ODBC Driver for 4D Server

Reference Manual



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General Architecture

ODBC stands for Open DataBase Connectivity. It is an interface that allows applications to query data sources, using Structured Query Language (SQL) as a standard. These data sources can be of any type, from a text file to the most sophisticated DBMS.

The ODBC driver for 4D Server allows any PC (Windows) application to communicate with 4D Server through ODBC calls and SQL queries. Based on existing 4D components (Server API and Network Components), this driver is a fully integrated element of our open architecture. With only a client installation, this solution can be deployed without any changes to an existing database in production.

This product follows the standards of the Open DataBase Connectivity interface defined by Microsoft. It supports the SQL syntax based on the X/Open and SQL Access Group (SAG) SQL CAE specification (1992).

ODBC Architecture

The ODBC architecture using the ODBC Driver for 4D Server consists of three parts:

- **Application**. The application calls functions defined in the ODBC API to access a data source.
- Driver Manager. The Driver Manager implements the ODBC API, loads the 4D Server driver dynamically, dispatches and manages the ODBC calls.
- **ODBC Driver for 4D Server**. The driver allows you to connect your ODBC-compliant application to a 4D Server database.

ODBC Driver

The ODBC Driver for 4D Server consists of four components:

- **ODBC Driver**. The ODBC driver for 4D Server itself. The driver processes ODBC function calls and manages exchanges between the application and the data source.
- **4D Open Library**. The client native part of 4D Server.
- Network Components. The networking part of 4D Server.
- **Data Source**. 4D Server is the data source, which contains data that an application needs to access.

The following figure describes an ODBC architecture using the ODBC Driver for 4D Server:



The ODBC Driver for 4D Server is only available for Windows. The 4D Server application can be located on a Macintosh or a PC, but the client application and the driver must be installed on a Windows machine.

2

Installation and Setup

This section describes the hardware and software requirements for ODBC Driver for 4D Server and how to install it from the CD-ROM.

Requirements

Client machine

Hardware	The client machine should be a PC with one of the following 32-bit systems installed: Windows 95/98, Windows NT 3.5.1 or Windows NT 4.
Software	Any ODBC-compliant application should be able to operate with the ODBC driver.
Server machine	
Hardware	The server machine can be one of the following:
	 PC running a 32-bit system (Windows 95/98, Windows NT 3.5.1 or Windows NT 4).
	■ Power Macintosh running Mac OS System 7.x or higher.
Software	The data source should be 4D Server version 6.0.5 or higher.

Installation

This section describes the installation of the SETUP program, which is automatically launched during the installation of the ODBC Driver for 4D Server.

The SETUP.exe program performs all the tasks necessary for installing the OBDC driver for 4D Server. This program correctly configures all the dependent files, such as ODBC.INI, ODBCINST.INI and the registry database.

- ► To install the ODBC Driver for 4D Server:
- 1 Double-click the Setup icon.

The Welcome dialog box appears.

ODBC Driver for 4D Server Setup	ODBC Driver for 4D Server Setup				
Welcome to the ODBC Driver for 4D Server Setup Utility.					
Setup will install the driver silently and run ODBC Data Source Administrator to set up a data source. Choose Continue to install or Exit to leave without installing the ODBC Driver for 4D Server.					
<u>Continue</u> E <u>x</u> it					

2 In the Welcome dialog box, click Continue to proceed with the installation.

🖑 OD	BC D	ata Source A	dministra	tor				? ×
User	DSN	System DSN	File DSN	Drivers	Tracing	Connecti	on Pool	ling About
<u>U</u> se	er Diata	Sources:					Γ	A <u>d</u> d
N.	ame		Driver					
dB	ASE F	ïles	Microsol	ft dBase D)river (*.db	f)		<u>R</u> emove
Fo	xPro F	iles	Microsol	ft FoxPro I	Driver (*.dt	of)		
MS	5 Acce	ess 97 Databas	e Microsol	ft Access	Driver (*.m	idb)	_	Configure
		An ODRC He			information			
		the indicated	er uata sou data provid	ice stores ier. AUs	er data so	in about no urce is only	visible	to vou.
	9	and can only	be used or	the curre	nt machin	e.		
			OK.		`ancel	App	ha I	Help
			UK		ancer	<u>8</u> pp	y -	

The ODBC Data Source Administrator window appears:

If you want to configure the data source now, refer to chapter "Creating and Modifying a Data Source" on page 11. Otherwise, just click the **Cancel** button.

Eventually, a message indicates that the installation was successful.



Creating and Modifying a Data Source

The ODBC architecture is based on applications that access one or several data sources. These data sources must be defined and qualified on the client in order to gain access to the right one. The Data Source Names (DSN) can be defined at three levels:

- User DSN
- File DSN
- System DSN

Each level corresponds to a specific application and is used in a unique way. Be careful, because client software does not support all the configurations. For example, "MS Query" from Microsoft Office 97 only works with the File DSN.

Chapters 3 and 4 describe how to configure a data source using the Driver Manager with ODBC Administrator versions 2.5 or 3.x.

Refer to the documentation of your ODBC-compliant application to determine which version of the Driver Manager you should configure, and at which level.

ODBC Administrator Version 2.5

Creating a User DSN

- ► To create a User DSN:
- 1 Double-click the ODBC Administrator icon in the Windows Control Panel to start the ODBC Administrator.

The Data Sources dialog box appears:

Data Sources	×
User <u>D</u> ata Sources (Driver):	<u>C</u> lose
Access97 (Microsoft Access Driver (*.mdb)) Excel Files (Microsoft Excel Driver (*.xls)) FoxPro Files (Microsoft FoxPro Driver (*.dbf))	<u>H</u> elp
	<u>S</u> etup
	Dejete
	<u>A</u> dd
Dptions System DSN	D <u>r</u> ivers

2 To add a Data Source, click the Add button.

The Add Data Source dialog box appears, displaying a list of the ODBC drivers installed on your machine.

Add Data Source	×
Select which ODBC driver you want to use	ОК
	Cancel
Installed UDBC <u>U</u> rivers: Microsoft FoxPro Driver (*.dbf)	Help
Microsoft ODBC Driver for Oracle Microsoft Paradox Driver (*.db.)	
Microsoft Text Driver (*.txt; *.csv) ODBC Driver for 4D Server (32 bits)	
SQL Server	

3 Select the ODBC Driver for 4D Server, then click OK.

The ODBC Driver for 4D Server Setup (32bit) dialog box appears:

ODBC Driver for 4D	Server Setup (32bit)	×
Data Source <u>N</u> ame	Video	
D <u>e</u> scription	ODBC Driver for 4D Server (32 bits)	
<u>N</u> etwork Path	TCP/IP:195.167.91.118	<u>B</u> rowse
<u>U</u> ser Name	sa	
<u>P</u> assword		
		data source)
	OK Cancel	<u>H</u> elp

4 In the Data Source Name text box, enter the name of the data source you want to access.

The data source name can be any name.

- **5** In the Description text box, enter the description of the driver. By default, the description is "ODBC Driver for 4D Server (32bit)", but it can be any string you want.
- 6 In the Network Path text box, enter the location and the protocol used to access your 4D Server data source. This should be typed according to the following rules:

The Network Path depends on the network protocol used on our network:

- Appletalk protocol: Enter "Appletalk:DatabaseName@ZoneName".
- TCP protocol: Enter "TCP/IP:Address,{PortNumber}".
- IPX protocol: Enter "IPX:Address".

You can also choose your 4D Server data source by using the Browse button. In this case, after you have selected the 4D Server data source, do not modify the Network Path as it appears in the Network Path text box.

For more information, please refer to the *4D Server Reference* and *Network Components for 4D Server* documentation.

7 You can test the new data source by clicking on the button "Test data source...".

If the connection failed, a message displays the number of the error and the description of the problem. Otherwise, a succesful message is displayed.

8 Click the OK button.

The User DSN will be added to the list.

Creating a System DSN

- ► To create a System DSN:
- 1 In the Data Sources dialog box, click the System DSN button. The System Data Sources window appears:

System Data Sources	×
System <u>D</u> ata Sources (Driver):	Close
	<u> </u>
	<u>S</u> etup
	Delete
	<u>A</u> dd
1	

2 Click the Add button to add a System Data Source, then follow steps 2 through 7 in the "Creating a User DSN" section.

ODBC Administrator Version 3.x

- ► To start the ODBC Administrator:
- Double-click the ODBC Administrator icon in the Windows Control Panel.

The ODBC Data Source Administrator window appears:

🚱 ODBC Data Sou	rce Administrator	? ×
User DSN System	DSN File DSN ODBC Drivers Tracii	ng About
<u>U</u> ser Data Sources		A <u>d</u> d
Name	Driver	
Access97 Excel Files FoxPro Files MSSQLServer	Microsoft Access Driver (*.mdb) Microsoft Excel Driver (*.xls) Microsoft FoxPro Driver (*.dbf) SQL Server	<u>R</u> emove Configure
An OD the ind and ca	BC User data source stores information al cated data provider. A User data source n only be used on the current machine.	bout how to connect to a is only visible to you,
	OK Cancel	Apply Help

Creating a User DSN

- ► To create a User DSN:
- 1 Click the Add button.

The Create New Data Source dialog box appears, displaying a list of drivers:

Create New Data Source				
	Select a driver for which you want to set u	ip a data source.		
	Name	Ve 🔺		
	Microsoft dBase Driver (*.dbf)	3.5		
	Microsoft Excel Driver (*.xls)	3.5		
	Microsoft FoxPro Driver (*.dbf)	3.5		
	Microsoft ODBC Driver for Oracle	2.(
	Microsoft Paradox Driver (*.db.)	3.5		
	Microsoft Text Driver (*.txt; *.csv)	3.5		
	ODBC Driver for 4D Server (32 bits)	6.0		
	Oracle	1.0		
	SQL Server	2.6		
		Advanced		
	< <u>B</u> ack <u>N</u> ext >	Cancel		

2 Select the ODBC Driver for 4D Server (32 bits), then click Advanced. The ODBC Driver for 4D Server Setup (32bit) dialog box appears.

ODBC Driver for 4D	Server Setup (32bit)	×
Data Source <u>N</u> ame	Video	
D <u>e</u> scription	ODBC Driver for 4D Server (32 bits)	
<u>N</u> etwork Path	TCP/IP:195.167.91.118	<u>B</u> rowse
.		
<u>U</u> ser Name	sa	
<u>P</u> assword		
		t data source)
	OK Cancel	<u>H</u> elp

3 In the Data Source Name text box, enter the name of the data source that you want to access.

The data source name can be any name you enter.

4 In the Description text box, enter the description of the driver. By default, the description is "ODBC Driver for 4D Server (32 bit)", but it can be any string that you choose. 5 In the Network Path text box, enter the location and the protocol used to access your 4D Server data source. This should be typed according to the following rules:

The Network Path depends on the network protocol used on your network:

- Appletalk protocol: Enter "Appletalk:DatabaseName@ZoneName".
- TCP protocol: Enter "TCP/IP:Address,{PortNumber}".
- IPX protocol: Enter "IPX:Address".

You can also choose your 4D Server data source by using the Browse button. In this case, after you have selected the 4D Server data source, do not modify the Network Path as it appears in the "ODBC Driver for 4D Server Setup (32bit) " dialog box.

For more information, please refer to the 4D Server Reference and Network Components for 4D Server documentation.

6 You can test the new data source by clicking on the button "Test data source...".

If the connection failed, a message displays the number of the error and the description of the problem. Otherwise, a succesful message is displayed.

7 Click the OK button.

The User DSN will be added to the list.

Creating a nonsharable File DSN

First, you should refer to the previous section, "Creating a User DSN", since the non-sharable File DSN is a pointer for this definition.

- ► To create a non-sharable File DSN:
- 1 Click the File DSN tab in the ODBC Data Source Administrator window.

💞 ODBC Data Source Administrator		? ×
User DSN System DSN File DSN ODB	C Drivers Tracing Abou	ιt][
Look in: Data Sources	•	A <u>d</u> d
dBASEFile (not sharable).dsn	🔊 Serveur 4D (not sha	<u>R</u> emove
■ Excel5Workbook (not sharable).dsn ■ ExcelFile (not sharable).dsn	 Sybasesparc10 (not TextFile (not sharab 	<u>C</u> onfigure
Gupta SQLBase (not sharable).dsn Jinformix5 (not sharable).dsn JiNGDESS404 (not sharable).dsn		Set Directory
MSSQLServer (not sharable).dsn		<u>Set Directory</u>
Oracle7 sparc10 (not sharable).dsn		
An ODBC File data source allow DSNs can be shared by users w	ws you to connect to a data who have the same drivers	a provider. File installed.
ОК	Cancel <u>Apply</u>	Help

2 Click the Add button.

The Create New Data Source dialog box appears:

Create New Data Source		
	Select a driver for which you want to set u Name Microsoft dBase Driver (*.dbf) Microsoft Excel Driver (*.dbf) Microsoft FoxPro Driver (*.dbf) Microsoft OBBC Driver (*.db) Microsoft Paradox Driver (*.db) Microsoft Text Driver (*.db) Microsoft Text Driver (*.db) OBBC Driver for 4D Server (32 bits) Oracle SQL Server	p a data source. Ve ▲ 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5
	< <u>B</u> ack <u>N</u> ext >	Cancel

3 Select the ODBC Driver for 4D Server (32bit), then click Advanced.

The Advanced File DSN Creation Settings dialog box appears:

Advanced File DSN Creation Settings	×
If you know the driver-specific keywords for this data source, you can type them and their values here. Put a new keyword-value pair on each line. For example, Server=MyServer Database=MyDatabase For more information on driver-specific keywords, please consult your ODBC driver documentation.	OK Cancel
Type driver-specific keywords and values: DRIVER={0DBC Driver for 4D Server (32 bits)}	
 ✓ ✓ Verify this connection (recommended) 	

- 4 Deselect the "Verify this connection" check box, then click OK.
- 5 In the Create New Data Source dialog box, click Next.

Create New Data Source		
	Select a driver for which you want to set u Name Microsoft dBase Driver (*.dbf) Microsoft Excel Driver (*.dbf) Microsoft FoxPro Driver (*.dbf) Microsoft DDBC Driver for Dracle Microsoft Paradox Driver (*.db) Microsoft Text Driver (*.txt; *.csv) ODBC Driver for 4D Server (32 bits) Dracle SQL Server 4	p a data source. Ve ▲ 3.f 3.f 3.f 2.(3.f 6.(1.(2.f ▼ ▲dvanced
	< <u>B</u> ack <u>N</u> ext >	Cancel

Another dialog box appears, in which you can enter the name of the data source.

6 In the file name text box, enter the name of the data source (in our example, Video).

Create New Data Source		
	Type the name of the file data source you want to save this connection to. Or, find the location to save to by clicking Browse. Video Browse	
	< <u>B</u> ack <u>N</u> ext > Cancel	

7 Click Next.

An information dialog box displays a summary of the definition of your File Data Source.



8 After checking all the information, click Finish.

The File DSN is added to the list:

🕅 ODBC Data Source Administrator	? ×	
User DSN System DSN File DSN ODBC Drivers Tracing About		
Look in: Data Sources	Add	
MSSQLServer (not sharable).dsn Oracle7 sparc10 (not sharable).dsn Serveur 4D (not sharable).dsn Serveur4DNT (not sharable).dsn Sybasesparc10 (not sharable).dsn TextFile (not sharable).dsn Video.dsn	<u>R</u> emove <u>C</u> onfigure Set Directory	
An ODBC File data source allows you to connect to a data provider. File DSNs can be shared by users who have the same drivers installed.		
OK Cancel Apply	Help	

- 9 Quit ODBC Administrator 3.x by clicking OK.
- 10 Open the video.dsn file using the Notepad text editor (Notepad.exe).

The video.dsn file is located in your system folder in the "System folder\ODBC\Data sources" path.

The file content appears as follows:



11 Replace the existing text "DRIVER= ODBC Driver for 4D Server (32 bits)" with "DSN=Name of the file data source".

In our example, we enter: "DSN=Video".

Video.dsn - Notepad	_ 🗆 ×
<u>F</u> ile <u>E</u> dit <u>S</u> earch <u>H</u> elp	
[ODBC] DSN=Video	<u>~</u>
	T
<u>-</u>	

12 Save the File DSN and quit the Notepad application.

Creating a System DSN

- ► To create a system DSN:
- 1 Click the System DSN tab in the ODBC Data Source Administrator window.

0	ODBC D	ata Source	Administra	tor				? ×
ſ	Jser DSN	System DSN	File DSN		3C Drivers	Tracing	About	
	<u>S</u> ystem D	ata Sources:						Add
	Name	Driv	er					Bemove
							-	
							_	<u>C</u> onfigure
	3	An ODBC S the indicate on this mac	ystem data s d data provid hine, includir	source der. / ng NT	stores info A System da services.	mation abo Ita source i	ut how t s visible	o connect to to all users
			OK		Cancel	A	pply	Help

2 Click the Add button to add a System Data Source, then follow steps 2 through 6 of the section "Creating a User DSN".

Specifications

This chapter covers several specifications concerning the use of the ODBC Driver for 4D Server:

Allowing Access to 4D Server

The ODBC Driver for 4D Server is based on 4D Open. 4D Open is the API (Application Programming Interface) that allows non-4D Client applications to connect to 4D Server.

To access 4D Server using the ODBC Driver, you must enable the 4D Open connection.

- ► To do so:
- 1 Open your structure file in the Design environment, using 4D or 4D Client.
- 2 In the File menu, choose Database Properties.
- 3 Select the "Data Control and Access" page.
- 4 Check the "Allow 4D Open Connections" option.

Structural Limitations

Description	Limit
Number of tables in a database	255
Number of columns per table	511
Number of rows per table	16 million
Number of select list columns in a query	300
Size of column	2 gigabytes
Maximum table name length	31 characters
Maximum column name length	31 characters
Maximum username length	30 characters
Number of connections	limited by your 4D Server
SQL statement length	16K
Number of statements per connection	limited by memory
Table qualifier	limited by the OS
Number of joined tables	limited by memory

For more information on the 4D specifications, please refer to the *4th Dimension Language Reference* manual.

SQL Statement Limitations

- Maximum of 1000 characters in a literal.
- Maximum of 300 ANDed predicates.
- A character in a character string literal may be any ANSI character between 1 and 255 decimal. A single-quote (') must be represented as two consecutive single-quotes ('').

Null Values

Selecting null values A 4D date field equal to !00/00/00! is considered a null value.

An empty 4D text or alphanumeric field is considered a null value.

Updating null values A null SQL_DATE or SQL_TIMESTAMP is updated as a 4D Date field equal to !00/00/00! in 4D Server.

A null SQL_CHAR, SQL_VARCHAR or SQL_LONGVARCHAR is updated as a 4D alphanumeric or text field equal to empty.

▼ For example, in the following code, the SELECT statement returns 2 and 3:

CLIENTS.IDCLIENTS.String

- 1 MyString 2 NULL
- 3 "

SELECT CLIENTS.ID FROM CLIENTS WHERE CLIENTS.String IS NULL

Comparison of Floats

The ODBC-compliant applications used to access 4D Server can store data in different ways than does 4D Server. This difference may produce rounding approximation and different result sets in a query containing comparisons.

Primary Key

The ODBC driver for 4D Server only considers the first (by creation order) unique, mandatory and indexed column as the primary key.

ODBC Conformance Levels

SQL Conformance Level

The main characteristic of the ODBC driver is its SQL conformance level, in other words, its capacity to support and address a certain SQL grammar. The ODBC version 2.5 specification provides three levels of SQL grammar conformance: Minimum, Core and Extended. Each higher level provides more fully-implemented data definition and data manipulation language support than the previous one.

The description of each level explains what is supported in the ODBC Driver for 4D Server.

Support of minimum SQL grammar ODBC Driver for 4D Server partially supports Minimum SQL Grammar as it is defined in Appendix C of the Microsoft *ODBC Programmer's Reference*.

The following is a list of supported elements:

- Supported Data Manipulation Language (DML): simple SELECT, INSERT, searched UPDATE, and DELETE statements
- Supported expressions: simple
- Supported data types: CHAR, VARCHAR, LONG VARCHAR

Support of core SQL grammar	ODBC Driver for 4D Server partially supports Core SQL Grammar as it is defined in Appendix C of the ODBC Programmer's Reference.
	The following is a list of supported elements:
	Supported Data Manipulation Language (DML): full SELECT.
•	Supported expressions: Subqueries, set-functions (SUM, MAX, MIN, AVG, and COUNT)
	Approximate-numeric-literal
•	Between-predicate: BETWEEN
	Correlation-name
	Exact-numeric literal
•	In-predicate: IN
•	Supported data types: DECIMAL, SMALLINT, INTEGER, REAL, DOUBLE PRECISION
Support of extended SQL grammar	ODBC Driver for 4D Server partially supports Extended SQL Grammar as documented in Appendix C of the ODBC Programmer's Reference.
grammai	The following is a list of supported elements:
•	DML: outer joins, UNION and UNION ALL
•	Expressions: scalar functions, date and time literals
•	Date arithmetic
•	Extended predicates
-	Data types: BIT, TINYINT, DATE, TIME, TIMESTAMP, LONG VARBINARY
	For examples about SQL statements, please refer to Appendix A of this manual.

API Conformance Level

An ODBC driver is accessed by a set of specific ODBC calls. Each driver implements more or fewer of these calls as needed to support the standard. Most of the time, you will not have to pay attention to this level of programming because of the transparency at the application level.

The application you are using will implement these calls to access the data source, and you will have only to control the SQL query sent through this API.

If you are directly programming the OBDC API in your application, you can refer to Appendix B of this manual for a complete list of the calls implemented by our driver.

Scalar Functions

The ODBC Driver for 4D Server supports ODBC scalar functions which may be included in an SQL statement as a primary expression. For a description of the SQL syntax for these functions, please refer to Appendix G of the *ODBC Programmer's Reference*.

The following is a list of the scalar functions supported by the ODBC Driver for 4D Server.

- String functions: CONCAT, LENGTH, RIGHT, UCASE, LCASE, LOCATE, RTRIM, LEFT, LTRIM, SUBSTRING
- Numeric functions: MOD
- Date functions: DAYOFMONTH, MONTH, DAYOFWEEK, YEAR
- System functions: IF, NULL
- Conversion functions: CONVERT

Mapping Data Types

6

4D Server supports a set of data types. The ODBC Driver for 4D Server maps these data types to their appropriate ODBC SQL data types. The following conversion tables list the 4D Server data types and their corresponding ODBC SQL data types.

Conversion from 4D Server to ODBC SQL data types

4D Server Data Types	ODBC SQL Data Types
Alpha	SQL_VARCHAR
Text	SQL_LONGVARCHAR
Real	SQL_DOUBLE
Integer	SQL_SMALLINT
Long Integer	SQL_INTEGER
Date	SQL_DATE
Time	SQL_TIME
Boolean	SQL_BIT
Picture	SQL_LONGVARBINARY
Subtable	N/A
BLOB	N/A

Conversion from ODBC SQL to 4D Server data types

ODBC SQL Data Types	4D Server Data Types
SQL_VARCHAR	Alpha
SQL_CHAR	Alpha
SQL_LONGVARCHAR	Text
SQL_REAL	Real
SQL_DOUBLE	Real
SQL_DECIMAL	Real
SQL_SMALLINT	Integer
SQL_TINYINT	Integer
SQL_INTEGER	Long Integer
SQL_LONGVARBINARY	Picture
SQL_DATE	Date
SQL_TIMESTAMP	Date
SQL_TIME	Time
SQL_BIT	Boolean

SQL Samples

To illustrate the SQL grammar (described in Chapter 5) and to help those who are discovering the SQL language, we provide several queries with their results, based on the "VIDEO" database distributed with the driver.

Examples

Simple SELECT statement

This example uses a simple SELECT statement. This query downloads the contents of the Firstname fields of all the customers in the CUSTOMERS table.

▼ SELECT

CUSTOMERS.FirstName FROM CUSTOMERS

The result is:

Cary John Ion Jeff Perry Fred Gus Dave Jeanette Rich Kate Cindi Jerry Thom Tico Janet

SELECT statement with a WHERE clause	This example uses a SELECT statement with a WHERE clause. This query downloads the video titles and rental prices from the VIDEOS table if the rental price is greater than 21.1.		
•	SELECT VIDEOS.Title, VIDEOS.RentingPrice FROM VIDEOS WHERE (VIDEOS.RentingPrice>21.1)		
	The result is:		
	Demoiselles de Rochefort (Les) Missing in Action I Jane Fonda's 10min Workout Slippery When Wet Living on a Prayer	24.5 24 50 26.3 45.2	
	Wyle Traps the Road Runner!	26.3	
SELECT statement with the BETWEEN predicate	This example uses a SELECT statement with the BETWEEN predicate. This query downloads the video titles and the rental prices from the VIDEOS table if the rental price is greater than or equal to 21.1 or less than or equal to 24.5.		
•	SELECT VIDEOS.Title, VIDEOS.RentingPrice FROM VIDEOS WHERE (VIDEOS.RentingPrice BETWEEN 21.1 An	d 24.5)	
	The result is:		
	Demoiselles de Rochefort (Les) Missing in Action I Boyz in New Jersey	24.5 24 21.1	
SELECT statement with a "begins with" condition	This example uses a SELECT statement with a "begins with" condition. This query downloads the video titles and the rental prices from the VIDEOS table if the title begins with the letter 'M' (case-sensitive).		

 ▼ SELECT VIDEOS.Title, VIDEOS.RentingPrice FROM VIDEOS WHERE (VIDEOS.Title Like 'M%')
 The result is: Missing in Action I
 24

SELECT statement with a sort on an alphanumeric column This example uses a SELECT statement with a sort on an alphanumeric column. This query downloads the video titles and the rental prices from the VIDEOS table if the rental price is lower than 21.1. The video titles are sorted alphabetically.

▼ SELECT

VIDEOS.Title, VIDEOS.RentingPrice FROM VIDEOS WHERE (VIDEOS.RentingPrice<21.1) ORDER BY VIDEOS.Title

The result is:

Blaze of Glory	18.8
Chip & Jeff's Excellent Adventure	19.5
Night of the Living Noni's	15.5
Prédateurs (Les)	15.5
Return of Cujo	13.5

SELECT statements These two examples use SELECT statements combined with string functions.

▼ Example 1: This query downloads the video titles from the VIDEOS table if the rental price is lower than 21.1, with the first ten letters of the title converted to uppercase.

SELECT left(ucase(VIDEOS.Title),10) FROM VIDEOS WHERE (VIDEOS.RentingPrice>21.1) The result is:

DEMOISELLE MISSING IN JANE FONDA SLIPPERY W LIVING ON WYLE TRAPS

▼ Example 2: This query locates the position of the letter 'a' (casesensitive) in the video titles from the VIDEOS table.

SELECT VIDEOS.Title, locate('a',VIDEOS.Title) FROM VIDEOS

The result is:

Demoiselles de Rochefort (Les)		
Prédateurs (Les)		
Missing in Action I		
Chip & Jeff's Excellent Adventure	0	
Jane Fonda's 10min Workout	2	
Return of Cujo	0	
Slippery When Wet	0	
Blaze of Glory	3	
Night of the Living Noni's	0	
Boyz in New Jersey	0	
Runaway	4	
Living on a Prayer	11	
Wyle Traps the Road Runner!	8	

SELECT statements
with numeric
functionsThese three examples use SELECT statements combined with numeric
functions.

▼ Example 1: This query returns the average rental price based on the titles in the VIDEOS table.

SELECT Avg(VIDEOS.RentingPrice) FROM VIDEOS The result is:

24.5153846153846

▼ Example 2: This query returns the lowest rental price of the titles in the VIDEOS table.

SELECT min(VIDEOS.RentingPrice) FROM VIDEOS

The result is:

13.5

▼ Example 3: This query returns the highest rental price of the titles in the VIDEOS table.

SELECT max(VIDEOS.RentingPrice) FROM VIDEOS

The result is:

50

SELECT statement with a grouping order

This example uses a SELECT statement combined with a grouping order. This query uses the Count function and the GROUP BY option to find the number of videos in each category (classic, comedy, etc.).

- ▼ SELECT
 - Count(*), VIDEOS.Category FROM VIDEOS VIDEOS GROUP BY VIDEOS.Category

The result is:

- 1 Classic
- 2 Comedy
- 2 Drama
- 1 Fantastic
- 1 Health
- 1 Martial Arts
- 2 Thriller
- 2 War
- 1 Western

SELECT statement This example uses a SELECT statement combined with an inner join on with an inner join the CLIENTS and TRACKING tables. This query shows how to select data from more than one table at once, using the joins: SELECT CUSTOMERS.FirstName, CUSTOMERS.LastName, TRACKING.BorrowDate, VIDEOS.Title, VIDEOS.Category FROM CUSTOMERS, TRACKING, VIDEOS WHERE TRACKING.Video ID = VIDEOS.Video ID AND CUSTOMERS.Customer ID = TRACKING.Client ID ORDER BY CLIENTS, LastName The result is: Demoiselles de Ion Bon Jovi 1997-08-02 Comedy Rochefort (Les) Jeff Davis 1992-12-26 Prédateurs (Les) Fantastic 1992-08-12 War Perry Fitch Missing in Action I Fred Forire 1992-01-17 Chip & Jeff's Comedy **Excellent** Adventure Demoiselles de 1997-08-02 Cary Grant Comedy Rochefort (Les) Gus Guilbert 1992-01-17 Jane Fonda's 10min Health Workout Huston 1992-12-26 Fantastic John Prédateurs (Les) Dave Popielarz 1992-12-15 Return of Cujo Martial Arts SELECT statement This example uses a SELECT statement with UNION on two distinct with UNION on two tables. This query retrieves data from two tables using the UNION distinct tables capabilities. *Note* Note that, in this example, the union of the video categories and the customer names is nonsense, but it is just to be considered as an

example!

▼ SELECT VIDEOS.Category FROM VIDEOS UNION SELECT CUSTOMERS.FirstName FROM **CUSTOMERS** The result is: Cary Cindi Classic Comedy Dave Drama Fantastic Fred Gus Health Janet Jeanette Jeff Jerry John Jon Kate Martial Arts Perry Rich Thom Thriller Tico War Western

SELECT statement with an IN predicate	This example uses a SELECT statement combined with an IN predicate. This query retrieves the videos that should have been brought back by the customers. The query is performed on the VIDEOS and TRACKING tables. The first part of the query searches out the Video_IDs in the TRACKING table using the Tracking."Days late" criteria. If this criteria is greater than zero, the video is selected. These IDs are used to select the VIDEOS within an IN predicate.
•	SELECT VIDEOS.Title FROM VIDEOS WHERE VIDEOS.Video_ID IN (SELECT TRACKING.Video_ID FROM TRACKING WHERE (TRACKING."Days Late">0))
	The result is: Demoiselles de Rochefort (Les) Prédateurs (Les) Chip & Jeff's Excellent Adventure Jane Fonda's 10min Workout Living on a Prayer Return of Cujo
Syntax considerations ▼	If a 4D column contains a space, its name must be written between quotes in order to avoid a syntax error. Example: SELECT TRACKING. "Days Late" FROM TRACKING

API Conformance Level

The following table lists the ODBC functions and their API conformance levels.

ODBC function and level	ID	Supported by the driver			
Core Level					
SQL_API_SQLALLOCCONNECT	1	Yes			
SQL_API_SQLALLOCENV	2	Yes			
SQL_API_SQLALLOCSTMT	3	Yes			
SQL_API_SQLBINDCOL	4	Yes			
SQL_API_SQLCANCEL	5	Yes			
SQL_API_SQLCOLATTRIBUTES	6	Yes			
SQL_API_SQLCONNECT	7	Yes			
SQL_API_SQLDESCRIBECOL	8	Yes			
SQL_API_SQLDISCONNECT	9	Yes			
SQL_API_SQLERROR	10	Yes			
SQL_API_SQLEXECDIRECT	11	Yes			
SQL_API_SQLEXECUTE	12	Yes			
SQL_API_SQLFETCH	13	Yes			
SQL_API_SQLFREECONNECT	14	Yes			
SQL_API_SQLFREEENV	15	Yes			
SQL_API_SQLFREESTMT	16	Yes			
SQL_API_SQLGETCURSORNAME	17	Yes			
SQL_API_SQLNUMRESULTCOLS	18	Yes			
SQL_API_SQLPREPARE	19	Yes			
SQL_API_SQLROWCOUNT	20	Yes			
SQL_API_SQLSETCURSORNAME	21	Yes			
SQL_API_SQLSETPARAM	22	Yes			
SQL_API_SQLTRANSACT	23	Yes			

ODBC function and level	ID	Supported by the driver			
Level 1					
SQL_API_SQLCOLUMNS	40	Yes			
SQL_API_SQLDRIVERCONNECT	41	Yes			
SQL_API_SQLGETCONNECTOPTION	42	Yes			
SQL_API_SQLGETDATA	43	Yes			
SQL_API_SQLGETFUNCTIONS	44	Yes			
SQL_API_SQLGETINFO	45	Yes			
SQL_API_SQLGETSTMTOPTION	46	Yes			
SQL_API_SQLGETTYPEINFO	47	Yes			
SQL_API_SQLPARAMDATA	48	Yes			
SQL_API_SQLPUTDATA	49	Yes			
SQL_API_SQLSETCONNECTOPTION	50	Yes			
SQL_API_SQLSETSTMTOPTION	51	Yes			
SQL_API_SQLSPECIALCOLUMNS	52	Yes			
SQL_API_SQLSTATISTICS	53	Yes			
SQL_API_SQLTABLES	54	Yes			
Level 2					
SQL_API_SQLBROWSECONNECT	55	Yes			
SQL_API_SQLCOLUMNPRIVILEGES	56	Yes			
SQL_API_SQLDATASOURCES	57	Yes			
SQL_API_SQLDESCRIBEPARAM	58	Yes			
SQL_API_SQLEXTENDEDFETCH	59	No			
SQL_API_SQLFOREIGNKEYS	60	Yes			
SQL_API_SQLMORERESULTS	61	Yes			
SQL_API_SQLNATIVESQL	62	Yes			
SQL_API_SQLNUMPARAMS	63	Yes			
SQL_API_SQLPARAMOPTIONS	64	No			
SQL_API_SQLPRIMARYKEYS	65	Yes			
SQL_API_SQLPROCEDURECOLUMNS	66	Yes			
SQL_API_SQLPROCEDURES	67	Yes			
SQL_API_SQLSETPOS	68	No			
SQL_API_SQLSETSCROLLOPTIONS	69	No			
SQL_API_SQLTABLEPRIVILEGES	70	Yes			
SDK 2.0 Additions					
SQL_API_SQLDRIVERS	71	Yes			
SQL_API_SQLBINDPARAMETER	72	Yes			

More Information on Specific Calls

SQLSetStmtOption / SQLGetStmtOption Options supported: 3, 2, 1, 1151, and 1153.

SQLSetConnectOption / SQLGetConnectOption Options supported: 101, 102, 109.

Note SQLMoreResults always returns SQL_NO_DATA_FOUND. The function is supported with its return value, due to the requirements of Microsoft Access.