

filePro Structured Query Language

fPSQL

For Single and Multi-user Computer Systems

Reference Guide

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TABLE OF CONTENTS

Chapter	Page
1. Getting Started	1-1
· Make sure you have everything	1-2
· Installing FPSQL	1-3
· Starting the FPSQL program	1-3
· FPSQL works with file Pro 16/16+, Profile 16	1-3
· How to use this manual	1-3
· Organization of this manual	1-3
· Style conventions used in this manual	1-4
2. What is FPSQL?	2-1
· What is SQL?	2-2
· What is FPSQL?	2-2
· A sample query	2-2
· The general form of a query	2-3
· Reserved words	2-4
3. Using FPSQL	3-1
· The main screen and commands	3-2
· Typing in a query	3-3
· Including comments in a query	3-4
· Editing a query.....	3-5
· Executing a query.....	3-7
· Passwords	3-8
· Viewing query output	3-9
· Redirecting query output to printer or file	3-10
· Controlling printed output formatting	3-11
· Saving a query	3-11
· Loading a saved Query	3-12
· Viewing the query file directory	3-13
· Viewing field headings, lengths, and edits	3-15
· Using online Help	3-18

TABLE OF CONTENTS (cont)

Chapter	Page
4. The FPSQL Demo Files	4-1
· The FPSQL demo files	4-2
· “sproduct” demo file	4-3
· “sclient” demo file	4-3
· “sinvoice” demo file	4-4
· “ssalesmn” demo file	4-4
5. “Select” and “From” Clauses	5-1
· The “select” clause	5-2
· Typing in field names	5-2
· The “from” clause	5-2
· Typing in file names	5-2
· Field names - what can be a field	5-3
· How fields are displayed in output	5-9
· How field names are justified in output	5-9
· File names - what can be a file	5-9
· Quiz query #1	5-9
6. The “Where” Clause.....	6-1
· The “where” clause	6-2
· Condition - general form	6-3
· Comparison - general form	6-4
· Literals	6-4
· Comparison operators	6-5
· Grouping comparisons	6-6
· Examples using comparison operators	6-8
· Expressions	6-9
· The “exists” subclause	6-10
· Quiz query #2	6-11
7. Aggregate Functions and tile “Group by’“ Clause	7-1
· Aggregate functions	7-2
· “Group by” clause	7-5
· Quiz query #3	7-6

TABLE OF CONTENTS (cont)

Chapter	Page
8. “Having” Clause	8-1
· The “having” clause	8-2
· When used with the “where” clause	8-3
· Quiz query #4	8-3
9. Subqueries and Variable Queries	9-1
· Multiple levels of nesting	9-3
· Subqueries	9-2
· Variable queries	9-5
· Quiz query #5	9-6
10. Order by” Clause	10-1
· The “order by” clause	10-2
· The sorting sequence	10-2
· Quiz query #6	10-4
11. Joining Files	11-1
· Joining files	11-2
· Quiz query #7	11-4
12. “Set” Clause	12-1
· The “set” clause	12-2
· Redirecting query output	12-2
· Controlling printed output formatting	12-3
· Querying qualified files	12-5
· Multiple “set” clauses	12-5
· Quiz query #8	12-5

Appendixes

A. Error Messages	A-1
B. Reserved words	B-1
C. FPSQL Syntax Diagrams	C-1
D. FPSQL versus ANSI Standard SQL	D-1
E. Answers to Quiz Queries	E-1
Index	I-1

1-1 Getting Started - Chapter 1

CHAPTER 1:

GETTING STARTED

In this chapter:

- Make sure you have everything
- Installing FPSQL
- Starting the FPSQL program
- How FPSQL works with filePro files
- How to use this manual
- Organization of this manual
- Style conventions used in this manual

1-2 Getting Started - Chapter 1

Make sure you have everything

Your FPSQL package should contain the following:

- Installation instructions
- User manual (see notes)
- Quick reference guide (see notes)
- Software license agreement

Check to see that the installation instructions refer to your computer and/or operating system.

The user manual is a complete reference for FPSQL (filePro SQL). It is also organized for easy learning.

The quick reference guide puts all the commands and capabilities of FPSQL at your fingertips.

Notes: A printable “.pdf” file is furnished on the Installation Download.

1-3 Getting Started - Chapter 1

Installing FPSQL

See the installation instructions in the package (it should refer to your computer and/or operating system). For most systems, installation involves little more than purchasing the fP SQL license as fP SQL is included with the filePro Development Installation Download. Certain demo files, which will enable you to duplicate the sample queries used in the manual, are also installed.

Starting the FPSQL program

Once installed, FPSQL can be started from the filePro main menu. It will be in the "Runtime Programs" column, menu selection "S". You may also start FPSQL from your operating system "fp" subdirectory: simply enter "fpsql".

How FPSQL works with filePro and filePro Plus

FPSQL will work with all filePro files and non filePro files that you have defined to filePro.

How to use this manual

For learning FPSQL, you should read the chapters in order and do the exercises ("quiz queries") at the ends of the chapters: the answers are in Appendix E. A good idea is to have FPSQL up and running on your computer so that you can gain hands-on experience duplicating the sample queries in the manual and experimenting with your own variations of them. You might also try to compose the example queries before you look at the query output in the manual. Once you are familiar with the program, use the manual as a reference.

Organization of this manual

Chapter 2 explains what FPSQL is and what it can do.

Chapter 3 gives you the mechanics of using FPSQL: entering, executing, saving, loading your queries; viewing files, etc.

Chapter 4 documents the files used in all the example queries in the manual.

1-4 Getting Started - Chapter 1

Chapters 5 through 10 introduce:

- “clauses” the building blocks used to construct queries
- query statement syntax
- comparative, aggregate, and mathematical operations you can use in queries
- “subqueries” and “variable” queries, for finding the answers to more complex questions.

Chapter 11 shows you how a query can use data from more than one file at a time.

Chapter 12 covers the “set” clause which enables you to redirect and control the output of your queries.

Appendix A documents some common on-screen error messages and their causes.

Appendix B is a list of “reserved words” in FPSQL.

Appendix C contains diagrams of FPSQL syntax.

Appendix D documents the differences between FPSQL and the American National Standards Institute (ANSI) standard for SQL.

Appendix E contains answers to the “quiz queries”.

Style conventions used in this manual

Keys and commands described in the text

References to keys and commands will give the Windows version followed by the UNIX/LINUX version.

Example: press [F5] or [Ctrl][R]

Note that keyboard buttons to be pressed are shown inside square brackets. If more than one key is to be pressed sequentially, they are separated by commas:

press [Esc] or [Esc],[Esc]

If they are to be pressed simultaneously, there is no comma:

press [Ctrl][Break] or [Break]

Keys and commands shown on the screen

The screens reproduced in this manual show the Windows version of FPSQL. Your version of FPSQL will show, on your screen, the keys and commands appropriate for your computer's operating system.

Text to be entered

In a sentence, text to be entered will have quotes (“ ”) around it:

Example: Then type “FPSQL” and press [Enter].

Or, as when used in an example, text may be indented and on a separate line:

FPSQL [Enter]

Prompts and messages

These will be marked with a [Enter] key and reproduced as they appear on the screen:

[Enter] Aggregate functions not permitted here

CHAPTER 2:

WHAT IS FPSQL?

In this chapter:

- What is SQL?
- What is FPSQL?
- A sample query
- The general form of a query
- Reserved words

What is SQL ?

SQL (usually pronounced “sequel”) means Structured Query Language. It is a relational inquiry and data manipulation language using English reserved words. SQL enables you to quickly manipulate your data and view the results. It’s easy enough for non-programmers to learn and use, yet powerful enough to satisfy data processing professionals.

What is FPSQL?

filePro’s implementation of SQL enables you to query the data but not manipulate it. FPSQL is especially easy and powerful. It has a simple-to-use screen editor, detailed online Help, easy file-handling, and flexible control over query output, making FPSQL the state-of-the-art in SQL implementations. With FPSQL, you can look at your data in relationships limited only by your imagination.

A Sample query

To get an idea of what FPSQL is like, let’s look at a sample query. Using FPSQL’s demo file, “sproduct” (see Chapter 4), the following is how you would ask FPSQL for a list of products whose prices are higher than \$99. The list should include the product number, description, and prices with the lowest price first. You would type in the query as follows:

```
select product_number, description, price
from sproduct
where price > 99
order by price
```

NOTE:

When typing in queries you’re not restricted to any set format of lines, spacing, or upper and lower case (except for file names in UNIX/LINUX). As long as the elements are in the right order and the syntax is correct, the query will be executed. This query, when executed, would produce the following result:

Product_number	Description	Price
67-8901	Humidity Meter	9.50
78-9012	Barometer Kit	199.60
23-4567	Metal Tracker	219.00

The general form of a query

Queries are constructed of clauses containing “reserved” words (words which have a special meaning to FPSQL). The following table shows the clauses, what type of information they contain, and the order in which they are used in a query statement. A query must have the “select” and “from” clauses; the others are optional:

CLAUSE	FUNCTION
“set...”	options redirects output to printer, file, screen; controls printer and print formatting
“select...”	data (fields) tells FPSQL what to display
“from...”	files tells FPSQL where to get the data (fields)
“where...”	conditions tells FPSQL what conditions apply in selecting the data (fields)
“group by...”	data (fields) tells FPSQL on what data (field) to subdivide the records. Generates subtotals
“having...”	conditions tells FPSQL what conditions apply in selecting which groups to display
“order by...”	data (fields) tells FPSQL what data

Reserved words

These are words which have specific meaning to FPSQL and, therefore, whenever possible, should not be used in naming files or fields in queries. The clauses we just looked at contain the reserved words: “set”, “select”, “from”, “where”, “group by”, “having”, “order by”.

Here is a complete list:

and	group	not	select
asc	having	null	separator
avg	help	off	set
between	in	on	spooler
by	insert	or	start
count	into	order	sum
desc	is	output	title
edit	like	printer	unique
end	lines	query	unlock
exists	max	records	where
fields	mid	restart	width
from	min	screen	with

CHAPTER 3:

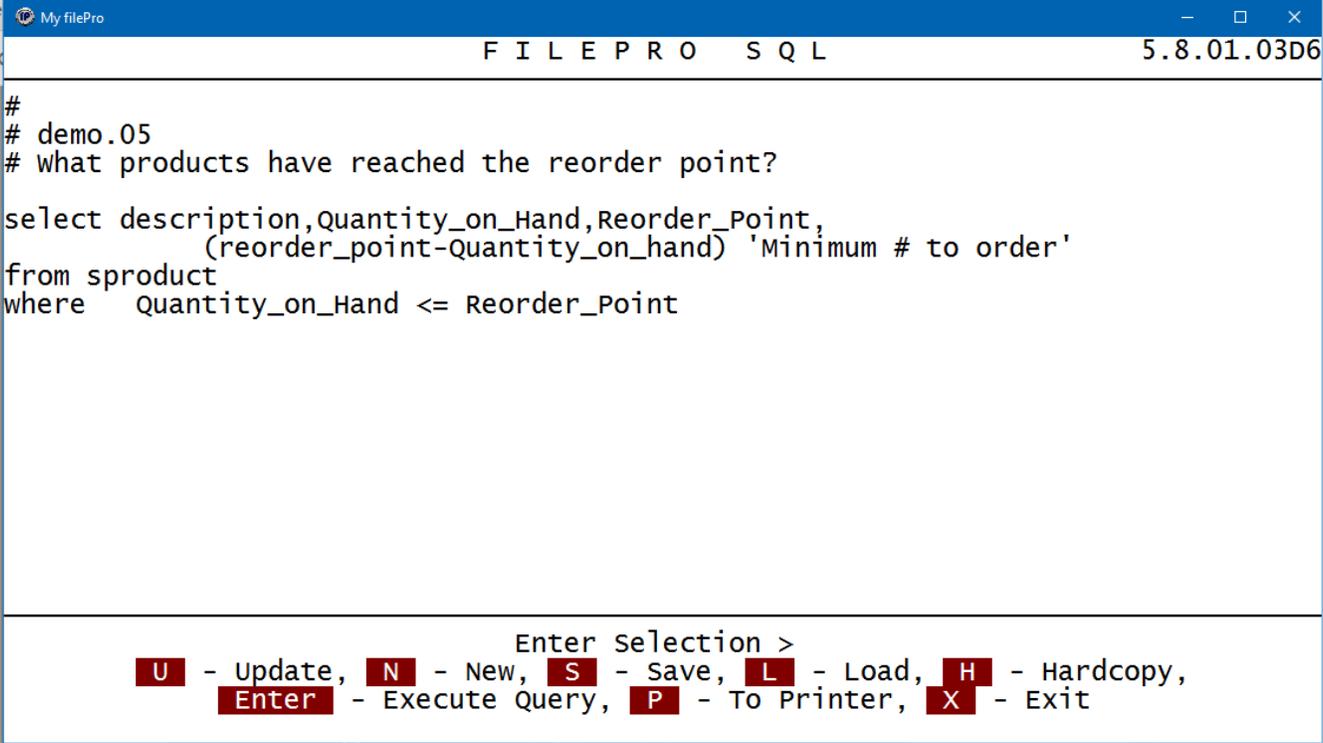
USING FPSQL

In this chapter:

- The main screen and commands
- Typing in a query
- Including comments in a query
- Editing a query
- Executing a query
- Passwords
- Viewing query output
- Redirecting query output to printer or file
- Controlling printed output formatting
- Saving a query
- Loading a saved query
- Viewing the query file directory
- Viewing field headings, lengths, and edits
- Using online Help

The main screen and commands

Below is the FPSQL main screen, shown with a sample query typed in.



```
My filePro FILEPRO SQL 5.8.01.03D6
#
# demo.05
# what products have reached the reorder point?
select description,Quantity_on_Hand,Reorder_Point,
      (reorder_point-Quantity_on_hand) 'Minimum # to order'
from sproduct
where  Quantity_on_Hand <= Reorder_Point

Enter selection >
[U] - Update, [N] - New, [S] - Save, [L] - Load, [H] - Hardcopy,
[Enter] - Execute Query, [P] - To Printer, [X] - Exit
```

FPSQL main screen with sample query

Main screen command keys

Press	In Order To:
[U]	update the current query
[N]	clear the current query, type in new query
[S]	save query to query file
[L]	load query from query file
[H]	send text of query statement to default printer
[Enter]	execute query
[P]	execute query, send output to default printer
[X]	exit FPSQL

Typing in a query

Query statements are typed in the query statement area (the area between the horizontal rules) on the FPSQL main screen (see above). When FPSQL starts, you will see the main screen; the query statement area will be blank. The cursor will be in the "Enter Selection" field. Press [N] for "New" and the cursor will move to the first space of the first line. The main screen command options will be replaced by:

F10 - Help, F6 - Display Fields, ESC - Record, BREAK - Cancel

These command options are covered later in this chapter.

Insert and typeover modes

There are two typing modes: "insert" and "typeover". You can toggle from one to the other with the [F5] or [Ctrl][R] keys. When you type in insert mode, existing characters to the right of the cursor are moved to the right to make room for the new characters. Also, the word "Insert" appears in the upper left corner of the screen. When you type in "typeover" mode, the new characters replace the existing characters; there is no word displayed in the upper left corner.

Rules for typing

There are almost no rules for the way your query statement is entered in the query statement area. As long as everything in your query statement is in the correct order, the query will be executed. You may type in upper or lower case (except for file names in UNIX/LINUX). You may break lines wherever you wish, use extra line returns and extra spaces between words. You can type as many as 79 characters on one line but, at the end of each line, you must press [Return] or [Enter] to move the cursor to the next line.

Editing

You may use the arrow keys to move the cursor left/right one character, or up/down one line. You may use the [Del] and [Back Space] keys to remove characters. Text editing is similar to filePro.

Long Queries - more than one screen

If your query statement is longer than one screen, you can scroll up and down a line at a time using the up and down arrow keys: [↑], [↓]; or a screen at a time using the [PgUp], [PgDn] keys or [Ctrl][P] (up), [Ctrl][N] (down).

NOTE: A complete list of editing keys and functions is in the "Editing a query" section, which follows the next two sections.

Recording the query

When you are finished and ready to execute or save your query to a query file, you must first “record” it. Simply press [Esc] or [Esc][Esc]. You will go back to the main screen, which will display your query, and the cursor will be in the “Enter Selection” field.

Including comments in a query

It may be helpful at times to add explanatory notes or comments to a query to make it easier for others to understand or for your own future reference. You may insert comments before, within, or after a query statement by preceding the comment with the “#” sign. FPSQL will regard everything from the “#” to the end of the line as a comment and not to be executed. If your comments require an additional line, start the additional line with the “#” again, as in the following example:

```
select name, sales, commission, salary*9 #total of  
#monthly salary Jan. through Sept., 1987  
from ssaalesmn  
order by salary
```

Editing a query

The editing keys are the same ones you use in filePro depending on your computer system:

FPSQL Editing Keys

The query editor uses the usual filePro editing keys:

Windows/Linux Press:	UNIX Press:	In Order To:
[ESC]	[ESC] [ESC]	Record current query
[F1]	[F1]	Insert a character space
[F2]	[F2]	Delete a character
[F3]	[Ctrl] [D]	Insert a blank line
[F4]	[Ctrl] [U]	Delete a line
[F7]	[Ctrl] [E]	Move to end of line
[PgUp]	[Ctrl] [P]	Move cursor up a screen
[PgDn]	[Ctrl] [N]	Move cursor down a screen
[Home]	[Home]	Move cursor to top of screen, to top of query
[Tab]	[Tab]	Move cursor right 8 characters
[Shift Tab]	[Esc Tab]	Move cursor left 8 characters
[Back Space]	[Back Space]	Delete character to left of cursor
[Ctrl] [End]	[Ctrl] [O]	Delete rest of line

Plus four additional keys:

[F5]	[Ctrl] [R]	Toggle Insert/type over modes
[F6]	[Ctrl][F]	Display filePro files
[F8]	[Ctrl][Z]	Copy/Paste a line
[F10]	[Ctrl][X]	Help

The copy/paste key works as follows:

1. Position the cursor on the line you wish to copy.
2. Press [F8] or [Ctrl][Z]. The word “copy” will appear in the upper left corner of the screen.
3. Position the cursor on the line where you want the copied line to appear.
4. Press [F8] or [Ctrl][Z] again. The copied line will appear. The word “copy” will disappear. Any characters present on the line where you insert the copied line will move down to the next line.

To edit a query that has already been recorded (using [Esc] or {Esc}[Esc]), you must first press [U] for “Update”. The cursor will move to the first space of the first line in the query statement area and the main screen command options will be replaced with:

F10 - Help, F6 - Display Fields, ESC - Record, BREAK - Cancel

Now you can edit the query.

Editing exercise

You might like to try the following to get used to editing query statements:

Type in the following query exactly as shown below:

```
#lists products with prices above $99
select product_number, description, price
from sproduct where price > 99 order by price
```

Then, use the editing keys to make it look like this:

```
select
    product_number, description, price
from
    sproduct
where
    price > 99
order by
    price
#lists products with prices above $99
```

Hint: use the copy/paste key ([F8] or [Ctrl][Z]) to move the comment line. Provided there are no typos, either version of this query will work. However, note how much easier it is to scan and comprehend the second version. This flexibility in typing queries, and the ability to include comments, makes it easier for you to compose queries, and for others to read and understand them.

Executing a query

(Refer to the FSQL main screen at the beginning of this chapter.) After you have typed in the query and pressed [Esc] or [Esc][Esc] to save it, press [Return] to execute it. If you have not used the “set” clause (see Chapter 12) to redirect the output to a printer or file, you will see the output on your screen.

Screen Display

While FSQL is executing the query, you may see briefly on your screen:

```
Sorting Keys . . .
Records Read: n
Selected: n
```

The number of records read will be updated as the query execution continues

This screen is followed by,

```
Writing Index . . .  
Records Written: n  
Selected: n
```

The number of records written is updated as the query execution continues. The next screen will contain the results of the query.

Direct Execution

You may also execute a query directly from your operating system “fp” sub-directory by entering at the command line:

```
fpsql queryfilename
```

FPSQL will run the query and exit when finished. Queries are normally saved to and loaded from the “fp\sql” directory, unless it has been given a file name including a “\”. In that case, FPSQL will use the path specified. You can use the FPSQL environmental variable to override the default directory.

No Output

When there is nothing in the data that meets your query’s specifications, the following message is displayed:

```
No Output for this Query  
Output for this Query  
Press Enter
```

Passwords:

FPSQL uses creation passwords for file security. In order to query a password-protected file you must know the creation password for the file. When you execute the query, either from FPSQL or your operating system command line, you will see the following:

```
Enter Password for filename
```

FPSQL will allow you three tries to enter the password correctly.

Once you have entered it correctly, and as long as you remain in the FPSQL program, you will not be asked for it again when you query that file. However, each time you execute FPSQL and want to query the file, you will have to enter the password again (one time).

Viewing query output

The output from a query may be as little as one field or as many fields as will fit into 32000 columns across and an unlimited number of screens deep. Ultimately, it is the capacity of your computer system that sets limits on the FPSQL's output.

Output of more than one screen

If the output is more than one screen (23 lines) deep, you will see the following prompt at the bottom of the screen:

Press any key to continue >

Press any key for the next screen.

(You can return to the main screen at any time when viewing output by pressing [Ctrl][Break] or [Break].)

At the bottom of the last screen you will see:

Press any key to continue > End of Query

Pressing ANY KEY will take you back to the main screen, which will still have your query on it.

If, while viewing output of more than one screen, you want to go back to a screen already passed, you must execute the query again.

Output wider than one screen - horizontal scrolling

When your query output is wider than 80 columns and you are not using a "wide screen" terminal (see next section), or, if you are using a "wide-screen" terminal and the output is wider than 132 columns, you can scroll horizontally to view the output. The command options at the bottom of the screen will look like this:

PGUP PGDN <-- --> - Scroll, [Enter] - Continue

The [PgDn] key will move you one screen to the right.
The [PgUp] key will move you one screen to the left.
The [Left-Arrow] key will display the next field to the left.
The [Right-Arrow] key will display the next field to the right.

“Wide-screen” terminals

If your terminal has a “wide-screen” capability, FPSQL will switch into 132-column display mode to display output that is more than 80 columns wide. When you are finished with the query, FPSQL will automatically return to 80-column mode. If the output is wider than 132 columns, FPSQL will allow you to scroll horizontally (see previous section).

Note: Two new termcap entries have been defined to permit use of wide-screen terminals:

```
PW Set terminal to wide (132-column) mode
PX Set terminal to normal (80-column) mode
```

Redirecting query output to printer or file

You can send the results of your query directly to a printer or file by using the “set” clause. The “set” clause is optional; without it, query output will go to your screen when you execute it using [Return]. If you press [P] instead, the output will go to the default printer (a “set” clause, if present, will override the “P” command.) In a query statement the “set” clause must always precede the “select” clause. More than one “set” clause can be used at a time.

To send query output to the printer, type:

```
set output printer
```

To send query output to a file, type:

```
set output 'filename'
```

See Chapter 12 for all the “set” clause commands and syntax.

Controlling printed output formatting

With the “set” clause you can also control the formatting of your printed query output. For example, you can specify page lengths and bottom margins. You can include or delete headings and titles. See Chapter 12 for all the “set” clause commands and syntax.

Saving a query

(Refer to the FPSQL main screen at the beginning of this chapter.) One of the options displayed at the bottom of the main screen is “S -Save”. To save your query, press [S]. You will then see the following prompt:

```
Save...  
Enter Query Name:  
Or press F10 for a list existing queries
```

Queries are normally saved to the “fp\sql” directory. However, you may save queries to another directory by giving the full path name when prompted for the query file name. Type in the name you wish to give the query. Use the file naming conventions that apply to your computer’s operating system. Then press [Return]. FPSQL will save the file and immediately take you back to the main screen which will still have your query on it.

If you had loaded a query (loading queries is covered in the next section) at some time prior to your “save” operation - let’s say the query file name was “sales.09”, when you go to save the query you will see an additional prompt:

```
Save...  
Enter File Name:  
Or Press [Enter] For ‘sales.09’ F10 for a list of  
existing queries
```

This convenient feature allows you to use the last file name loaded for saving a query on the assumption, as may, often be the case, you loaded a query, modified it, and wish to save it again.

Loading a saved query

Another option displayed at the bottom of the FPSQL main screen is “L - Load”. Press [L] to load a query from a query file into the query statement area. The main screen command options will be replaced by the prompt:

```
Load...  
Enter File Name: Or press F10 for a list existing  
queries
```

At this time you may type in the query name or look at the query file directory. After you type in the query name press [Return]. You will then see the query in the query statement area and the main screen command options will have been restored.

Queries are normally loaded from the “fp\sql” directory. However, you may load queries from another directory by giving the full path name at the prompt.

If, when you try to load a query, the query statement area already contains a query – a newly composed one, or one that had been previously loaded and modified, the following message will appear:

```
WARNING Query has been modified.  
Do you want to save it first?  
Press Y or N
```

If you press [N], the main screen command options will be replaced by the prompt:

```
Load...  
Enter File Name: Or press F10 for a list existing  
queries
```

At this time you may type in another query name or look at the query file directory. After you type in the query name press [Return]. The query in the query statement area will be replaced by the new one.

If you press [Y], and the query, on the screen is brand new, the main screen command options will be replaced by the prompt:

Save...
Enter File Name:
Or press F10 for a list existing queries

At this time you may save the query with a new name or look at the query file directory. After you type in the query name press [Return]. The query will be saved and the prompt will change to "Load...". Now you can load another query.

If you press [Y] and the query on the screen is one that had been loaded and modified, the main screen command options will be replaced by the prompt:

Save...
Enter File Name:
Or Press [Enter] For 'filename' F10 for a list of existing queries

At this time you may save the query under a new name, or by its original name (just press [Return]), or look at the query file directory. After typing in the query name press [Return]. The query will be saved and the prompt will change to "Load..." Now you can load another query.

Viewing the query file directory

There will be times when you will want to see the query file directory. All you have to do is press [S] ("Save") or [L] ("Load"), and, as you have learned in the last section, when you see the "Save..." or "Load..." prompt, press [F10]. Whatever is in the query statement area will be temporarily replaced by a wide format listing of all your query files, with the current query file name highlighted in reverse video, as in the sample screen on the next page.



You may select a file by any of three methods:

- type in the full file name and press [Return]
- type in a partial file name until the highlight moves to the desired file name and then press [Return]
- move the highlight to the desired file name with the directional arrow keys and then press [Return]

As soon as you press [Return], you will return to the main screen where the query selected will be displayed.

Viewing field headings, lengths, and edits

To compose query statements you need to know your file names, field headings, and the nature of the data in the fields (field length and field edit type). You can quickly and easily check them while in FPSQL. Follow the procedure below.

From the main screen select "Update" or "New" mode (press [U] or [N]). The main screen command options will be replaced by:

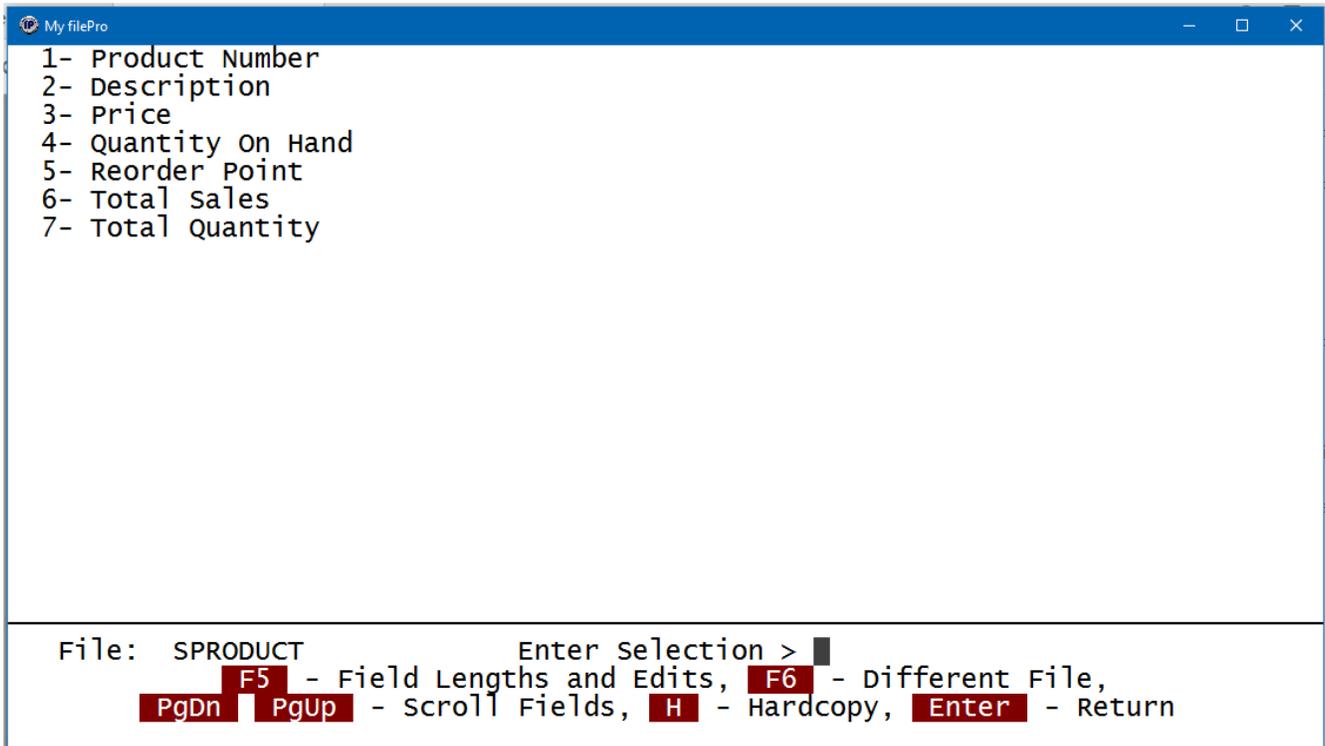
**F10 - Help, F6 - Display Fields,
ESC - Record, BREAK - Cancel**

At this point press [F6] and you will see the following prompt:

**Enter File Name:
Press F10 for a list of filePro files**

Type in the file name. If the name uses the maximum file name length allowed by your computer system, a "Return" will automatically be entered when you type the last character of the file name (same as in filePro). If the file name is shorter than the maximum, you will have to press [Return].

The next screen you see will contain a list of that file's field numbers and headings. If, at the prompt, you had typed in "sproduct", one of the filePro demo files (see Chapter 4), you would see the following screen:



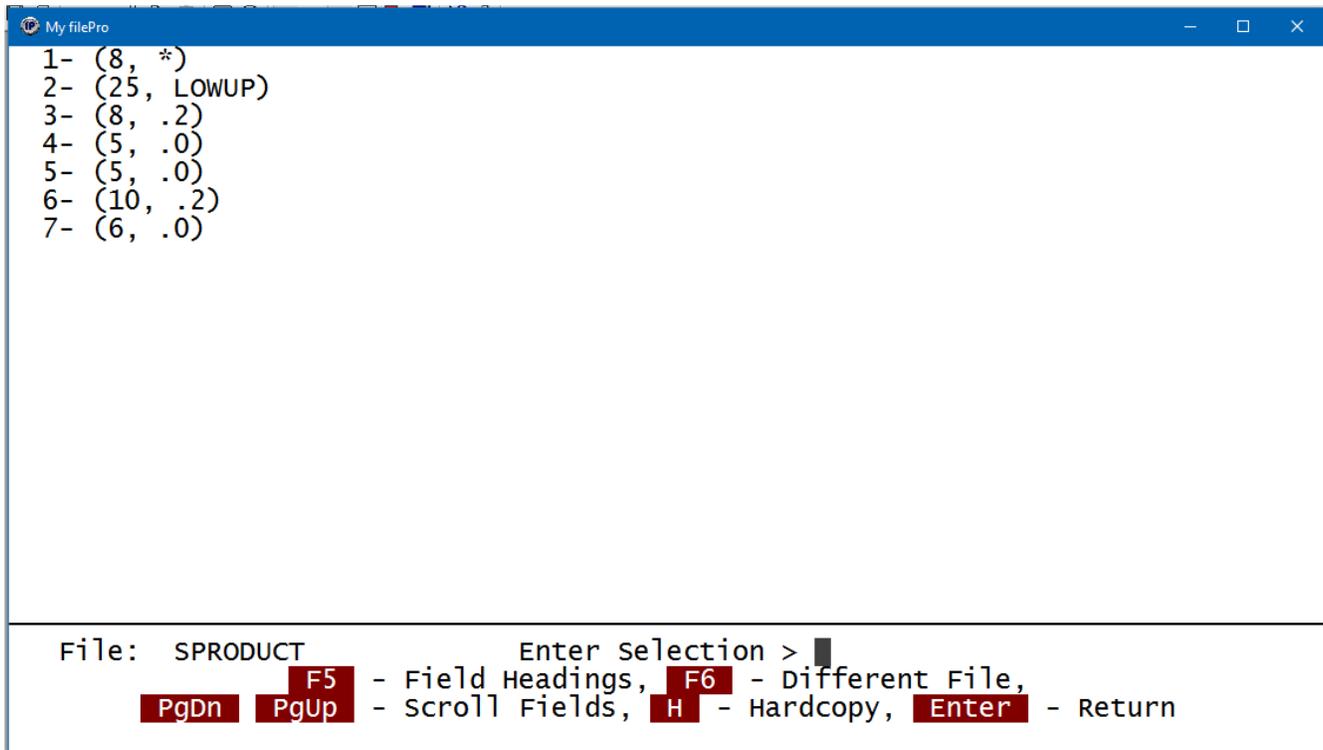
```
My filePro
1- Product Number
2- Description
3- Price
4- Quantity On Hand
5- Reorder Point
6- Total Sales
7- Total Quantity

File: SPRODUCT      Enter selection >
  F5 - Field Lengths and Edits,  F6 - Different File,
PgDn - Scroll Fields,  PgUp - Scroll Fields,  H - Hardcopy,  Enter - Return
```

Commands

- [F5] toggles between displaying field headings and displaying field lengths and edits to
- [F6] view a different file (asks for file name)
- [PgDn] [PgUp] to scroll down/up list of fields to print
- [H] headings, lengths, and edits on the default printer

If you want to see the field lengths and edits, press [F5], and you would see the following:



```
My filePro
1- (8, *)
2- (25, LOWUP)
3- (8, .2)
4- (5, .0)
5- (5, .0)
6- (10, .2)
7- (6, .0)

File:  SPRODUCT          Enter selection > █
      F5 - Field Headings, F6 - Different File,
PgDn PgUp - Scroll Fields, H - Hardcopy, Enter - Return
```

FPSQL screen (with Windows command keys) displaying field lengths and edits for file, “sproduct”

Pressing [F5] again toggles you back to the field headings.

If you want to see a different file, press [F6}. You will then see the prompt:

Enter File Name:
Press F10 for a list of filePro files

Enter the name of the file you want to see.

The hardcopy command, “H”, will produce a printout from your printer which includes headings, lengths, and edits in one list, as shown on the next page:

Sep 3, 1987 14:10 File Name: sproduct

Page 1

Number	Field Heading	Len	Type
1	Product Number	8	*
2	Description	25	LOWUP
3	Price	8	.2
4	Quantity on Hand	5	.0
5	Reorder Point	5	.0
6	Total Sales	10	.2
7	Total Quantity	6	.0

Key segment record length: 87

There is no data segment.

FPSQL printout of filePro file headings, lengths, and edits

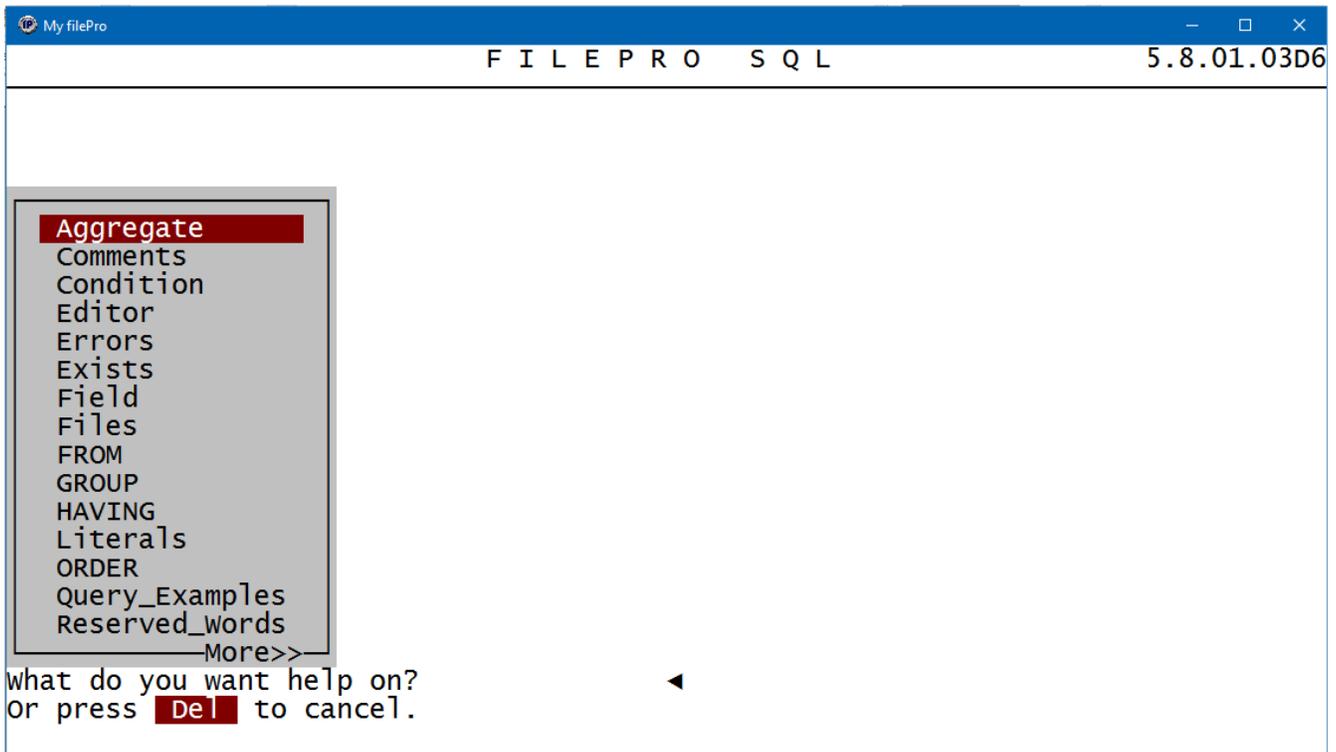
To return to the FPSQL main screen, press [Return].

Using online Help

FPSQL provides you with a full complement of online Help screens. All major topics are covered. All you have to do to access online Help is to go into the "Update" or "New" modes (press [U] or [N] while at the main screen). A new set of command options will be displayed:

**F10 - Help, F6 - Display Fields,
ESC - Record BREAK - Cancel**

Press [F10] to see a list of Help subjects, as shown on the next page



FPSQL Help subject screen

You can select a topic by any of three methods:

- Type in the complete subject name
- Type in the first few characters of the subject name until the highlight moves to the subject you want, then press [Return]
- Move the highlight to the subject you want with the arrow keys, then press [Return]

To get back to the FPSQL main screen from here, press [Ctrl][Break] or [Break].

Having selected a topic, for example: "SET", you will then see the first Help screen for the subject, as shown below:

```
My filePro - Condition types can be:
  comparison
  NOT condition
  condition AND condition
  condition OR condition
  [ condition ]

The condition cannot refer to any aggregates.

Note that brackets -- "[" and "]" -- are used to group conditions, not
parentheses, which are used to group expressions.

Enter -Exit  PgUp  PgDn -scroll  F9 -search
```

FPSQL Help screen for “Condition”

Pressing [X] will take you back to the Help subject screen (with the list of subjects). If there are multiple screens of information on the subject, press [] to see the next screen, and [⏪] to see a previous screen. At the bottom of the last Help screen the prompts are:

Last Page. Press RETURN To Continue

[Return] takes you back to the Help subject screen where you can press [Ctrl][Break] or [Break] to take you back to the FPSQL main screen.

CHAPTER 4

THE FPSQL DEMO FILES

In this chapter:

The FPSQL demo files

- “sproduct” demo file
- “sclient” demo file
- “sinvoice” demo file
- “ssalesmn” demo file

The FPSQL demo files

All the queries shown in this manual use filePro demonstration files which are automatically installed in your “\filepro” directory when you install the FPSQL program. The presence of these files in your own system gives you the ability to try out the queries presented in the manual. You can try them as is, or experiment with modifications. Either way, they should make your learning FPSQL easier and more enjoyable.

The essential ingredients in composing a query, besides the clauses and reserved words, of course, are the file and field names. It also helps to know the type of data that a field contains (specified by the field edit) and the length of the field.

To help you understand the queries composed for the demo files, the field parameters from each file are presented here. This is the same information you could print out yourself from within FPSQL (see “viewing field headings, lengths, and edits” in the previous chapter).

“sproduct” demo file

Number	Field Heading	Len	Type
1	Product Number	8	*
2	Description	25	LOWUP
3	Price	8	.2
4	Quantity on Hand	5	.0
5	Reorder Point	5	.0
6	Total Sales	10	.2
7	Total Quantity	6	.0

“sclient” demo file

Number	Field Heading	Len	Type
key segment:			
1	Client Number	6	*
2	Name	25	UPLOW
3	Address	25	LOWUP
4	City	16	UPLOW
5	State	2	*
6	Zip	5	*
7	Phone Number	14	*
8	Tax Rate	4	.2
9	Company Name	20	LOWUP
10	Total Sales	10	.2
11	Balance Due	10	.2

“sproduct” demo file

Number	Field Heading	Len	Type
key segment:			
1	Product Number	8	*
2	Description	25	LOWUP
3	Price	8	.2
4	Quantity on Hand	5	.0
5	Reorder Point	5	.0
6	Total Sales	10	.2
7	Total Quantity	6	.0

“sclient” demo file

Number	Field Heading	Len	Type
key segment:			
1	Client Number	6	*
2	Name	25	UPLOW
3	Address	25	LOWUP
4	City	16	UPLOW
5	State	2	*
6	Zip	5	*
7	Phone Number	14	*
8	Tax Rate	4	.2
9	Company Name	20	LOWUP
10	Total Sales	10	.2
11	Balance Due	10	.2

CHAPTER 5

“SELECT” AND “FROM” CLAUSES

In this chapter:

- The “select” clause
- Typing in field names
- The “from” clause
- Typing in file names
- Field names - what can be a field
- File names - what can be a file
- Quiz query #1

SET (options)
SELECT (fields)
FROM (files)
WHERE (conditions)
GROUP BY (fields)
HAVING (conditions)
ORDER BY (fields)

The “select” clause

The “select” clause is required in every query statement. It tells FPSQL what data is to be displayed. The data can be real fields or the results of arithmetic operations on fields. For example, you can tell FPSQL to add the “commission” fields to the “salary” fields to create, in the query output, brand new fields containing the sum. In fact, as you will learn further on, you can even tell FPSQL apply the heading, “earnings”, to this new field when it displays the query output. *Please Note: FPSQL does not support 5.0 Blob or Memo Fields*

Typing in field names

When typing in field names, put them after the word “select” and separate them with commas (,). Put them in the order in which you want them to be displayed in the query output. The number of fields you may use is virtually unlimited.

Example: SELECT field, field, field,

The “from” clause

The “from” clause is also required in every query statement. It tells FPSQL which files are to be accessed for the query. The fields named in the “select” clause must be in the file(s) named in the “from” clause.

Typing in file names

When typing in the file names, put them after the word “from” and separate them with commas (,). Their order in the query statement is not important. The number of files you may use is virtually unlimited.

Example: FROM file, file, file,

As you will see in the next section, a field used in the “select” clause, as well as in other clauses in FPSQL, can be much more than just the name of a real field in a filePro file.

Field names - what can be a field

A real field

A field used in the “select” clause can be a real field.

Example:

```
select product_number, description, price
from sproduct
```

product_number	description	price
01-2345	Soldering Iron	14.00
90-1234	Car Antenna	26.45
89-0123	Lite Dimmer	9.35

***** QUERY OUTPUT TRUNCATED *****

NOTE: In several cases in this manual, the output of example queries has been truncated. This was done in the interests of brevity, and only when the complete output is not needed to illustrate the point.

Multiple-word field names

To select a field name that has more than one word, you substitute an underscore (_) for the space between words, as in “**product_number**”. Above.

Field name order

As mentioned before, you can put the field names in any order you wish to see them displayed in the output, as in the following example.

```
Example: select price, description, product_number
          from sproduct
```

Price	description	Product_Number
14.00	Soldering Iron	01-2345
26.45	Car Antenna	90-1234
9.35	Lite Dimmer	89-0123

*** QUERY OUTPUT TRUNCATED ***

Partial Name of real fields

You don't have to type in all the words in a multi-word field name. You can use the first word of the field name, truncating it in the same place you would use the underscore, as described previously. In this example you would use "product" instead of "product_number", and get the same results.

Example:

```
select product, description, price
from sproduct
```

product_number	description	price
01-2345	Soldering Iron	14.00
90-1234	Car Antenna	26.45
89-0123	Lite Dimmer	9.35

*** QUERY OUTPUT TRUNCATED ***

NOTE: Make sure there are no other fields with the same first words in their names as the one you use. When executing the query, FPSQL grabs the first field name it finds that matches.

Substituting your own column headings

If you want the resultant field in the query output to have a heading which more concisely describes its content, such as "earnings" instead of "commission+salary*9. for example, you can tell FPSQL to use the alias, "earnings" as the column heading in the output.

```
Example: select name, commission+salary*9 'earnings'
from ssalessmn
```

<i>name</i>	<i>earnings</i>
Macmillan	18055.38
Winston	10927.03
Mifflin	16200.00

*** QUERY OUTPUT TRUNCATED ***

A real field referenced by its number

Example:
select @1, @2, @3
from sproduct

<i>product_number</i>	<i>description</i>	<i>price</i>
01-2345	Soldering Iron	14.00
90-1234	Car Antenna	26.45
89-0123	Lite Dimmer	9.35

A system-maintained field

Example: select @RN, @CD, @TD
 An associated field group

Example:
select @A1, @A2, @A3
from sinvoice

A1) Items A2) Quantities A3) Line Item Totals

01-2345	10	140.00
90-1234	5	132.25
89-0123	3	28.05

*** QUERY OUTPUT TRUNCATED ***

Associated Fields

Associated fields are fields which are grouped together in a record because they contain the same kind of information. Associated fields enable you to make multiple entries in the same field in a record.

The demo file, "sinvoice" (see Chapter 4) contains three associated field groups:

@A1 "Items", @A2 "Quantities", and @A3 "Line Item Totals".

Each associated field group in the sinvoice file consists of four "subfields", allowing each record to contain four "Items", four "Quantities", and four "Line Item Totals". You can have as many as 10 associated field groups with 16 subfields in each. (see your filePro Reference manual for more about associated fields.)

When you use an associated field in a query, FPSQL uses all the subfields in computing the answer.

Fields preceded by a file name, as in "filename.field".

Example:

```
select sclient.address, invoice_number
from sclient, sinvoice
```

Use this form when you are querying two or more files, such as "sclient" and "sinvoice", which contain the identical field name, "address". The name, "sclient.address" tells FPSQL precisely which file and field to access. (See Chapter 11, "Joining Files".)

An asterisk, meaning "all fields"

Example:

```
select * from ssalessmn
```

Name	Territory	Manager	Sales	Commission	Comm Rate	Salary	Hired Date
Macmillan	NYC	Knopf	692.30	5538.40	8.00	2000.00	01/15/80
Winston	NYC	Knopf	2822.79	12702.56	4.50	1200.00	06/01/87
Mifflin	NYC	Knopf			7.20	1800.00	02/10/82
Hall	PA	Jovanovich	3746.83	26227.81	7.00	1700.00	11/20/83

*** QUERY OUTPUT TRUNCATED ***

NOTE: When you use "*" to select all fields, they are displayed in the order in which they were defined in the file.

An aggregate function applied to a field

(Aggregate functions, MIN, MAX, AVG, SUM, and COUNT are described in Chapter 7)

Example: select max(price), count()*

The "mid" function

(The "mid" function in FPSQL is similar to the "mid" function in filePro processing. In FPSQL it gives you the ability to create, for purposes of querying data, a field within a field, such as the month in an MDY field. The "mid" function requires the use of real fields only. It can be used in the "select" and "order by" clauses. (See Chapter 10, "Order by Clause".) "Mid" specifies a character position and a character range in the field's character string.

Example: select mid(invoice_date,1,2)

In the example above, the "1" means the first character in the string. The "2" means two characters, starting with the first. In an 8-character MDY/ field, the specified characters, "1,2" would be the first two, i.e., the month. To select the year in an MDY/ field, specify the seventh character and a range of two characters:

Example: List just the years of the dates-of-hire for the salesmen.

*select mid(hired_date,7,2)
from ssalessmn*

```
mid(hired_date,7,2,)  
-----  
80  
87  
82  
*** QUERY OUTPUT TRUNCATED ***
```

Example: List the first initials of the names of the salesmen.

```
select mid(name,1,1)
from ssalessmn
```

```
mid(name, 1, 1)
-----
M
W
M
*** QUERY OUTPUT TRUNCATED ***
```

A text literal

Example: `select 'text'`

A numeric literal

Example: `select 19.95`

NOTE: Text literals are enclosed in single quotes(''). Numeric literals are not. Literals are primarily useful in the "where" clause. However, both numeric and text literals can be used in the "select" clause. If they are, they will appear in the output as column headings, and they will take up column space.

Example:

```
select name, sales, ' (write comments here) '
from ssalessmn
```

```
Name                Sales (write comments here)
-----
Macmillan           692.30
Winston             2822.79
*** QUERY OUTPUT TRUNCATED ***
```

An expression using fields

(Expressions are covered in Chapter 6)

Example: Display the salesmen's names, their commissions plus the total (monthly) salary for the first nine months of the year.

```
select name, commission+salary*9  
from ssalessmn
```

```
name          commission+salary*9  
-----  
Macmillan      18055.38  
Winston        10927.03  
Mifflin        16200.00  
Hall           15562.28  
*** QUERY OUTPUT TRUNCATED ***
```

“commission+salary*9” is the expression. The plus sign(+) is for addition, the asterisk (*) is for multiplication. These and other “arithmetic operators” are covered in Chapter 6.

How fields are displayed in output

The width of a field as displayed in query’ output is determined by one of the following:

1. The length of the field name or alias used in the “select” clause
2. The length of the field itself, if it is longer than the field name

Also, FPSQL inserts a single blank space between output fields.

You can place literals full of blanks between field names in your “select” clause to spread the output fields apart. You can use aliases in place of long field names in your “select” clause to narrow the output fields.

How field names are justified in output

Names of fields with numerical values are right-justified when displayed in output. All other field names are left-justified.

File names - what can be a file

Files are the object of the “from” clause, and they can be used in two ways.

A filePro file

Example: from ssalessmn

A filePro file with an “alias”

As you will see later in this manual (Chapter 11, “Joining Files”), some queries require that you access the same file more than once in the query. To do this you use an “alias” as follows:

Examples: from ssalessmn territory, ssalessmn manager

from ssalessmn x, ssalessmn y

The file is “ssalessmn”, the aliases are “territory” and “manager”, or “x” and “y” You can use any name for an alias. What’s important is that you use it consistently throughout the query statement whenever you refer to the file name.

A filePro qualified file

To execute a query on a qualified file, you must first use the “set” clause (see Chapter 12) to give FPSQL the qualifier name.

Quiz query #1 (answer in Appendix E)

See if you can compose a query statement to accomplish the following:
Produce a list of salesmen showing their dates of hire, commissions, and salaries, in that order.

(refer to Chapter 4 if you need to see demo files and field headings, or use the online file directories; their use is covered in Chapter 3)

CHAPTER 6

THE “WHERE” CLAUSE

In this chapter:

- The “where” clause
- Condition - general form
- Comparison - general form
- Literals
- Comparison operators
- Grouping comparisons
- Examples using comparison operators
- Expressions
- Quiz query #2

SET (options)
SELECT (fields)
FROM (files)
WHERE (conditions)
GROUP BY (fields)
HAVING (conditions)
ORDER BY (fields)

The “Where” Clause

As we know, the “select” clause specifies the fields we want to display. However, “select” (and “from”) used without any other clauses retrieves the specified fields from ALL the records. To really unleash the analytical power of FPSQL, you need to be able to extract the fields from just the records you want. This is what the “where” clause does. It tells FPSQL exactly which fields, out of all of them, to display by specifying the conditions the fields must meet in order to be selected.

The following query retrieves the fields specified from all the records.

Example:

```
select product_number, description, price  
from sproduct
```

<code>product_number</code>	<code>description</code>	<code>price</code>
01-2345	Soldering Iron	14.00
90-1234	Car Antenna	26.45
89-0123	Lite Dimmer	9.35
78-9012	Barometer Kit	199.60
67-8901	Humidity Meter	99.50
56-7890	Thermo Reader	12.00
45-6789	DigiClock	12.00
34-5678	Battery Pak	15.10
23-4567	Metal Tracker	219.00
12-3456	Touch Button Phone	29.99

Let's say you're interested in items with high prices - greater than \$99, for example. You would then type in the query with a "where" clause specifying that the condition to be met is that the price field contain a number greater than 99. FSQL then retrieves the specified fields from all the records whose price field contains a number greater than 99.

Example:

```
select product_number, description, price  
from sprocket where price > 99
```

<i>product_number</i>	<i>description</i>	<i>price</i>
<i>78-9012</i>	<i>Barometer Kit</i>	<i>199.60</i>
<i>67-8901</i>	<i>Humidity Meter</i>	<i>99.50</i>
<i>23-4567</i>	<i>Metal Tracker</i>	<i>219.00</i>

Note the use of the "greater than" symbol (>). This and other "comparison operators" are covered later on in this chapter.

Condition - general form

The general form of a condition is:

```
comparison op comparison op comparison...
```

A "comparison" is two things compared. In the previous example, "price" is compared with "99". They would make a comparison. "Op" is a boolean operator, either "and", or "or". You can use as many comparisons as you wish.

Example:

```
where hired > '01/01/80' and salary < 1800 and territory = 'nys'
```

Comparison - general form

The general form of a comparison is:

field rel field...

“Field” can be any of the kinds of fields used in the “select” clause (see the previous chapter), except the aggregate functions, which are not allowed in the “where” clause.

(Aggregate functions are covered in the next chapter.)

“Field” may also be a “subquery” (see Chapter 9).

“Field” may also be a “literal” (see next section).

“Rel” is the relation: < <= = >= > <> (see “comparison operators” following “literals”, on the next page).

Literals

In comparisons, you may want to compare a field name to a character string or a number.

Examples: where name = 'Holt'
where price > 99

A character string used in a comparison is a “text literal”. A number may be a “text literal” or a “numeric literal”. If the number is used to identify rather than quantify, e.g., zip codes, catalog numbers, invoice numbers, it is a text literal. If the number is used as a numerical value, e.g., price, quantity, sales, commission rate, it is a numeric literal.

Example of text literals: where territory = 'nys'
and product = '89-0123'

Note the use of single quotes to enclose the text literals.

Example of numeric literals: where price = 29.99
and quantity on hand = -12

As shown in the example, above, FPSQL allows you to use negative numbers as numeric literals.

Comparison operators

These define the relation between fields in a comparison:

Operator	Relation
<	field is less than field
<=	field is less than or equal to field
=	field is equal to field
>=	field is greater than or equal to field
>	field is greater than field
<>	field is not equal to field

Note: When using the above operators with dates, “greater than” means “later than”. “Less than” means “earlier than”.

Note: When comparing a field name to the text contents of a field, a “text literal”, you must determine if there are any empty spaces in the field preceding the text string. The empty spaces must be added to the literal between the first single quote and the first character of the literal:

Example: where product_number = ' 89-0123'

Note: FPSQL does not require the complete text literal to make a comparison. However, the more characters you include in literal, the closer the match.

*Example: select name from ssalessmn
where name = 'H'*

name

Hall

Haughton

Holt

*Example: select name from ssalessmn
where name = 'Ha'*

name

Hall

Haughton

*Example: select name from ssalessmn
where name = 'Hau'*

name

Haughton

IS BETWEEN field A is between field B and field C

Note: same as field A >= field B and field A <= field C

Example: where zip is between 10036 and 10500

IS NOT BETWEEN field A is not between field B and field C

IS IN field A is in (field B, field C, field D, . . .)

Note: same as field A = field B or field A = field C or field A = field D Sets of fields used with "is in" require inclusion within parentheses, "()".

Example: where territory is in ('nj', 'pa', 'oh')

IS NOT IN field A is not in (field B, field C, field D, . . .)

IS LIKE field is like 'text literal'

IS NOT LIKE field is not like 'text literal'

Note: The "is like" comparison operator allows "wild card" matching of individual characters and strings: Use the underscore (_) to represent any single character.

Example: where territory is like 'ny_'

Use the percent sign (%) to represent any string of zero or more characters.

Example: where company name is like 'first%'

"is like '%text%'" is the same as filePro's Contains (CO) relation.

IS NULL field = ""

IS NOT NULL field <> ""

NOTE: You **cannot** use the identical system-maintained fields from different files, as in the following.

Example: where customer.@rn = cust2.@rn

Accessing different files in the same query is covered in Chapter 11.

Grouping comparisons

Comparisons can be grouped by placing them within square brackets:

[comparison op comparison] op [comparison op comparison]

*Example: where [salary < 1800 or comm_rate < 7.5] and
not [territory = 'ny_' or hired < '01/01/83']*

Examples using comparison operators

Example: Let's say you want the name and telephone numbers of customer contacts from companies in New York State that owe you more than \$1,000.

```
select balance_due, name, state, phone_number
from sclient
where state = 'ny' and balance_due >= 1000
```

<i>balance_due</i>	<i>name</i>	<i>state</i>	<i>phone_number</i>
2655.32	Bill Smith	NY	(212) 555-1223
1111.34	G Can	NY	(914) 555-4040

Example: Let's say someone left you a poorly written phone message and you can't make out all the letters of the name of the person who called, or all the numbers in the phone number. You can make out that it's a customer contact from one of your clients. The letters of what you can make out are "e gel a". You want to know the person's name and phone number.

```
select name, phone_number
from sclient
where name is like '%e_gel_a%' and
phone_number is like '%555-3_1_'
```

<i>name</i>	<i>phone_number</i>
Ellen Eigelvar	(613) 555-3218

Example: You want to see a list of companies and their balances due if the balances due are between \$300 and \$1,000. Included are contact names and phone numbers.

```
select company, balance, name, phone
from sclient
where balance is between 300 and 1000
```

<i>company</i>	<i>balance</i>	<i>name</i>	<i>phone</i>
Pooh Enterprises	915.41	Zeb Wellman	(212) 555-4456
Bingo Enterprises	648.32	John Bingo	(201) 555-9876
Canary Card Co	400.00	Carl Bird	(212) 555-6565
First National Corp.	598.92	Ellen Eigelvar	(613) 555-3216
Boomer Instruments	335.49	John Boomer	(412) 555-0971
Mallard Industries	371.69	Ed Murphy	(514) 323-3233

Example: You want to see a list of companies (with cities, states, and phone numbers) located in Pennsylvania, Ohio, and New Jersey only.

```
select company_name, city, state, phone_number  
from sclient  
where state is in ('PA', 'OH', 'NJ')
```

Company_Name	City	State	Phone_Number
Bingo Enterprises	Bingolo Blvd	NJ	(201) 555-9876
First National Corp.	Cincinnati	OH	(613) 555-3218
Boomer Instruments	Pittsburgh	PA	(412) 555-0971

Expressions

Unlike comparisons, expressions do not compare fields. They combine fields (containing numeric values), arithmetic operators, and numbers to derive and express a resultant value.

Example: where payment < (subtotal+tax_amount).25*

In the example, “(subtotal+tax_amount)*.25” is the expression. It represents the number derived by adding together the values in the “subtotal” and “tax amount” fields and then multiplying the sum by .25.

Arithmetic operators

Operator	Function
+	Add
-	Subtract
*	Multiply
/	Divide

Expressions can only use fields containing numeric values, and dates, if appropriate.

Example: where @TD >= invoice_date+60

When calculating expressions, FPSQL performs multiplication and division before addition and subtraction. Use parentheses to group the elements of the expression so that the calculations are performed as desired.

Example:

```
select name, sales-commission*9
from ssalessmn
```

name	sales-commission*9
Macmillan	193.88
Winston	1679.52

*** QUERY OUTPUT TRUNCATED ***

Example:

```
select name, (sales-commission)*9
from ssalessmn
```

name	(sales-commission)*9
Macmillan	5732.28
Winston	24261.84

*** QUERY OUTPUT TRUNCATED ***

The "Exists" Subclause

The "exists" subclause tests whether a condition exists or doesn't exist (is true or not true). "Exists" is always used in the "where" clause, and the condition it tests is expressed in a subquery (see Chapter 9. "Subqueries and Variable Queries"). If the subquery generates output (the condition is true), the outer query will be executed. If the subquery generates no output (the condition is not true), the outer query will not be executed.

Example:

```
select * #this is the "outer" query
from ssalessmn
where exists
select name #this is the "subquery"
from salesmn
where sales >2800
```

Name	Territory	Manager	Sales	Commission	Comm_Rate	Salary	Hired_Date
Macmillan	NYC	Knopf	692.30	5538.40	8.00	2000.00	01/15/80
Winston	NYC	Knopf	2822.79	12702.56	4.50	1200.00	08/01/87
Mifflin	NYC	Knopf			7.20	1800.00	02/10/82
Hall	PA	Jovanovich	3746.83	26227.81	7.00	1700.00	11/20/83
Wiley	OH	Jovanovich	794.78	5166.07	6.50	1500.00	08/12/85
McGraw	NYC	Knopf			7.50	1850.00	03/13/81
Reinhart	NYS	Knopf			6.70	1600.00	10/17/84
Holt	NJ	Jovanovich	311.05	1866.30	6.00	1400.00	03/14/86
Haughton	NYS	Knopf			5.00	1300.00	11/11/86

NOTE: When you use "*" to select all fields, they are displayed in the order in which they were defined in the file.

This query displays the entire contents of the salesmn file because the condition in the subquery is true; at least one of the salesmen has sales greater than \$2800 (the subquery generates output). If no salesman had sales greater than \$2800 (the subquery generated no output), there would be no output for this query.

Quiz query #2 (answer in Appendix E)

From the invoice file, you want to see a list of companies (with the sum of their subtotals and tax amounts, their payments, invoice numbers) whose payments are greater than 25% of the amounts owed.

CHAPTER 7

AGGREGATE FUNCTIONS AND THE “GROUP BY” CLAUSE

In this chapter:

- Aggregate functions
- “Group by” clause
- Quiz query #3

SET (options)
SELECT (fields)
FROM (files)
WHERE (conditions)
GROUP BY (fields)
HAVING (conditions)
ORDER BY (fields)

Aggregate functions

The aggregate functions are:

“min” minimum
“max” maximum
“avg” average
“sum” sum
“count” count (number of records)
“Avg” and “sum” can only be applied to fields with numeric values.

Example:

```
select sum(salary)
from ssalesman
```

```
sum(salary)
-----
14350.00
```

“Min” and “max” can be applied to any type of field. With dates, “min” is earliest, “max” is latest.

Example:

```
select min(hired)
from ssalesman
```

```
min(hired)
-----
01/15/80
```

“Count” counts the number of records in the query output.

Example:

```
select count(*)  
from sproduct
```

```
count (*)  
-----  
10
```

The query output shows that there are 10 records in sproduct.

Example:

```
select manager, count(*)  
from ssalesmn  
where manager = 'knopf'
```

```
manager count (*)  
-----  
knopf      6
```

Manager Knopf has six salesmen reporting to him.

Example:

```
select count(*), avg(sales), avg(commission),  
avg(sales)-avg(commission), avg(salary)*9  
from ssalesmn
```

Queries using aggregate functions, except “count”, should be composed to include only fields that share some common characteristic. It makes no sense to include salesmen’s name with average salary, sales, and commission because each record has a different salesman’s name.

Example:

```
select name, avg(sales), avg(commission),  
avg(sales)-avg(commission) avg(salary)*9  
from ssalessmn
```

<i>name</i>	<i>avg(sales)</i>	<i>avg(commission)</i>	<i>avg(sales)-avg(commission)</i>	<i>avg(salary)*9</i>
Haughton	929.7500	57.2233	872.5267	14350.0000

The values in the output above, are the averages for all the salesmen in the file, not for salesman Haughton. Finding these same kinds of averages for a manager is meaningful because there are more than one record which have the same manager.

Example:

```
select manager, avg(sales), avg(commission),  
avg(sales)-avg(commission), avg(salary)*9  
from ssalessmn where manager = 'knopf'
```

<i>manager</i>	<i>avg(sales)</i>	<i>avg(commission)</i>	<i>avg(sales)-avg(commission)</i>	<i>avg(salary)*9</i>
Knopf	585.8483	30.4017	555.4467	14625.0000

As you will see later in this chapter, you can find the averages for both managers in one query by using the “group by” clause. Without the “group by” clause aggregate functions apply to the entire set of selected records.

Aggregate functions are used in the “select” and “having” clauses (see Chapter 8, “Having Clause”), and commonly used with the “group by” clause, but not used in the “where” clause. However, you can usually achieve the same effect in the “where” clause by using a “subquery” (see Chapter 9, “Subqueries and Variable Queries”.)

“Group by” clause

The “group by” clause enables you to perform aggregate functions on groups of records. The effect of the “group by” clause is to first group the records by some shared characteristic and then perform the aggregate functions for each group.

In the following example the records are grouped by manager, creating two groups (one for each manager). In each group the records all have the same manager (the “shared characteristic”). The aggregate functions are then performed for each group.

Example: For each manager, find the average sales, average commission, average sales minus average commission and average salary through September (9 months)

```
select manager, avg(sales), avg(commission),  
avg(sales)-avg(commission), avg(salary)*9  
from ssalessmn  
group by manager
```

manager	avg(sales)	avg(commlssion)	avg(sales)-avg(commission)	avg(salary)*9
Jovanovich	167.5533	110.8867	1506.6867	13800.0000
Knopf	585.8483	30.4017	555.4467	14625.0000

You may use more than one field in the “group by” clause. The records grouped by the first field named will be subdivided and grouped by the second field named, and so on.

The aggregate functions are performed for each of the subdivisions.

Example:

```
select manager, territory, avg(salary)  
from ssalessmn  
group by manager, territory
```

manager	territory	avg(salary)
Jovanovich	NJ	1400.0000
Jovanovich	OH	1500.0000
Jovanovich	PA	1700.0000
Knopf	NYC	1712.5000
Knopf	NYS	1450.0000

Quiz query #3 (answer in Appendix E)

You want to find out, for each manager, the average salary, number of salesmen, and the earliest date of hire - from the "ssalesmn" file.

CHAPTER 8

“HAVING” CLAUSE

In this chapter:

- The “having” clause
- When used with the “where” clause
- Quiz query #4

SET (options)
SELECT (fields)
FROM (files)
WHERE (conditions)
GROUP BY (fields)
HAVING (conditions)
ORDER BY (fields)

The “having” clause

The “having” clause applies to groups formed with the “group by” clause. It can only be used with the “group by” clause. It enables you to specify the conditions to be met in selecting the groups to output.

The conditions you can specify with the “having” clause are the same as for the “where” clause (see Chapter 6) except that you have the added capability of using the aggregate functions (see Chapter 7).

Example: Show the territories, and their managers, whose salesmen’s average salary is between 1000 and 1600.

```
select territory, avg(salary), manager  
from ssalessmn  
group by territory  
having avg(salary) between 1000 and 1600
```

```
territory avg(salary) manager  
-----  
NJ          1400.0000   Jovanovich  
NYS          1450.0000   Knopf  
OH           1500.0000   Jovanovich
```

NOTE: In the “ssalessmn” file all the salesmen in a given territory have the same manager, otherwise, this query wouldn’t work.

When used with the “where” clause

When the “having” clause is used with the “where” clause the query is evaluated as follows:

1. “Where” clause is applied to select records.
2. Groups specified by the “group by” clause are formed.
3. “Having” clause is applied to further select the groups.

Example: Find the territories (with their managers), in the NY/NJ area, in which the salesmen’s average salary is between \$1,000 and \$1,600.

```
select territory, avg(salary) , manager
from ssalessmn
where territory is Like 'N%'
group by territory
having avg(salary) between 1000 and 1600
```

<i>territory</i>	<i>avg(salary)</i>	<i>manager</i>
NJ	1400.0000	Jovanovich
NYS	1450.0000	Knopf

Quiz query #4 (answer in Appendix E)

From the ssalessmn file, show the territories, with salesmen’s average salaries, that have exactly two salesmen in them.

CHAPTER 9

SUBQUERIES AND VARIABLE QUERIES

In this chapter:

- Subqueries
- Multiple levels of nesting
- Variable queries
- Quiz query #5

Subqueries

A subquery is a query within a query. It enables you to use the results of the “inner” query (subquery) as input to the “outer” query - all in the same query statement. Suppose, for example, you wanted to find the name of the salesman with the highest earnings through September (the 9th month). Using what you have learned so far, you might try:

```
select name, max(commission+salary*9)
from ssalessmn
```

```
name          max(commission+salary*9)
-----
Haughton      18055.38
```

FPSQL supplies a name. and the maximum of the sums of commissions plus salaries multiplied by 9, just as you requested. However, this query doesn't give FPSQL a way to connect a name with the amount, so it displays any name from the name field. Actually, the name of the salesman who makes the maximum amount is Macmillan, not Haughton. You might try using two distinct queries to find the answer. First, you would find the maximum amount:

```
select max(commission+salary*9)
from ssalessmn
```

```
max(commission+salary*9)
-----
18055.38
```

Once you had this amount, you would then compose and execute another query to find the name that goes with the amount:

```
select name
from ssalessmn
where commission+salary*9 = 18055.38
```

```
name
-----
Macmillan
```

By nesting a sub-query within a query you can accomplish the above in one query statement:

```
select name, commission+salary*9
from ssalessmn
where commission+salary*9 =
select max(commission+salary*9)
from ssalessmn
```

```
name commission+salary*9
-----
Macmillan 18055.38
```

This query works by first evaluating the “inner” query, (“select max(commission+salary*9)...”) to get a value for “commission+salary*9”. The value is then used as a condition in the “where” clause of the “outer” query (“where commission+salary*9 = ...”) to select the name of the salesman earning that value.

Multiple levels of nesting

Queries can be nested to any number of levels.

Example: Who is the salesperson in the NY/NJ area who has the second highest sales?

```
select name, territory, sales
from ssalessmn
where sales =
select max(sales)
from ssalessmn
where [territory is like 'NY%'
or
territory is like 'NJ%']
and
[sales <
select max(sales)
from ssalessmn
where [territory is like 'NY%'
or
territory is like 'NJ%']
]
```

name	territory	sales

Macmillan	NYC	692.30

Working outward, the innermost query finds the highest sales in the NY/NJ territories. The next query outward does the same except that it compares its result to the result of the innermost query in a “not equal to” comparison (“sales <> select max(sales)...”). Since the result of the outer query is not allowed to be equal to the maximum sales (already selected by the inner query), it represents the next highest sales.

Note the use of square brackets to enclose the grouped comparisons. If there are any more elements of a query following a subquery, a semicolon (;) is used to mark the end of the subquery. This enables FPSQL to differentiate between the end of a subquery and the rest of the query statement.

Example: List the product number, description, quantity-on hand for each product whose quantity-on-hand is less than the average quantity-on-hand. List the smaller quantities first.

```
select product, description, price, quantity
from sproduct
where quantity <
select avg(quantity)
from sproduct;
order by quantity
```

product	description	price	quantity

67-8901	Humidity Meter	99.50	24
34-5678	Battery Pak	15.10	26
12-3456	Touch Tone Phone	29.99	27
78-9012	Barometer Kit	199.60	58
56-7890	Thermo Reader	12.00	74
23-4567	Metal Tracker	219.00	76
90-1234	Car Antenna	26.45	82

NOTE: Without the semicolon, the “order by” clause would be applied to the inner query, and the outer query would not be sorted as in the following example:

Example:

```
select product, description, price, quantity
from sproduct
where quantity <
select avg(quantity)
from sproduct
order by quantity
```

product	description	price	quantity
90-1234	Car Antenna	26.45	82
78-9012	Barometer Kit	199.60	58
67-8901	Humidity Meter	99.50	24
56-7890	Thermo Reader	12.00	74
34-5678	Battery Pak	15.10	26
23-4567	Metal Tracker	219.00	76
12-3456	Touch Tone Phone	29.99	27

Example: (See Chapter 10 for more information on the “order by” clause.)

Variable queries

Variable queries contain subqueries which are computed multiple times with different records, giving variable results which affect the outer query. Suppose, for example, you were doing a comparative study of salary and commission levels and you wanted to know which salesmen made more than 25% of the total paid to everyone else with the same manager.

Example: Find the managers who have at least 3 salesmen and then list the name.

salary+commission, for each salesman in the group whose salary+commission is more than 25% of the total of the remaining salesmen’s salary+commission.

```
select name, salary+commission , manager
from ssalesmn x
where manager is in
select manager
from ssalesmn
group by manager
having count(*) >= 3;
```

```

and salary+commission >
select sum(salary+commission) * .25
from ssalesmn
where ssalesmn.manager = x.manager and
ssalesmn.name <> x.name
group by manager

```

name	salary+commission	manager
Macmillan	2055.38	Knopf
Hall	1962.28	Jovanovich
Wiley	1551.66	Jovanovich
Holt	1418.66	Jovanovich

This query works as follows:

1. It finds the managers who have at least three salesmen. (“where manager is in . . .”)
2. For EACH salesman working for one of these managers it computes:
 - a. the total of salary plus commission for everyone else with the same manager, leaving out the salary plus commission of the current salesman being computed. (“where ssalesmn.manager = x.manager and ssalesmn.name <> x.name”)
 - b. whether or not the current salesman earns more than 25% of this total. (“salary+commission > select sum(salary+commission)*.25 from ssalesmn... “). If he does, he is selected (by the outer query).

Quiz query #5 (answer in Appendix E)

List the territories, their salesmen's average salaries and managers, where the territories' average salary is greater than the average salary for all the salesmen.

CHAPTER 10

“ORDER BY” CLAUSE

In this chapter:

- The “order by” clause
- The sorting sequence
- Quiz query #6

SET (options)
SELECT (fields)
FROM (files)
WHERE (conditions)
GROUP BY (fields)
HAVING (conditions)
ORDER BY (fields)

The “order by” clause

The “order by” clause tells FPSQL which fields to sort the records by.

Example:

```
order by name  
order by product_number  
order by invoice_date
```

The fields you may use are the same as in the “select” clause (see Chapter 5), including aggregate functions (see Chapter 7).

If you don’t use an “order by” clause, FPSQL sorts the records by the fields specified in the “group by” clause, if any. If neither clause is used, the records are displayed in no specific order.

You **cannot** use the “order by” and “group by” clauses together in a query.

The sorting sequence

The default sorting sequence in the “order by” clause is “ascending”:

```
for text: A to Z  
for numbers: 0 to 9  
for alphanumeric: 0 to 9, then A to Z (ASCII order)  
for dates: earlier to later
```

You can specify a “descending” sequence by adding the word, “desc” after the field for which you want the descending order.

Example: order by salary desc

Example: List the product descriptions, numbers, and prices with the highest prices first.

```

select description, product_number, price
from sproduct
order by price desc

```

description	product_number	price
Metal Tracker	23-4567	219.00
Barometer Kit	78-9012	199.60
Humidity Meter	67-8901	99.50

*** QUERY OUTPUT TRUNCATED ***

You can sort by more than one field and have a different sorting sequence, ascending or descending, for each field.

Example: list the managers, their territories, salesmen's names, and salaries. Order by descending manager, ascending territory and descending name.

```

select manager, territory, name, salary
from ssalessmn
order by manager desc, territory, name desc

```

manager	territory	name	salary
Knopf	NYC	Winston	1200.00
Knopf	NYC	Mifflin	1800.00
Knopf	NYC	McGraw	1850.00
Knopf	NYC	Macmillan	2000.00
Knopf	NYS	Reinhart	1600.00
Knopf	NYS	Haughton	1300.00
Jovanovich	NJ	Holt	1400.00
Jovanovich	OH	Wiley	1500.00
Jovanovich	PA	Hall	1700.00

When you compose a query with more than one field in the "order by" clause, list the major sorting key first, followed by the minor keys, with the innermost key last. The order in which you put them in your query statement is the order in which FPSQL will sort them, as well as display them.

Quiz query #6 (answer in Appendix E)

Display the managers, territories, names, and dates of hire for all the salesmen. Order by manager, territory, and names.

CHAPTER 11

JOINING FILES

In this chapter:

- Joining files
- Quiz query #7

Joining files

So far, all the queries we have looked at access a single file for the data. However, a query statement may specify fields from a virtually unlimited number of files. All you have to do is list them, in any order, in the "from" clause. FPSQL determines the most efficient method by which to perform the selection and qualification of the fields.

NOTE: Be sure that all the fields specified in the "select" clause are contained by the files specified in the "from" clause.

Example: from ssalessmn, sinvoice, sclient

When two or more files use the same field name such as the "name" field in the "ssalessmn" and "sclient" files, you have to differentiate them by prefixing the file name with the field name, in the "select" clause.

Example: For each salesman find the customer_number and client name. Order by salesman's name, customer_number.

```
select ssalessmn.name, customer_number, sclient.name
from sclient, ssalessmn, sinvoice
order by ssalessmn.name, customer_number
```

If we execute this query we get the following results.

ssalessmn.name	customer_number	sclient.name
Hall	1	Zeb Wellman
Hall	1	Bill Smith
Hall	1	John Bingo
Hall	1	Carl Bird
Hall	1	G Can
Hall	1	Ellen Eigelvar
Hall	1	John Boomer
Hall	1	John Jones
Hall	1	Ed Murphy
Hall	2	Zeb Wellman
Hall	2	Bill Smith
Hall	2	John Bingo

*** QUERY OUTPUT TRUNCATED ***

The complete output contains every possible combination of salesman's name, customer_number, and client name. This voluminous output is of little use. The real power of FPSQL in joining files is in the ability to qualify the results so that you can list the customer numbers and client names for each salesman. This is done by adding a "where" clause that selects, from all these possible combinations, only those that meet the conditions specified.

Example:

```
select ssalesmn.name, customer_number, sclient.name
from sclient, ssalesmn, sinvoice
where ssalesmn.name = sinvoice.salesman
and customer_number = client_number
order by ssalesmn.name, customer_number
```

<i>ssalesmn.name</i>	<i>customer_number</i>	<i>sclient.name</i>
Hall	4	Ellen Eigelvar
Hall	7	Zeb Wellman
Hall	8	John Bingo
Hall	9	G Can
Holt	3	John Boomer
Macmillan	6	Bill Smith
Wiley	2	John Jones
Wiley	5	Carl Bird
Wiley	8	John Bingo
Winston	1	Ed Murphy
Winston	6	Bill Smith

By specifying that the name field in ssalesmn be the same as the "salesman" (name) field in "sinvoice" and that the sinvoice file's "customer_number" be the same as the sclient file's "client number", we are eliminating all the "possible" relations between these files by specifying the ones that really do exist. Each invoice has a salesman's name on it and each invoice has a customer number that is the same as a client number in the sclient file.

The following example contains multiple files and subqueries:

Example: For each sales manager show the total sales of the product with the maximum sales.

```
select manager, @A1, sum(@A3)
from ssalessmn, sinvoice
where
    salesman = name
and
@a1 =
    select product
    from sproduct
    where total_sales =
        select max(total_sales)
        from sproduct;
group by manager
order by sum(@a3) desc
```

manager	@A1)	Items	sum(@a3)
Knopf	78-9012	1796.40	
Jovanovich	78-9012	998.00	

Note the use of the semicolons (;) to mark the ends of both subqueries.

Quiz query #7 (answer in Appendix E)

List the products, their descriptions, product numbers, quantities, prices, total sales (quantities*prices) in each territory. Include salesmen's names. Sort by territory, salesperson and product number. Hint: you will need to use all the FPSQL demo files for this one.

CHAPTER 12

“SET” CLAUSE

In this chapter:

- The “set” clause
- Redirecting query output
- Controlling printed output formatting
- Multiple “set” commands
- Quiz query #8

SET (options)

SELECT (fields)
FROM (files)
WHERE (conditions)
GROUP BY (fields)
HAVING (conditions)
ORDER BY (fields)

The “set” clause

The “set” clause must precede the “select” clause. The “set” clause enables you to redirect query output to printer, file, or screen, to control printed output formatting, and to enable querying qualified files. If a “set” clause in a query conflicts with the main screen command option “P” (to printer), the “set” clause overrides command “P”.

Redirecting query output

set output screen

Query output is sent to the screen when no other set clause is used. Even when the main screen command, “P”, is used to print out the query results, the results will still be displayed on your screen.

set output printer

set output spooler

You can send output to the default printer.

set output printer *‘operating system command’*

set output spooler *‘operating system command’*

Example: set output printer ‘lp -copies 2’

Example: set output spooler ‘lp -copies 2’

set output 'filename'

You can send query output to a file in the current directory by specifying the file name. If you want to send it to another directory, use the path name. Use **single quotes** around the name in either case.

Example: set output '\wp\sales.jan'

set output...with query

You can include the text of your query statement in the output by adding "with query" to the "set" clause This works with files as well as printers.

Example:

```
set output printer with query  
set output '\wpksales.jan' with query  
Controlling printed output formatting  
set lines nn (page length)
```

You can set the output for the length of the paper in your printer by specifying the number of lines that will fit on a page. At the standard 6 lines per inch an 11" page will accommodate 66 lines from the top edge of the paper to the bottom edge. Without any additional numbers specifying the number of lines to actually print on a page (see next section) FPSQL will *print* on every line of the page.

Example:

```
set Lines 66  
set lines mm,nn (bottom margin)
```

If, as in the previous example, the number of lines on a page is set at 66, you can create a 6-line bottom margin by setting the number lines to be *printed* on a page at 60. (You can "split" the margin between top and bottom of the page by positioning the top edge of the paper three lines above the print head before you start to print.)

When typing the "set" clause, precede the number of lines on a page with the number of lines to be printed on a page; separate the numbers with a comma.

Example: set Lines 60,66

These settings can be used when sending output to a file, as well.

set lines 0 (zero) (to delete default heading)

Normally, the top of each page contains the field headings and a horizontal divider. You can delete this default heading from the output. This is especially useful if the output will be input for another program, such as a word processor.

Simply set lines to zero.

set title
set title on (to include default title)

You can include a default title with the output. The default title is the date, time, and page number on the first line printed.

Example:

set title on

Sep 30, 1987 13:48 Page : 1

set title 'text' (your own title)

You can add your own title to the output. FPSQL inserts it between the date/time and page number..

Example:

set title 'Sales for January'

Sep 30, 1987 13:48 Sales for January Page : 1

set title off (delete title)

No title will be printed (this is the default)

Default lines values

Output to the screen conforms to the height of the screen.

Output to the printer defaults to 60,66.

Output to a file defaults to 60,66.

Set delimiter ','

Used with **set output 'filename'** to create delimited output.

(* New Feature with fP SQL 5.8)

Querying qualified files

`set qualifier qualifier name`

Only one qualified file can be used in a query.

Multiple “set” clauses

You can combine a single “set output...” with a single “set lines...” with a single “set title...” in any order, separated by a space or line return.

Example: set output printer set lines 72,84 set title

You cannot, however, use more than one “set output...” or more than one “set lines...” or more than one “set title...” together. You cannot, for instance, set output to both printer and file in the same query.

Quiz query #8 (answer in Appendix E)

Use the “set” clause to send your query output to a file named “contract”. Later, the contents of “contract” will be printed on legal size paper (14 inches long). Create a one inch bottom margin (lines per inch = 6). Give the output a title of “Assets Sorted By Location”.

APPENDIX A

ERROR MESSAGES

The error messages in this appendix are listed in alphabetical order. This is not a complete list; many of the error messages are so specific as to need no elaboration. Listed with each error message are the likely causes to look for.

Error messages appear in the middle of the query statement area in a small window:

'Select' clause missing.
Press [Enter]

The query will not be executed until the problem is corrected. To clear the error message from the screen, press [Return]. In many cases the cursor will be positioned in the query statement at the source of the problem.

Bad comparison.

Incorrect boolean operator symbols.

Error in aggregate function.

Open parenthesis, "(" missing.
Comma missing before, after "from"
"COUNT" used with something other than (*).

'From' clause missing.

A problem with text preceding the "from" clause.
Comma missing between fields.
Extra comma between fields and/or, after last field.

Mismatched brackets.

Close bracket, "]", missing, or extra bracket: "[" or "]"

Mismatched parentheses.

Close parenthesis, ")", missing, or extra parenthesis: "(" or ")"

No or invalid map: *'path/filename'*.

File name misspelled.

Number of lines per page has already been set.

“Set lines...” used more than once.

Output has already been redirected.

“Set output...” used more than once.

'Select' clause missing.

“Select” spelled wrong.

A problem with text preceding “select”.

“#” missing from commentary text.

Syntax error.

Incorrect order of reserved words, clauses.

Misspelling of reserved word.

Commas missing or extra commas present.

Quotes around text missing or extra quotes present.

Underscore missing from multiple-word field name.

Title has already been set.

“Set title...” used more than once.

Unknown field *'field name'*.

Incorrect spelling of field name.

File name missing from “from” clause.

Unknown field *'filename.fieldname'*.

Comma missing before or after file name in “from” clause.

Period missing in prefix.

APPENDIX B

Reserved words

These are words which have specific meaning to FPSQL and, therefore, whenever possible, should not be used in naming files or fields in queries. The clauses we just looked at contain the reserved words: “set”, “select”, “from”, “where”, “group by”, “having”, “order by”.

Here is a complete list:

and	group	not	select
asc	having	null	separator
avg	help	off	set
between	in	on	spooler
by	insert	or	start
count	into	order	sum
desc	is	output	title
edit	like	printer	unique
end	lines	query	unlock
exists	max	records	where
fields	mid	restart	width
from	min	screen	with

APPENDIX C

FPSQL SYNTAX DIAGRAMS

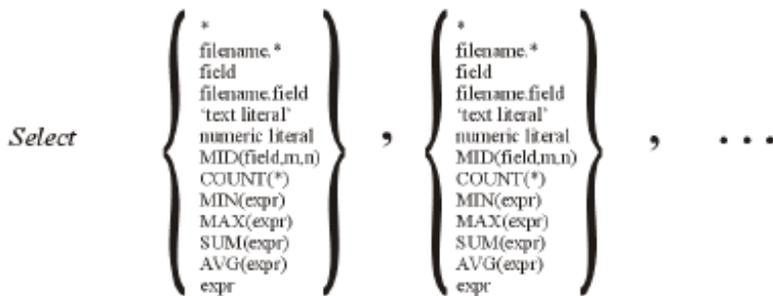
The following diagrams are also in the “FPSQL Quick Reference Guide” included in the FPSQL software package. The diagrams represent the syntax of all the clauses, except, “set”, in a query statement.

Key to diagrams:

Large brackets { } enclose a list of allowable entities: fields, files, numbers, expressions, aggregate functions, etc., for use in the clause.

Comma (,) means that the following entity is optional.

Ellipsis (. . .) means that preceding may be repeated any number of times.



Where { condition } { AND } { condition } ...
 { NOT condition } { OR } { NOT condition }

(condition)

{ field } { field } { field } { field }
 { filename.field } { filename.field } { filename.field } { filename.field }
 { literal } { literal } { literal } { literal }
 { expr } { expr } { expr } { expr }

IS BETWEEN { field } AND { field }
 IS NOT BETWEEN { filename.field } AND { filename.field }
 { literal } { literal }
 { expr } { expr }

IS IN { (field, field, field, ...) }
 IS NOT IN { subquery }

IS NOT LIKE 'text literal'
 IS LIKE 'text literal'
 IS NULL
 IS NOT NULL

Exists { Subquery }

Group By { field } , { field } , ...
 { filename.field } { filename.field }
 { expr } { expr }

Having { condition } { AND } { condition } ...
 { NOT condition } { OR } { NOT condition }

Order By { field } , { field } , ...
 { filename.field } { filename.field }
 { 'text literal' } { 'text literal' }
 { numeric literal } { numeric literal }
 MID(field,m,n) MID(field,m,n)
 COUNT(*) COUNT(*)
 MIN(expr) MIN(expr)
 MAX(expr) MAX(expr)
 SUM(expr) SUM(expr)
 AVG(expr) AVG(expr)
 expr expr

APPENDIX D

FPSQL VERSUS ANSI STANDARD SQL

The following is a list of differences between FPSQL, version 5.0, and the American National Standards Institute (ANSI) X3.135-1986 SQL standard.

In FPSQL:

- The “select distinct” clause is not implemented.
- Password security is based on the creation password.
- There is no case sensitivity in sorts and comparisons (just like the rest of filePro).
- A “set” clause has been added.
- filePro’s system-maintained fields can be used.

Example: @RN, @CD, @TD

- filePro’s additional field types can be used.

Example: MDY, HMS, \$

- Associated fields can be used.

Example: @A0, @A1, @A2

- Fields can be referenced by number.

Example: @1, @2, @3

- The “mid” function has been incorporated.

Example: mid(field,1,2)

APPENDIX E

ANSWERS TO QUIZ QUERIES

Answer to #1:

```
select name, hired, commission, salary
from ssalessmn
```

name	hired	commission	salary
Macmillan	01/15/80	55.38	2000.00
Winston	06/01/87	127.03	1200.00
Mifflin	02/10/82		1800.00

*** QUERY OUTPUT TRUNCATED ***

Answer to #2:

```
select customer, subtotal+tax_amount, payment, invoice_date, invoice_number
from sinvoice
where payment > (subtotal+tax_amount)*.25
```

customer	subtotal+tax	payment	invoice_date	invoice_number
7	1405.41	500.00	08/20/87	9
8	255.85	100.00	02/19/87	11
4	788.92	200.00	05/05/87	14
2	209.68	150.00	07/30/87	16
1	1156.69	800.00	09/20/87	17

Answer to #3:

```
select manager, avg(salary), count(*), min(hired)
from ssalessmn
group by manager
```

manager	avg(salary)	count(*)	min(hired)
Jovanovich	1533.3333	3	11/20/84
Knopf	1625.0000	6	01/15/80

Answer to #4:

```
select territory, avg(salary)
from ssalessmn
group by territory
having count(*) = 2
```

territory	avg(salary)
NYS	1450.0000

Answer to #5:

```
select territory, avg(salary), manager
from ssalessmn
group by territory
having avg(salary) >
select avg(salary)
from ssalessmn
```

territory	avg(salary)	manager
NYC	1712.5000	Knopf
PA	1700.0000	Jovanovich

Note, in the example, above, that the “having” clause can compare the results of two aggregate functions by using a subquery.

Subqueries in the “having” clause are evaluated in the same manner as they are in the “where” clause. In FPSQL subqueries can be used in both the “where” and “having” clauses at the same time.

Answer to #6:

```
select manager, territory, hired, name  
from ssalessmn  
order by manager, territory, hired
```

<i>manager</i>	<i>territory</i>	<i>hired</i>	<i>name</i>
Jovanovich	NJ	03/14/86	Holt
Jovanovich	OH	08/12/85	Wiley
Jovanovich	PA	11/20/83	Hall
Knopf	NYC	01/15/80	Macmillan
Knopf	NYC	03/13/81	McGraw
Knopf	NYC	02/10/82	Mifflin
Knopf	NYC	06/01/27	Winston
Knopf	NYS	10/17/84	Reinhart
Knopf	NYS	11/11/86	Haughton

Answer to #7:

```
select territory,
       ssalesmn.name 'Sales Rep',
       sinvoice.@A1 'Product',
       sinvoice.@A2 'Quan.',
       description 'Description',
       sproduct.price * sinvoice.@A2 'Total Sales'
from sinvoice, scllent, sproduct, ssalesmn
where
       sinvoice.@l = sclient.@l
       and
       sinvoice.@A1 = sproduct.product
       and
       sinvoice.salesman = ssalesmn.name
order by territory, ssalesmn.name, sinvoice.@A1
```

Territory	Sales Rep	Product	Quan.	Description	Total Sales
NJ	Holt	01-2345	2	Soldering Iron	28.00
NJ	Holt	23-4567	1	Metal Tracker	219.00
NJ	Holt	56-7890	3	Thermo Reader	36.00
NJ	Holt	89-0123	3	Lite Dimmer	28.05
NYC	Macmillan	78-9012	3	Barometer Kit	598.80
NYC	Macmillan	89-0123	10	Lite Dimmer	93.50
NYC	Winston	12-3456	1	Touch Tone Phone	29.99
NYC	Winston	45-6789	4	DigiClock	48.00
NYC	Winston	58-7890	3	Thermo Reader	36.00
NYC	Winston	67-8901	15	Humidity Meter	1492.50
NYC	Winston	78-9012	5	Barometer Kit	998.00
NYC	Winston	78-9012	1	Barometer Kit	199.60
NYC	Winston	89-0123	2	Lite Dimmer	18.70
OH	Wiley	01-2345	2	Soldering Iron	28.00
OH	Wiley	12-3456	2	Touch Tone Phone	59.98
OH	Wiley	23-4567	1	Metal Tracker	219.00

*** QUERY OUTPUT TRUNCATED ***

Answer to #8:

```
set output 'contract' set lines 72,84 set title 'Assets Sorted by Location'
```

INDEX

A

Aggregate Functions, applied to a real field, 5-7
descriptions, 7-2
Alias, file name, 5-10
ANSI Standard SQL, FSQL versus. D-1
Answers to Quiz Queries, E-1
Arithmetic Operators, 6-9
Associated Fields, description, 5-6
Avg (Aggregate Function), 7-2

B

Command Keys, main screen, 3-2
Comparisons, general form of, 6-4
examples, 6-8
grouping, 6-7
operators, 6-5
Conditions, general form of, 6-3
Count (Aggregate Function), 7-3

D

Demo Files purpose, 4-2
“sclient”, 4-3
“sinvoice”, 4-4
“*sproduct*”, 4-3
“ssaleman”, 4-4

E

Editing a Query, 3-5
Error Messages, list of, A-1
Executing a Query, 3-7
Exists Subclause, description, 6-10
syntax diagram, C-2
Expressions arithmetic operators, 6-9
description, 6-9

F

Fields displayed in output, 5-9
field headings, lengths, edits, 3-15
justified in output, 5-9
names, 5-8
aggregate function applied to, 5-7
associated field group, 5-5
associated fields, 5-6
asterisk, 5-6
expressions, 5-8
literals text, 5-8
numeric, 5-8
multiple-word name, 5-3
name order, 5-3
numeric literal, 5-8

- partial names, 5-4
- preceded by filename, 5-6
- referencing by number, 5-5
- substituting headings, 5-4
- system-maintained fields, 5-5
- typing in field names, 5-2
- viewing headings, lengths, edits, 3-15
- Files names filePro files, 5-10
- filePro qualified files, 5-10
- filePro file with alias, 5-10
- typing in filenames, 5-2
- filePro and filePro Plus, 1-3
- joining, 1 1-2
- Non-filePro, 1-3
- Profile 16, 1-3
- Formatting Printed Query Output, 12-3
- FPSQL. description, 2-2
- “From” Clause function, 5-2syntax diagram, C-1

G

- “Group by” Clause description, 7-5
- syntax diagram, C-2

H

- “Having” Clause description, 8-2
- syntax diagram, C-2
- when used with “where” clause, 8-3
- Help, how to use online, 3-18

I

- Installing FPSQL, 1-3

J

- Joining Files, 1 1-2

L

- Literals,
 - text and numeric, 5-8
 - description, 6-4
- Loading a Query, 3-12

M

- Manual
 - how to use, 1-3
 - organization of, 1-3
- Max (Aggregate Function), 7-2
- Mid (Aggregate Function),
 - description, 5-7
 - example, 7-2
- Min (Aggregate Function), 7-2

N

- Nesting Subqueries, 9-3

O

Operators

arithmetic, 6-9

comparison, 6-5

“Order by” Clause description, 10-2

sorting sequence, 10-2

syntax diagram, C-2

P

Passwords, 3-8

Q

Qualified Files. querying, 12-5

Query a sample, 2-2

editing a, 3-5

executing a direct execution of, 3-8

no output from. 3-8

screen display, 3-7

including comments in. 3-4

loading a, 3-12

output controlling print formatting, 3-11, 12-3

redirecting to printer or file, 3-10, 12-2

viewing extra-wide screens, 3-9

multiple screens, 3-9

wide-screen terminals, 3-10

query file directory, 3-13

saving a, 3-1

typing in editing, 3-4

insert mode, 3-3

long queries, 3-4

recording, 3-4

rules for, 3-3

type over mode, 3-3

Quiz Query Answers

answer to #1 E-1

answer to #2 E-1

answer to #3 E-1

answer to #4 E-2

answer to #5 E-2

answer to #6 E-3

answer to #7 E-4

answer to #8 E-4

R

Reserved Words, list of, 2-4, B-1

S

Saving a Query, 3-11

Screens, main screen, command keys, 3-2

wide screen terminals, 3-10

Scrolling, horizontal, 3-9

- “Select” Clause function, 5-2
- syntax diagram, C-1
- “Set” Clause description, 12-2
- formatting printed output adding default title, 12-4
- adding your own title, 12-4
- bottom margin, 12-3
- default lines values, 12-4
- delete default heading, 12-4
- deleting the title, 12-4
- delimiters, 12-4
- page length, 12-3
- multiple “set” clauses, 12-5
- querying qualified files, 12-5
- redirecting output, 12-2
- to file, 12-3
- to printer, spooler, 12-2
- to screen, 12-2
- with query statement, 12-3
- Sorting Sequence, “order by” clause, 10-2
- SQL, description, 2-2
- Starting FPSQL, 1-3
- Style Conventions keys and commands described in text 1-4
- shown on screen 1-5
- prompts and messages, 1-5
- text to be entered, 1-5
- Subqueries description, 9-2
- multiple levels of nesting, 9-3
- Sum (Aggregate Function), 7-2
- Syntax Diagrams, C-1
- “sclient” Demo File, 4-3
- “sinvoice” Demo File, 4-4
- “sproduct” Demo File, 4-3
- “ssatesman” Demo File, 4-4

T

- Termcap, for wide-screen terminals, 3-10
- Terminals, wide screen, 3-10
- Typing in a Query, 3-3

V

- Variable Queries, description, examples, 9-5
- Viewing
 - field headings, lengths, edits, 3-15
 - query file directory, 3-13
 - query output, 3-9

W

- “Where” Clause
 - description, 6-2
 - syntax diagram, C-2
- Wide-Screen Terminals, 3-10