questions of the query in sequence and precedes each question by the query name and the question number. For a particular question, EZQUERY prints the table skeletons and the condition area (if it is part of the question). If a table skeleton row contains more columns than can be printed in a single line, EZQUERY folds the table skeleton into more than one line.

Figure 3-23 gives an example of a printed query. The number of characters per line is 80. Because all of the columns in the CLIENT table skeleton do not fit in an 80-character line, the BROKER column appears below the first line of that skeleton. For an explanation of the query shown in Figure 3-23, refer to Section 3.1.2.

Query=MACLIENT Question 01

```

CLIENT      !! ACCOUNT      ! FIRST      ! LAST      ! STATE      !
              !!              !            !            !            !
              !! BROKER      !            !            !            !
              !!              !            !            !            !
MASSCLIENTS !! ACCOUNT      ! FIRST      ! LAST      ! BROKER      !
DISPLAY      !!              !            !            !            !
    
```

Query=MACLIENT Question 02

```

HOLDINGS     !! ACCOUNT      ! SYMBOL      !
              !! #LINK        ! WPCO        !
MASSCLIENTS !! ACCOUNT      ! FIRST      ! LAST      ! BROKER      !
DISPLAY      !! #LINK        !            !            !            !
    
```

Query=MACLIENT Question 03

```

HOLDINGS     !! ACCOUNT      ! SYMBOL      !
              !! #LINK        ! SC          !
WPCOSTOCK    !! ACCOUNT      ! FIRST      ! LAST      ! BROKER      !
              !! #LINK        !            !            !            !
ANSWER-03    !! FIRST      ! LAST      ! BROKER      !
DISPLAY      !!            !            !            !
    
```

Figure 3-23. Sample Printed Query

3.11.4 Ending the Query

To end the current query and return to the EZQUERY Functions menu, press PF16 from the Question menu. If that query has not been saved, EZQUERY then displays a screen that prompts you to press PF16 to confirm the exit. To return to the Question menu, press PF1.

CHAPTER 4 EXECUTING A QUERY

4.1 INTRODUCTION

To obtain the data that meets the conditions specified in a query, you must execute the query. Query execution takes place in one of the following ways:

- While formulating a question in a new query, you press `ENTER` from the Formulate Query screen, the Manage Questions screen, or the Edit Question screen.
- While reviewing and modifying the questions in a stored query, you press `ENTER` from the Formulate Query screen, the Manage Questions screen, or the Edit Question screen.
- To execute a stored query without modification, you can press `PF4` from the EZQUERY Functions menu and then specify the query on the Run Query screen.

When you execute a query, EZQUERY displays the answer to the query in the answer table. From the answer table, you can edit the answer, select a type of output for the answer, or update the information in the data base. After examining the answer, you can save it and define the next question, or you can end the current query.

Figure 4-1 illustrates the process of executing a query. The actual flow of query execution, from screen to screen according to the options selected, is shown in Figure 4-2.

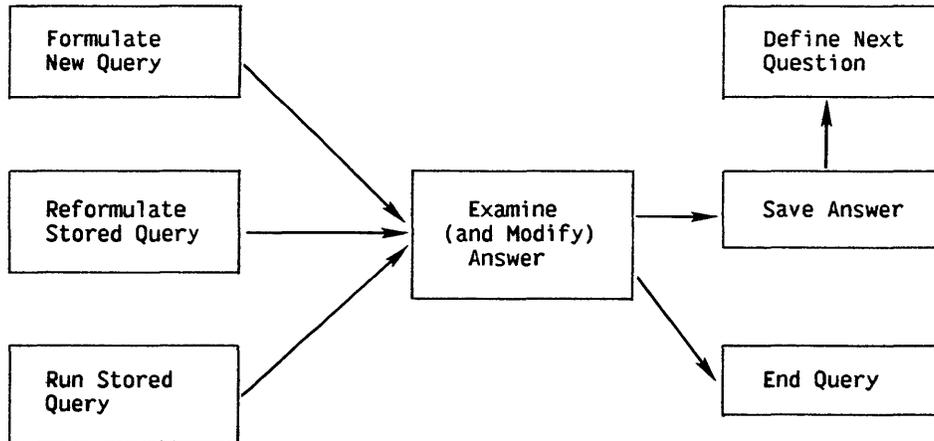


Figure 4-1. Logical Sequence in Query Execution

EZQUERY always executes the questions in a query in sequence, but it displays in the answer table only the results of the last question. However, to optimize repeated query execution, EZQUERY does not re-execute the entire sequence of questions, but rather begins execution with the first question that has been modified or that is affected by data base update. Thus, if you execute a query that consists of six questions and you then modify the fourth question, EZQUERY executes only the fourth through sixth questions in a repeated execution of the query.

NOTE

To guarantee repeatability, the data base access must be Private or Readonly. When the data base access is Shared or Limited, the repeated execution of a query reflects changes made to the data base by other users.

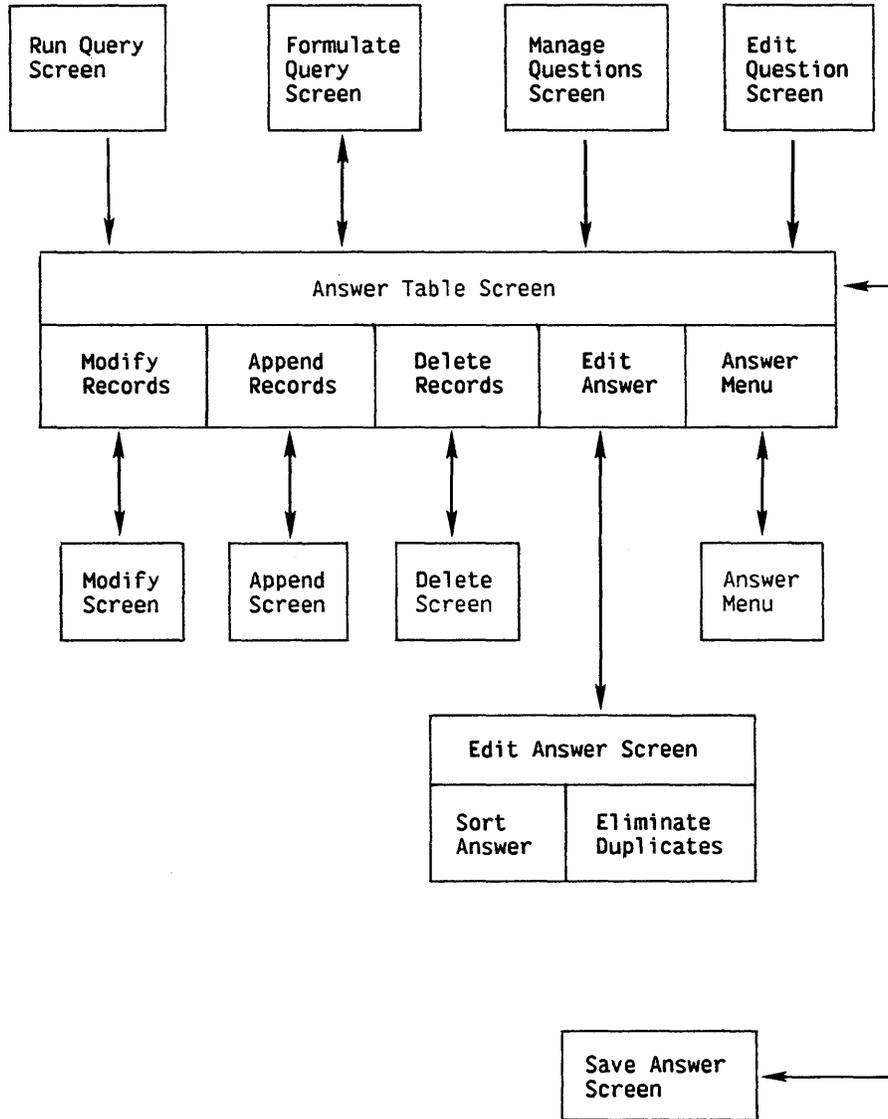


Figure 4-2. Screen Display Sequence in Query Execution

4.2 THE ANSWER TABLE SCREEN

When you execute a query, EZQUERY displays the results of the last question in the answer table. The columns of the answer table correspond to the columns of the table skeleton that contains the row operator DISPLAY. The rows of the answer table contain the data that meets the conditions for retrieval.

Figure 4-3 illustrates the Answer Table screen. In this figure, the answer table contains the trading symbol, name, price, and dividend of all stocks with a price less than \$35. To obtain these results, select all of the columns (i.e., SYMBOL, NAME, PRICE, and DIVIDEND) from the STOCKS table, enter LT 35 in the PRICE column of the STOCKS table skeleton, and then press ENTER from the Formulate Query screen.

*** Answer of the Query - Table STOCKS *** (from Question 01)			
SYMBOL	NAME	PRICE	DIVIDEND
BMET	BAROMETRICS INC	13.500	0.000
CHM	CHALLENGE MOTORS INC	26.000	0.000
HV	HOME VIDEO INC	21.625	1.000
LCOM	LUCKY COMPUTERS CORP	9.875	0.000
PANC	PACIFIC NATIONAL CORP	21.500	0.000
QQ	QUICK QUOTES CORP	22.500	0.000
SC	SCANNERS INC	18.375	0.000
SNET	SUPERNET CORP	28.125	0.000
TACO	TACO TAKEOUT INC	31.250	0.600
WPCO	WORD PROCESSING CORP	32.250	0.120

Please press ENTER to save the query answer and define the next question, or select:

(1) return to modify the query	(10) modify records	(13) EZQUERY HELP
(2) first	(11) append records	(15) edit answer
(3) last	(12) delete records	(16) answer menu

Figure 4-3. The Answer Table Screen

The following restrictions apply to the Answer Table screen:

- The answer table contains a minimum of 1 and a maximum of 255 columns.
- Each column in the answer table displays a maximum of 77 characters of data. If a particular column contains more than 77 characters, EZQUERY displays only the first 77 characters.
- Each row in the answer table displays a maximum of 2016 characters of data.
- EZQUERY suppresses leading zeroes in the answer table.
- EZQUERY uses blanks to replace characters that cannot be displayed and a string of asterisks (e.g., *****) to replace numbers that cannot be displayed.

- EZQUERY uses asterisks to replace the following hexadecimal characters: 00, 05, 0B, and characters greater than 7F. To preserve the actual data values, do not modify the asterisks if you update the record.
- EZQUERY displays duplicate rows in the answer table. EZQUERY provides a function that allows you to eliminate duplicates.

The Answer Table screen provides several functions that enable you to save the answer and proceed to the next question, to update the data base, to edit the answer, to select the type of output for the answer, or to store the query for future execution. The functions available from the Answer Table screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
ENTER	Save	Allows you to save the answer and proceed to define the next question in the query. For more information, refer to Section 4.3.
1	Return	Returns you to the Formulate Query screen so that you can modify the query. For more information, refer to Section 4.4.
2	First	Displays the first screen of the answer table.
3	Last	Displays the last screen of the answer table.
4	Previous	Displays the previous screen of the answer table.
4↑ (20)	Scroll Previous	Continuously displays the previous screens of the answer table.
5	Next	Displays the next screen of the answer table.
5↑ (21)	Scroll Next	Continuously displays the subsequent screens of the answer table.
6	Left	Moves the screen of the answer table being displayed to the left.
7	Right	Moves the screen of the answer table being displayed to the right.
10	Modify Records	Allows you to update the data base by modifying records displayed in the answer table. For more information, refer to Section 4.5.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
11	Append Records	Allows you to update the data base by appending records to the answer table. For more information, refer to Section 4.5.
12	Delete Records	Allows you to update the data base by deleting records from the answer table. For more information, refer to Section 4.5.
13	EZQUERY HELP	Enters the EZQUERY HELP facility. Through EZQUERY HELP, you can review the attributes of the tables and the stored queries associated with the data base.
15	Edit Answer	Allows you to sort the answer table or to eliminate any duplicates in it. For more information, refer to Section 4.6.
16	Answer Menu	Allows you to copy the answer to a data file and its definition to a control file, to enter the VS/Report facility or the REPORT utility, to create a word processing document or word processing merge document, to store the current query, to print the query and answer, or to end the query and return to the EZQUERY Functions menu. For more information, refer to Section 4.7.

PF keys 2 through 5 enable you to manipulate the contents of the answer table when a single screen cannot contain the entire table. To scan a long answer table, you can press PF4↑ (PF20) or PF5↑ (PF21); to stop the continuous scrolling of the screen, press PF1. PF keys 6 and 7 move the contents of the screen to the left and right when there are more columns than can be contained on one screen. In Figure 5-3, PF keys 4, 4↑, 5, and 5↑ do not appear because the screen displays the entire answer table; PF keys 6 and 7 do not appear because all of the columns fit on the screen.

4.3 SAVING THE ANSWER

EZQUERY allows you to save the answer table and use it as the basis for subsequent questions within the same query. When saved, the answer table is temporarily attached to the data base as a consecutive DMS file. The saved answer table is then available to subsequent questions for data retrieval requests. All answer tables are scratched when you end the query; to save the query results permanently, you must copy them to a data file. (For more information, refer to Section 4.7.1.)

To save the answer table, press ENTER from the Answer Table screen. After you press ENTER, the Save Answer screen prompts you to specify the name of the saved answer table. An answer table name consists of a minimum of 1 and a maximum of 28 characters. (For the rules that govern the naming of tables in EZQUERY, refer to Section 7.2.1.) The answer table has the default name of ANSWER-#, where # is the number of the current question (e.g., ANSWER-01 or ANSWER-15). To change the name, enter the new name in the pseudoblanks. Figure 4-4 illustrates the Save Answer screen.

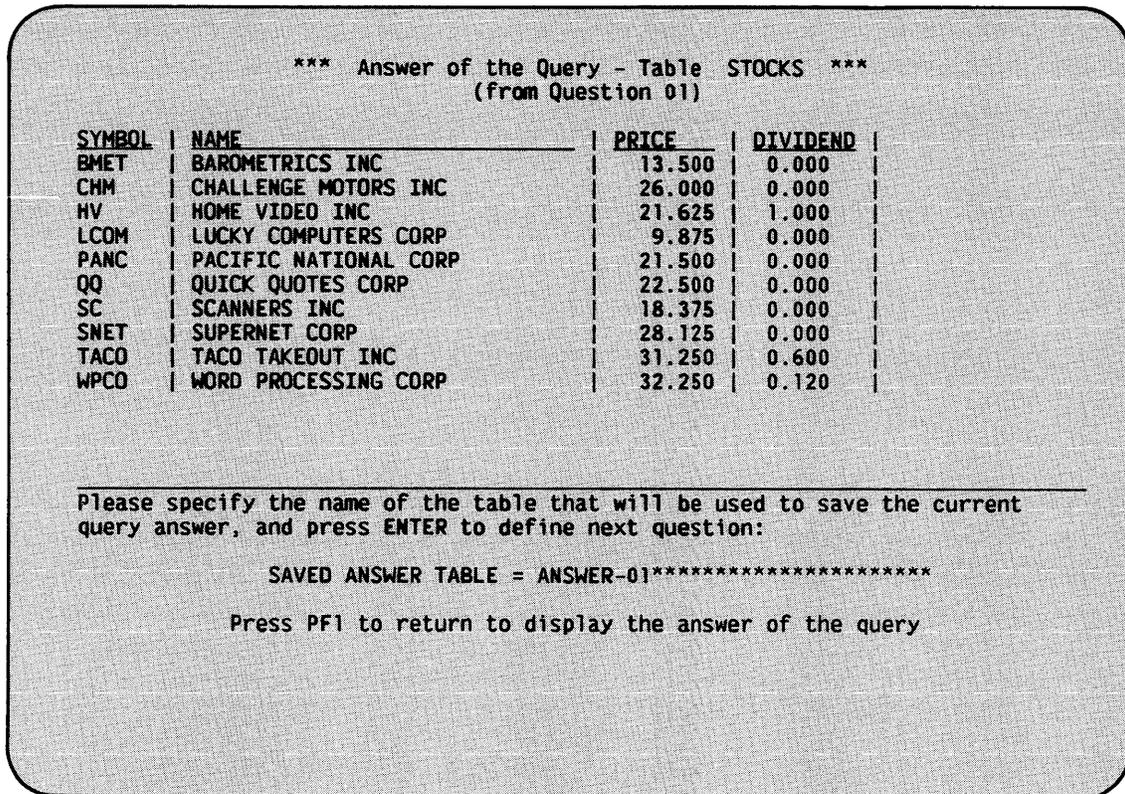


Figure 4-4. The Save Answer Screen

To save the answer table and begin the next question, press ENTER from the Save Answer screen. EZQUERY then displays the Select Tables screen for the next question in the query, and you can begin definition of that question. The Select Tables screen for all subsequent questions in the query includes the saved answer table in its listing of tables, and you can select its columns to be included in a question. To return to the Answer Table screen without saving the answer table, press PF1.

NOTE

If you edit the answer table (e.g., sort the answer) before saving it, EZQUERY stores the answer table in its edited form. However, the editing changes are scratched along with the answer table itself when you end the query. A subsequent execution of the query would not reflect these editing changes.

4.4 RETURNING TO THE FORMULATE QUERY SCREEN

To return to the Formulate Query screen, press PF1 from the Answer Table screen. The Formulate Query screen then displays the question that you were formulating or editing at the time of execution. If you are executing a stored query without modification, the Formulate Query screen displays the last question in the query.

After returning to the Formulate Query screen, you can modify the displayed question or use the Manage Questions function to navigate through the query.

4.5 UPDATING THE DATA BASE

EZQUERY allows you to modify, append, and delete records in indexed data files and to append records to consecutive data files. You can check whether a file is indexed or consecutive through the EZQUERY HELP facility. Note that the update code in the corresponding record description file must be 0 to allow update. If you want to delete records, the delete code must also be 0.

The following steps must be performed to update a data file:

1. Set the data base access to Shared or Private.
2. Define a question that retrieves the records and fields that you want to update. To retrieve a field, you select the corresponding column. If the data file is indexed, you must select the primary key. If the primary key is a compound key, you must select all of the columns that are components of the compound key.
3. Execute the question (or a stored query that has such a question as its last question). EZQUERY then displays the selected records in the answer table.
4. Press PF10 from the Answer Table screen to modify a record displayed in the answer table, press PF11 to append a record to the answer table, or press PF12 to delete a record from the answer table. The Answer Table screen only displays PF keys 10 through 12 when data update is possible. The sections that follow describe these operations in detail.
5. Press ENTER to update the corresponding data file. The data file now incorporates the changes made to the answer table.

To initiate data update, press PF10, PF11, or PF12 from the Answer Table screen. To return to the Answer Table screen, press PF1.

4.5.1 Modifying Records

To modify a record, position the cursor in the record and press PF10 from the Answer Table screen. The Modify screen then highlights the record, and you can enter the desired changes to its columns. The Modify screen does not highlight a column if you cannot modify it. Figure 4-5 shows a request to modify the third record.

```
*** Answer of the Query - Table STOCKS ***
      (Modify the Record in the Data Base)

SYMBOL | NAME | PRICE | DIVIDEND |
BMET | BAROMETRICS INC | 13.500 | 0.000 |
CHM | CHALLENGE MOTORS INC | 26.000 | 0.000 |
HV** | HOME*VIDEO*INC***** | **21.625 | *1.000 |
LCOM | LUCKY COMPUTERS CORP | 9.875 | 0.000 |
PANC | PACIFIC NATIONAL CORP | 21.500 | 0.000 |
QQ | QUICK QUOTES CORP | 22.500 | 0.000 |
SC | SCANNERS INC | 18.375 | 0.000 |
SNET | SUPERNET CORP | 28.125 | 0.000 |
TACO | TACO TAKEOUT INC | 31.250 | 0.600 |
WPCO | WORD PROCESSING CORP | 32.250 | 0.120 |

-----
Please modify the table entry and press ENTER, or select:

      (1) return to display the answer of the query
                                (13) EZQUERY HELP
```

Figure 4-5. The Modify Screen

If a data validation range is defined for a column, you must enter a value within that range. Through EZQUERY HELP, you can review the data validation ranges. If you modify the primary key or an alternate key that does not allow duplicate values, you must enter a value that is unique to that record.

To modify the record in both the answer table and the data file, press ENTER from the Modify screen. The other functions available from the Modify screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Answer Table screen without updating the data base.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
6	Left	Moves the screen of the answer table being displayed to the left. This function is available when there are more columns than can be contained on a single screen.
7	Right	Moves the screen of the answer table being displayed to the right. This function is available when there are more columns than can be contained on a single screen.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.

NOTE

A selective index in EZQUERY is an index that does not contain all records of a particular record type. EZQUERY does not know the criteria used to place records on a selective index. Therefore, when you use EZQUERY to modify a record, the record remains on its current indexes. If you append a record, EZQUERY adds the record to all indexes (including any selective indexes) defined for its record type. The Manage Record Description function sets the update code to 1 (i.e., updates are not allowed) if you define a record description file with one or more selective indexes.

The Modify screen allows you to modify only one record at a time. To modify another record, position the cursor in the record and press PF10 to return to the Modify screen.

4.5.2 Appending Records

To append a record, press PF11 from the Answer Table screen. The Append screen then displays a row of pseudoblanks in which you can enter data for the new record; this row always appears at the end of the answer table. Figure 4-6 shows you how to append a record that contains the data SCHP, SUPERCHIP CORP, 33.750, and 0.600 in the columns SYMBOL, NAME, PRICE, and DIVIDEND, respectively.

NOTE

You cannot append records if the answer table does not include all columns for which a data validation range is defined. If a column is an alternate key that does not allow duplicate values, the answer table should include it so that you can enter a value that is unique to the appended record.

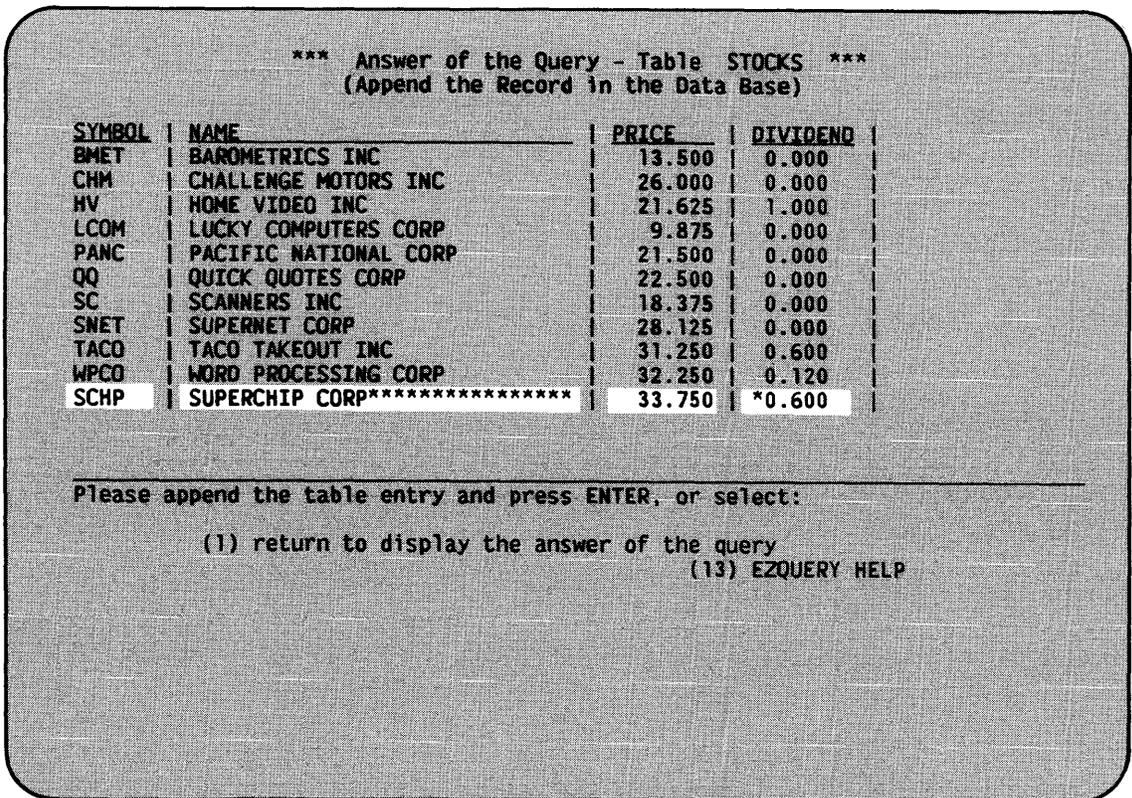


Figure 4-6. The Append Screen

If a data validation range is defined for a column, you must enter a value within that range in the corresponding column. If a column is the primary key or an alternate key that does not allow duplicate values, you must enter a value that is unique to that record. Through EZQUERY HELP, you can check the attributes of a column.

You can leave a column blank. If you leave a column blank or if the answer table does not contain a column, the column in the appended record has the default value of blank if it is of data type CHARACTER. The default value is 0 if the column is of data type NUMBER (SIGNED or UNSIGNED).

To append the record to both the answer table and the data file, press ENTER from the Append screen. EZQUERY then appends the record to the end of the answer table and inserts it at the appropriate point in the data file. The other functions available from the Append screen are identical to those available from the Modify screen.

After you press ENTER, the Append screen displays another row of pseudoblanks. You can then append another record or press PF1 to return to the Answer Table screen.

4.5.3 Deleting Records

To delete a record, position the cursor in the record and press PF12 from the Answer Table screen. The Delete screen then highlights the record and prompts you to delete it by pressing ENTER. Figure 4-7 illustrates a request to delete the second record.

```
*** Answer of the Query - Table STOCKS ***
      (Delete the Record in the Data Base)

SYMBOL | NAME | PRICE | DIVIDEND |
-----|-----|-----|-----|
BMET   | BAROMETRICS INC | 13.500 | 0.000 |
CHM*   | CHALLENGE*MOTORS*INC***** | **26.000 | *0.000 |
HV     | HOME VIDEO INC | 21.625 | 1.000 |
LCOM   | LUCKY COMPUTERS CORP | 9.875 | 0.000 |
PANC   | PACIFIC NATIONAL CORP | 21.500 | 0.000 |
QQ     | QUICK QUOTES CORP | 22.500 | 0.000 |
SC     | SCANNERS INC | 18.375 | 0.000 |
SNET   | SUPERNET CORP | 28.125 | 0.000 |
TACO   | TACO TAKEOUT INC | 31.250 | 0.600 |
WPCO   | WORD PROCESSING CORP | 32.250 | 0.120 |

-----
To delete the table entry press ENTER, or select:
      (1) return to display the answer of the query
      (13) EZQUERY HELP
```

Figure 4-7. The Delete Screen

To delete the record from both the answer table and the data file, press ENTER. The other functions available from the Delete screen are identical to those available from the Modify screen.

The Delete screen allows you to delete only one record at a time. To delete another record, position the cursor in the record and press PF12 to return to the Delete screen.

4.6 EDITING THE ANSWER TABLE

The Edit Answer screen enables you to sort the answer table or to eliminate any duplicates in it. To access the Edit Answer screen, press PF15 from the Answer Table screen. Figure 4-8 illustrates the Edit Answer screen.

*** Answer of the Query - Table STOCKS ***
 (Edit the Answer of the Query)

<u>SYMBOL</u>	<u>NAME</u>	<u>PRICE</u>	<u>DIVIDEND</u>
BMET	BAROMETRICS INC	13.500	0.000
CHM	CHALLENGE MOTORS INC	26.000	0.000
HV	HOME VIDEO INC	21.625	1.000
LCOM	LUCKY COMPUTERS CORP	9.875	0.000
PANC	PACIFIC NATIONAL CORP	21.500	0.000
QQ	QUICK QUOTES CORP	22.500	0.000
SC	SCANNERS INC	18.375	0.000
SNET	SUPERNET CORP	28.125	0.000
TACO	TACO TAKEOUT INC	31.250	0.600
WPCO	WORD PROCESSING CORP	32.250	0.120

Please select a function and press the appropriate PF key:

- (1) return to display the answer of the query
- (9) sort the answer of the query (13) EZQUERY HELP
- (10) eliminate duplicate rows

Figure 4-8. The Edit Answer Screen

The functions available from the Edit Answer screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Answer Table screen.
9	Sort Answer	Allows you to sort the answer table.
10	Eliminate Duplicates	Allows you to eliminate any duplicates that exist in the answer table.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.

NOTE

Operations performed through the Edit Answer screen affect only the answer table displayed on the screen. The actual tables in the data base remain unchanged.

4.6.1 Sorting the Answer Table

The Sort screen enables you to define the order in which the answer table displays the answer. To access the Sort screen, press PF9 from the Edit Answer screen. Figure 4-9 illustrates the Sort screen.

```
*** Answer of the Query - Table STOCKS ***
(Sort the Answer of the Query)

SYMBOL | NAME | PRICE | DIVIDEND |
-----|-----|-----|-----|
BMET   | BAROMETRICS INC | 13.500 | 0.000 |
CHM    | CHALLENGE MOTORS INC | 26.000 | 0.000 |
HV     | HOME VIDEO INC | 21.625 | 1.000 |
LCOM   | LUCKY COMPUTERS CORP | 9.875 | 0.000 |
PANC   | PACIFIC NATIONAL CORP | 21.500 | 0.000 |
QQ     | QUICK QUOTES CORP | 22.500 | 0.000 |
SC     | SCANNERS INC | 18.375 | 0.000 |
SNET   | SUPERNET CORP | 28.125 | 0.000 |
TACO   | TACO TAKEOUT INC | 31.250 | 0.600 |
WPCO   | WORD PROCESSING CORP | 32.250 | 0.120 |

Please specify the sort keys and sort orders (A: ascending, or D: descending),
and press ENTER:
column for key 1: ***** order: A (A/D)
column for key 2: ***** order: A (A/D)
column for key 3: ***** order: A (A/D)

Press PF1 to return to edit the answer of the query
```

Figure 4-9. The Sort Screen

You can sort up to three columns in the answer table in ascending (e.g., 1, 2, 3, or A, B, C) or descending order (e.g., 3, 2, 1, or C, B, A). You enter the names of the columns to be sorted in the pseudoblanks and specify the sorting order with the appropriate one-letter code (A = ascending order, D = descending order); the default sorting order is ascending.

The order in which you enter the column names determines the sorting priority. The primary column on which the sort will be based is assigned to key 1; the secondary and tertiary columns, if any, are assigned to keys 2 and 3. In Figure 4-9, for example, if you assign PRICE to key 1 and DIVIDEND to key 2, EZQUERY first sorts the answer according to the price of the stock and then, within each price, sorts the answer according to dividend. In the sorted answer table, a \$20 stock would be listed before a \$30 stock, and a \$30 stock with a dividend of \$1 would be listed before a \$30 stock with a dividend of \$3.

To sort the answer according to the specified columns, press ENTER from the Sort screen. To return to the Edit Answer screen without sorting the answer, press PF1.

4.6.2 Eliminating Duplicates

To eliminate duplicates from the answer table, press PF10 from the Edit Answer screen. EZQUERY then displays a screen that prompts you to press ENTER to eliminate them. To return to the Edit Answer screen without eliminating the duplicates, press PF1.

4.7 THE ANSWER MENU

The Answer menu enables you to copy the answer to a data file and its definition to a control file, to enter the VS/Report facility or the REPORT utility, to create a word processing document or a word processing merge document, to create or replace a stored query, to print the query and answer, or to end the current query and return to the EZQUERY Functions menu. To access the Answer menu, press PF16 from the Answer Table screen. Figure 4-10 illustrates the Answer menu.

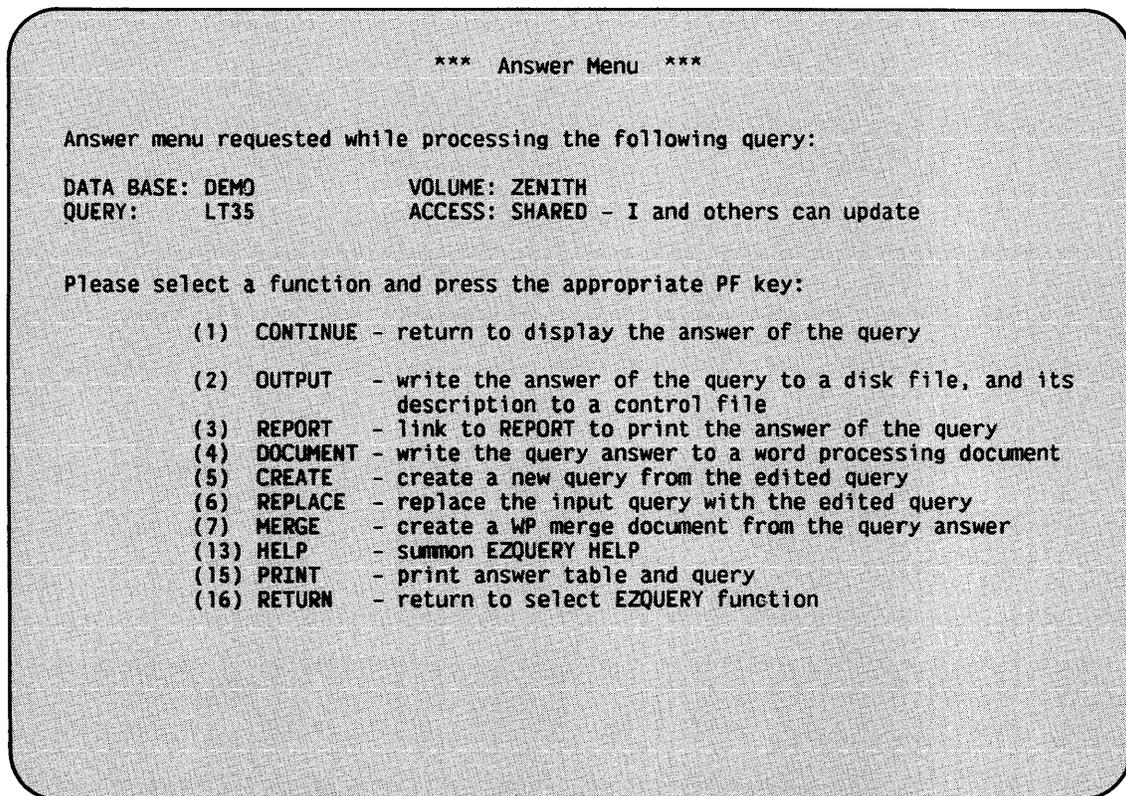


Figure 4-10. The Answer Menu

The functions available from the Answer menu are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Continue	Returns to the Answer Table screen.
2	Output	Copies the answer to a data file and its definition to a control file.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
3	Report	Allows you to produce a report through the VS/Report facility (if your system includes it) or the REPORT utility.
4	Document	Creates a word processing document that contains the answer to the query.
5	Create	Creates a stored query from the query that you are currently formulating or editing.
6	Replace	Replaces the existing stored query with the version that you are currently editing. This function is available when you are processing a stored query, as in Figure 4-10.
7	Merge	Creates a word processing merge document that contains the answer to the query.
13	Help	Enters the EZQUERY HELP facility.
15	Print	Prints the current query and answer.
16	Return	Ends the current query and returns you to the EZQUERY Functions menu to select another function.

4.7.1 Copying the Answer

To save the query results permanently, press PF2 from the Answer menu. EZQUERY then enables you to copy the answer to a data file and its definition to a control file. You can then, for example, enter the REPORT utility to create a report on this file, or you can use the Manage Data Base function to attach the file to a data base.

When you press PF2 from the Answer menu, the Copy Answer screen prompts you to specify the name, library, and volume of the data file and of the control file and to define the organization and type of the data file. Figure 4-11 illustrates the Copy Answer screen.

After specifying the data file and control file, press ENTER. EZQUERY then copies the answer to the data file and its definition to the control file. It also displays a message to signal the successful completion of the copy operation. If a file with the name, library, and volume that you specify for the data file or control file already exists, EZQUERY displays a screen that prompts you to respecify the file name or to press PF3 to scratch the existing file. To return to the Answer menu without copying the answer, press PF1 from the Copy Answer screen.

The number of records in the data file equals the number of rows in the answer table. The control file that EZQUERY creates for the answer describes the structure and contents of the data file. Through the CONTROL utility, you can examine or modify the control file. (For a detailed discussion of control files and the CONTROL utility, refer to the VS File Management Utilities Reference.)

If you specify a data file with an organization of indexed (I) or indexed with one or more alternate keys (A), EZQUERY prompts you to select the primary key and the alternate keys (if any) before it copies the answer. The sections that follow describe the process of selecting primary and alternate keys for the data file that will contain the answer.

Selecting a Primary Key

After you press ENTER from the Copy Answer screen, EZQUERY displays the Select Primary Key screen if the data file has an organization of I or A. The Select Primary Key screen lists all of the columns in the answer table; the order of the columns is from left to right and then from top to bottom. Figure 4-12 illustrates this screen.

To select a column as the primary key, place a nonblank character (e.g., X) in the pseudoblank preceding that column. To select a compound primary key (i.e., a key that is composed of more than one column), select columns that are contiguous. For example, Figure 4-12 shows you how to select a compound key that is composed of the columns PRICE and DIVIDEND. Note that the maximum length of a key is 132 bytes.

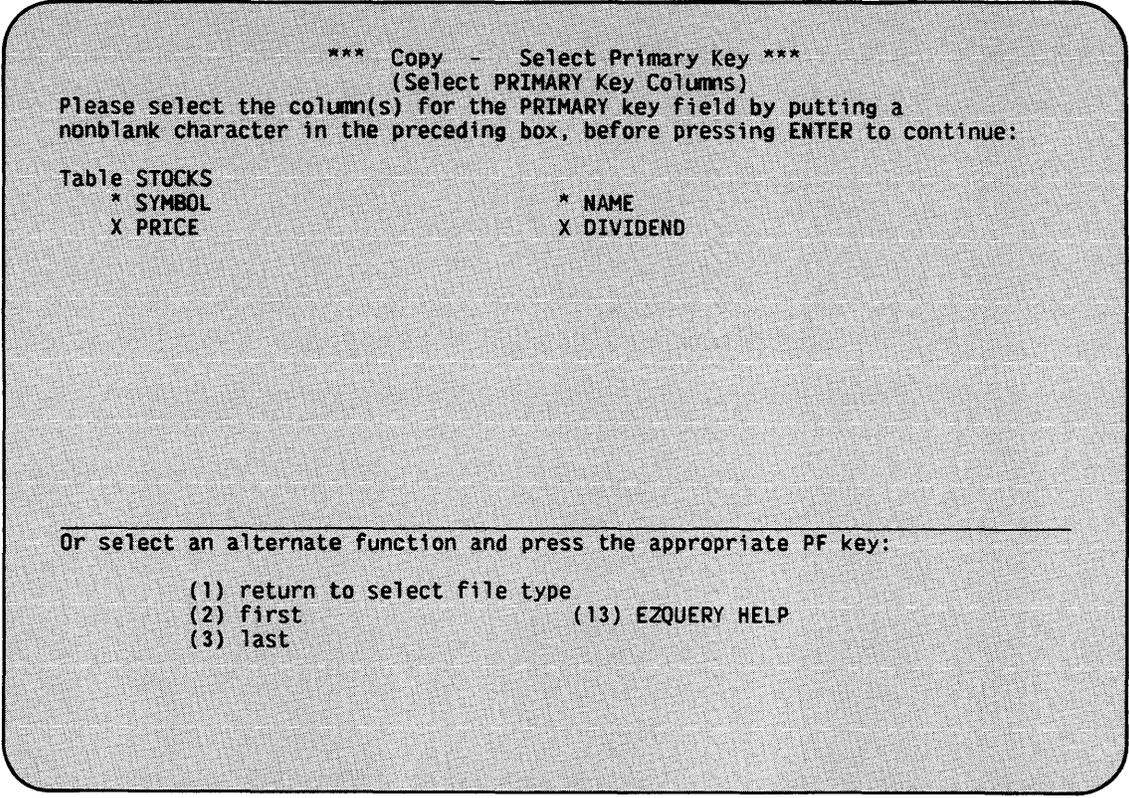


Figure 4-12. The Select Primary Key Screen

After selecting the primary key, press ENTER. The other functions available from the Select Primary Key screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns you to the Copy Answer screen without defining a primary key.
2	First	Displays the first screen of columns.
3	Last	Displays the last screen of columns.
4	Previous	Displays the previous screen of columns.
5	Next	Displays the next screen of columns.
13	EZQUERY HELP	Enters the EZQUERY HELP facility.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more columns than can be listed on a single screen. In Figure 4-12, PF keys 4 and 5 do not appear because the entire listing of columns fits on one screen.

If you selected a compound key, EZQUERY then displays a screen that prompts you to name the compound key. The name must consist of one to eight characters. The allowed characters are A through Z, 0 through 9, @, \$, #, and the hyphen; the first character must be alphabetic. The name cannot contain embedded blanks and must be unique within the data file. Enter the name of the compound key and press ENTER.

Because a data file cannot contain duplicate values for the primary key, EZQUERY copies only the first answer table row with a particular primary key value. After copying the answer, EZQUERY issues a warning if it was unable to copy one or more answer table rows. The sum of the number of records in the data file plus the number of records not copied equals the number of rows in the answer table.

Selecting Alternate Keys

After you select the primary key, EZQUERY displays the Select Alternate Key screen if the data file has an organization of indexed with one or more alternate keys (A). Use this screen to select up to 16 alternate keys for the data file; you select each alternate key one at a time. Figure 4-13 illustrates the Select Alternate Key screen; it shows you how to select SYMBOL as the first alternate key.

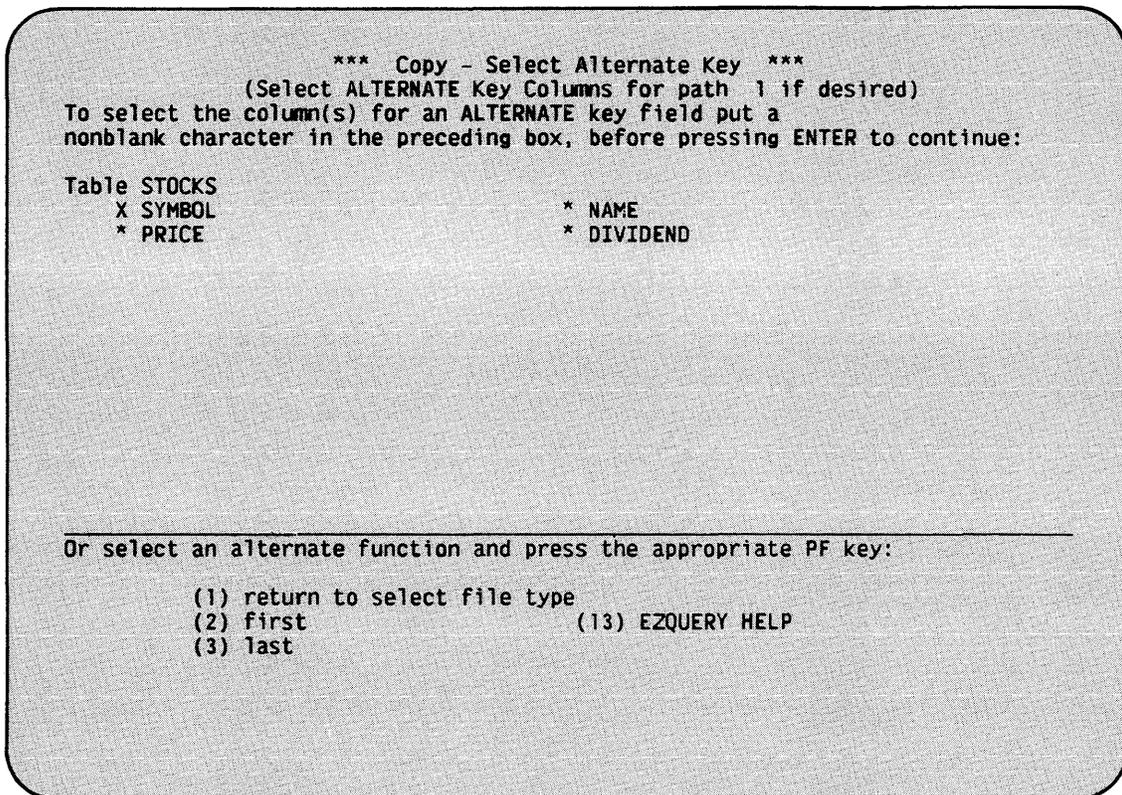


Figure 4-13. The Select Alternate Key Screen

You select an alternate key in the same manner as a primary key. The alternate key can be simple or compound. Note that the sum of the lengths of the primary key and the largest alternate key cannot exceed 255 bytes. After selecting an alternate key, press ENTER. The other functions available from the Select Alternate Key screen are identical to those available from the Select Primary Key screen.

After you press ENTER, EZQUERY displays a screen that prompts you to specify whether the alternate key can contain duplicate values. Answer YES to allow duplicate alternate key values or NO to disallow them; YES is the default. After specifying YES or NO, press ENTER. If you selected a compound alternate key, the screen that EZQUERY displays also prompts you to name the compound key.

NOTE

If you answer NO and the answer table contains duplicate alternate key values, EZQUERY cannot construct the alternate index for the data file. While copying the answer, EZQUERY displays a screen that prompts you to create an error log.

To indicate that you have selected all of the alternate keys, select no columns and press ENTER from the Select Alternate Key screen. EZQUERY then copies the answer to the data file that you specified.

4.7.2 Producing a Report

To produce a report, press PF3 from the Answer menu. EZQUERY then establishes access to the VS/Report facility (if your system includes it) or the REPORT utility.

The VS/Report Facility

If your system includes VS/Report, press PF3 from the Answer menu to access VS/Report directly from EZQUERY. To use VS/Report to create a report from the answer to the current query, you must first create or replace the query from the Answer menu. The Reports screen then prompts you to specify a report and to select the action that you want to perform on it. For detailed information about the operation of VS/Report, refer to the VS VS/Report User's Manual.

NOTE

If you are using a VS50 or a VS80 or if your remaining Segment 2 size is less than 512K, you cannot access VS/Report from EZQUERY. You must run VS/Report directly.

The REPORT Utility

If your system does not include VS/Report, press PF3 from the Answer menu to enter the REPORT utility. The Specify Report ID screen then prompts you to specify a Report ID. The Report ID is the name of the Report Definition file that defines the format and content of the report to be produced. If you then press ENTER, REPORT uses this information to produce the requested report. For detailed information about the operation of REPORT, refer to the VS File Management Utilities Reference.

If you press ENTER without specifying a Report ID, the REPORT Utility menu allows you to create a Report Definition file, to modify an existing one, or to produce a report. To return to the Answer menu without producing a report, press PF16 from the Specify Report ID screen.

NOTE

To use REPORT to create a report from the answer to the current query, you must first copy the answer to a data file and its definition to a control file.

4.7.3 Creating a Word Processing Document

To create a word processing document that contains the answer to the query, press PF4 from the Answer menu. The Create Document screen then prompts you to specify the word processing document to be created. Figure 4-14 illustrates the Create Document screen.

A Document ID consists of four digits and a letter that designates the document's library. If VS Word Processing is installed on your system, the Create Document screen displays the default workstation library as the document's library (e.g., J in Figure 4-14). You can enter a specific ID, or you can enter blank, next, or NEXT to direct EZQUERY to use the next available document in the library that you specify. You do not need to specify the volume if the library resides on the volume that VS Word Processing associates with that letter.

The Create Document screen also enables you to specify the other components of the word processing document summary: the title, author, operator, and comments. You can leave any or all of the fields blank.

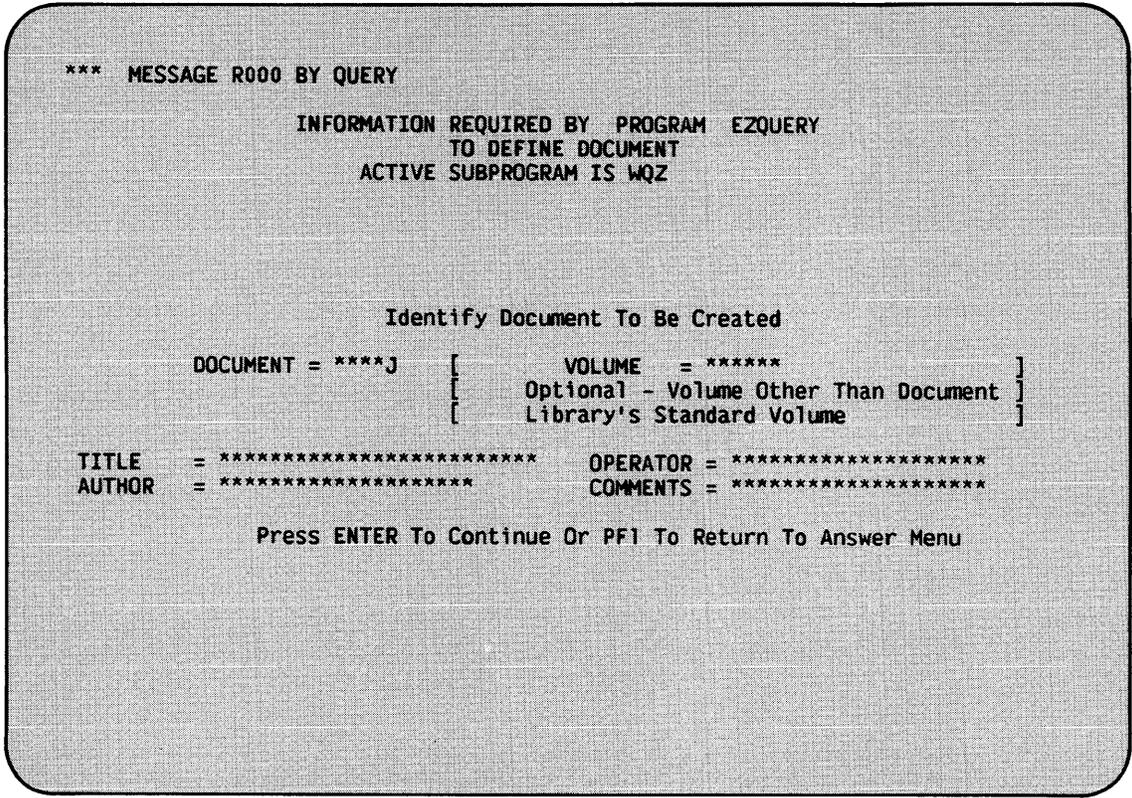


Figure 4-14. The Create Document Screen

After specifying the Document ID, press ENTER. EZQUERY then creates a word processing document that contains the answer. It also displays a message to signal the successful creation of the document. If a document with the ID that you specify already exists, EZQUERY displays a message that prompts you to respecify the Document ID or to press PF3 to scratch the existing document. To return to the Answer menu without creating a word processing document, press PF1.

Figure 4-15 gives an example of a word processing document that contains the answer to a query. EZQUERY centers all lines on the page and ends each line with a return graphic (◀). A line contains a maximum of 156 characters to allow a center graphic (◆) in Position 1 and a return graphic in Position 158. EZQUERY creates a format line to accommodate the width of the answer table.

Each page of the word processing document contains a maximum of 54 lines. The name of the answer table appears on the first line of the first page. The column names appear on the fourth line of the first page and on the first line of subsequent pages. EZQUERY underlines the column names and separates them by three spaces. The answer to the query appears below the column names. The word processing document contains a maximum of 120 pages.

If a query with the name that you specify already exists in that library, EZQUERY displays a screen that prompts you to respecify the query name, to press PF3 to scratch the existing query, or to press PF1 to return to the Answer menu.

4.7.5 Replacing a Stored Query

To replace a stored query, press PF6 from the Answer menu. EZQUERY then displays a screen that prompts you to confirm the replacement. If you press ENTER, EZQUERY replaces the stored query with the version that you are currently editing. It also creates a record description file for the answer to the edited query and stores the file in the library @dbnameC (e.g., @DEMOC). To return to the Answer menu without replacing the query, press PF1.

4.7.6 Creating a Word Processing Merge Document

To create a word processing merge document that contains the answer to the query, press PF7 from the Answer menu. You can then use the Merge Print feature of VS Word Processing to produce a document that integrates the answer into another word processing document.

When you press PF7 from the Answer menu, the Create Document screen, shown in Figure 4-14, prompts you to specify the word processing merge document to be created. You specify a word processing merge document in the same manner as a word processing document.

After specifying the Document ID, press ENTER. EZQUERY then creates a word processing merge document that contains the answer. It also displays a message to signal the successful creation of the document. If a document with the ID that you specify already exists, EZQUERY displays a message that prompts you to respecify the Document ID or to press PF3 to scratch the existing document. To return to the Answer menu without creating a word processing merge document, press PF1.

Figure 4-16 gives an example of a word processing merge document that contains the answer to a query. The document contains a format line with a return graphic (↵) in Position 80. A merge graphic (⇅) separates the columns within a row, and a merge safeguard (⌄) separates each row of the answer table. Each page of the document contains 100 records; the maximum number of pages is 120.

```

11.....◀
BMET·$BAROMETRICS·INC·$·13.500$·0.000·$CHM·$CHALLENGE·MOTORS·INC·$·26.000$·
0.000·$HV·$HOME·VIDEO·INC·$·21.625$·1.000·$LOM·$LUCKY·COMPUTERS·CORP·$·
9.875$·0.000·$PANC·$PACIFIC·NATIONAL·CORP·$·21.500$·0.000·$QQ·$QUICK·QUOTES·
CORP·$·22.500$·0.000·$SC·$SCANNERS·INC·$·18.375$·0.000·$SNET·$SUPERNET·CORP·
$·28.125$·0.000·$TACO·$TACO·TAKEOUT·INC·$·31.250$·0.600·$WPCO·$WORD·
PROCESSING·CORP·$·32.250$·0.120·$·

```

(Document End)

Figure 4-16. Sample Word Processing Merge Document

Figure 4-17 illustrates the use of the Merge Print feature to produce a document that combines a standard text with the first record in the word processing merge document.

```

TO:      Brokers

FROM:    Duncan Gill

DATE:    18 December 1982

SUBJECT  BMET

        I believe that the stock of BAROMETRICS INC
        represents an attractive buy opportunity in today's
        market climate. Its current price is 13.500, and
        the dividend is 0.000. Further information is
        enclosed in the attached report. Why don't you give
        your clients a call and recommend it today?

```

Figure 4-17. Sample Merge Print Output

4.7.7 Printing the Query and Answer

To print the current query and answer, press PF15 from the Answer menu. The Print Options screen then prompts you to specify the names of the file, library, and volume for the print file and to define its format. Figure 4-18 illustrates the Print Options screen.

```
*** MESSAGE P001 BY WQ4PRT

                INFORMATION REQUIRED BY PROGRAM EZQUERY
                TO DEFINE OPTIONS

Please specify print file options and press ENTER

FILE      = QRY0000*   LIBRARY = #JMCPR*   VOLUME  = ZENITH
Number of COPIES = 1***   Form NUMBER = 000

Characters per LINE = 132 (Minimum 80)
Lines per PAGE     = 055 (Minimum 10)
Print CLASS       = A

                Press PF16 to exit print function
```

Figure 4-18. The Print Options Screen

The Print Options screen displays the following default values for the name, library, and volume of the print file:

<u>Name</u>	<u>Default Value</u>
File	The query name if you are printing a stored query; a unique name generated by EZQUERY if you are printing a new query.
Library	The value defined for SPOOLIB through the Set Usage Constants command.
Volume	The value defined for SPOOLVOL through the Set Usage Constants command.

You can accept these defaults or enter new values in the pseudoblanks. A file or library name consists of one to eight characters; the volume that you specify must be mounted on the system.

To define the format of the print file, you specify the following characteristics:

<u>Characteristic</u>	<u>Description</u>
Number of Copies	The number of copies to be printed. You can print a minimum of 1 and a maximum of 9999 copies. The default is 1.
Form Number	The form type used to print the file. The possible form numbers are 000 through 254. The default is the value defined for FORM# through the Set Usage Constants command.
Characters per Line	The number of characters to be printed on a line. The minimum number of characters per line is 80, and the maximum is 999. The default is 132.
Lines per Page	The number of lines to be printed on each page. The minimum number of lines per page is 10, and the maximum is 999. The default is the value defined for LINES through the Set Usage Constants command.
Print Class	The print class of the print file. The print class determines which printers can print the file. The possible print classes are A through Z. The default is the value defined for PRICLASS through the Set Usage Constants command.

For more information about the Set Usage Constants command, refer to the VS Programmer's Introduction.

After specifying the print file and its format, press ENTER. EZQUERY then prints the current query and answer and returns you to the Answer menu. To return to the Answer menu without printing the query and answer, press PF16.

Each page of the printed query contains the following information: the data base name and volume, the date, and the page number. EZQUERY prints the questions of the query in sequence and precedes each question by the query name and the question number. For a particular question, EZQUERY prints the table skeletons and the condition area (if it is part of the question). If a table skeleton row contains more columns than can be printed in a single line, EZQUERY folds the table skeleton into more than one line.

Figure 4-19 gives an example of a printed query. For clients with an account number of less than 1000, the query requests the trading symbol, name, number of shares, purchase date, purchase price, and current price of their stocks. The number of characters per line is 80. Because the table skeleton columns do not fit in an 80-character line, the BUY-PRICE column, for example, appears below the first line of the HOLDINGS table skeleton.

```

DBname=DEMO   Volume=ZENITH   Date August 08, 1983   PAGE   1

Query=New     Question 01

HOLDINGS     !! ACCOUNT      ! SYMBOL      ! QUANTITY    ! BUY-DATE    !
              !! LT '1000'    ! #STOCK     !             !             !
              !! BUY-PRICE    !             !             !             !
              !!             !             !             !             !

STOCKS       !! SYMBOL      ! NAME       ! PRICE      !
              !! #STOCK     !           !           !

ANSWER-01    !! ACCOUNT      ! SYMBOL      ! NAME       ! QUANTITY    !
DISPLAY      !!             !             !           !             !
              !! BUY-DATE    ! BUY-PRICE  ! PRICE     !
              !!             !           !           !

```

Figure 4-19. Sample Printed Query

Each page of the printed answer contains the following information: the data base name and volume, the date, the page number, the query name, the answer table name, and the column names. If an answer table row contains more columns than can be printed in a single line, EZQUERY indents and folds the row into more than one line.

Figure 4-20 illustrates the printed answer to the query shown in Figure 4-19. As in Figure 4-19, the number of characters per line is 80. Because the answer table rows do not fit in an 80-character line, the column name PRICE appears below the first line of column names. The price of a particular stock appears below the first line of information; thus, for example, the price of the first stock in the answer table, 45.000, appears below the other information about it.

DBname=DEMO Volume=ZENITH Date August 08, 1983 PAGE 1
Query=New Answer=ANSWER-01

<u>ACCOUNT</u>	<u>SYMBOL</u>	<u>NAME</u>	<u>QUANTITY</u>	<u>BUY-DATE</u>	<u>BUY-PRICE</u>
0100	BUYN	BUY 'N CRY CORP	150	110882	39.000
	45.000				
0100	PANC	PACIFIC NATIONAL CORP	250	031883	23.000
	21.500				
0100	TGTK	TIGER TANK CORP	300	111982	29.375
	36.875				
0400	BMET	BAROMETRICS INC	150	040483	18.625
	13.500				
0400	SNET	SUPERNET CORP	400	011083	21.875
	28.125				
0450	BUYN	BUY 'N CRY CORP	250	012181	15.375
	45.000				
0450	TACO	TACO TAKEOUT INC	300	100182	21.500
	31.250				
0500	QQ	QUICK QUOTES CORP	6000	060182	7.875
	22.500				
0500	SC	SCANNERS INC	4500	083182	7.875
	18.375				

Figure 4-20. Sample Printed Answer

4.7.8 Ending the Query

To end the current query and return to the EZQUERY Functions menu, press PF16 from the Answer menu. If that query has not been saved, EZQUERY then displays a screen that prompts you to press PF16 to confirm the exit. To return to the Answer menu, press PF1.

CHAPTER 5 MANAGING A DATA BASE

5.1 INTRODUCTION

The Manage Data Base function enables you to define new EZQUERY data bases or modify existing ones. A data base in EZQUERY consists of one or more tables. Each table is the logical representation of a record description file and an associated data file. The record description file defines the attributes of the data file, and the data file contains the actual data that you can retrieve and update by formulating and executing queries. The table name is identical to the record description file name and must be unique within the data base.

To manage a data base, you first specify the name of the data base that you want to create or modify. EZQUERY enables you to create, rename, or delete a data base, to set the default access to the data base, or to manage the record description files in the data base. When managing a particular record description file, you can create, modify, rename, or delete it, copy it into the data base, or change the data file with which it is associated. The actual flow of data base management, from screen to screen according to the options selected, is illustrated in Figure 5-1.

5.2 DATA BASE STRUCTURE

Although the data base files are created and maintained by EZQUERY and are transparent to you, it is helpful to understand the general structure of the data base and the naming conventions for its files and libraries. Figure 5-2 illustrates the data base environment.

For each EZQUERY data base, there is a data base definition library with the name @dbnameD, where dbname is the data base name (e.g., @DEM0D). When you create a data base, you specify its name and the volume that will contain all data base libraries. The file @OBJDIR in the data base definition library contains the data base contents list. This list is a directory of the record description files and associated data files that constitute the data base. All record description files in the data base contents list must be located in the data base definition library. The data files can reside anywhere on your VS system. Thus, in Figure 5-2, the entry in the data base contents list (i.e., the file @OBJDIR) points to a record description file in the same library (i.e., the data base definition library) and to a data file located elsewhere on the system.

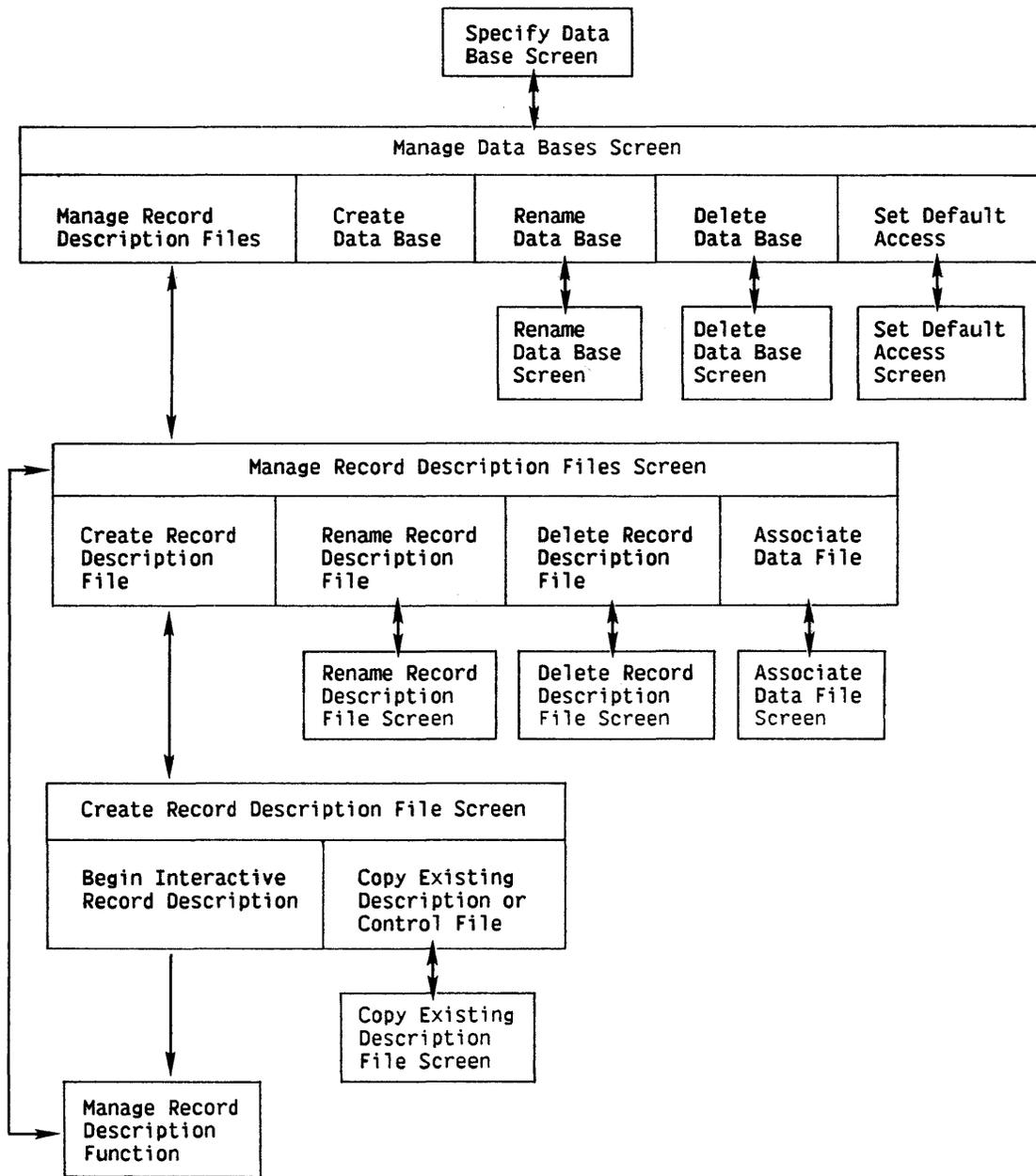


Figure 5-1. Screen Display Sequence in Data Base Definition

VOLUME: data base volume

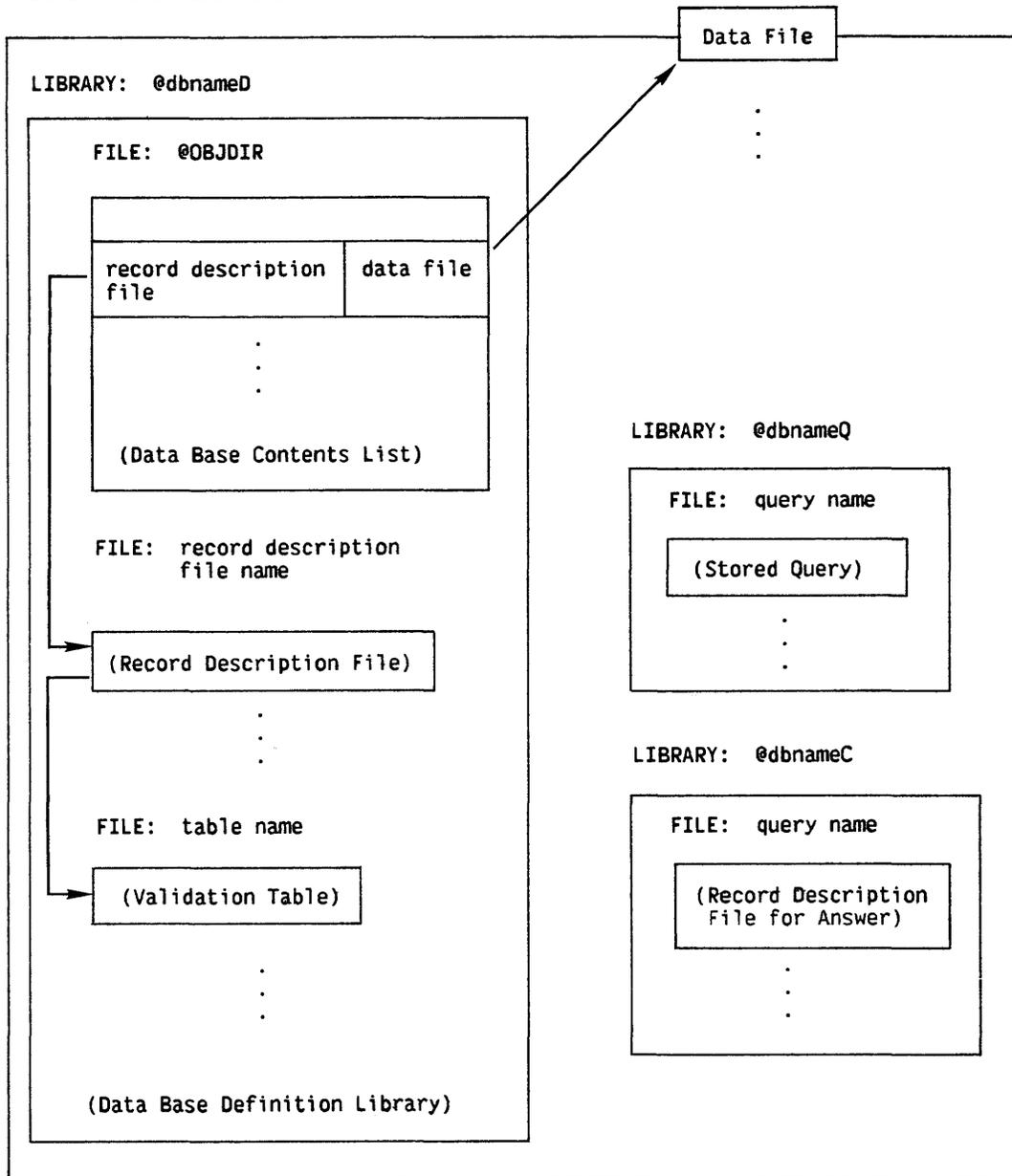


Figure 5-2. Data Base Environment

In addition to the data base definition library, a data base may have other libraries associated with it. The names of all data base libraries take the form @dbnameX, where dbname is the data base name and X is a single character that designates the library. For example, the library @dbnameQ (e.g., @DEMOQ) contains the stored queries for a data base, and the library @dbnameC (e.g., @DEMO C) contains record description files for the answers to the stored queries. The files in the libraries correspond to stored queries with the same name. As in Figure 5-2, all data base libraries are on the same volume.

NOTE

EZQUERY also recognizes as data base libraries those libraries with the name @dbnameX, where dbname is the data base name and X is one of the following characters: E, L, O, P, R, S, or T. These libraries are reserved for use by VS/Report. When you rename or delete the data base, EZQUERY also renames or deletes those libraries.

5.3 THE MANAGE DATA BASES SCREEN

To enter the Manage Data Base function, press PF1 from the Specify Data Base screen. The Manage Data Bases screen then prompts you to specify the name and volume of a data base and to select the action that you want to perform on the data base. Figure 5-3 illustrates the Manage Data Bases screen.

The Manage Data Bases screen displays default values for the data base and volume names under the following circumstances:

- If you specified the data base and volume names on the Specify Data Base screen, the Manage Data Bases screen displays those names as default values.
- If a default input volume has been defined through the Set Usage Constants command, the Manage Data Bases screen displays its name as the default value for the data base's volume. In Figure 5-3, for example, ZENITH is the default input volume.

You can accept the default values or enter new values in the pseudoblanks.

To manage the record description files in the specified data base, press ENTER. EZQUERY then grants you exclusive access to the file containing the data base contents list. While you have exclusive access to this file, no one else can manage the data base or begin to process a query against it. It is possible, however, to obtain exclusive access to this file when another user is already processing a query. EZQUERY always reads in the information from the data base definition library at the beginning of query processing and then relinquishes control of the library's files.

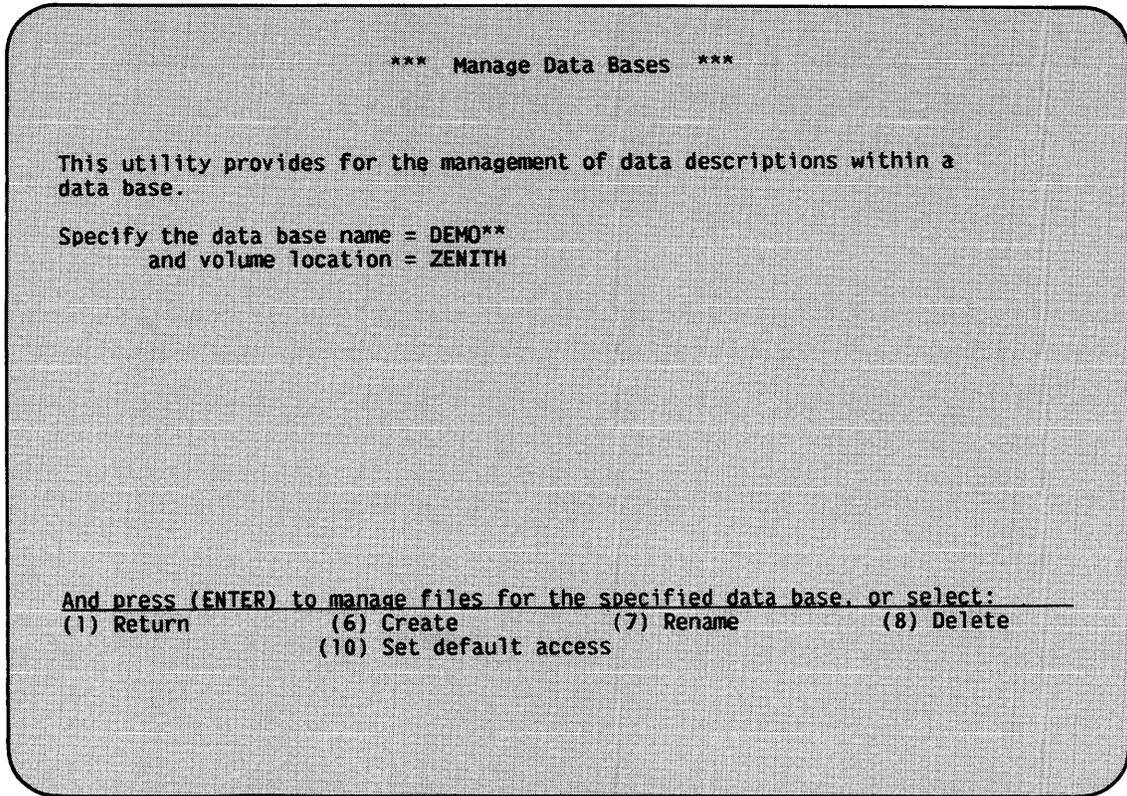


Figure 5-3. The Manage Data Bases Screen

The other functions available from the Manage Data Bases screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
1	Return	Returns to the Specify Data Base screen.
6	Create	Allows you to create a data base.
7	Rename	Allows you to rename an existing data base.
8	Delete	Allows you to delete an existing data base.
10	Set Default Access	Allows you to set the default access to a data base and to specify whether individual users can modify the access.

NOTE

All functions that involve access to files require you to have the appropriate access rights to those files. For more information about file security and user access rights, refer to the VS Programmer's Introduction.

5.3.1 Creating a Data Base

To create a data base, press PF6 from the Manage Data Bases screen. EZQUERY then creates the file for the data base contents list in the data base definition library (i.e., the file @OBJDIR in the library @dbnameD, where dbname is the data base name). It also displays a message to signal that the data base was created.

At the time of data base creation, EZQUERY checks to make sure that the data base volume contains no other libraries with the name @dbnameX, where X is any character. These names might be needed by other data base libraries; for example, the library @dbnameQ contains the stored queries associated with a data base.

5.3.2 Renaming a Data Base

To rename a data base, press PF7 from the Manage Data Bases screen. After granting you exclusive access to the file containing the data base contents list, EZQUERY displays the Rename Data Base screen. The Rename Data Base screen prompts you to enter the new name in the pseudoblanks and press ENTER. A data base name consists of one to six alphanumeric characters. By pressing PF1, you can return to the Manage Data Bases screen without renaming the data base. Figure 5-4 illustrates the Rename Data Base screen; it shows how to rename the data base DEMO to TEST.

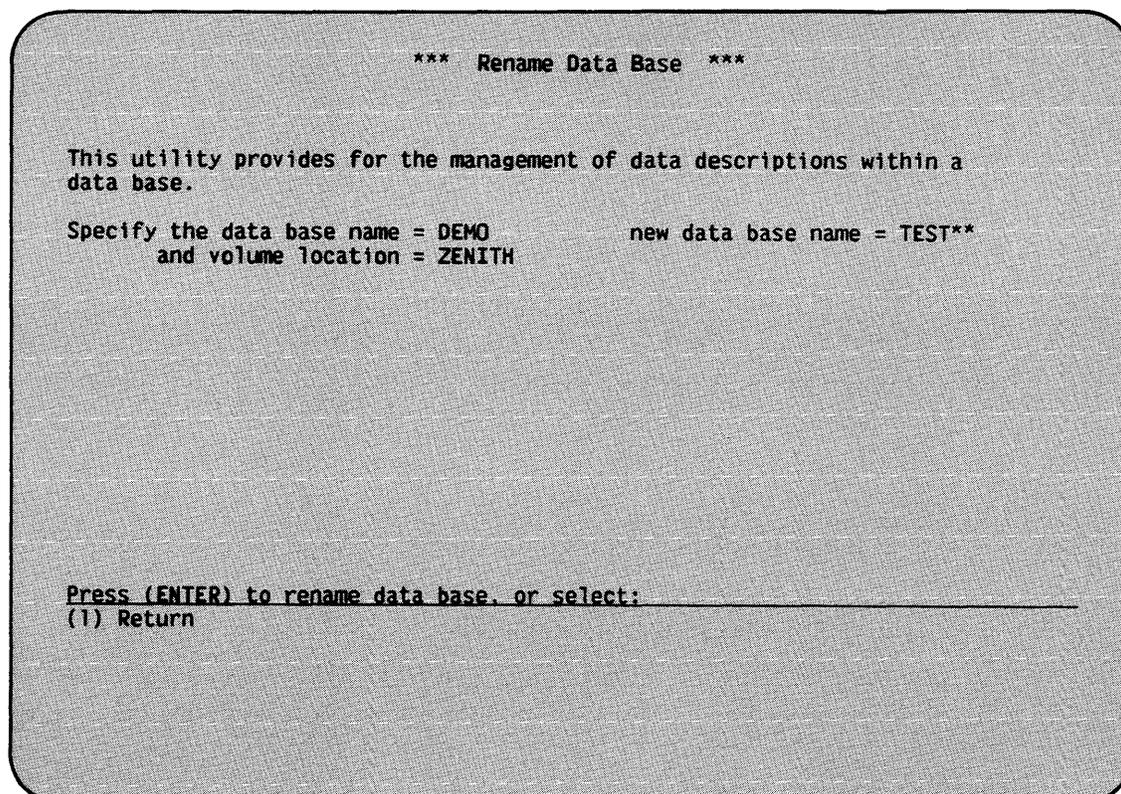


Figure 5-4. The Rename Data Base Screen

EZQUERY first attempts to rename the data base definition library (e.g., @DEMOM). For the renaming to take place, you must have the right to update all files in the library, and the retention period for all files must have expired. If it cannot rename the data base definition library, EZQUERY does not attempt to rename any other data base libraries.

After renaming the data base definition library, EZQUERY then proceeds to rename all other data base libraries (e.g., @DEMOQ). If it is unable to rename one or more libraries, EZQUERY displays a screen that lists those libraries and prompts you to complete the renaming through the Manage Files/Libraries command of the VS Command Processor menu. (For more information about the Manage Files/Libraries command, refer to the VS Programmer's Introduction.)

5.3.3 Deleting a Data Base

To delete a data base, press PF8 from the Manage Data Bases screen. After granting you exclusive access to the file containing the data base contents list, EZQUERY displays the Delete Data Base screen. The Delete Data Base screen prompts you to press ENTER to confirm the deletion. By pressing PF1, you can return to the Manage Data Bases screen without deleting the data base. Figure 5-5 illustrates the Delete Data Base screen; it shows how to delete the data base DEMO.

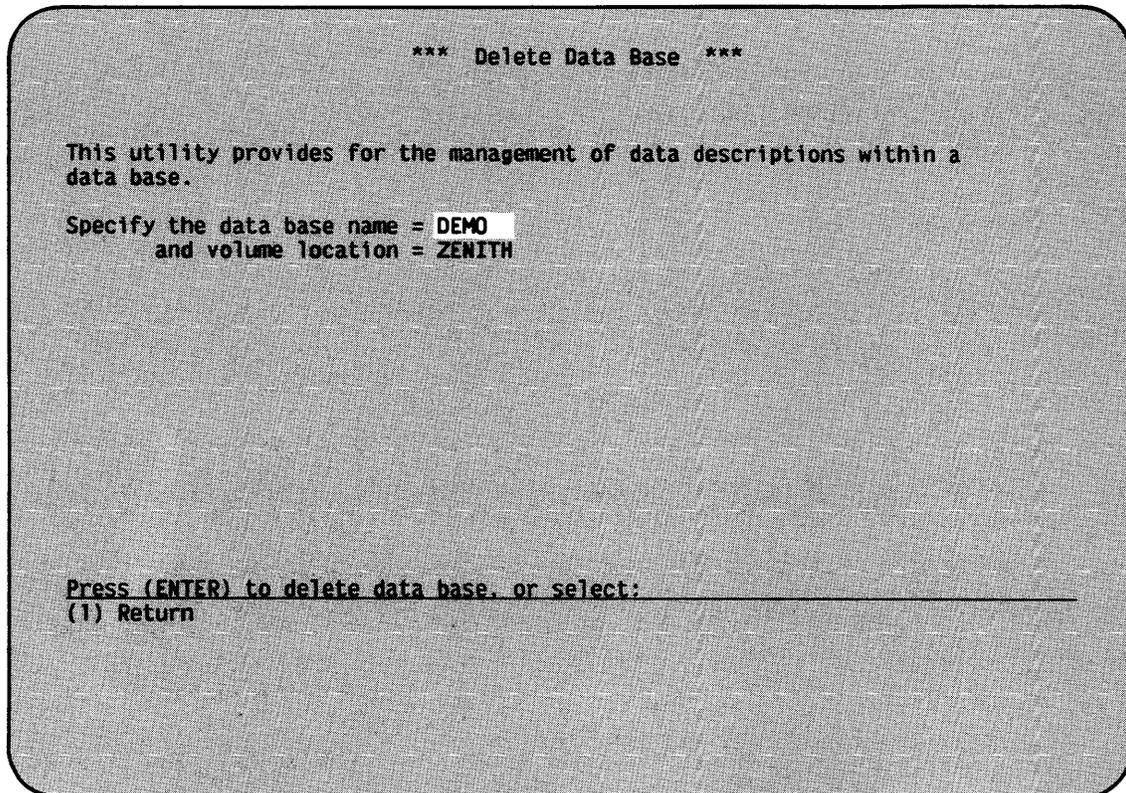


Figure 5-5. The Delete Data Base Screen

EZQUERY first attempts to delete the file that contains the data base contents list. If it cannot delete the file, EZQUERY does not attempt to delete any other files. If it does delete the file, EZQUERY proceeds to delete all files in the data base definition library (e.g., @DEMOM) and in all other data base libraries. It does not delete the associated data files. EZQUERY deletes the individual files in a library one at a time. Note that EZQUERY can delete part of a library if, for example, you do not have the right to update all files in that library.

If it is unable to delete all of the files in one or more libraries, EZQUERY displays a screen that lists the libraries and prompts you to complete the deletion through the Manage Files/Libraries command of the VS Command Processor menu. (For more information about the Manage Files/Libraries command, refer to the VS Programmer's Introduction.)

5.3.4 Setting the Default Data Base Access

To set the default access to a data base, press PF10 from the Manage Data Bases screen. The Set Default Access screen then prompts you to set the default access to the data base and to specify whether individual EZQUERY users can modify the access. Figure 5-6 illustrates the Set Default Access screen.

```
*** Modify Default Data Base Access ***

Data base name = DEMO
Volume location = ZENITH

Please specify the access each EZQUERY user will see as his or her own
access to data files:

SHARED - I can update. Others can update.
PRIVATE - I can update. Others cannot update. Others cannot read.
LIMITED - I cannot update. Others can update.
READONLY - I cannot update. Others cannot update. Others can read.

ACCESS = SHARED**

Is an EZQUERY user allowed to change the default access? YES

Press (ENTER) to modify default access, or select:
(1) Return
```

Figure 5-6. The Set Default Access Screen

Shared access is the default. You can accept the default or specify another type of access in the pseudoblanks. To allow individual EZQUERY users to modify their access to the data base, answer YES to the question; to prevent them from modifying the access, answer NO. YES is the default.

After setting the access, press ENTER. You can press PF1 to return to the Manage Data Bases screen without modifying the data base access.

A hidden GETPARM, identified by the parameter reference name INHIBIT, allows the procedure writer to prevent a particular user from modifying the access to the data base. For more information, refer to Appendix A.

5.4 THE MANAGE RECORD DESCRIPTION FILES SCREEN

The Manage Record Description Files screen enables you to review and modify the data base contents list for a particular data base. To access the Manage Record Description Files screen, press ENTER from the Manage Data Bases screen. Until you return to the Manage Data Bases screen, EZQUERY grants you exclusive access to the file containing the data base contents list. Figure 5-7 illustrates the Manage Record Description Files screen for the data base DEMO.

```

*** Manage Record Description Files ***

Description files for data base DEMO are in library @DEM0D on ZENITH

Specify the record description filename = ***** or position the cursor:

      Description  Data File
      Filename   Filename Library Volume
*  BROKER        BROKER  JMCDATA  ZENITH
*  CLIENT        CLIENT  JMCDATA  ZENITH
*  HOLDINGS      HOLDINGS JMCDATA  ZENITH
*  STOCKS        STOCKS  JMCDATA  ZENITH

And press (ENTER) to EDIT a record description file, or select:
(1) Return          (6) Create description file  (9) Associate
                   (7) Rename description file  data file
                   (8) Delete description file

```

Figure 5-7. The Manage Record Description Files Screen

The data base contents list is a directory of the record description files that belong to the data base and the data files associated with those record description files. Each record description file must have a unique name; it is located by default within the data base definition library (i.e., the library @dbnameD, where dbname is the data base name). The names of data files do not have to be unique; thus, the same data file can be associated with more than one record description file in the data base contents list. To describe a multiple record type file, you simply associate the same data file with a record description file for each record type. The data base contents list can list a maximum of 450 record description files.

NOTE

There is no guarantee that every entry in the data base contents list corresponds to a record description file in the data base definition library. Nor is every record description file in the data base definition library necessarily an entry in the data base contents list. The Manage Record Description Files screen provides functions that enable you to bring the data base contents list and the contents of the data base definition library into agreement.

The functions available from the Manage Record Description Files screen are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
ENTER	Edit	Allows you to modify an existing record description file.
1	Return	Returns to the Manage Data Bases screen. You relinquish exclusive access to the file containing the data base contents list at this point.
2	First	Displays the first screen of entries in the data base contents list.
3	Last	Displays the last screen of entries in the data base contents list.
4	Previous	Displays the previous screen of entries in the data base contents list.
5	Next	Displays the next screen of entries in the data base contents list.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
6	Create Description File	Allows you to create a record description file interactively or to copy an existing record description file or control file into the data base definition library. You also create a corresponding entry in the data base contents list.
7	Rename Description File	Allows you to rename a record description file and the corresponding entry in the data base contents list.
8	Delete Description File	Allows you to delete a record description file and the corresponding entry in the data base contents list.
9	Associate Data File	Allows you to change the data file with which a record description file is associated.

PF keys 2 through 5 enable you to manipulate the contents of the screen when there are more entries in the data base contents list than can appear on a single screen. Figure 5-7 does not show these PF keys because all of the entries fit on one screen.

To perform a function that involves a record description file, you must first select the record description file in one of the following ways:

- Specify the name of the record description file in the pseudoblanks.
- Position the cursor in the box preceding the record description file name.

If you both specify a name and position the cursor before a record description file name, EZQUERY assumes that you are selecting the record description file indicated by the cursor position.

5.4.1 Modifying a Record Description File

To modify a record description file, make your selection and press ENTER from the Manage Record Description Files screen. The selected record description file must be an entry in the data base contents list, and it must be located in the data base definition library (e.g., @DEM0D). After you press ENTER, EZQUERY proceeds to the Record Description menu, from which you can select an action that you want to perform on the record description file. For more information, refer to Section 6.3.

EZQUERY validates the record description file after you modify it. If the file does not adhere to the restrictions that EZQUERY imposes or if it is not consistent with other record description files that describe the same data file, EZQUERY displays a message on the Manage Record Description Files screen. It is your responsibility to correct the situation indicated by the message. Note that you cannot access a data base through the Query function if EZQUERY cannot validate the record description files.

5.4.2 Creating a Record Description File

To create a record description file or to copy an existing description file into the data base definition library, make your selection and press PF6 from the Manage Record Description Files screen. EZQUERY then displays the Create Record Description File screen. Figure 5-8 shows how to create a record description file named BONDS.

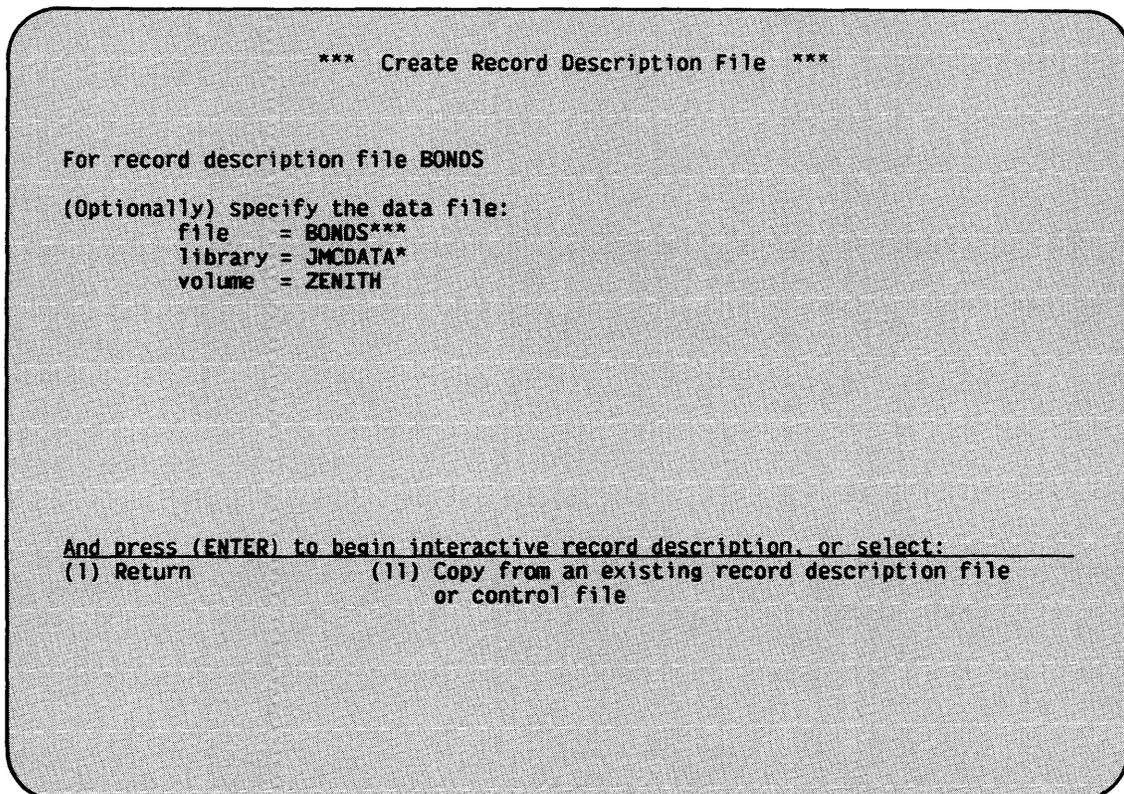


Figure 5-8. The Create Record Description File Screen

When you access the Create Record Description File screen, one of the following conditions is true for the selected record description file:

- The data base definition library (e.g., @DEMODO) does not contain the record description file, nor is it an entry in the data base contents list.

- The data base definition library does not contain the record description file, but it is an entry in the data base contents list.
- The data base definition library contains the record description file, but it is not an entry in the data base contents list.

By pressing ENTER, you can create whatever is missing: the record description file, the entry in the data base contents list, or both (in the case of a new record description file). To return to the Manage Record Description Files screen without creating a record description file, press PF1.

If the data base definition library does not contain the selected record description file, EZQUERY allows you to create the file interactively through the Manage Record Description function. After returning from the Manage Record Description function, EZQUERY first checks whether the record description file was in fact created and, if it was, updates the data base contents list.

If the third condition is true for the selected record description file, EZQUERY displays a message that prompts you to press ENTER to add it to the data base contents list. After you press ENTER, EZQUERY first checks whether the file is a valid record description file and, if it is, adds it to the data base contents list. By pressing PF1, you can return to the Manage Record Description Files screen without modifying the data base contents list.

The Create Record Description File screen also enables you to associate a data file with the record description file that you are creating. By specifying the name, library, and volume of a data file in the pseudoblanks, you create an entry for that file in the data base contents list and indicate that the record description file defines its attributes.

NOTE

The creation of an entry in the data base contents list for a data file does not guarantee the existence of that data file. EZQUERY allows you to create an empty data file that corresponds to an entry in the data base contents list. For more information, refer to Section 2.9.

After creating the record description file and the entry in the data base contents list, EZQUERY validates the record description file. If the file does not adhere to the restrictions that EZQUERY imposes or if it is not consistent with other record description files that describe the same data file, EZQUERY displays a message on the Manage Record Description Files screen. It is your responsibility to correct the situation indicated by the message. Note that you cannot access a data base through the Query function if EZQUERY cannot validate the record description files.

5.4.3 Copying a Record Description File or Control File

To copy an existing record description file or control file into the data base definition library and to create a corresponding entry in the data base contents list, press PF11 from the Create Record Description File screen. EZQUERY then displays the Copy Existing Description File screen. Figure 5-9 shows you how to copy a record description file named BALANCES.

```
*** Copy Existing Description File ***

To create the record description file BALANCES      in library @DEMOM
                                                    on volume  ZENITH
                                                    for data base DEMO

Specify an existing control (or record description) file to be copied:
file      = BALANCES
library   = JMCCTL**
volume    = ZENITH

and (Optionally) specify the data file:
file      = BALANCES
library   = JMCDATA*
volume    = ZENITH

Then press (ENTER) to copy the specified description file, or select:
(1) Return
```

Figure 5-9. The Copy Existing Description File Screen

When you access the Copy Existing Description File screen, one of the following conditions is true for the selected record description file:

- The data base definition library (e.g., @DEMOM) does not contain the record description file, nor is it an entry in the data base contents list.
- The data base definition library does not contain the record description file, but it is an entry in the data base contents list.

By pressing ENTER, you can copy the record description file into the data base definition library and create the entry in the data base contents list (if it does not already exist). To return to the Create Record Description File screen without copying a record description file, press PF1.

The Copy Existing Description File screen displays the following default values for the name, library, and volume of the record description or control file that you want to copy:

<u>Name</u>	<u>Default Value</u>
File	The name that you specify for the record description file, e.g., BALANCES in Figure 5-9.
Library	The User ID concatenated with the letters CTL.
Volume	The value defined for INVOL through the Set Usage Constants command.

You can accept these default values or enter new values in the pseudoblanks.

After you press ENTER, EZQUERY first checks whether the file exists and whether it is a valid record description or control file. If it is a valid record description file, EZQUERY copies it into the data base definition library. If it is a valid control file, EZQUERY converts it to a record description file and then copies the record description file into the data base definition library. Upon successful completion of the copy operation, it adds the file to the data base contents list.

NOTE

By copying a record description file, you add a new record description file to the data base. If you want to replace a record description file in the data base, you must delete the file before you copy the replacement file into the data base definition library.

The Copy Existing Description File screen also enables you to associate a data file with the record description file that you are copying. By specifying the name, library, and volume of a data file in the pseudoblanks, you create an entry for that file in the data base contents list. You also indicate that the record description file defines its attributes.

After copying the record description file and creating the entry in the data base contents list, EZQUERY validates the record description file. If the file does not adhere to the restrictions that EZQUERY imposes or if it is not consistent with other record description files that describe the same data file, EZQUERY displays a message on the Manage Record Description Files screen. It is your responsibility to correct the situation indicated by the message. Note that you cannot access a data base through the Query function if EZQUERY cannot validate the record description files.

5.4.4 Renaming a Record Description File

To rename a record description file, make your selection and press PF7 from the Manage Record Description Files screen. The Rename Record Description File screen then highlights the record description file and allows you to rename it. Figure 5-10 shows you how to rename the record description file HOLDINGS.

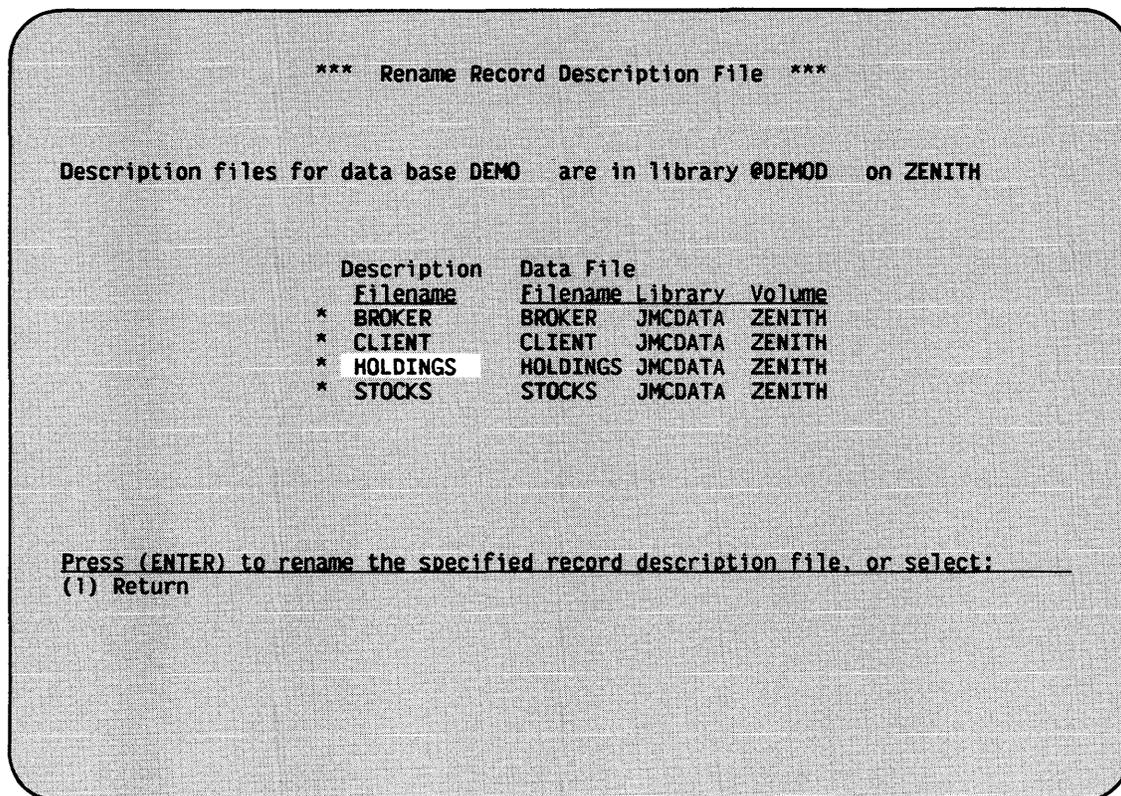


Figure 5-10. The Rename Record Description File Screen

Specify the new name in the data base contents list and press ENTER. EZQUERY then renames the record description file in the data base definition library (e.g., @DEMOM) and updates the corresponding entry in the data base contents list. By pressing PF1, you can return to the Manage Record Description Files screen without renaming the record description file.

5.4.5 Deleting a Record Description File

To delete a record description file, make your selection and press PF8 from the Manage Record Description Files screen. The Delete Record Description File screen then highlights the file and prompts you to delete it by pressing ENTER. Figure 5-11 shows you how to delete the record description file CLIENT.

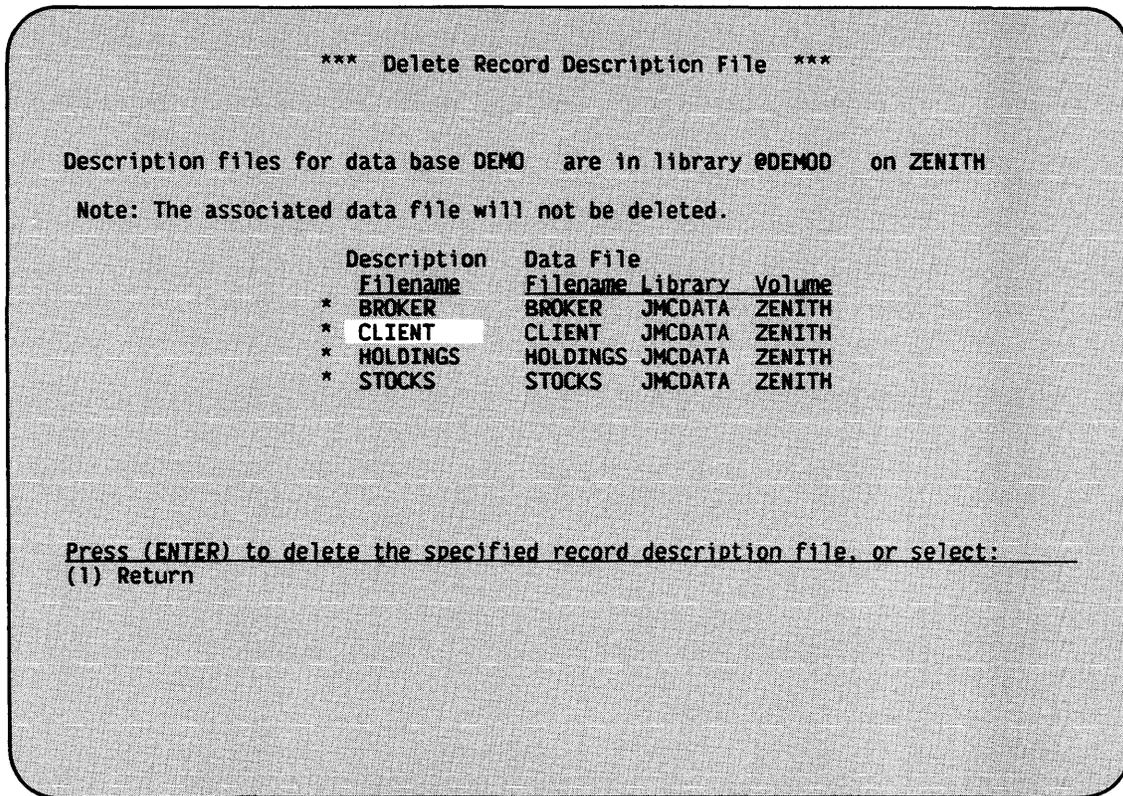


Figure 5-11. The Delete Record Description File Screen

If you press ENTER, EZQUERY deletes the record description file and the corresponding entry in the data base contents list. The associated data file is not deleted, nor are any other related files (e.g., record description file validation tables). You can delete those files through the Manage Files/Libraries command of the VS Command Processor menu. (For more information, refer to the VS Programmer's Introduction.) By pressing PF1, you can return to the Manage Record Description Files screen without deleting the record description file.

5.4.6 Associating a Data File

To change the data file with which a record description file is associated, select the record description file and press PF9 from the Manage Record Description Files screen. The Associate Data File screen then highlights the data file name, library, and volume and allows you to modify them. Figure 5-12 shows you how to modify the data file associated with the BROKER record description file.

To change the data file association, specify the name, library, and volume of the new data file in the data base contents list and press ENTER. To associate no data file with a record description file, blank out the data file entry in the data base contents list. By pressing PF1, you can return to the Manage Record Description Files screen without modifying the data file entry.

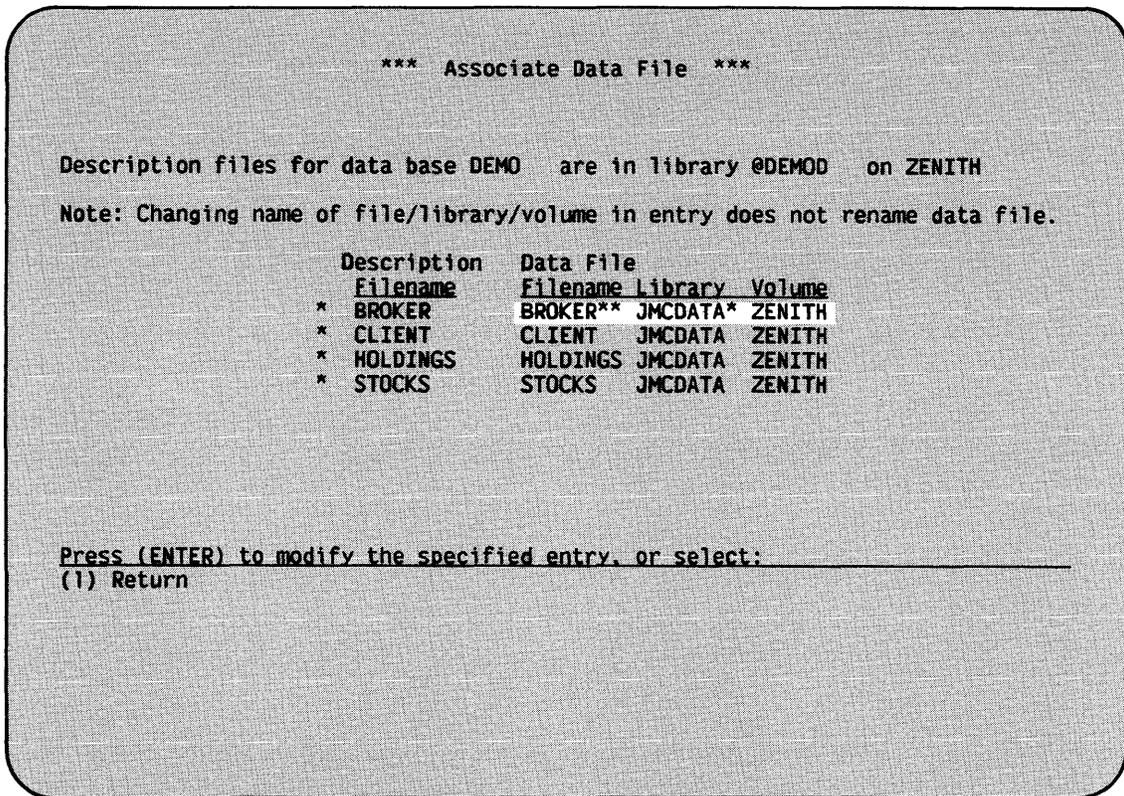


Figure 5-12. The Associate Data File Screen

You do not rename a data file by modifying its entry in the data base contents list; instead, you associate the record description file with a different data file. You can rename a data file through the Manage Files/Libraries command of the VS Command Processor menu. (For more information, refer to the VS Programmer's Introduction.) If you rename a data file, you must modify the entry in the data base contents list to reflect the new name.

After modifying the entry in the data base contents list, EZQUERY validates the record description file with which the data file is associated. If the file does not adhere to the restrictions that EZQUERY imposes or if it is not consistent with other record description files that describe the same data file, EZQUERY displays a message on the Manage Record Description Files screen. It is your responsibility to correct the situation indicated by the message. Note that you cannot access a data base through the Query function if EZQUERY cannot validate the record description files.

5.5 EZQUERY DATA BASE TABLES

Before you can formulate and execute a query that involves a particular data base table, the table must meet the following conditions:

- The table corresponds to a record description file and associated data file in the data base contents list.
- The record description file is located in the data base definition library (i.e., the library @dbnameD, where dbname is the data base name).
- The record description file adheres to the restrictions that EZQUERY imposes on record description files, and it is consistent with other record description files that describe the same data file.
- The associated data file is located somewhere on the VS system.

It is important, therefore, that the data base contents list remains consistent with the actual record description files and data files that constitute the data base tables. Through the Manage Data Base function, you can modify the data base contents list and the record description files in the data base.

EZQUERY allows you to create the following types of data files: empty data files that correspond to entries in the data base contents list and files that contain the results of a particular query. The sections that follow summarize the process by which you can create data base tables that correspond to these data files.

5.5.1 Creating an Empty Data File

EZQUERY enables you to create an empty data file that corresponds to an entry in the data base contents list. After creating such a file, you can then update the data base to enter data into the file. You must perform the following steps to create and use an empty data file:

1. Create the record description file and the corresponding entry in the data base contents list.
2. Associate a data file with the record description file in the data base contents list. The data file specified should not correspond to an existing data file.
3. Create the empty data file.
4. Set the data base access to Shared or Private.
5. Execute a query that retrieves the columns into which you want to enter data. The answer table that EZQUERY then displays is empty because the corresponding data file is also empty.

6. Append records to the answer table. EZQUERY appends each record to the end of the answer table and inserts it at the appropriate point in the data file.

5.5.2 Copying the Query Results

To create a permanent data base table that contains the results of a particular query, perform the following steps:

1. Copy the answer to a data file. The file can be located anywhere on the VS system.
2. Assign the corresponding control file to the library @dbnameD, where dbname is the data base name.
3. Create the entry in the data base contents list for the record description file. Note that EZQUERY converts the control file to a record description file.
4. Associate the data file that contains the answer with the record description file in the data base contents list.

CHAPTER 6 MANAGING A RECORD DESCRIPTION FILE

6.1 INTRODUCTION

The Manage Record Description function enables you to define a record description file or modify an existing one. A record description file describes the structure and contents of the data file with which it is associated. A data base table in EZQUERY is the logical representation of a record description file and its associated data file.

This chapter describes the process of defining and modifying a record description file and the interpretation of record description file information by EZQUERY. For a description of the record description file record formats, refer to Appendix D.

6.1.1 Single and Multiple Record Type Files

EZQUERY is fully compatible with data files that contain single or multiple record types. A single record type file contains one type of record, and one record description file can define all of the records in the data file. The BROKER, CLIENT, HOLDINGS, and STOCKS data files in the DEMO data base are examples of single record type files.

A multiple record type file contains more than one type of record, and a separate record description file must define each record type. When you define each record description file, you must specify one or more fields that uniquely identify its record type. Each record type corresponds to a separate data base table in EZQUERY. A particular data record cannot belong to more than one record type in EZQUERY. The Manage Record Description function includes features that allow you to describe multiple record type files. Section 6.4 gives an example of a multiple record type file and the record description files that describe it.

6.1.2 The Relationship of Record Description Files to Data Files

Although a record description file describes the attributes of a data file, the record description file and data file exist independently of each other. Thus, while you can easily modify a record description file, you must take care to ensure that any modifications do not affect the structure of the data file. For example, you cannot add indexes to a record description file without restructuring the data file.

If you anticipate a future change or expansion to a data file, you may want to reserve extra space in the data file when you create the record description file. You can then, for example, add fields to the file or modify the internal format and length of a particular field without destroying the existing data file structure. Unless the data file contains appropriate space, changes to the record description file that affect the length of the data record require you to create a new data file.

NOTE

Although the Manage Record Description function of EZQUERY resembles the CONTROL utility and the structure of record description files is similar to that of control files, do not use CONTROL or the other File Management Utilities with record description files. EZQUERY, however, does support control files that you create through CONTROL. For more information about the File Management Utilities, refer to the VS File Management Utilities Reference.

6.2 DEFINING A RECORD DESCRIPTION FILE

To define a new record description file, press ENTER from the Create Record Description File screen. When you define a record description file, you must first specify the parameters for the data file on the Data File Parameters screen. You then use the Field Specifications screen to define the field specifications for individual records in the file. You can also define validation criteria for a particular field.

6.2.1 The Data File Parameters Screen

The Data File Parameters screen prompts you to specify the attributes of the data file that the record description file defines. Figure 6-1 illustrates the Data File Parameters screen. It defines the attributes of the HOLDINGS data file.

The Data File Parameters screen allows you to specify the following data file attributes:

- Record length
- Key field name
- Alternate key fields
- User exit
- Report code
- Update code
- Delete code
- File type
- Comments

The sections that follow describe these data file attributes in detail. After specifying the data file attributes, press ENTER. To cancel the creation of the record description file, press PF16.

```

*** MESSAGE C001 BY RECDSC

                INFORMATION REQUIRED BY PROGRAM EZQUERY
                TO DEFINE HEADER
                ACTIVE SUBPROGRAM IS EXTCNTRL

Creation of file header information.  Enter parameters for the data file.

RECLEN   = 0020          (1-2040 fixed; 1-2020 var; 1-2024 compress length)
KEYFIELD = KEY*****    (assume consecutive file if not specified)
ALTKEYS  = 01           (1-16,number of alternate keys to indexed file)
USEREXIT = *****     (user supplied, if any: "USER1" -- "USER10")
REPORT   = 0            (0-report allowed, 1-not allowed)
UPDATE   = 0            (0-record update allowed, 1-not allowed)
DELETE   = 0            (0-record deletions allowed, 1-not allowed)
FILETYPE = F            (F-fixed, V-variable, C-compressed records)
COMMENT1 = *****
COMMENT2 = *****
COMMENT3 = *****
          ***any comments to be included in file*** (optional)

                Press PF16 to return to Record Description menu

```

Figure 6-1. The Data File Parameters Screen

Record Length

The record length (RECLEN) that you specify is the expected length of data file records. If the data file contains variable-length records, specify the maximum record length. If a multiple record type file contains fixed-length records, you must specify the same record length in all record description files that define record types for the data file.

The minimum record length is 1. The maximum record length depends on the type of record. The maximum record length is 2048 for consecutive fixed-length records, 2040 for indexed fixed-length records, and 2024 for variable-length and compressed-length records.

Key Field Name

The key field name (KEYFIELD) is the name of the primary key for the data file. If you specify a primary key, the data file is indexed; if not, the data file is consecutive.

A key field name consists of one to eight characters. The characters allowed in key field names are A through Z, 0 through 9, @, \$, #, and the hyphen; the first character must be alphabetic. The maximum length of a key field is 132 bytes. Duplicate primary key values are not allowed.

The record description files that define the record types for a multiple record type file must be consistent in the designation of the primary key. For example, if the key field name is blank in one of the record description files, it must be blank in all of the record description files. If one record description file specifies a primary key, all of the record description files must specify a primary key. The names of the primary keys do not have to be identical; the starting position and length of the primary keys, however, must be the same.

EZQUERY allows you to retrieve data from both indexed and consecutive files, to modify, append, and delete records in indexed files, and to append records to consecutive files. When accessing consecutive files, EZQUERY scans the file from beginning to end; when accessing an indexed file, however, EZQUERY uses the keyed access paths in which all records participate to improve performance. Therefore, it is to your advantage to identify as keys any fields that you will frequently use in data retrieval.

NOTE

EZQUERY only uses the keyed access path for a field with an internal format of B (binary), P (packed decimal), or Z (zoned decimal) if the field has a validation range with a lower limit greater than or equal to zero.

Alternate Key Fields

If the data file is indexed, you can specify from 1 to 16 alternate key fields (ALTKEYS). The default number of alternate key fields is 0. The sum of the lengths of the primary key field and the largest alternate key field cannot exceed 255 bytes. Duplicate alternate key values are allowed.

If, as in Figure 6-1, you indicate that the data file contains alternate key fields, the Define Alternate Keys screen prompts you to specify the names and path numbers of the alternate keys. You must also indicate whether the keys allow duplicates and whether they are selective. Refer to Section 6.2.2 for more information.

User Exit

You can invoke a program subroutine that validates or performs operations on data that you enter through DATENTRY. To invoke a User Exit subroutine, enter the name of the subroutine; valid subroutine names are USER1 through USER10. For more information about User Exit subroutines, refer to the VS File Management Utilities Reference.

Note that EZQUERY ignores the User Exit option. Do not use DATENTRY with record description files.

Report Code

The file report code (REPORT) indicates whether the REPORT utility can access the data file. If the report code is 0, REPORT can access the data file; if it is 1, REPORT cannot access the data file. The default is 0.

Note that EZQUERY ignores the report code. Do not use REPORT with record description files.

Update Code

The file update code (UPDATE) indicates whether you can use EZQUERY to update the data file. If the update code is 0, you can modify, append, and delete records in indexed files and append records to consecutive files. If the update code is 1, you cannot update the data file. Because EZQUERY does not maintain selective indexes (i.e., indexes that do not contain all records of a particular record type), the update code must be 1 if a data file contains one or more selective indexes. The default is 0.

Delete Code

The file delete code (DELETE) indicates whether you can use EZQUERY to delete records from an indexed file. If the delete code is 0, you can delete records. If the delete code is 1, you cannot delete records. The default is 0. Note that both the update and delete codes must be 0 to allow record deletion.

File Type

The file type (FILETYPE) is the type of records in the data file. The possible file types are F (fixed-length), V (variable-length), or C (compressed-length). The default file type is F.

All record description files that define the record types for a multiple record type file must specify the same file type.

Comments

To document the record description file internally, you can enter from one to three comment records. The comments appear when you display or print the record description file by pressing PF6 from the Record Description menu.

6.2.2 The Define Alternate Keys Screen

After you press ENTER from the Data File Parameters screen, EZQUERY displays the Define Alternate Keys screen if you indicated that the data file contains alternate key fields. Figure 6-2 illustrates the Define Alternate Keys screen. It describes the alternate key SYMBOL in the HOLDINGS data file.

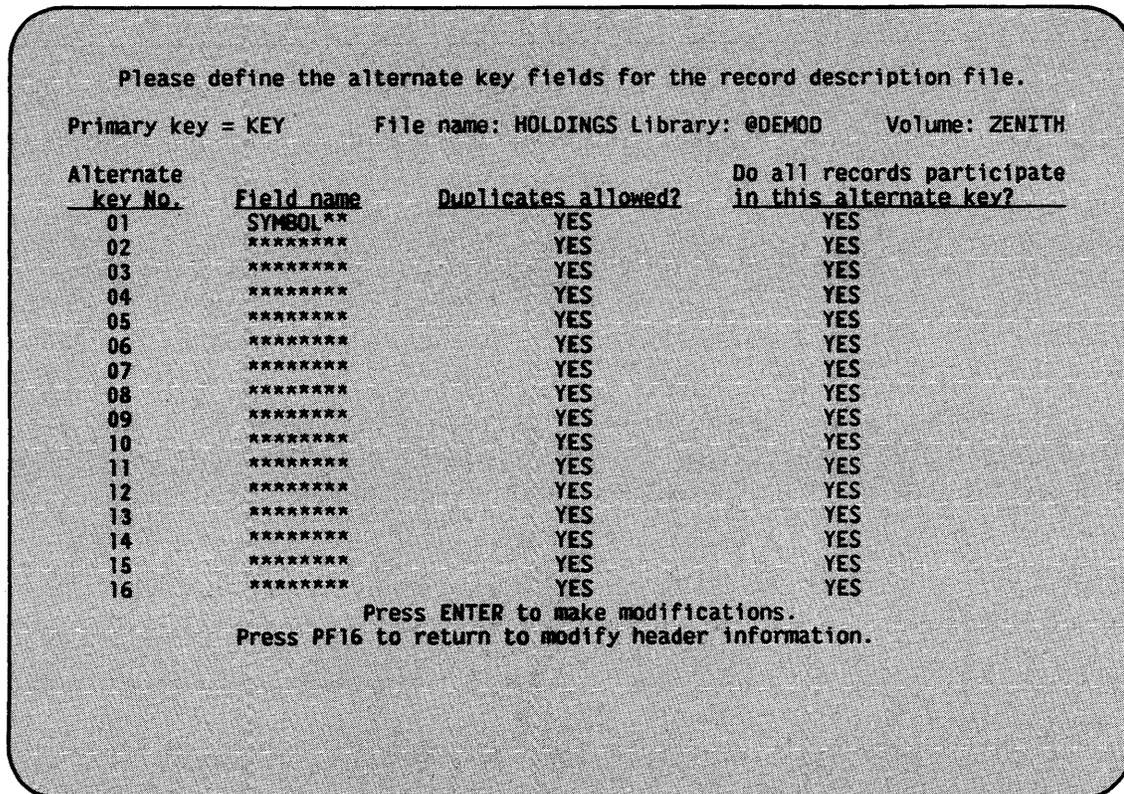


Figure 6-2. The Define Alternate Keys Screen

You can skip path numbers when you define the alternate key fields. Thus, the Define Alternate Keys screen displays all 16 alternate key paths, and you can enter alternate key information for any of the 16 paths. You must define the same number of alternate keys as you specified on the Data File Parameters screen.

An alternate key field name consists of one to eight characters. The characters allowed in alternate key field names are A through Z, 0 through 9, @, \$, #, and the hyphen; the first character must be alphabetic.

You must answer the following questions for each alternate key field that you define:

Question

YES Answer

Duplicates allowed?

Indicates that the alternate key allows duplicate values. The default answer is YES.

Do all records participate in this alternate key?

Indicates that the alternate key path contains all records that the record description file describes. The default answer is YES.

If you answer NO to the second question, you are defining a selective index (i.e., an index that does not contain all records of a particular record type). For example, if you wanted the SYMBOL alternate key path to contain only the records of stocks purchased on a margin basis, you would answer NO. Because EZQUERY does not maintain selective indexes, you must set the file update code to 1.

The record description files that define the record types for a multiple record type file must describe the alternate key paths consistently. For any alternate key path, the names of the alternate keys do not have to be identical; the starting position and length of the keys, however, must be the same. If an alternate key path allows duplicate values in one of the record description files, it must allow them in all of the record description files. The selectivity of the alternate key path can vary from record type to record type.

After defining the alternate keys, press ENTER. If you have defined one or more selective indexes and the update code is 0, EZQUERY displays a message that advises you that updates are not allowed. If you then press ENTER, EZQUERY changes the update code to 1 (i.e., updates are not allowed) if the record description file still defines one or more selective indexes. EZQUERY does not maintain selective indexes, and you may obtain unexpected results if you use EZQUERY to update the data file. To return to the Data File Parameters screen, press PF16.

6.2.3 The Field Specifications Screen

After you press ENTER from the Data File Parameters screen or the Define Alternate Keys screen (if the data file contains alternate key fields), the Field Specifications screen prompts you to define the attributes of each field in the data file. Figure 6-3 illustrates the Field Specifications screen for the PRICE field in the HOLDINGS data file.

The Field Specifications screen allows you to specify the following field attributes:

- Field name
- Starting location
- Internal format
- Internal length
- External length
- Decimal positions
- Occurrences
- Report code
- Update code
- Display code
- Zero suppress code
- Sign control code
- Dollar/comma code
- Binary edit code
- Date stamp code
- Cumulative field
- Field alias

The sections that follow describe these field attributes in detail. After specifying the field attributes, press ENTER. To return without specifying them or to indicate that you have defined all of the data file fields, press PF16.

Creation of field specifications.

These entries create the field specifications
for the file.
Make the appropriate entries and press ENTER.

```
Field name: PRICE***
Start loc: 0017
Int. format: P      (P-packed, B-binary, C-character, Z-zoned, U-unsigned)
Int. length: 004   (# disk pos - max: P-8, B-4, C-132, Z-15, U-15)
Ext. length: 009   (only if not calculated from int. length)
Decimal pos: 3     (0-9, define for numeric fields only)
Occurrences: 01    (number of times this field repeated)
Report code: 0     (0-report of field allowed, 1-not allowed)
Update code: 0     (0-update of field allowed, 1-not allowed)
Display code: 0    (0-blank after, 1-no blank after, 2-display only)
0-suppress : 0     (0-no zero suppress,1-suppress leading zero,2-* prot)
Sign contrl: 0     (0-no sign,1-trailing minus,2-CR on -,3-DB on -)
Dol/comma : 0      (0-none 1-" 2-"$" 3-"$" and ",")
Binary edit: 1     (0-hex, 1-CVB ,used only for INTERNAL FORMAT=B)
Date stamp: 0      (0-no, 1-yes)
Cum. field: ***** (Enter field name to be accumulator)
Field alias: BUY-PRICE***** (Name used by EZQUERY, INQUIRY)
                          Press PF16 to return to Record Description menu.
```

Figure 6-3. The Field Specifications Screen

Field Name

A field name consists of one to eight characters. The characters allowed in field names are A through Z, 0 through 9, @, \$, #, and the hyphen; the first character must be alphabetic. The field name cannot contain embedded blanks and must be unique within a particular record description file.

Each field in a data file corresponds to a column in a data base table. EZQUERY sets the name of the column to the field name if the field alias does not exist or is not a valid column name. A column name must be unique within a particular table.

Starting Location

The starting location is the byte number within the data record at which the field begins. The starting location has a minimum value of 1 (i.e., the first byte in the record) and a maximum value of the data file record length.

When you specify the attributes of the first field, you must enter a value for the starting location. For subsequent fields, EZQUERY assesses the starting location and internal length of the previous field and sets the default starting location to the next open byte. You can accept the default starting location or enter a different value in the pseudoblanks. You can thus specify the fields in any order. You must, however, specify a cumulative field before its source fields.

EZQUERY does not allow non-key fields to overlap other fields. EZQUERY interprets an overlapping primary or alternate key field as a compound key and requires that it have the same starting and ending position as one or more contiguous fields. No gaps can occur between the fields that are components of a compound key. The field update code must be 1 for a compound key. Thus, for example, the compound key KEY in the HOLDINGS data file occupies bytes 1 through 8; its field update code is 1. The ACCOUNT field occupies bytes 1 through 4, and the SYMBOL field occupies bytes 5 through 8.

Internal Format

The internal format defines the manner in which the field's data is stored internally. You can define five types of internal format: C (character), B (binary), P (packed decimal), Z (zoned decimal), and U (unsigned). Character fields must have an internal format of C and are stored in ASCII code; numeric fields must have an internal format of B, P, Z, or U. The binary edit code determines the external representation of a binary field; the external representation is decimal (CVB) or hexadecimal (hex).

Table 6-1 summarizes the relationship between internal format, maximum internal length, the calculation of internal length, and valid entry characters. For further information about the internal format, refer to the VS File Management Utilities Reference.

EZQUERY does not support fields with an internal format of B (binary) if the internal length is not 2 or 4 or if the external representation is not decimal (CVB). It interprets the internal format of such fields as C (character).

Internal Length

The internal length is a positive integer that specifies the number of bytes to reserve for the field in the data record. Note that the data record must be able to contain the field; thus, the starting location plus the internal length minus one must not exceed the data record length. Table 6-1 lists the maximum internal length for each type of internal format.

Table 6-1. Internal Format Description

Internal Length	Maximum Internal Length (in bytes)	Internal Length Calculation	Valid Entry Characters
C	67 (if modifiable) 132 (if nonmodifiable)	1 character/byte	All alphanumerics
B (CVB)	4	1 (if ext. length = 4) 2 (if ext. length = 6) 3 (if ext. length = 8) 4 (if ext. length = 11)	0-9, -
B (HEX)	4	2 characters/byte	0-9, A-F
P	8	1 byte for first digit and sign; 2 digits/byte for the other digits	0-9, -, .
Z	15	1 byte/digit	0-9, -, .
U	8	1 byte/digit	0-9, .

External Length

The external length is a positive integer that specifies the number of character or digit positions used to represent the field externally. If you do not enter a value for the external length, EZQUERY calculates this value as shown in Table 6-2. The default external length is also the maximum value, and you cannot enter a value greater than the default external length.

Table 6-2. Default External Length Values

Internal Format	External Length Calculation (in bytes)
C	Internal length
B (external representation = decimal)	4 (if internal length = 1) 6 (if internal length = 2) 8 (if internal length = 3) 11 (if internal length = 4)
B (external representation = hexadecimal)	2 * internal length
P (decimal positions = 0)	2 * internal length
P (decimal positions ≠ 0)	(2 * internal length) + 1
Z (decimal positions = 0)	Internal length + 1
Z (decimal positions ≠ 0)	Internal length + 2
U (decimal positions = 0)	Internal length
U (decimal positions ≠ 0)	Internal length + 1

Each column in a data base table has a data type, data length, storage type, and storage size. Table 6-3 summarizes the relationship of these column attributes to the internal format, internal length, and external length of the corresponding field in the data file.

Table 6-3. Relationship of Column Attributes to Field Specifications

Field	Column			
	Data Type	Data Length	Storage Type	Storage Size
C	CHARACTER	Internal length	ASCII	Int. length
B (int. length = 2 or 4 and binary edit code = 1)	SIGNED NUMBER	5 (int. length = 2) 10 (int. length = 4)	Binary	2 4
B (int. length \neq 2 or 4 or binary edit code = 0)	CHARACTER	Internal length	ASCII	Int. length
P (range with lower limit \geq 0)	UNSIGNED NUMBER	The smaller of external length or $2 * (\text{internal length}) - 1$	Decimal	Int. length
P (no such range)	SIGNED NUMBER	The smaller of external length, $(2 * \text{internal length}) - 1$, or 14 (if scale $>$ 0)	Decimal	Int. length
Z	SIGNED NUMBER	The smaller of external length, internal length, or int. length - 1 (if scale $>$ 0)	Zoned	Int. length
U	UNSIGNED NUMBER	The smaller of external or internal length	Numeric	Int. length

Note that you can enter numbers between -32768 and +32767 in columns that correspond to fields with an internal format of B (binary) and an internal length of 2. If the column is of data type SIGNED NUMBER and the corresponding field has an internal format of P (packed decimal), you can enter numbers between -9...9 and +9...9, where the number of digits is equal to the data length.

Decimal Positions

The number of decimal positions is a positive integer in the range 0 to 9. It specifies how many decimal places can occur to the right of the decimal point in a decimal field. The default number of decimal positions is 0. The internal format of the field must be P (packed decimal), Z (zoned decimal), or U (unsigned). The internal length of the field remains unchanged if you include decimal places.

EZQUERY sets the data scale of a column to the number of decimal positions that you specify for the corresponding field. If you use EZQUERY to update the field, it ensures that the data that you enter contains the proper number of decimal positions.

Occurrences

The number of occurrences is a positive integer in the range 1 to 99. It specifies the number of times that the field is repeated within the data record. The default number of occurrences is 1. If the number of occurrences is greater than 1, the field is treated as a one-dimensional array, and the field name is subscripted whenever it is represented externally. If the file and field update codes allow update, EZQUERY checks to ensure that the field does not overlap other modifiable fields.

EZQUERY creates a separate column in the corresponding data base table for each occurrence of a particular field. Thus, for example, if the field YIELD occurs three times, EZQUERY creates three columns with the names YIELD-1, YIELD-2, and YIELD-3. If the field alias (e.g., BOND-YIELD) is a valid column name, EZQUERY subscripts the field alias as the corresponding column names (e.g., BOND-YIELD-1, BOND-YIELD-2, and BOND-YIELD-3).

Report Code

The field report code indicates whether the REPORT utility can access the field. If the report code is 0, REPORT can access the field; if it is 1, REPORT cannot access the field. The default is 0.

EZQUERY ignores the report code. Do not use REPORT with record description files.

Update Code

The field update code indicates whether you can use EZQUERY to modify the field. If you set the update code to 1 for a non-key field, EZQUERY does not allow you to modify the corresponding column. If you set the update code to 0, you can modify the column. The default is 0.

If a field is a compound key (i.e., a key field that has the same starting and ending position as one or more contiguous fields), you must set the field update code to 1. EZQUERY does not create a corresponding column for a compound key field. Note that EZQUERY does not allow non-key fields to overlap other fields.

If a primary or alternate key is not a compound key, you must set the update code to 0 (i.e., updates to the field are allowed). You can protect such a primary or alternate key from modification in the following way:

1. Define a compound key field that has the same starting and ending position as the primary or alternate key that you do not want to modify. The field update code must be 1 for the compound key field.
2. Set the update code to 1 for the field that you do not want to modify.
3. Specify the new compound key field, not the field that you do not want to modify, as the primary or alternate key. To modify the data file parameters, press PF4 from the Record Description menu and then press PF3.

NOTE

A compound key field cannot be a component of another compound key field. Thus, if a primary or alternate key is a component of a compound key, you cannot use the method described above to protect the field from modification. The field update code must be 0.

For example, to protect the BROKER field in the BROKER data file from modification, you can define a compound key field named COMPOUND with a starting location of 1 and an internal length of 4 (i.e., the same starting location and internal length as the BROKER field). The update code for the COMPOUND field must be 1. Set to 1 the update code for the BROKER field. Specify COMPOUND as the primary key for the BROKER data file. You then cannot modify the BROKER column in the BROKER table.

Display Code

The display code is used by DATENTRY to determine the way in which data appears on the Data Entry screen. EZQUERY ignores the display code. Do not use DATENTRY with record description files.

Zero Suppress Code

VS/Report uses the zero suppress code to determine the default representation of leading (i.e., leftmost) zeros in numeric fields. You can modify the default when you define the report format.

The relationship of the three zero suppress codes to the default representation of the field by VS/Report is summarized below.

<u>Zero Suppress Code</u>	<u>Default Representation</u>	<u>Example</u>
0	Leading zeros are displayed	0010
1	Leading zeros are not displayed	10
2	Asterisks represent leading zeros	**10

Sign Control Code

VS/Report uses the sign control code to determine the default representation of negative values in numeric fields. You can modify the default when you define the report format.

The relationship of the four sign control codes to the default representation of the field by VS/Report is summarized below.

<u>Sign Control Code</u>	<u>Default Representation</u>	<u>Example</u>
0	No sign	1500
1	Trailing minus sign	1500-
2	Trailing CR	1500CR
3	Trailing DB	1500DB

Dollar/Comma Code

VS/Report uses the dollar/comma code to determine the default placement of dollar signs and commas in numeric fields. You can modify the default when you define the report format.

The relationship of the four dollar/comma codes to the default representation of the field by VS/Report is summarized below.

<u>Dollar/Comma Code</u>	<u>Default Representation</u>	<u>Example</u>
0	No dollar sign or commas are displayed	250000
1	Commas are inserted	250,000
2	A dollar sign precedes the field	\$250000
3	Commas are inserted, and a dollar sign precedes the field	\$250,000

Binary Edit Code

The binary edit code determines the external representation of a field with an internal format of B (binary). EZQUERY ignores the binary edit code if the field has another type of internal format. If the binary edit code is 1, the field is represented externally as decimal (CVB). The default binary edit code is 1.

If the binary edit code is 0, EZQUERY interprets the internal format of the field as C (character). Note that EZQUERY only supports binary fields with an internal length of 2 or 4 and a binary edit code of 1.

Date Stamp Code

The date stamp code indicates whether the field represents a date in the form MMDDYY, where MM is a two-digit month number, DD is a two-digit day number, and YY is a two-digit year number. If the date stamp code is 0, the field does not represent a date; if it is 1, the field represents a date. The default date stamp code is 0.

If the date stamp code is 1, the field must have an external length of 6. If the field has an internal format of C (character), Z (zoned decimal), or U (unsigned), it must also have an internal length of 6. If the field has an internal format of P (packed decimal), it must have an internal length of 4. You cannot use fields with an internal format of B (binary) as date stamp fields.

If the date stamp code is 1, VS/Report displays the data by default in the format MM/DD/YY.

Cumulative Field

A cumulative field is a numeric field that accumulates the data in one or more additional numeric fields (source fields) within a particular record. You must define the cumulative field before its source fields and then enter the cumulative field name when you define the source fields.

EZQUERY cannot accumulate data in cumulative fields. Therefore, if you define one or more cumulative fields, EZQUERY does not allow you to append records to the data file.

Field Alias

The field alias is an alternate name for the field. A field alias has a minimum length of 1 character and a maximum length of 31 characters. A field alias can consist of several words separated by single spaces.

EZQUERY sets the column name to the field alias if it exists and is a valid column name in EZQUERY (e.g., BUY-PRICE in Figure 6-3). Section 7.2.1 lists the rules that govern column names. Note that a field alias can contain spaces between its characters, while EZQUERY does not allow spaces in a column name. If the field alias does not exist or is not a valid column name, EZQUERY sets the column name to the field name. A column name must be unique within a particular data base table.

6.2.4 The Field Input Validation Specifications Screen

After you press ENTER from the Field Specifications screen, EZQUERY displays the Field Input Validation Specifications screen under the following conditions:

- The file and field update codes allow update.
- The date stamp code is 0 (i.e., you have not selected the Date Stamp option).
- The field is not a cumulative source field.
- The internal length of the field is less than or equal to 16 bytes.

The Field Input Validation Specifications screen enables you to specify a range or table of values for data in the field. You must also indicate whether the field validation differentiates a record type in a multiple record type file. Figure 6-4 illustrates the Field Input Validation Specifications screen for the PRICE field in the HOLDINGS data file.

The Field Input Validation Specifications screen prompts you to indicate whether the field validation differentiates a record type. You must answer either YES or NO; NO is the default. When you define each record description file for a multiple record type file, you must specify one or more fields that uniquely identify its record type. You must then specify a range of values for data in the field.

The Field Input Validation Specifications screen displays the update sequence of the field (e.g., 05 in Figure 6-4). The update sequence corresponds to the order in which DATENTRY displays the field. Do not use DATENTRY with record description files.

Field Input Validation Specifications

To specify table or range validation, make the appropriate entries and press ENTER.

Indicate whether or not the field validation is to be used to differentiate record types in a multiple record type data file. This option may be ignored for single record type data files.

Use validation to differentiate record types: NO
(In multiple record type data files)

Field name: PRICE
Update sequence: 05

Table lookup
Name: *****

Range
Low: 0
High: 9999.999

Press PF16 to return to Record Description menu.

Figure 6-4. The Field Input Validation Specifications Screen

After specifying the range or table of values (if any), press ENTER. EZQUERY then displays the Field Specifications screen, and you can define the next field in the data file. To return to the Record Description menu, press PF16.

NOTE

To define the attributes of a field and store this information in the record description file, you must press ENTER from both the Field Specifications screen and the Field Input Validation Specifications screen (if it appears). If you press PF16 from the Field Input Validation Specifications screen, you cancel the definition of the field.

Range

EZQUERY allows you to specify a range of values for data in the field. For example, the screen shown in Figure 6-4 defines a range of 0 to 9999.999 for data in the PRICE field. To specify a range, enter the lower and upper bounds of the range and press ENTER. Note that you can enter both uppercase and lowercase characters when you specify the range. If you use EZQUERY to update the field, it checks to ensure that the data you enter is within the specified range.

If you indicate that the field validation differentiates a record type, you must enter a range of values for data in the field. You can define a range with a low and high value of blank if the field has an internal format of C (character). To define such a range, indicate that the field validation differentiates a record type and press ENTER. EZQUERY then displays a message that prompts you to press ENTER to confirm the blank to blank range.

NOTE

Although you can define a table that differentiates record types, EZQUERY only recognizes a range as field validation criteria.

If you want EZQUERY to use the keyed access path for a field with an internal format of B (binary), P (packed decimal), or Z (zoned decimal), you must specify a range with a lower limit greater than or equal to zero.

Table Look-Up

EZQUERY allows you to create a table of values for data in the field. To specify a table of values, enter the name of the table and press ENTER. A table name consists of one to six characters. The table name can identify a table that already exists, or you can specify the name of a new table. You can use the same table to validate the data in more than one field. The table must reside in the same library as the record description file.

If the table that you specify does not exist, EZQUERY displays a screen that prompts you to enter the table values. The number of pseudoblanks displayed corresponds to the external length of the field. Enter a value in the pseudoblanks and press ENTER. Note that you can enter both uppercase and lowercase table values. After entering the table values, press PF3 to define the next field in the data file. To return without defining the field, press PF16. You can leave the table blank and enter the values through the Maintain Table Entries function. (For more information, refer to Section 6.3.6.)

NOTE

EZQUERY does not use table look-up to validate data. Therefore, if you associate a table with one or more fields, EZQUERY allows you to retrieve, but not update, records in the data file.

6.3 MODIFYING A RECORD DESCRIPTION FILE

To modify an existing record description file, select the file and press ENTER from the Manage Record Description Files screen. The Record Description menu then prompts you to select the action that you want to perform on the record description file. Figure 6-5 illustrates the Record Description menu.

```
*** MESSAGE 0002 BY RECDSC

      INFORMATION REQUIRED BY PROGRAM EZQUERY
      TO DEFINE OPTIONS
      ACTIVE SUBPROGRAM IS EXTCNTRL

Press the appropriate pfkey for record description option.

      PFKEY          ACTION
      2             create a record description file
      3             add records to a record description file
      4             modify header/field from a record description
      5             delete records from a record description file
      6             list records on a record description file
      7             maintain table entries
      8             create source from this record description file
      16            exit to respecify record description file location
```

Figure 6-5. The Record Description Menu

The functions available from the Record Description menu are summarized below.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
2	Create	Allows you to create a record description file to replace the existing record description file.

<u>PF Key</u>	<u>Function</u>	<u>Description</u>
3	Add Records	Allows you to describe additional fields in the record description file.
4	Modify Header or Field Records	Allows you to modify the data file parameters or the specifications of individual fields in a record description file.
5	Delete Records	Allows you to delete fields from the record description file.
6	List Records	Allows you to display or print the record description file.
7	Maintain Entries	Allows you to create a table file or to list or modify an existing table file.
8	Create Source	Allows you to create a source file from the record description file. The two available source languages are COBOL and RPG II.
16	Exit	Returns you to the Manage Record Description Files screen after EZQUERY validates the record description file.

If you attempt to modify a record description file that contains extensions that EZQUERY cannot handle, EZQUERY displays a message that prompts you to press PF16. This action returns you to the Manage Record Description Files screen.

6.3.1 Creating a Record Description File

To create a record description file to replace an existing one, press PF2 from the Record Description menu. The Data File Parameters screen then prompts you to specify the data file parameters for the new file. If you then press ENTER, EZQUERY displays a message that prompts you to respecify the name of the record description file or to press PF3 to scratch the existing file. If you respecify the file name, the data base definition library contains the new record description file, but there is no corresponding entry in the data base contents list.

6.3.2 Describing an Additional Field

To describe an additional field in the record description file, press PF3 from the Record Description menu. EZQUERY then displays the Field Specifications screen, and you can define the new field.

Note that if you add or delete fields from a record description file, you may have to create a new data file.

6.3.3 Modifying the Data File Parameters or Field Specifications

To modify the data file parameters or the specifications of a particular field, press PF4 from the Record Description menu. You must then press PF3 to modify the data file parameters (e.g., record length and key field name). EZQUERY then displays the Data File Parameters screen, and you can modify the data file parameters.

To modify the specifications of a field (e.g., internal format and internal length), specify the field name and press ENTER. EZQUERY then displays the Field Specifications screen for the field, and you can modify the specifications. Note that you may have to create a new data file if you modify the internal length of a field.

6.3.4 Deleting a Field

To delete a field from the record description file, press PF5 from the Record Description menu. EZQUERY then prompts you to specify the field that you want to delete and to press ENTER.

Note that if you add or delete fields from a record description file, you may have to create a new data file.

6.3.5 Displaying or Printing a Record Description File

To display or print the record description file, press PF6 from the Record Description menu. EZQUERY then prompts you to specify either SCREEN or PRINTER as the output device and to press ENTER; SCREEN is the default.

EZQUERY first lists the data file parameters (e.g., file type, record length, and primary and alternate key field names). It then lists in tabular format the specifications of the individual fields (e.g., starting position, internal format, and internal length). If a field's validation differentiates a record type in a multiple record type data file, EZQUERY places an asterisk before it.

6.3.6 Maintaining Table Entries

To create a table file or to list or modify an existing table file, press PF7 from the Record Description menu. EZQUERY then displays the Table Maintenance menu. The functions available from the Table Maintenance menu are summarized below.

<u>PF Key</u>	<u>Function</u>
2	Create a table file
3	Add values to a table file
5	Delete values from a table file
6	List a table file
16	Exit to Record Description menu

Note that EZQUERY does not use table look-up to validate data. Therefore, if you associate a table with one or more fields, EZQUERY allows you to retrieve, but not update, records in the data file.

6.3.7 Creating a Source File

To create a source file from the record description file, press PF8 from the Record Description menu. EZQUERY then prompts you to select either COBOL (PF1) or RPG II (PF3) as the source language. You must then specify the name, library, and volume of the source file that you are creating.

If you select COBOL as the source language, the source file contains 01 level record descriptions. If you select RPG II, the source file contains file specifications, alternate index specifications, and extension specifications for table data.

To insert the generated source code into a program, you can use either the XCOPY function of the VS EDITOR or a COPY statement within the program. For more information about the VS EDITOR, refer to the VS Program Development Tools Reference.

6.4 MULTIPLE RECORD TYPE FILES

EZQUERY allows you to retrieve and update records in both single and multiple record type files. A separate record description file must define each record type in a multiple record type file. Each record type corresponds to a separate data base table in EZQUERY.

EZQUERY assumes that a particular data base contains record description files that define all of the record types in a multiple record type file. If you do not completely define the record types, queries to that file may produce incomplete or inaccurate answers.

NOTE

While EZQUERY fully supports multiple record type files, the use of these files does not make EZQUERY more powerful.

The record description files that describe the record types in a multiple record type file must meet the following conditions:

- File Type Consistency

The files must specify the same file type (i.e., fixed-length, variable-length, or compressed-length). If the data file contains fixed-length records, you must specify the same record length in all of the record description files.

- Primary Key Consistency

The primary key must be designated consistently. If one record description file specifies a primary key, all of them must specify a primary key. The names of the primary keys do not have to be identical; the starting position and length of the primary keys, however, must be the same.

- Alternate Key Path Consistency

Alternate key paths must be designated consistently. For any alternate key path, the names of the alternate keys do not have to be identical; the starting position and length of the keys, however, must be the same. If an alternate key path allows duplicate values in one record description file, it must allow them in all of these files. The selectivity of the alternate key path can vary from record type to record type.

- Range Validation Specification

When you define each record description file, you must specify one or more fields that uniquely identify its record type. You must then define a range of values for data in the field. You can use a combination of fields to establish the uniqueness of a particular record type.

EZQUERY validates the record description files for adherence to these conditions. You cannot access a data base through the Query function if EZQUERY cannot validate the record description files.

A particular record cannot belong to more than one record type in EZQUERY. When validating the record description files, EZQUERY checks for overlapping record types and does not allow obvious errors. If the record differentiation fields for all record types are in the same position and have the same data type, EZQUERY can guarantee the ability to uniquely identify a record type.

EZQUERY allows you to create an empty data file that corresponds to a data base table. You only need to create a multiple record type file once; you do not have to create it for each data base table with which it is associated.

NOTE

It is your responsibility to establish unique record differentiation criteria. If a record that belongs to one record type happens to have the required bit pattern that identifies another record type, EZQUERY incorrectly considers the record as a member of both record types. Thus, the answers to queries may be incorrect, and indexes may be updated improperly.

6.4.1 Example of a Multiple Record Type File

In the DEMO data base, the BROKER and CLIENT data files contain information about the brokers and clients of a hypothetical brokerage firm. You could, instead, use a multiple record type file that contains two types of records to store the same information.

To describe the two record types, you need to create two record description files. One record description file, BROKER, describes a record type with the following fields:

<u>Field Name</u>	<u>Internal Format</u>	<u>Starting Position</u>	<u>Internal Length</u>	<u>Type of Key</u>	<u>Range</u>
MAINKEY	C	1	5	Primary	
BROKER	C	1	4	Alternate	0001 - 0999
REC-TYPE	C	5	1	Alternate	B-B
FIRST	C	6	10		
LAST	C	16	10	Alternate	
SALARY	P	26	4		0 - 99999.99
MANAGER	C	30	4	Alternate	

The other record description file, CLIENT, describes a record type with the following fields:

<u>Field Name</u>	<u>Internal Format</u>	<u>Starting Position</u>	<u>Internal Length</u>	<u>Type of Key</u>	<u>Range</u>
BIGKEY	C	1	5	Primary	
ACCOUNT	C	1	4	Alternate	
REC-TYPE	C	5	1	Alternate	C-C
FIRST	C	6	10		
LAST	C	16	10	Alternate	
CITY	C	26	15		
STATE	C	41	2		
BROKER	C	43	4	Alternate	0001 - 0999

Because the BROKER records have a record length of 33 and the CLIENT records have a record length of 46, you must specify the file type as V (variable-length).

Both record description files designate a primary key. Although the primary keys have different names, they have the same starting position and length. Note that MAINKEY and BIGKEY are compound keys (i.e., key fields that have the same starting and ending position as one or more contiguous fields). When you define the attributes of the MAINKEY and BIGKEY fields, you must set the field update code to 1. EZQUERY requires that compound primary or alternate keys have an update code of 1 (i.e., updates are not allowed).

Each record description file uses the REC-TYPE field to differentiate its record type. Because the record differentiation fields for all record types are in the same position and have the same data type, EZQUERY can guarantee the ability to uniquely identify the record types. All records that belong to the BROKER record type must have a value of B in the REC-TYPE field, and all records that belong to the CLIENT record type must have a value of C in this field. If, however, you specified a range of E to M for BROKER records and a range of J to T for CLIENT records, the record types would overlap. EZQUERY would detect the overlapping record types when it validated the record description files.

When you define the alternate keys in the record description files, you can assign them to the following path numbers:

<u>Alternate Key</u> <u>Path Number</u>	<u>BROKER</u> <u>Record Type</u>	<u>CLIENT</u> <u>Record Type</u>
1	BROKER	ACCOUNT
2	REC-TYPE	REC-TYPE
3	LAST	LAST
4	MANAGER	
5		BROKER

You can use Alternate Key Path Number 1 for both the BROKER and ACCOUNT alternate keys. The BROKER and ACCOUNT fields have the same starting position and length. Both keys allow duplicates because a person may have both an BROKER record and a CLIENT record. Similarly, Alternate Key Path Number 2 can contain the REC-TYPE alternate key for both record types, and Alternate Key Path Number 3 can contain the LAST alternate keys.

The MANAGER alternate key for the BROKER record type uses Alternate Key Path Number 4. Because the CLIENT record type does not have a key field with the same starting position and length, you must skip Alternate Key Path Number 4 when you define its alternate keys. The BROKER alternate key for the CLIENT record type uses Alternate Key Path Number 5. The MANAGER and BROKER alternate keys are record type selective; that is, all records of a particular record type and only records of that record type belong on those key paths. It is to your advantage to identify one or more record type selective keys for each record type in a multiple record type file.

The EZQUERY table that corresponds to the BROKER record description file has the name BROKER. The table contains the following columns: BROKER, REC-TYPE, FIRST, LAST, SALARY, and MANAGER. Because the MAINKEY field is a compound key, EZQUERY does not create a corresponding column.

The EZQUERY table that corresponds to the CLIENT record description file has the name CLIENT. The table contains the following columns: ACCOUNT, REC-TYPE, FIRST, LAST, CITY, STATE, and BROKER. Because the BIGKEY field is a compound key, EZQUERY does not create a corresponding column.

CHAPTER 7 EZQUERY LANGUAGE REFERENCE

7.1 INTRODUCTION

This chapter provides a reference to the EZQUERY language and the types of data retrieval available in EZQUERY. Refer to Chapters 2 through 4 for detailed information about EZQUERY processing.

The EZQUERY language is a screen-oriented, relational query language. A query is a request for information from one or more tables in a data base. A query consists of 1 to 16 individually defined questions. You formulate a question by specifying data retrieval requests in the appropriate screen objects. Syntax rules define the ways in which you can combine components of the EZQUERY language in a data retrieval request. This chapter describes in detail the screen objects, components, and syntax rules of the EZQUERY language.

7.2 SCREEN OBJECTS

EZQUERY provides two types of screen objects, the table skeleton and the condition area, in which you formulate a question. A question contains a minimum of 1 table skeleton and a maximum of 10 table skeletons (or 9 table skeletons and the condition area). The sections that follow describe the EZQUERY screen objects.

7.2.1 The Table Skeleton

The table skeleton provides a two-dimensional visual format in which you enter requests for information from a table. EZQUERY displays a table skeleton for each table that you select for inclusion in a question. The table skeleton name corresponds to the table name, and the column names of a table skeleton correspond to column names in that table. Figure 7-1 illustrates the general form of a table skeleton.

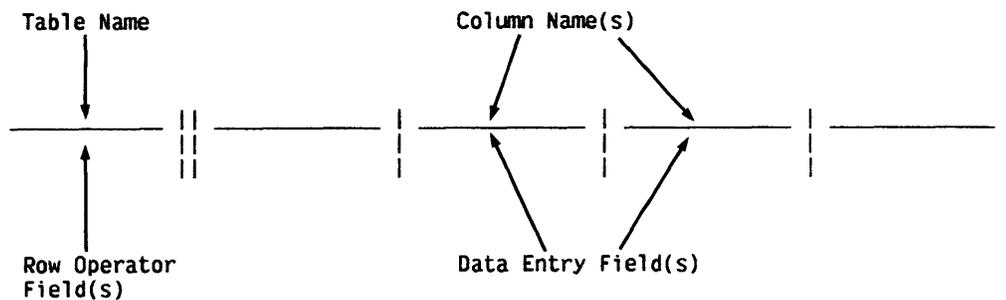


Figure 7-1. The Table Skeleton

The four fields of a table skeleton are described below.

<u>Field</u>	<u>Description</u>
Table Name	Contains the name of the table skeleton.
Column Name(s)	Contains the names of the columns in the table skeleton.
Row Operator Field(s)	Permits you to specify the row operator DISPLAY for a particular row in the table skeleton. Section 7.3.1 describes the row operator DISPLAY.
Data Entry Field(s)	Permits you to specify data retrieval requests. Section 7.4 describes in detail the syntax used in the data entry fields.

The following rules state the requirements for table skeletons in EZQUERY:

1. A question contains a minimum of 1 and a maximum of 10 table skeletons.
2. The name of a table skeleton must be unique in a data base.
3. The name of a column must be unique in a table skeleton.
4. A table name consists of a minimum of 1 and a maximum of 28 characters.
5. A column name consists of a minimum of 1 and a maximum of 31 characters.
6. The characters allowed in table or column names are 0 through 9, A through Z, @, #, \$, and the hyphen. A name cannot begin or end with a hyphen.

7. The table skeleton name must correspond to a table name, and the column names of a table skeleton must be valid column names in that table.
8. A table skeleton contains a minimum of 1 and a maximum of 255 columns. A table skeleton cannot contain more columns than the number of columns in the corresponding table.
9. You can select all or some of the columns in a table for inclusion in a question. EZQUERY displays only the selected columns in the table skeleton.
10. A table skeleton contains a minimum of 1 and a maximum of 12 continued or independent rows. Thus, EZQUERY can always display an entire table skeleton on one screen.
11. Colons that separate columns indicate the continuation of the previous row rather than an independent row.
12. Each independent row contains a separate retrieval request to the table.
13. The number of data entry fields in a row must be the same as the number of columns in the table skeleton.
14. A data entry field contains a maximum of 2000 characters.

The Answer Table Skeleton

The answer table skeleton is a table skeleton in which you can combine columns from one or more tables to form the answer to a question. To obtain the answer table skeleton, press PF9 from the Formulate Query screen.

The following rules state the additional requirements for the answer table skeleton in EZQUERY:

1. A question contains at most one answer table skeleton.
2. The name of an answer table skeleton must be unique.
3. The name of a column must be unique in an answer table skeleton.
4. EZQUERY must be able to map data to an answer table column from a column in another table.
5. To make this data mapping possible, an answer table column must have the same name as a column in another table skeleton. Or an example element must link that column to a column in another table skeleton. Section 7.3.6 discusses the example element.

6. If columns from more than one table skeleton (or more than one row in the same table skeleton) have the same name as an answer table column, EZQUERY maps data from the first column of that name (i.e., the column that appears first on the Formulate Query screen). To map data from another column, you must link the answer table column to it with an example element.
7. If the same example element appears alone (i.e., without a comparison operator other than EQ) in several columns and in an answer table column, EZQUERY maps data from one of those columns (usually the last column) to the answer table.
8. If the answer table skeleton contains more than one row, example elements must link the columns in all rows except the first to the corresponding columns in other table skeletons.
9. The data type, scale, and length of an answer table column are identical to those of the corresponding data base table column.
10. The data entry fields of the answer table skeleton can contain only example elements or numeric expressions. You use a numeric expression to define a computed field in the answer table skeleton.
11. You can modify the answer table name and the names and sequence of its columns.
12. EZQUERY always displays the answer table skeleton after all other table skeletons.
13. The presence of an answer table skeleton in a question does not add a corresponding table to the data base. To create a new table, you must execute the query and save the results.

7.2.2 The Condition Area

EZQUERY allows you to define conditions for data retrieval in a condition area. To access the condition area, press PF8 from the Edit Question screen.

Figure 7-2 illustrates the general form of the condition area. The Condition Entry field contains the conditional criteria. Section 7.4 describes in detail the syntax used in this field.

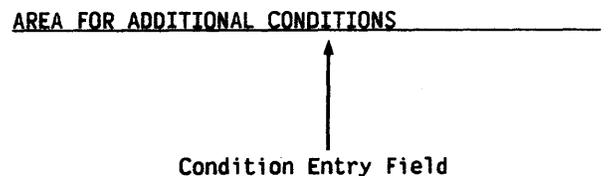


Figure 7-2. The Condition Area

The following rules state the requirements for the condition area in EZQUERY:

1. A question contains at most one condition area.
2. The condition area contains a minimum of 1 and a maximum of 12 rows.
3. Each row contains conditions for the data in a column of a particular table. You can continue a row if necessary.
4. EZQUERY always displays the condition area after all table skeletons.

7.3 LANGUAGE COMPONENTS

The EZQUERY language consists of two basic components: operators and elements. Operators define EZQUERY processing or specify retrieval conditions. The four types of operators are the row operator DISPLAY, arithmetic operators, comparison operators, and logical operators. Elements specify retrieval conditions or link data. The two types of elements in EZQUERY are constant elements and example elements. The following sections describe the EZQUERY operators and elements.

7.3.1 The Row Operator DISPLAY

The row operator DISPLAY directs EZQUERY to retrieve data from the selected columns of a table. You enter DISPLAY (or D) in one or more rows of the corresponding table skeleton. Figure 7-3 illustrates the use of DISPLAY in a query. The columns are blank because no conditions qualify the data retrieval.

Query Retrieve the trading symbol, name, price and dividend of all stocks.

```

STOCKS _____ || SYMBOL _____ | NAME _____ | PRICE _____ | DIVIDEND _____ |
DISPLAY          ||                    |                    |                    |                    |
  
```

Figure 7-3. The Row Operator DISPLAY

The following rules state the requirements for the use of the row operator DISPLAY:

1. DISPLAY and D have the same meaning in EZQUERY.
2. PRINT and P have the same meaning as DISPLAY in EZQUERY.
3. The row operator DISPLAY must appear in at least one row of a table skeleton.

4. The row operator DISPLAY cannot appear in more than one table skeleton.
5. If you have selected columns from only one table, DISPLAY appears by default in the corresponding table skeleton.
6. If you define an answer table, DISPLAY appears by default in its table skeleton.
7. If DISPLAY appears in more than one row of a table skeleton, EZQUERY retrieves data that meets any of the conditions defined in the individual rows.
8. DISPLAY does not instruct EZQUERY to eliminate duplicates from the query results. After executing the query, you can eliminate duplicates by editing the answer table.

7.3.2 Arithmetic Operators

To compare numeric data to a calculable value, you combine arithmetic operators and elements to form numeric expressions. Section 7.4 describes in detail the syntax of numeric expressions.

The two types of arithmetic operators--unary and binary--are listed below. Unary arithmetic operators define an operation for a single element. Binary arithmetic operators define an operation for a pair of elements.

<u>Unary Operator</u>	<u>Sample Operation</u>	<u>Meaning</u>
+	+1500	Multiply 1500 by +1.
-	-1500	Negate 1500 (i.e., multiply 1500 by -1).
<u>Binary Operator</u>	<u>Sample Operation</u>	<u>Meaning</u>
*	1500 * 2	Multiply 1500 by 2.
/	1500/2	Divide 1500 by 2.
+	1500 + 1000	Add 1000 to 1500.
-	1500 - 1000	Subtract 1000 from 1500.

The following rules state the requirements for the use of the arithmetic operators:

1. You must specify explicitly all arithmetic operators. While algebraic notation allows you to indicate multiplication by an expression such as 2000(-5), EZQUERY requires you to specify the arithmetic operator for multiplication, e.g., 2000 * (-5).

2. An arithmetic operator cannot immediately follow another arithmetic operator. Therefore, if the numeric expression contains a binary arithmetic operator followed by a unary arithmetic operator and an element, you must enclose the unary arithmetic operator and the element within parentheses. For example, 1000 * (-2) is a valid numeric expression, but 1000 * -2 is not.

7.3.3 Comparison Operators

To specify a condition for data retrieval, you combine a comparison operator and an element or numeric expression to form a comparison expression. Section 7.4 describes in detail the syntax of comparison expressions. The six comparison operators are listed below.

<u>Operator</u>	<u>Meaning</u>
EQ (or =)	Equal to
NE (or \neq)	Not equal to
GT (or >)	Greater than
LT (or <)	Less than
GE (or \geq)	Greater than or equal to
LE (or \leq)	Less than or equal to

The following rules state the requirements for the use of the comparison operators:

1. The two-letter code and the symbol for a comparison operator (e.g., EQ and =) have the same meaning.
2. EZQUERY allows you to substitute lowercase letters for the corresponding uppercase letters of operators. Thus, for example, eq, Eq, eQ, and EQ all have the same meaning.

7.3.4 Logical Operators

To specify complex conditions for data retrieval, you combine comparison expressions into logical expressions. The logical operators AND and OR define the relationship between the individual comparison expressions. Section 7.4 describes in detail the syntax of logical expressions.

The logical operators are listed below.

<u>Operator</u>	<u>Meaning</u>
AND	All of the comparison expressions joined by AND must be true for the logical expression to be true.

<u>Operator</u>	<u>Meaning</u>
OR	Only one of the comparison expressions joined by OR must be true for the logical expression to be true.

The following rules state the requirements for the use of the logical operators:

1. You can only use the logical operators to define a logical expression in the condition area. The logical relationship between expressions in table skeletons is implicit, as is that between separate logical expressions.
2. EZQUERY allows you to substitute lowercase letters for the corresponding uppercase letters of operators. Thus, for example, or, Or, oR, and OR all have the same meaning.
3. A blank or parenthesis must precede and follow AND and OR.

7.3.5 Constant Elements

A constant element is a specific value to which you can compare a column's data. The two types of constant elements, CHARACTER and NUMBER, are discussed below.

CHARACTER Constant Elements

A CHARACTER constant element is a character string. For example, BOSTON, Brown, and VS100 are all CHARACTER constant elements. The following rules state the requirements for the use of CHARACTER constant elements:

1. All characters that appear on the VS workstation keyboard are valid characters.
2. Single quotes must surround a CHARACTER constant element in the following circumstances:
 - a. The CHARACTER constant element contains one or more blanks, e.g., 'JANET ELLIOTT' or 'CRAZY KILTS LTD'.
 - b. The CHARACTER constant element contains a comparison operator or an example element, e.g., 'A = B', 'EQ', or '#SALARY'.
 - c. The CHARACTER constant element begins with an arithmetic operator (i.e., +, -, *, /), e.g., '*STRUCK' or '+FACTOR'.
 - d. The CHARACTER constant element contains the at sign (i.e., @), e.g., '@SYSTEM' or 'DINNER@8'.
 - e. The CHARACTER constant element contains only digits, e.g., '000015' or '35'. This distinguishes such a CHARACTER constant element from a NUMBER constant element.

3. The use of single quotes to delimit other CHARACTER constant elements is optional. Thus, for example, BOSTON and 'BOSTON' have the same meaning.
4. EZQUERY allows you to substitute double quotes for single quotes. Thus, for example, "DUNCAN GILL" and 'DUNCAN GILL' have the same meaning.
5. If the CHARACTER constant element contains a single quote or an apostrophe (e.g., 'HELLO' or BUY 'N CRY CORP), you must surround the CHARACTER constant element with double quotes (e.g., "HELLO" or "BUY 'N CRY CORP"). Or you can replace the single quote with two single quotes and surround the CHARACTER constant element with single quotes (e.g., ''HELLO'' or 'BUY ''N CRY CORP').
6. If the CHARACTER constant element contains a double quote (e.g., "JAWS"), you must surround the CHARACTER constant element with single quotes (e.g., 'JAWS'). Or you can replace the double quote with two double quotes and surround the CHARACTER constant element with double quotes (e.g., ""JAWS"").
7. Uppercase letters are distinct from lowercase letters in CHARACTER constant elements. Thus, for example, BOSTON, Boston, and boston do not have the same meaning.
8. The maximum length of a CHARACTER constant element is 2000 characters.
9. You can compare a CHARACTER constant element only to data of type CHARACTER.
10. When you compare a CHARACTER constant element to the data of a column, the length of the CHARACTER constant element must be less than or equal to the data length of the column. If its length is less than the data length, the CHARACTER constant element is left justified and filled with blanks. If its length is greater than the data length, the CHARACTER constant element is left justified, and the extra characters are truncated. For example, if the column NAME has a data length of 3, EZQUERY truncates the CHARACTER constant element YASTRZEMSKI to YAS in a comparison to data in that column. Thus, EZQUERY compares the column's data to YAS, not YASTRZEMSKI, and the query results reflect that comparison.

NUMBER Constant Elements

A NUMBER constant element is a sequence of digits. A preceding sign is optional, as is a decimal point. For example, 30000, -40, +1000, and 5.65 are all NUMBER constant elements. The following rules state the requirements for the use of NUMBER constant elements:

1. Valid digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

2. You can compare a NUMBER constant element only to data of type SIGNED NUMBER or UNSIGNED NUMBER.
3. When you compare a NUMBER constant element to the data of a column, the length of the NUMBER constant element must be less than or equal to the data length of that column. If its length (not including leading zeroes or the decimal point) is greater than the data length, you receive an error message.
4. The scale of a NUMBER constant element is the number of positions that occur to the right of the decimal point. For example, the scale of 5.65 is 2. The scale of a NUMBER constant element must be less than or equal to its length.

7.3.6 Example Elements

The example element links different parts of a query. While a constant element has a specific value, the example element itself has no value. Its significance derives from the relationship that it establishes between the parts of a query (e.g., the table skeletons or the columns and rows in a particular table skeleton).

An example element consists of the pound sign (#) followed by one to eight alphanumeric characters. For example, #B, #NAME, and #30STOCKS are all example elements.

The following rules state the requirements for the use of example elements:

1. The example element always begins with the pound sign (#).
2. No blanks separate the pound sign and the following alphanumeric character string. The string has a minimum length of one and a maximum length of eight characters. The characters allowed in the string are 0 through 9 and A through Z (uppercase and lowercase).
3. Uppercase letters are distinct from lowercase letters in example elements. Thus, for example, #STOCK, #Stock, and #stock do not have the same meaning.
4. You have complete freedom in specifying the name of an example element and may find it helpful to devise a suitable mnemonic. For example, the example element #NAME could link parts of a question about names in the data base.
5. You must use the same example element in all parts of a particular link. It must, of course, be spelled identically in all instances.
6. An example element must be bound. That is, it must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

7.4 SYNTAX RULES

Syntax rules define the ways in which you can specify data retrieval requests. To retrieve data, you combine operators and elements into expressions and then enter those expressions into the appropriate screen objects. The sections that follow list the syntax notation, describe the types of expressions, and summarize the types of data retrieval available in EZQUERY.

7.4.1 Syntax Notation

The syntax notation used to describe the EZQUERY expressions is listed below.

<u>Notation</u>	<u>Meaning</u>
[]	The enclosed item is optional.
...	You can repeat the item to the immediate left as often as necessary.
{ }	You must choose one of the enclosed items.

You must enter uppercase and special characters exactly as shown. Lowercase characters indicate items that you must specify.

7.4.2 Expressions

Expressions are the building blocks of data retrieval requests. The five types of expressions -- numeric expressions, comparison expressions, ranges, range expressions, and logical expressions -- are described below.

Numeric Expressions

A numeric expression consists of an element or a series of elements connected by arithmetic operators. A numeric expression is part of a comparison expression. You can also use a numeric expression to define a computed field in the answer table skeleton. Refer to Section 3.5.4 for more information. A numeric expression takes the following general form:

$$\left[\begin{array}{c} \text{unary} \\ \text{arithmetic} \\ \text{operator} \end{array} \right] \left\{ \begin{array}{c} \text{NUMBER} \\ \text{constant} \\ \text{element} \\ \\ \text{example} \\ \text{element} \end{array} \right\} \left[\begin{array}{c} \text{binary} \\ \text{arithmetic} \\ \text{operator} \end{array} \right] \left[\begin{array}{c} \text{unary} \\ \text{arithmetic} \\ \text{operator} \end{array} \right] \left\{ \begin{array}{c} \text{NUMBER} \\ \text{constant} \\ \text{element} \\ \\ \text{example} \\ \text{element} \end{array} \right\} \dots$$

For example, #PRICE + 5000, (#SALARY + #BONUS)/12, and (70 + 8)/2 are numeric expressions.

The following rules state the requirements for the use of numeric expressions:

1. Each constant element in a numeric expression must be of type NUMBER.
2. All example elements in a numeric expression must appear alone (i.e., without a comparison operator other than EQ) in the same row or in connected rows.
3. If a column contains an example element that is part of a numeric expression, the data in the column must be of type NUMBER (SIGNED or UNSIGNED).
4. EZQUERY evaluates numeric expressions from left to right.
5. You can use parentheses to indicate the evaluation sequence of a numeric expression. Expressions within parentheses are evaluated first. If the numeric expression contains nested parentheses, evaluation proceeds from the innermost set to the outermost set.
6. EZQUERY performs arithmetic operations in the following order:
 - a. All unary negation and plus operations from left to right
 - b. All multiplication and division from left to right
 - c. All addition and subtraction from left to right

Thus, the numeric expression, $10000 - 2000/2$, is equal to 9,000 because EZQUERY performs division before subtraction. The numeric expression, $(200 - 50) * 4$, is equal to 600 because EZQUERY first evaluates all expressions within parentheses.

Comparison Expressions

A comparison expression is a comparison operator followed by a constant element, an example element, or a numeric expression. A comparison expression takes the following general form:

$$[\text{comparison operator}] \left\{ \begin{array}{l} \text{constant element} \\ \text{example element} \\ \text{numeric expression} \end{array} \right\}$$

If you do not specify a comparison operator, EZQUERY assumes that the comparison operator is EQ (equal to). For example, BOSTON, GT 5000, and #MONEY - 1000 are all comparison expressions.

Ranges

A range consists of two constant elements separated by a colon. A range takes the following general form:

$$\text{constant element} : \text{constant element}$$

The first constant element specifies the lower bound of the range, and the second constant element specifies the upper bound of the range. The upper bound of the range must be greater than or equal to the lower bound. For example, B:K and 10000:20000 are ranges.

Blanks on either side of the colon in a range are optional. Thus, for example, 10000:30000 and 10000 : 30000 have the same meaning.

Range Expressions

A range expression consists of one or more ranges, one or more constant elements, or both, separated by commas. A range expression takes the following general form:

$$\left\{ \begin{array}{l} \text{range} \\ \text{constant element} \end{array} \right\} \left[, \left\{ \begin{array}{l} \text{range} \\ \text{constant element} \end{array} \right\} \right] \dots$$

For example, 10000:25000, 0, 3000:5000 is a range expression. Logical OR defines the relationship between the individual ranges and constant elements in a range expression.

Blanks on either side of the comma are optional. Thus, for example, 10000:25000, 0, 3000:5000 and 10000:25000,0,3000:5000 have the same meaning.

Logical Expressions

A logical expression consists of an example element, the keyword IS, and one or more comparison expressions. The logical operators AND and OR join the individual comparison expressions. A logical expression takes one of the following general forms:

$$\begin{array}{l} \text{example element} \quad \text{IS} \quad \left[\begin{array}{l} \text{comparison} \\ \text{operator} \end{array} \right] \quad \text{constant} \\ \text{element} \quad \left[\left\{ \begin{array}{l} \text{AND} \\ \text{OR} \end{array} \right\} \left[\begin{array}{l} \text{comparison} \\ \text{operator} \end{array} \right] \quad \text{constant} \right. \\ \left. \text{element} \right] \quad \dots \\ \\ \text{example element} \quad \text{comparison operator} \quad \left\{ \begin{array}{l} \text{constant element} \\ \text{example element} \\ \text{numeric expression} \end{array} \right\} \end{array}$$

For example, #SALARY IS GT 30000 OR LT 20000, and #LAST IS GT BROWN AND LT GLASS OR EQ SMITH, and #PRICE LT #QPRICE - 10 are logical expressions.

The following rules state the requirements for the use of logical expressions:

1. You can define logical expressions only in the condition area.
2. Each logical expression must occupy a separate row in the condition area.
3. The example element in a logical expression must be bound. That is, it must appear alone (i.e., without a comparison operator other than EQ) in at least one column.
4. EZQUERY evaluates logical expressions from left to right.
5. You can use parentheses to indicate the evaluation sequence of a logical expression. Expressions within parentheses are evaluated first.
6. Logical AND takes precedence over logical OR. That is, EZQUERY treats expressions joined by logical AND as if parentheses surrounded them. For example, #LAST IS GT BROWN AND LT GLASS OR EQ SMITH has the same meaning as #LAST IS (GT BROWN AND LT GLASS) OR EQ SMITH.
7. All comparison expressions joined by AND must be true for the logical expression to be true.
8. Only one of the comparison expressions joined by OR must be true for the logical expression to be true.
9. When the logical expression consists of more than one comparison expression, the comparison expressions must not contain example elements or numeric expressions.
10. EZQUERY allows you to substitute lowercase letters for the corresponding uppercase letters of the keyword IS. Thus, is, Is, iS, and IS all have the same meaning.
11. The keyword IS appears in a logical expression in the following circumstances:
 - a. It is required when the logical expression consists of more than one comparison expression (e.g., #DIVIDEND IS GT 3 OR LT 1).
 - b. It is optional when the logical expression consists of one comparison expression and that comparison expression contains a constant element. Thus, for example, #PRICE IS GT 30 and #PRICE GT 30 have the same meaning.

- c. It is not allowed when the logical expression consists of one comparison expression and that comparison expression contains an example element or numeric expression (e.g., #LAST LT #MANAGER or #DIVIDEND GE #PRICE/20).

7.4.3 Types of Data Retrieval

EZQUERY enables you to formulate a wide variety of queries to meet different needs for information from the data base. A summary of the types of data retrieval available in EZQUERY follows.

Unconditional Retrieval

To obtain all of the data from the selected columns of a table, you enter DISPLAY in the corresponding table skeleton. The columns are blank because no conditions qualify the data retrieval. Figure 7-4 illustrates unconditional retrieval.

Query Retrieve the account number, first name, last name, and broker of all clients.

```
CLIENT _____ || ACCOUNT _____ | FIRST _____ | LAST _____ | BROKER _____ |
DISPLAY          ||                    |                    |                    |                    |
```

Figure 7-4. Unconditional Retrieval

Conditional Retrieval by Comparison

To compare the data in a column to a specific value and to use that condition as the basis for data retrieval, you enter a comparison expression in the column. Figure 7-5 illustrates conditional retrieval by comparison.

Query Retrieve the trading symbol, name, price, and dividend of all stocks that have a price less than \$50.

```
STOCKS _____ || SYMBOL _____ | NAME _____ | PRICE _____ | DIVIDEND _____ |
DISPLAY          ||                    |                    | LT 50          |                    |
```

Figure 7-5. Conditional Retrieval by Comparison

Figure 7-6 illustrates the use of a comparison expression that contains a numeric expression.

Query Retrieve the trading symbol, name, price, and dividend of all stocks that have a dividend greater than \$100/20 - \$2.

```

STOCKS      || SYMBOL      | NAME      | PRICE      | DIVIDEND   |
DISPLAY    ||          |          |          | GT 100/20 - 2 |

```

Figure 7-6. Comparison Expression Containing a Numeric Expression

The following rules state the requirements for conditional retrieval by comparison:

1. The comparison expression consists of a comparison operator and a constant element or numeric expression.
2. If the comparison expression does not contain a comparison operator, EZQUERY assumes that it is EQ (equal to) and retrieves data with the same value as the constant element or numeric expression.
3. All constant elements in the comparison expression must be of the same data type as the actual data.
4. If you specify a blank column (i.e., one that contains no data) as the condition for retrieval, single quotes must surround a blank space in the column.

Conditional Retrieval by a Range of Values

To compare the data in a column to a range of values and to use that comparison as the basis for data retrieval, you enter a range in the column. Figure 7-7 illustrates conditional retrieval by a range of values.

Query Retrieve the first name, last name, and broker of all clients whose last name is in the range Chen to Enman.

```

CLIENT      || FIRST      | LAST      | BROKER      |
DISPLAY     ||          | CHEN:ENMAN |          |

```

Figure 7-7. Conditional Retrieval by a Range of Values

The following rules state the requirements for conditional retrieval by a range of values:

1. EZQUERY retrieves all data with a value equal to or between the lower and upper bounds of the range.

2. The constant elements in the range must be of the same data type as the actual data.

Conditional Retrieval by a Range Expression

To compare the data in a column to several ranges and specific values and to use that comparison as the basis for data retrieval, you enter a range expression in the column. Figure 7-8 illustrates conditional retrieval by a range expression.

Query Retrieve the trading symbol, name, and price of all stocks that have a price between \$10 and \$20, between \$40 and \$50, or of \$70.

<u>STOCKS</u>		<u>SYMBOL</u>		<u>NAME</u>		<u>PRICE</u>	
DISPLAY						10:20, 40:50, 70	

Figure 7-8. Conditional Retrieval by a Range Expression

The following rules state the requirements for conditional retrieval by a range expression:

1. The individual constant elements and the constant elements in the ranges must be of the same data type as the actual data.
2. Logical OR defines the relationship between the individual constant elements and ranges in a range expression. Thus, EZQUERY retrieves data that falls within any of the ranges or equals any of the constant elements.

Conditional Retrieval in Multiple Columns of a Single Row - AND

To define conditions for data in multiple columns of a table and to retrieve data that meets all of those conditions, you enter the conditions in the same row of the corresponding table skeleton. Logical AND defines the relationship between the conditions in different columns of the same row. Thus, EZQUERY retrieves data if all of the conditions are true. Figure 7-9 illustrates conditional retrieval in multiple columns of the same row.

Query Retrieve the account number, last name, state, and broker of all clients who live in Massachusetts and whose broker has the identification number 0400.

<u>CLIENT</u>		<u>ACCOUNT</u>		<u>LAST</u>		<u>STATE</u>		<u>BROKER</u>	
DISPLAY						MA		'0400'	

Figure 7-9. Conditional Retrieval in Multiple Columns of a Single Row

Conditional Retrieval in Multiple Rows - OR

To define conditions for data in several columns of a table and to retrieve data that meets any of these conditions, you enter the conditions in different rows of the corresponding table skeleton and place the row operator DISPLAY in each of the rows. Logical OR defines the relationship between the conditions in multiple rows when each row contains the row operator DISPLAY. Thus, EZQUERY retrieves data if any of the conditions are true. Figure 7-10 illustrates conditional retrieval in multiple columns of different rows.

Query Retrieve the account number, last name, state, and broker of all clients who live in Massachusetts or whose broker has the identification number 0400.

CLIENT		ACCOUNT		LAST		STATE		BROKER	
DISPLAY						MA			
DISPLAY								'0400'	

Figure 7-10. Conditional Retrieval in Multiple Rows - OR

Conditional Retrieval by Joining Tables

To compare related rows in more than one table and to use that comparison as the basis for data retrieval, you must join the tables. To join tables, you enter the same example element in a column in each of the table skeletons and a comparison operator in one of the columns. Figure 7-11 illustrates conditional retrieval by joining tables.

Query Retrieve the account number, first name, last name, and broker of all clients who own stock in the Tiger Tank Corporation (TGTK).

CLIENT		ACCOUNT		FIRST		LAST		BROKER	
DISPLAY		#SAMENO							
HOLDINGS		ACCOUNT		SYMBOL					
		#SAMENO		TGTK					

Figure 7-11. Conditional Retrieval by Joining Tables

The following rules state the requirements for conditional retrieval by joining tables:

1. The data in the columns joined by the example element must be of the same data type, e.g., CHARACTER or NUMBER (SIGNED or UNSIGNED). The data length, scale, and storage type of the columns do not have to be identical.
2. If a comparison operator does not appear in one of the columns joined by the example element, EZQUERY assumes that the comparison operator is EQ (equal to). If the comparison operator is EQ, the data in the columns must be identical to establish a link between particular rows in the tables.
3. The example element must be bound. That is, it must appear alone (i.e., without a comparison operator other than EQ) in at least one column.
4. DISPLAY appears in the table that will supply the answer.

Conditional Retrieval by Joining Columns

To compare related data in different columns and to use that comparison as the basis for data retrieval, you enter an example element in one column and a comparison expression containing that example element in the other column. Figure 7-12 illustrates conditional retrieval by joining columns.

Query Retrieve the trading symbol, name, price, and dividend of all stocks that have a price less than the dividend multiplied by 20.

STOCKS		SYMBOL		NAME		PRICE		DIVIDEND	
DISPLAY						LT #DIV * 20		#DIV	

Figure 7-12. Conditional Retrieval by Joining Columns

The following rules state the requirements for conditional retrieval by joining columns:

1. The data in the columns joined by the example element must be of the same data type, e.g., CHARACTER or NUMBER (SIGNED or UNSIGNED). The data length, scale, and storage type of the columns do not have to be identical.
2. If the comparison expression does not contain a comparison operator, EZQUERY assumes that it is EQ (equal to) and requires the data in the columns to be equal for retrieval to take place.

- The example element must be bound. That is, it must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

Conditional Retrieval by Joining Rows

To compare related data in different rows and to use that comparison as the basis for data retrieval, you must join rows. For example, to find all stocks that have a price less than that of the Old Harbor Corporation (OLDH), you must compare the price of that stock to the prices of all other stocks. Because the price information about each stock is contained in a different row of the STOCKS table, you must join rows to formulate this query.

Each row in a table skeleton contains a separate data retrieval request to the corresponding table. One or more example elements establish the relationship between columns in the individual rows. To compare columns in different rows, you enter an example element in one column and a comparison expression containing that example element in the other column. Figure 7-13 illustrates conditional retrieval by joining rows.

Query Retrieve the trading symbol, name, and price of all stocks that have a price less than that of the Old Harbor Corporation (OLDH).

<u>STOCKS</u>		<u>SYMBOL</u>		<u>NAME</u>		<u>PRICE</u>	
DISPLAY		OLDH				LT #PRICE	
						#PRICE	

Figure 7-13. Conditional Retrieval by Joining Rows

Figure 7-14 shows you how to join rows with more than one example element. EZQUERY retrieves the identification number, last name, salary, and manager of a broker if the following condition is true: if the broker has a certain manager, e.g., #BOSS, and #BOSS earns a certain salary, e.g., #BIGBUCKS, then the broker earns a salary greater than #BIGBUCKS.

Query Retrieve the identification number, last name, salary, and manager of all brokers who earn more than their manager.

<u>BROKER</u>		<u>BROKER</u>		<u>LAST</u>		<u>SALARY</u>		<u>MANAGER</u>	
DISPLAY		#BOSS				GT #BIGBUCKS		#BOSS	
						#BIGBUCKS			

Figure 7-14. Joining Rows with More Than One Example Element

The following rules state the requirements for conditional retrieval by joining rows:

1. An example element must join all rows in a table skeleton.
2. You can join up to 12 rows in a table skeleton.
3. The order of the rows is immaterial.
4. Data in columns joined by an example element must be of the same data type, e.g., CHARACTER or NUMBER (SIGNED or UNSIGNED). The data length, scale, and storage type of the columns do not have to be identical.
5. If a comparison operator does not appear in one of the columns joined by an example element, EZQUERY requires the data in the columns to be equal for retrieval to take place.
6. Each example element must be bound. That is, it must appear alone (i.e., without a comparison operator other than EQ) in at least one column.
7. DISPLAY appears in the row that will supply the answer.

Conditional Retrieval in the Condition Area

You can define conditions for data retrieval in the condition area. You enter a logical expression in a row of the condition area and link the expression to a column with an example element. As Figure 7-15 illustrates, it is often more convenient to define complex conditional criteria (i.e., several conditions joined by logical AND or OR or both logical operators) in the condition area.

Query Retrieve the trading symbol, name, price, and dividend of all stocks that have a symbol before HAL or after QQ and not equal to TACO and that have a price less than \$30 or greater than \$40.

<u>STOCKS</u>	<u>SYMBOL</u>	<u>NAME</u>	<u>PRICE</u>	<u>DIVIDEND</u>
DISPLAY	#SYMBOL		#PRICE	
<u>AREA FOR ADDITIONAL CONDITIONS</u>				
#SYMBOL IS LT HAL OR (GT QQ AND NE TACO)				
#PRICE IS LT 30 OR GT 40				

Figure 7-15. Logical Expression in the Condition Area

Figure 7-16 illustrates the use of a logical expression that contains a numeric expression. As in Figure 7-16, the logical expression must define a condition for data of type NUMBER (SIGNED or UNSIGNED).

Query Retrieve the account number of the owner, the trading symbol, the number of shares, and the purchase price of all stocks that have a current price greater than or equal to twice the purchase price.

```

HOLDINGS  || ACCOUNT  | SYMBOL  | QUANTITY | BUY-PRICE |
DISPLAY   ||         | #SYMBOL |          | #PURCHASE |

STOCKS    || SYMBOL   | PRICE   |
          || #SYMBOL  | #CURRENT |

AREA FOR ADDITIONAL CONDITIONS
#CURRENT GE #PURCHASE * 2

```

Figure 7-16. Logical Expression Containing a Numeric Expression

If a column already contains an example element, you can use the condition area to define conditions for that column's data. For example, in Figure 7-17, the example element #ACCTLINK in the ACCOUNT columns joins the CLIENT and HOLDINGS table skeletons. To define a condition for data in the ACCOUNT column, you define in the condition area a logical expression that begins with the example element #ACCTLINK (i.e., #ACCTLINK IS LT '1500').

Query Retrieve the account number, first name, and last name of all clients whose account number is less than 1500 and who own stock in Barometrics Incorporated (BMET).

```

CLIENT    || ACCOUNT  | FIRST   | LAST     |
DISPLAY   || #ACCTLINK |         |          |

HOLDINGS  || ACCOUNT  | SYMBOL  |
          || #ACCTLINK | BMET    |

AREA FOR ADDITIONAL CONDITIONS
#ACCTLINK IS LT '1500'

```

Figure 7-17. Condition for a Column Containing an Example Element

The following rules state the requirements for conditional retrieval in the condition area:

1. The condition area contains a maximum of 12 rows.
2. You formulate each logical expression in a separate row of the condition area.
3. Logical AND defines the relationship between the individual logical expressions. Thus, EZQUERY requires all of the expressions to be true for data retrieval to take place.
4. The example element in a logical expression must be bound. That is, it must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

APPENDIX A EZQUERY GETPARMS

A.1 INTRODUCTION TO GETPARMS

The VS Operating System supports a supervisor call, known as the GETPARM SVC, that solicits and accepts run-time parameter information and displays and awaits acknowledgement of run-time messages. GETPARM-generated prompts appear on the workstation screen during normal execution. These prompts solicit parameter information from a user or from a controlling procedure. The GETPARM SVC verifies values entered from either source for validity. If the values entered are not acceptable, the GETPARM SVC responds with an error message.

GETPARM processing is distinguished from other methods of obtaining run-time information primarily because it can interface with a procedure. (Refer to the VS Procedure Language Reference for further information.) A procedure is the preferred source of information for a GETPARM request; thus, GETPARM prompts never appear on the workstation screen when they are satisfied by a Procedure language ENTER statement. Therefore, the procedure writer can precisely control the interaction between a user and an executing program.

The VS system programs use GETPARM requests wherever possible to solicit parameter information. This enables a user to run system programs with little or no user interaction by supplying most or all of the required program parameters from procedures.

A.2 THE STRUCTURE OF A GETPARM

A parameter reference name (prname) identifies each GETPARM request in a program. The prname for each request is, in general, unique within that program. System programs observe certain conventions when identifying GETPARM requests with prnames. For example, the prname INPUT usually identifies a GETPARM request soliciting information for an input file, while OUTPUT names a GETPARM soliciting information for an output file.

Many GETPARM requests contain one or more modifiable fields into which a user or a procedure can enter information. A keyword identifies each of these fields. When a GETPARM request appears, the keyword for each field provides a description of the information to be supplied for that field. Keyword naming commonly follows certain conventions; for example, a request for a file name often uses the keyword FILE. Also, many GETPARM requests solicit a PF key response (such as 16 = Exit Program). There is no keyword associated with a PF key choice; only the PF key number itself is specified.

A.3 ASSOCIATING A PROCEDURE WITH A GETPARM

Within a procedure, each ENTER or DISPLAY statement supplies parameters for a single GETPARM request. The prname of a specific GETPARM request associates the request with a particular ENTER or DISPLAY statement. (GETPARM requests issued by a user-program can, of course, be assigned any prname that the programmer chooses. The GETPARM issuer specifies the modifiable fields and their keywords for user-defined GETPARM requests.)

When a procedure supplies parameters, keywords in the ENTER or DISPLAY statement associate the specified values with the fields to which they are to be assigned in the GETPARM request. In this case, the procedure passes the values associated with keywords to the corresponding keyword-identified fields in the GETPARM request. (Keywords must, of course, be spelled correctly in the procedure statement.) If the procedure does not assign new values to fields, they retain their default values.

Refer to the VS Procedure Language Reference for more information on the VS Procedure language and the use of GETPARM requests.

A.4 PRNAMES AND KEYWORDS FOR VS EZQUERY

The table that follows contains the prnames, keywords, options, and default values used by GETPARM requests for VS EZQUERY. Note that when PF keys are options for a prname, no keyword is listed. When the ENTER key is a PF key option, \uparrow appears; otherwise use of the ENTER key is assumed.

<u>Prname</u>	<u>Keyword</u>	<u>Length</u>	<u>Options</u>	<u>Defaults</u>
DATABASE	DATABASE	6		
	VOLUME	6		INVOL
	PF Keys ¹		1 = Manage data base definition 16 = Exit	

¹ The keyword is not required.

<u>Prname</u>	<u>Keyword</u>	<u>Length</u>	<u>Options</u>	<u>Defaults</u>
FUNCTION	PF Keys ¹		1 = Return to Specify Data Base Screen 2 = Formulate new query 3 = Reformulate stored query 4 = Run stored query 5 = Create the file for a data base table 6 = Set data base access 7 = Rename query 8 = Delete query 13 = Enter EZQUERY HELP 16 = Exit	
QUERY	QUERY DISPLAY PRINTANS PRINTQRY PF Keys ¹	8 3 3 3	YES, NO YES, NO YES, NO 1 = Return to EZQUERY Functions menu 13 = Enter EZQUERY HELP 16 = Exit	YES NO NO
OPTIONS	FILE LIBRARY VOLUME COPIES NUMBER LINE PAGE CLASS PF Keys ¹	8 8 6 4 3 3 3 1	1-9999 000-254 80-999 10-999 A-Z 16 = Exit	Query name for stored query; sys- tem generat- ed name for new query SPOOLIB SPOOLVOL 1 FORM# 132 LINES PRTCLASS
CREATE	TABLE PF Keys ¹	8	1 = Return to EZQUERY Functions menu 13 = Enter EZQUERY HELP 16 = Exit	
INHIBIT	INHIBIT	3	YES, NO	NO

¹ The keyword is not required.

<u>Prname</u>	<u>Keyword</u>	<u>Length</u>	<u>Options</u>	<u>Defaults</u>
ACCESS	ACCESS PF Keys ¹	8	SHARED, PRIVATE, LIMITED, READONLY 16 = Return to EZQUERY Functions menu	SHARED
RENAME	OLDNAME NEWNAME PF Keys ¹	8 8	1 = Return to EZQUERY Functions menu 13 = Enter EZQUERY HELP 16 = Exit	
DELETE	QUERY PF Keys ¹	8	1 = Return to EZQUERY Functions menu 13 = Enter EZQUERY HELP 16 = Exit	
FILEORG	FILEORG LENGTH FILE LIBRARY VOLUME CFILE CLIBRARY CVOLUME PF Keys ¹	1 1 8 8 6 8 8 6	C, I, A F, V, C 1 = Return to Answer menu	C C Query name if it exists OUTVOL Query name if it exists User ID CTL OUTVOL
KEYNAME	KEYNAME	8		
ALLOWDU	ALLOWDUP	3	YES, NO	YES
ALTKEY	ALLOWDUP KEYNAME	3 8	YES, NO	YES
REPORT	ID PF Keys ¹	8	16 = Exit	

¹ The keyword is not required.

<u>Prname</u>	<u>Keyword</u>	<u>Length</u>	<u>Options</u>	<u>Defaults</u>
DOCUMENT	DOCUMENT	5	Valid document IDs, including \$\$\$, next, and NEXT	\$\$\$ & default WP library
	VOLUME	6		
	TITLE	25		
	OPERATOR	20		
	AUTHOR	20		
	COMMENTS	20		
	PF Keys ¹		1 = Return to Answer menu	
OUTPUT	QUERY	8		
	PF Keys ¹			
REPLACE	PF Keys ¹			
			␣ = Replace stored query with edited version	
			1 = Return to Question or Answer menu	
WORKFILE	VOLUME	6		
	PF Keys ¹			

¹ The keyword is not required.

APPENDIX B
EZQUERY EXAMPLE

B.1 INTRODUCTION

Wang includes a sample data base named DEMO with the EZQUERY software. The examples that appear in this document are drawn from this data base. As you use this reference, you may find it helpful to formulate and execute the queries described in the text.

The data base DEMO consists of four data files, BROKER, CLIENT, HOLDINGS, and STOCKS, which contain information about a hypothetical brokerage firm. The record description files BROKER, CLIENT, HOLDINGS, and STOCKS define the attributes of these data files; these record description files are located in the data base definition library @DEMOC.

Five stored queries are included with the DEMO data base. These queries correspond to examples in this manual. They are located in the stored query library @DEMOQ. Record description files for the answers to the queries are located in the library @DEMOC.

The sections that follow describe the data files and stored queries associated with the DEMO data base.

B.2 BROKER DATA FILE

The data file BROKER is an indexed file that contains five fields: BROKER, FIRST, LAST, SALARY, and MANAGER. The Primary Key field is BROKER, and LAST and MANAGER are Alternate Key fields that allow duplicates. The BROKER record description file specifies the following information about the individual fields:

<u>Field Name</u>	<u>Internal Format</u>	<u>Internal Length</u>	<u>External Length</u>	<u>Decimal Positions</u>	<u>Range</u>
BROKER	C	4	4	0	0001 - 0999
FIRST	C	10	10	0	
LAST	C	10	10	0	
SALARY	P	4	9	2	0 - 99999.99
MANAGER	C	4	4	0	

The BROKER data file contains a total of 12 records. Table B-1 lists these records.

Table B-1. The BROKER Data File

Broker	First	Last	Salary	Manager
0100	LILLIAN	BROWN	15000.00	0250
0150	DENNY	SKARDON	27000.00	0150
0200	TUCKER	FAULKNER	32000.00	0150
0250	RUSS	KILLEEN	31500.00	0250
0300	JODY	PELTASON	18350.00	0150
0350	MEREDITH	BECKER	24500.00	0400
0400	MARTY	ENMAN	50000.00	0400
0450	DUNCAN	GILL	48750.00	0250
0500	MARCIA	SHENNAN	45000.00	0500
0550	KATHY	MCKINNEY	29500.00	0500
0600	TIM	DEWANDEL	23500.00	0400
0650	LINDA	ALLISON	75000.00	0500

B.3 CLIENT DATA FILE

The data file CLIENT is an indexed file that contains six fields: ACCOUNT, FIRST, LAST, CITY, STATE, and BROKER. The Primary Key field is ACCOUNT, and LAST and BROKER are Alternate Key fields that allow duplicates. The CLIENT record description file specifies the following information about the individual fields:

<u>Field Name</u>	<u>Internal Format</u>	<u>Internal Length</u>	<u>External Length</u>	<u>Decimal Positions</u>	<u>Range</u>
ACCOUNT	C	4	4	0	
FIRST	C	10	10	0	
LAST	C	10	10	0	
CITY	C	15	15	0	
STATE	C	2	2	0	
BROKER	C	4	4	0	0001 - 0999

The CLIENT data file contains a total of 24 records. Table B-2 lists these records.

Table B-2. The CLIENT Data File

Account	First	Last	City	State	Broker
0100	LILLIAN	BROWN	WILTON	CT	0450
0400	MARTY	ENMAN	SAUGUS	MA	0400
0450	DUNCAN	GILL	WESTON	MA	0450
0500	MARCIA	SHENNAN	LOWELL	MA	0400
1000	JUDITH	COLE	BOSTON	MA	0450
1050	STEVEN	LAMPREY	HONOLULU	HI	0100
1100	SANDRA	TOLKIN	CAMBRIDGE	MA	0400
1150	JANET	ELLIOTT	PASADENA	CA	0300
1250	WILLIAM	DORSEY	VIRGINIA BEACH	VA	0350
1300	THOMAS	CLARK	COLUMBUS	OH	0600
1350	JOAN	CHAMBERS	ARLINGTON	MA	0500
1400	KAREN	TOUSSAINT	HARTFORD	CT	0200
1450	KIM	YOUNG	CONCORD	MA	0650
1500	DOUG	LESNIAK	PRINCETON	NJ	0250
1600	SARAH	MORROW	DARIEN	CT	0200
1650	LISA	CHEN	LEXINGTON	MA	0450
1700	STUART	LAFRENAYE	PROVIDENCE	RI	0500
1750	GLENN	HARRIGAN	WASHINGTON	DC	0400
1800	ANNE	SCHWARTZ	LIMA	OH	0650
1900	JULIE	SMITH	GROTON	MA	0100
2000	LOU	DE WYZE	BURLINGTON	MA	0400
2050	MURRAY	HARNETT	EDGARTOWN	MA	0650
2100	ANN	O'ROURKE	CINCINNATI	OH	0400
2150	RON	MORSE	NAGS HEAD	NC	0250

B.4 HOLDINGS DATA FILE

The data file HOLDINGS is an indexed file that contains six fields: KEY, ACCOUNT, SYMBOL, QUANTITY, DATE, and PRICE. The Primary Key field is KEY, and SYMBOL is an Alternate Key field that allows duplicates. The HOLDINGS record description file specifies the following information about the individual fields:

<u>Field Name</u>	<u>Internal Format</u>	<u>Internal Length</u>	<u>External Length</u>	<u>Decimal Positions</u>	<u>Range</u>
KEY	C	8	8	0	
ACCOUNT	C	4	4	0	
SYMBOL	C	4	4	0	
QUANTITY	B	2	6	0	
DATE	C	6	6	0	
PRICE	P	4	9	3	0 - 9999.999

KEY is a compound key that consists of the ACCOUNT and SYMBOL fields. EZQUERY does not create a corresponding column for compound key fields. The DATE and PRICE fields have alternate names of BUY-DATE and BUY-PRICE; EZQUERY uses the alternate names as the column names.

The HOLDINGS data file contains a total of 48 records. Table B-3 lists these records.

Table B-3. The HOLDINGS Data File

Account	Symbol	Quantity	Buy-Date	Buy-Price
0100	BUYN	150	110882	39.000
0100	PANC	250	031883	23.000
0100	TGTK	300	111982	29.375
0400	BMET	150	040483	18.625
0400	SNET	400	011083	21.875
0450	BUYN	250	012181	15.375
0450	TACO	300	100182	21.500
0500	QQ	6000	060182	7.875
0500	SC	4500	083182	7.875
1000	BMET	300	063082	7.250
1000	SC	100	061482	14.500
1000	SNET	100	031582	8.500
1000	WPCO	300	090182	17.500
1050	TGTK	200	082482	24.875
1100	HV	400	101582	41.000
1100	QQ	200	022482	12.625
1150	TGTK	100	031682	29.625
1250	BST	300	032883	60.250
1250	CK	500	042583	71.000
1250	OLDH	100	061583	45.000
1300	BUYN	100	080383	47.000
1300	MEPR	50	032882	15.000
1350	USCA	200	122882	98.000
1400	CHM	1000	081582	6.750
1400	HAL	2000	122879	55.500
1450	PANC	200	111982	16.000
1450	WPCO	100	070183	41.250
1500	LCOM	1500	021883	22.000
1600	BST	50	091578	33.000
1600	HV	100	103182	45.000
1600	WPCO	100	030183	35.000
1650	CK	100	070583	63.000
1650	MEPR	200	070583	37.000
1650	OLDH	300	070583	42.000
1650	QQ	400	070583	29.000
1650	SNET	400	070583	32.000
1700	BST	100	011881	60.000
1700	CHM	250	102282	17.500
1750	LCOM	50	031583	18.500
1800	TACO	1500	061083	28.500
1800	USCA	100	120179	53.375
1900	WPCO	400	081582	12.500
2000	HV	1000	101782	28.625
2050	BST	100	012183	68.000
2050	LCOM	500	032183	14.500
2100	MEPR	300	051082	15.375
2100	SNET	400	061583	33.250
2150	CHM	100	091982	19.500

B.5 STOCKS DATA FILE

The data file STOCKS is an indexed file that contains four fields: SYMBOL, NAME, PRICE, and DIVIDEND. The Primary Key field is SYMBOL, and NAME is an Alternate Key field that allows duplicates. The STOCKS record description file specifies the following information about the individual fields:

<u>Field Name</u>	<u>Internal Format</u>	<u>Internal Length</u>	<u>External Length</u>	<u>Decimal Positions</u>	<u>Range</u>
SYMBOL	C	4	4	0	
NAME	C	30	30	0	
PRICE	P	4	9	3	0 - 9999.999
DIVIDEND	P	3	7	3	0 - 99.999

The STOCKS data file contains a total of 18 records. Table B-4 lists these records.

Table B-4. The STOCKS Data File

<u>Symbol</u>	<u>Name</u>	<u>Price</u>	<u>Dividend</u>
BMET	BAROMETRICS INC	13.500	0.000
BST	BAY STATE TELEPHONE CORP	62.250	5.400
BUYN	BUY 'N CRY CORP	45.000	0.000
CHM	CHALLENGE MOTORS INC	26.000	0.000
CK	CRAZY KILTS LTD	59.000	0.000
HAL	HIGHER ARTIFICIAL LOGIC	119.500	3.800
HV	HOME VIDEO INC	21.625	1.000
LCOM	LUCKY COMPUTERS CORP	9.875	0.000
MEPR	MERCHANDISE PROTECTION CORP	38.000	0.050
OLDH	OLD HARBOR CORP	36.000	0.120
PANC	PACIFIC NATIONAL CORP	21.500	0.000
QQ	QUICK QUOTES CORP	22.500	0.000
SC	SCANNERS INC	18.375	0.000
SNET	SUPERNET CORP	28.125	0.000
TACO	TACO TAKEOUT INC	31.250	0.600
TGTK	TIGER TANK CORP	36.875	3.200
USCA	UNITED STATES CAMERA CORP	70.000	3.000
WPCO	WORD PROCESSING CORP	32.250	0.120

B.6 SAMPLE STORED QUERIES

The DEMO data base includes five stored queries that correspond to examples in this manual. To execute a stored query, press PF4 from the EZQUERY Functions menu, enter the name of the query, and press ENTER.

The stored queries are listed below. For additional explanation of a particular query, refer to the section cited below.

<u>Name</u>	<u>Description</u>	<u>Reference</u>
BUYNCRY	Retrieves the trading symbol, name, price, and dividend of all stocks that have a price greater than that of the Buy 'n Cry Corporation (BUYN).	3.10.2
LT35	Retrieves the trading symbol, name, price, and dividend of all stocks that have a price less than \$35.	4.2
LT1000	Retrieves for clients with account numbers of less than 1000 the full name, number of shares, and value of their stocks, where value is equal to the number of shares multiplied by the current price.	3.5.4
MACLIENT	Retrieves the first name, last name, and broker of all clients who live in Massachusetts and who own stock in the Word Processing Corporation (WPCO) and in Scanners Incorporated (SC).	3.1.2
QQSTOCK	Retrieves the account number, first name, last name, and broker of all clients who own Quick Quotes Corporation (QQ) stock.	3.3

APPENDIX C
EZQUERY ERROR MESSAGES

C.1 INTRODUCTION

This appendix lists the VS EZQUERY error messages. These messages are designed to be self-explanatory and self-documenting. Section C.2 lists alphabetically the error messages associated with the Query function. Section C.3 is an alphabetical list of the messages associated with the Manage Data Base function. Additional explanation follows some of the error messages.

If you can reproduce a situation that generates a system error, supply your Wang analyst with the following information: a description of the data base (e.g., the record description files) and the query, the type of data base access, the operation in progress, and any other relevant factors.

C.2 QUERY FUNCTION ERROR MESSAGES

An example element must appear alone at least once in a question table.

An example element must be bound. It must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

An invalid number, example element, or character string specified.

Section 7.3.5 lists the rules that govern CHARACTER and NUMBER constant elements. Section 7.3.6 lists the rules that govern example elements.

An invalid number, example element, or character string specified in an expression.

Section 7.3.5 lists the rules that govern CHARACTER and NUMBER constant elements. Section 7.3.6 lists the rules that govern example elements.

Answer table columns come from unconnected question table rows.

If the answer table includes columns from more than one table, an example element must link the corresponding table skeletons.

A question can have only one answer table.

A question can have only one condition area.

Cannot open word processing document - WPOPEN status = xxxx.

Refer to the VS Programmer's Guide to VS/IIS for an explanation of the WPOPEN status code.

Constant not found - possibly EZQUERY error.

Constants or parameters are not allowed in the answer table skeleton.

Section 3.5 describes the use of the answer table skeleton in a question.

Control file name is blank - please supply name.

Refer to Section 4.7.1.

Data base file alternate index paths are not the same as defined in the record description file.

Data base file is not consistent with its record description file.

Data base file record size disagrees with record description file.

Data conversion error - invalid format or decimal overflow.

Data conversion error - number of digits exceeds limits.

Data file for the table is not specified in the data base definition.

Through the Manage Data Base function, you can associate a data file with a data base table. Refer to Section 5.4.6 for more information.

Data file name is blank - please supply name.

Refer to Section 4.7.1.

Data file write error - answer table not copied.

EZQUERY was unable to copy the answer table because of an I/O error. The data file and control file were not created.

Data value out the allowed value range specified by the control file.

Through EZQUERY HELP, you can review the data validation ranges of the columns.

Directory of the data base is currently being updated by another user.

While another user is managing a data base or its record description files, you cannot manage the data base or begin to process a query against it. Refer to Section 5.3 for more information.

DISPLAY can appear in only one table.

Refer to Section 7.3.1 for the rules that govern DISPLAY.

Display option incorrect or Query is not executable.

DMS error occurred while accessing the file - unable to proceed.

DMS or I/O error occurred while accessing the data dictionary.

DMS or I/O error occurred while accessing the stored query file.

Duplicate column name specified in the answer table.

The name of a column must be unique in the answer table.

Error while trying to open the query.

Error while writing WP document xxxxL - document not completed.

While creating the word processing document, EZQUERY encountered an I/O error. The document is not complete. Try again to create the document.

Error while reading WP format - document xxxxL not completed.

EZQUERY could not read the format line in your word processing prototype document. After examining the prototype document, try again to create the document.

Error while writing WP format - document xxxxL not completed.

EZQUERY could not override the prototype format line. Try again to create the document.

Example elements in a join condition are not connected to any question table column.

An example element must be bound. It must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

Example elements in the condition are not connected to any question table column.

An example element must be bound. It must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

Example elements not connected to any question table column.

An example element must be bound. It must appear alone (i.e., without a comparison operator other than EQ) in at least one column.

EZQUERY SYSTEM ERROR - cannot establish differentiation criteria for a multiple record type file.

EZQUERY SYSTEM ERROR - key field name collision or unexpected DMS error when writing file.

EZQUERY system error 401 - did not find root.

EZQUERY system error 402 - the top node was not root.

EZQUERY system error 403 - join3 node w/o dom. child.

EZQUERY system error 404 - did not find answer table.

EZQUERY system error 405 - no match on column ID.

EZQUERY system error 407 - join node w/o dom. child.

File organization must be C or I or A.

The data file to which you copy the answer table can have a file organization of consecutive (C), indexed (I), or indexed with one or more alternate keys (A). Refer to Section 4.7.1. for more information.

Inconsistent element descriptors - possibly EZQUERY error.

Input symbol exceeds the maximum length of 2000 characters.

A data entry field contains a maximum of 2000 characters.

Insufficient memory in segment 2 to process the data base.

EZQUERY requires a minimum Segment 2 size of 512K.

Insufficient memory to do selection - too many conditions or parameters.

The sum of the lengths of the selected columns may be too large.

Insufficient memory to execute the query.

Try to formulate the query in several simpler questions.

Invalid aggregate function specified.

EZQUERY does not currently support aggregate functions.

Invalid arithmetic expression - missing operand, or invalid combination of numbers, example elements, "+", etc.

Refer to Section 7.4.2 for the rules that govern numeric expressions.

Invalid arithmetic expression - missing operator "+", "-", "*", or "/".

Refer to Section 7.4.2 for the rules that govern numeric expressions.

Invalid arithmetic operand - an arithmetic operand must be a number or an example element.

Refer to Section 7.4.2 for the rules that govern numeric expressions.

Invalid character string specified.

Refer to Section 7.3.5 for the rules that govern CHARACTER constant elements.

Invalid condition - missing example element.

A logical expression must begin with an example element. Refer to Section 7.4.2 for the rules that govern logical expressions.

Invalid example element name - the name must consist of 1 to 8 alphanumeric characters.

Refer to Section 7.3.6 for the rules that govern example elements.

Invalid expression in a condition - missing comparison operator.

A logical expression must contain a comparison operator if the keyword IS does not appear. Refer to Section 7.4.2 for the rules that govern logical expressions.

Invalid internal table ID - possibly EZQUERY error.

Invalid logical expression - missing operand, or invalid combination of constants, AND, OR, parentheses, etc.

Refer to Section 7.4.2 for the rules that govern logical expressions.

Invalid name - exceeds 30 characters.

Refer to Section 7.2.1 for the rules that govern table and column names.

Invalid name specified for the answer table.

Refer to Section 7.2.1 for the rules that govern table names.

Invalid name specified for the column.

Refer to Section 7.2.1 for the rules that govern column names.

Invalid number - decimal point (".") follows a blank.

Invalid number - decimal point (".") in the wrong position.

Invalid number - the number is larger than the physical upper limit.

Invalid number - the number is less than the physical lower limit.

Invalid number with more digits than allowed by external size.

Through EZQUERY HELP, you can review the storage attributes of the columns.

Invalid numeric constant element.

Refer to Section 7.3.5 for the rules that govern NUMBER constant elements.

Invalid operand or missing operand - a logical operand must be a constant, i.e., a number or a character string.

Refer to Section 7.4.2 for the rules that govern logical expressions.

Invalid range - a range is a constant, or two constants separated by a colon.

Refer to Section 7.4.2 for the rules that govern ranges.

Invalid range expression - ranges within a range expression are separated by commas.

Refer to Section 7.4.2 for the rules that govern range expressions.

Invalid range: the lower bound is greater than the upper bound.

Refer to Section 7.4.2 for the rules that govern ranges.

Invalid syntax specified.

Refer to Section 7.4 for the syntax rules.

Invalid syntax specified in an expression.

Refer to Section 7.4 for the syntax rules.

Invalid table entries other than an example element specified.

Key contains more than 132 characters - please reselect.
The maximum length of a key field is 132 bytes.

Key fields are not contiguous - please reselect.
The components of a compound key field must be contiguous.

KEYNAME must start with a letter and have no embedded blanks.
Refer to Section 6.2.3 for the rules that govern field names.

Length must be F or C or V.
The data file to which you copy the answer table can have a file type of fixed-length (F), compressed-length (C), or variable-length (V).
Refer to Section 4.7.1.

Length of buffer is different from length of result.

Memory overflow - too many inputs specified.

Mismatched left and right parentheses.

Missing question table.

No access right to read the data dictionary files of the data base.
The data base definition library has the name @dbnameD, where dbname is the data base name. Through the Manage Files/Libraries command of the VS Command Processor menu, you can review the protection class of the library.

No answer table selected - possibly EZQUERY error.

No columns selected for primary key - please select column.
If you specify a file organization of I or A, you must select a primary key for the data file that will contain the answer table.

No disk or VTOC space to save the intermediate result of the query.

No syntax in the question.

No table specified in this question.
A question contains a minimum of 1 and a maximum of 10 table skeletons.

Number of parentheses, example elements, or expressions exceeds limits.

Only example elements are allowed in the answer table skeleton.
A column in the answer table can also contain a numeric expression; refer to Section 3.5.4 for more information.

Parameters and arithmetic expressions are not currently supported.

Query already opened - possibly EZQUERY error.

Query not opened - possibly EZQUERY error.

Question table entry exceeds 2000 characters.

A data entry field contains a maximum of 2000 characters.

Record description and data file information are incompatible for the table indicated.

Stored query is no longer valid - previously safe indexes are no longer safe.

Table and column spacing too wide for WP document - redo query.

The answer and the three spaces between each column exceed the maximum line width of 156 characters. Execute a query that has fewer columns in the answer table, or divide the query into more than one query.

Table definition requires an index file: data base file is consecutive.

Table entry is inconsistent with data type specified in the dictionary, or example element in the entry links to different data type.

The data in columns joined by an example element must be of the same data type, e.g., CHARACTER or NUMBER (SIGNED or UNSIGNED).

Table ~~XXXXXXXX~~ criteria overlaps with another record type criteria.

Refer to Section 6.4 for more information.

Table ~~XXXXXXXX~~ has columns with invalid data scale.

Table ~~XXXXXXXX~~ has columns with invalid names.

Section 7.2.1 lists the rules that govern table and column names.

Table ~~XXXXXXXX~~ has inconsistent file type in multiple record type file.

The record description files that describe the record types in a multiple record type file must specify the same file type. Refer to Section 6.4 for more information.

Table ~~XXXXXXXX~~ has invalid or complex index key structure.

Table ~~XXXXXXXX~~ has misaligned index in multiple record type file.

Table ~~XXXXXXXX~~ has overlapping columns.

Table ~~XXXXXXXX~~ record description file contains incorrect information.

Table ~~XXXXXXXX~~ record description file is being updated by another user.

Table ~~XXXXXXXX~~ record size not equal to the sum of its column sizes.

Table ~~XXXXXXXX~~ uses incomplete record type differentiation criteria.

Refer to Section 6.4 for more information.

Table ~~XXXXXXXX~~ uses unsupported record differentiation criteria.

EZQUERY only recognizes ranges as valid record differentiation criteria. Refer to Section 6.2.4 for more information.

The aggregate function is not currently supported.

The answer table is inconsistent with restrictions.

The answer table is the union of more than two rows: please break your question into several questions, each unioning only two rows.

Section 3.1.2 discusses multiple question queries.

The answer table row size must be less than or equal to 2016.

The character "+" is not allowed in a name.

Section 7.2.1 lists the rules that govern table and column names.

The column name cannot be blank.

The combined size for two join columns exceeds 1750.

The data base has no table: please use `MANAGE` to define the tables.

Press `PF1` from the Specify Data Base screen to access the Manage Data Base function.

The data base name is blank.

The directory of the data base does not exist.

The file `@OBJDIR` in the library `@dbnameD`, where `dbname` is the data base name, contains the data base contents list. Refer to Section 5.2 for more information about the structure of a data base.

The `DISPLAY` operator is not specified in the question.

`DISPLAY` must appear in at least one row of a table skeleton.

The document specified is in use - please specify another.

The document ID specified is invalid.

A document ID consists of four digits and a letter that designates the document's library.

The document library specified is invalid.

You use a letter (i.e., A through Z and a through z) to designate a document library.

The first character of a name must be a letter, a digit, @, #, or \$.

Section 7.2.1 lists the rules that govern table and column names.

The key name is the same as another field name.

A field name must be unique in a data file.

The last character of a name must be a letter, a digit, @, #, or \$.

Section 7.2.1 lists the rules that govern table and column names.

The name used for the answer table already exists.

The name of a table must be unique in a data base.

The "NOT" operator is currently not supported.

The query name is blank.

The question is too complex: please break it into several questions.
Section 3.1.2 discusses multiple question queries.

The question table column does not correspond to a base table column.

The question table skeleton does not correspond to a base table.

The specified data base does not exist.

The specified query does not exist.
Through EZQUERY HELP, you can review the stored queries associated
with the data base.

The specified query is currently in use by another user.

The specified volume is not mounted.

The table name cannot be blank.

The table row operator DISPLAY is missing.
DISPLAY must appear in at least one row of a table skeleton.

The type of access is not valid.
The four types of data base access are Shared, Private, Limited, and
Readonly. Section 2.10 discusses data base access.

The volume name is blank.

The volume specified is invalid.

This document already exists. Press PF3 to delete it or respecify.

This feature not currently supported.

This query has not been validated.
A validated query is a query for which EZQUERY creates files in the
libraries @dbnameQ and @dbnameC, where dbname is the data base name.
You can create or replace a validated query from the Answer menu.
Refer to Section 4.7 for more information.

Too many arithmetic expressions.

Unable to complete the query - insufficient work file space.
Make more disk space available on work volume.

Unable to complete the query - I/O error while writing to work volume.

Unable to create the file for the data base table.

Unable to find the column in the base table - possibly EZQUERY error.

Unable to link to WQXDD.

The file WQXDD contains the Manage Data Base function. It must be located in the same library as the file EZQUERY.

Unable to link to WQZ.

The file WQZ must be located in the same library as the file EZQUERY.

Unable to locate the base table - possible EZQUERY error.

Unable to open the data dictionary files for the data base.

Unable to open the debugging file to run EZQUERY.

Unable to open the file - system error.

Unable to open the file for the table - file does not exist.

Unable to open the file for the table - insufficient access right.

Unable to open the file for the table - possession conflict.

Another user has the file open in an incompatible DMS Open mode.
Refer to Section 2.10.1 for more information.

Unable to open the file for the table - volume not mounted.

Unable to open the stored query file for the query.

Unable to open the workstation to run EZQUERY.

Unable to process this query - stored query format incorrect.

Unable to save the answer for the current question - the saved table name already exists.

The name of a table must be unique in a data base.

Unable to sort the answer file.

Make sure that the SORT utility works.

Unexpected DMS error when writing file.

Unexpected parsing error found - possibly EZQUERY error.

Unexpected table sequence - possibly EZQUERY error.

Unused blank table specified.

WP document xxxL greater than 120 pages - document not completed.

A WP document contains a maximum of 120 pages. The document created does not contain all of the answer table rows. To save all of the rows in the current answer table, you must divide the query into more than one query.

WP document xxxxL has an illegal character - document not completed.
An answer table character does not convert to a character in a WP document. The WP document created by EZQUERY contains the answer table rows up to the row containing the illegal character.

XXXXXX records with duplicate primary key values not copied.
Because a data file cannot contain duplicate values for the primary key, EZQUERY copies only the first answer table row with a particular primary key value.

You are not allowed to change access.
Through the Manage Data Base function or a procedure, you can prevent users from modifying the access to a data base. Refer to Section 5.3.4 for more information.

You do not have the privilege to access the query.
Through EZQUERY HELP, you can review the protection class of the query.

You must supply a document library.
Section 4.7.3 explains how to specify a word processing document.

You must supply the VOLUME to scratch this document.
The document that you are trying to scratch is not in your default WP library. Please specify the volume.

C.3 MANAGE DATA BASE FUNCTION MESSAGES

Blank data base name is not allowed.

Blank name is not allowed.

Blank volume name is not allowed.

Cannot find the specified file.

Contents list entry not found.

Contents list entry not found. Press PF6 to create.

Contents list is not accessible by this version of the utility.

Contents list missing for specified data base.
The file @OBJDIR in the library @dbnameD, where dbname is the data base name, contains the data base contents list.

Data base created.

Data base in use.

Data base not found on specified volume.

Description already exists in the data base library with this name.

Entry already exists in contents list with this name.

The name of a record description file must be unique in a data base.

Entry is in contents list, but record description file does not exist.

Press ENTER to create the record description file interactively through the Manage Record Description function.

File is in use.

File is not a valid record description file nor a valid control file.

The file that you copy into the data base definition library must be a record description file or a control file.

Filename reserved for system use.

@OBJDIR, the data base contents list file, is a reserved file name. It cannot be an entry in the data base contents list.

File, library, and volume names must be all blank or fully specified.

Section 5.4.6 explains how to associate a data file with a record description file.

Insufficient space on specified volume.

Invalid compound key structure found in record description file.

Section 6.2.3 discusses compound keys.

Invalid data item name found in record description file.

Invalid data item used for record type differentiating criteria.

Refer to Section 6.4 for more information.

Invalid data scale in record description file.

Invalid file name.

A file name consists of one to eight alphanumeric characters.

Invalid or inconsistent record found in record description file.

Maximum exceeded for description file entries in data base contents list.

The data base contents list lists a maximum of 450 record description files.

Multiple record type file has records with inconsistent keys.

Section 6.4 discusses multiple record type files.

Multiple record type file has records with nonmatching file types.

Section 6.4 discusses multiple record type files.

Multiple record type file may have overlap in record type criteria.

Section 6.4 discusses multiple record type files.

Multiple record type file with overlapping record type criteria.

Section 6.4 discusses multiple record type files.

No available space in VTOC on specified volume.

Record description file does not exist.

Press PF6 from the Manage Record Description Files screen to create it.

Record description file exists, but entry is not in contents list.

Press ENTER to add the record description file to the data base contents list.

Record description file has overlapping data items that are updatable.

EZQUERY does not allow non-key fields to overlap. It interprets an overlapping primary or alternate key field as a compound key. Refer to Section 6.2.3 for more information.

Record description file library does not exist.

Record size too small to cover all data items in description file.

Retention period has not expired.

You can modify the retention period through the Manage Files/Libraries command of the VS Command Processor menu.

Specified data base already exists on this volume.

Specified data base name is already in use on this volume.

The volume contains one or more libraries with the name @dbnameX, where dbname is the data base name and X is any character.

Specified file already exists, but is not a valid description file.

The data base definition library contains the file, but it is not a record description file. You cannot add it to the data base contents list.

The listed data base libraries could not be renamed.

You can use the Manage Files/Libraries command of the VS Command Processor menu to complete the renaming.

The listed data base libraries could not be scratched.

You can use the Manage Files/Libraries command of the VS Command Processor menu to complete the deletion.

Unexpected error in input param (count wrong) to validation routine.

Unexpected status returned by open.

Status code is displayed on screen.

Unexpected status returned by readfdr.

Status code is displayed on screen.

Unexpected status returned by rename.

Status code is displayed on screen.

Unexpected status returned by scratch.
Status code is displayed on screen.

Unsuccessful link to EXTCNTRL.
Status code is displayed on screen.

User has insufficient access rights.

Value not in list.
The four types of data base access are Shared, Private, Limited, and
Readonly. You must answer YES or NO to the question.

Volume is in use.

Volume is not mounted.

APPENDIX D
RECORD DESCRIPTION FILE RECORD FORMATS

D.1 INTRODUCTION

A record description file is an indexed file that has the key in bytes 3 through 10 and a record length of 130 bytes. The records in the record description file are of fixed length.

A record description file contains the following types of records: Header (or File Descriptor) record, Alternate Key records, Comment records, and Field Descriptor records. The Header record describes the attributes of the data file that the record description file defines. If you specify alternate keys in the Header record, the Alternate Key records contain the names of the alternate keys and indicate whether the keys allow duplicates and whether they are selective. Optional Comment records allow you to document the record description file internally. The Field Descriptor records describe the attributes of the individual fields in the data file.

The sections that follow describe the format of the record description file records.

D.2 HEADER RECORD

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
1-2	Not used	ASCII zeros.
3-10	Header Label	HEADER .
11	File Type	F - Fixed-length records. V - Variable-length records. C - Compressed-length records.
12-19	Key Field	Name of key field for indexed file. If blank, consecutive file assumed.
20	Report Code	0 - Allowed. 1 - Not allowed.
21	Update Code	0 - Allowed. 1 - Not allowed.

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
22	Delete Code	0 - Allowed. 1 - Not allowed.
23-26	Record Length	Record length of data file (1-2048). If variable-length records, maximum record length.
27	Reserved for system use	
28	Extensions (EXTCNTRL) Exist	Y(YES). N(NO) - default value.
29	Not used	
30-37	User Exit	Name of User Exit subroutine, USER1-USER10.
38-39	Number of Alternate Keys	Numeric values, 1-16. Total number of alternate keys in data file.
40-47	Not used	
48	DATENTRY Screen Spacing	1 - Single. 2 - Double.
49	Not used	
50-69	Extensions (Specific) Exist (20 occurrences)	Y(YES). N(NO) - default value.
70-130	Not used	

D.3 ALTERNATE KEY RECORD

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
1-2	Not used	
3-10	Record Name	Ø KEY1 ØØ or Ø KEY2 ØØ .
11-18	Alternate Key Name 1	Valid field name.
19	Allow Duplicates 1	Y(YES). N(NO).

The preceding two fields are repeated seven times in the following byte positions:

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
20-27 28	Alternate Key Name 2 Allow Duplicates 2	
29-36 37	Alternate Key Name 3 Allow Duplicates 3	
38-45 46	Alternate Key Name 4 Allow Duplicates 4	
47-54 55	Alternate Key Name 5 Allow Duplicates 5	
56-63 64	Alternate Key Name 6 Allow Duplicates 6	
65-72 73	Alternate Key Name 7 Allow Duplicates 7	
74-81 82	Alternate Key Name 8 Allow Duplicates 8	
83	All Records on Path 1	Y(YES). N(NO) - default value.

The preceding field is repeated seven times in the following byte positions:

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
84	All Records on Path 2	
85	All Records on Path 3	
86	All Records on Path 4	
87	All Records on Path 5	
88	All Records on Path 6	
89	All Records on Path 7	
90	All Records on Path 8	
91-130	Not used	

NOTE

A record description file can contain a maximum of two Alternate Key records to define up to 16 alternate keys.

D.4 COMMENT RECORD

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
1-2	Not used	
3-10	Comment Descriptor	!1 COMM , !2 COMM , or !3 COMM .
11-70	Comment	Alphanumeric data.
71-130	Not used	

NOTE

A record description file can contain a maximum of three Comment records.

D.5 FIELD DESCRIPTOR RECORD

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
1-2	Not used	
3-10	Field Name	1-8 character field name. Must begin with alphabetic character and must not contain any embedded blanks.
11	Internal Format	B - Binary. C - Character. P - Packed decimal. U - Unsigned. Z - Zoned decimal.
12-14	Internal Length	Number of bytes required for internal representation. 1-67 if the field can be updated. 1-132 if the field cannot be updated.
15-18	Starting Position	Starting position of field. Must be less than record length.
19-20	Occurrences	01-99. Number of occurrences of the field.

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
21	Zero Suppress Code	0 - No zero suppression. 1 - Suppress leading zeroes. 2 - Protect.
22	Decimal Insert Code	0-9. Number of decimal positions to be printed.
23	Sign Control Code	0 - No sign control. 1 - Trailing minus sign. 2 - CR on minus (trailing). 3 - DB on minus (trailing).
24	Dollar/Comma Code	0 - No dollar or comma edit. 1 - Comma edit for numeric field. 2 - Dollar edit for numeric field. 3 - Dollar and comma edit for numeric field.
25-27	External Length	Calculated from internal length in bytes or specified by the user. 1-67 if the field can be updated. 1-132 if the field cannot be updated. If format = C, external length = internal length. If format = P, external length = (internal length * 2) + 1 (for decimal point if number of decimal positions \neq 0). If format = U, external length = internal length + 1 (for decimal point if number of decimal positions \neq 0). If format = Z, external length = internal length + 1 (for sign) + 1 (for decimal point if number of decimal positions \neq 0).

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
		If format = B and binary edit code = 0 (for hexadecimal representation), external length = (internal length * 2).
		If format = B and binary edit code = 1 (for decimal representation), external length = 4 if internal length = 1; external length = 6 if internal length = 2; external length = 8 if internal length = 3; external length = 11 if internal length = 4.
28	Report Code	0 - REPORT can access this field. 1 - REPORT cannot access this field.
29	Update Code	0 - Update allowed. 1 - Update not allowed.
30	Decimal Positions Code	Numeric 0-9. Number of decimal positions.
31	Binary Edit Code	Used only if format = B. 0 - Hexadecimal representation of field. 1 - Decimal representation of field.
32	Record Differentiation Criteria	Y(YES). N(NO) - default value.
33-34	Update Sequence	Sequence in which this field appears on DATENTRY screen.

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
35-36	Validation Type	Validation criteria for field. T - An external table is used. R - A range is used. CF - The field is accumulated in a predefined field. Both this field and the predefined field must be numeric (format = P or Z). DF - The field is a date field.
37-42	Table Name	1-6 character name of external validation table for this field. Used only if validation type = T.
43-58	Low Range	Low range for this field. Used only if validation type = R.
59-74	High Range	High range for this field. Used only if validation type = R.
75-76	Packed Digits	Number of packed digits (if internal format = P). This number is equal to (internal length * 2) - 1.
77-84	Cumulative Field Name	Name of cumulative source field. Used if validation type = CF. The cumulative field name must be an existing numeric field in the record description file.
85-115	Field Alias	An alternate name for the field.
116-119	Reserved for system use	
120-124	Not used	
125	Display Code	0 - Pseudoblanks appear. 1 - Data remains on screen. 2 - Data can be added, but not modified.

<u>Byte Number</u>	<u>Field Name</u>	<u>Permissible Values</u>
126-128	Report Field Length	Total number of field positions required for report format (includes external length, signs, symbols, etc.).
129	Default FAC Character	Any valid field attribute character.
130	Not used	

APPENDIX E
THE REPLACE QUERY UTILITY

E.1 INTRODUCTION

The Replace Query utility (REPLACEQ) generates a procedure that converts queries created by previous versions of EZQUERY to validated queries. That is, the queries converted by the procedure have two associated files: a file in the library @dbnameQ and a file in the library @dbnameC, where dbname is the data base name. The procedure can convert a maximum of 1000 queries.

VS/Report uses the file in the library @dbnameC. Thus, if your system does not include VS/Report, you do not need to convert existing queries.

E.2 RUNNING THE REPLACE QUERY UTILITY

To run the Replace Query utility, press PF1 from the Command Processor. Enter REPLACEQ as the name of the program and press ENTER. If the file REPLACEQ is not in the library @SYSTEM@ on the System volume, you must also enter the library and volume names.

NOTE

Before you run the Replace Query utility, delete any queries that you no longer need.

The Define Data Base screen prompts you to specify the names of a data base and its volume and to press ENTER. Figure E-1 illustrates the Define Data Base screen.

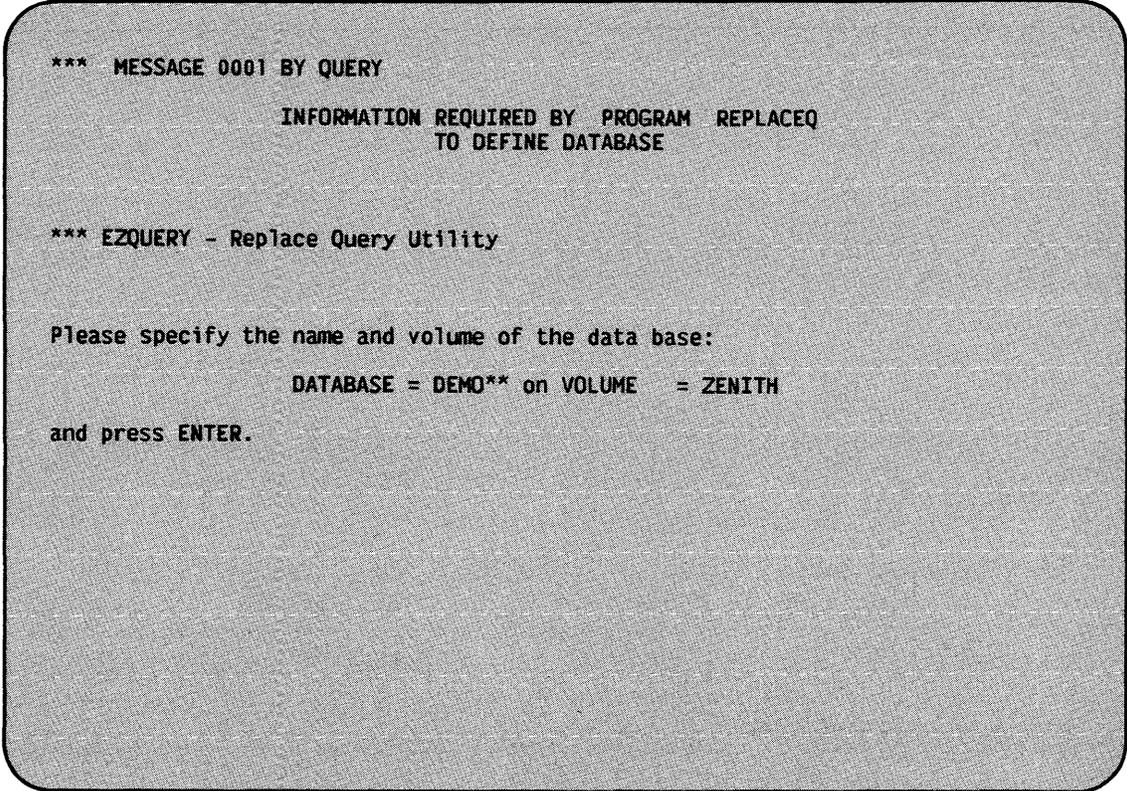


Figure E-1. The Define Data Base Screen

The Assign Output screen then prompts you to specify the names of the file, library, and volume for the procedure. Figure E-2 illustrates the Assign Output screen; it shows how to assign the procedure to the file RQDEMO in the library JMCOBJ on the volume ZENITH.

The Assign Output screen displays the following default values for the file, library, and volume of the procedure:

<u>Name</u>	<u>Default Value</u>
File	RQdbname, where dbname is the data base name (e.g., RQDEMO in Figure E-2)
Library	The value defined for OUTLIB through the Set Usage Constants command
Volume	The value defined for OUTVOL through the Set Usage Constants command

You can accept these defaults or enter new values in the pseudoblanks. A file or library name consists of one to eight characters; the volume that you specify must be mounted on the system.

```
*** MESSAGE 000 BY OPEN

                INFORMATION REQUIRED BY PROGRAM REPLACQ
                TO DEFINE OUTPUT

PLEASE ASSIGN "OUTPUT"      (TO BE CREATED AS OUTPUT BY THE PROGRAM)

TO ASSIGN THIS FILE TO A DISK FILE, PLEASE SPECIFY:
FILE      = RQDEMO** IN LIBRARY = JMCOBJ** ON VOLUME = ZENITH
RECORDS   = 0006100   RETAIN    = *** DAYS   RELEASE = YES
FILECLAS  = *

DEVICE    = DISK*****
```

Figure E-2. The Assign Output Screen

The Assign Output screen allows you to modify the following file characteristics:

- RECORDS The number of records contained in the file. The default is 6100.
- RETAIN The length of time that you can protect the file from deletion. A file can be protected for a minimum of 0 days and a maximum of 999 days.
- RELEASE Indicates whether unused storage extents, previously allocated to data, can be released for use by other files. RELEASE is a YES/NO indicator. RELEASE defaults to YES.
- FILECLAS The protection class of the file. The protection class determines which users have access to the file. The possible protection classes are #, \$, @, blank, and A through Z. The default is the value defined for FILECLAS through the Set Usage Constants command. For more information, refer to the VS Programmer's Introduction.

The Assign Output screen does not allow you to modify the device to which the file is copied; the Replace Query utility displays an error message if you enter a device other than DISK.

After specifying the file that will contain the procedure, press ENTER. The Replace Query utility then generates the procedure, stores it in the file that you specified, and returns you to the Command Processor.

E.3 RUNNING THE PROCEDURE

You must then run the procedure to convert all queries associated with the data base that you specified. If the procedure cannot validate a query, it performs one of the following actions:

- If you are running the procedure interactively, the procedure displays a screen that prompts you to create a print file for the query. The default name for the print file is the query name; it resides in your spool library (SPOOLIB) on your spool volume (SPOOLVOL).
- If you are running the procedure as a background task, the procedure creates a print file for the query. The print file has the name QRYnnnn, where nnnn is a number generated by the procedure; it resides in your spool library (SPOOLIB) on your spool volume (SPOOLVOL).

After executing the procedure, you can examine the queries that were not validated and delete them, or you can attempt to validate them from the Answer menu.

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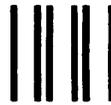
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