Connecting to Your Database

**PowerBuilder®**

11.5
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PowerBuilder
About This Book

**Audience**

This book is for anyone who uses PowerBuilder® to connect to a database. It assumes that you are familiar with the database you are using and have installed the server and client software required to access the data.

**How to use this book**

This book describes how to connect to a database in PowerBuilder by using a standard or native database interface. It gives procedures for preparing, defining, establishing, maintaining, and troubleshooting your database connections. For an overview of the steps you need to take, see “Basic connection procedure” on page 3.

**Related documents**

For detailed information about supported database interfaces, DBParm parameters, and database preferences, see the Database Connectivity section in the online Help. For a complete list of PowerBuilder documentation, see PowerBuilder Getting Started.

**Other sources of information**

Use the Sybase® Getting Started CD, the SyBooks CD, and the Sybase Product Manuals Web site to learn more about your product:

- The Getting Started CD contains release bulletins and installation guides in PDF format, and may also contain other documents or updated information not included on the SyBooks CD. It is included with your software. To read or print documents on the Getting Started CD, you need Adobe Acrobat Reader, which you can download at no charge from the Adobe Web site using a link provided on the CD.

- The SyBooks CD contains product manuals and is included with your software. The Eclipse-based SyBooks browser allows you to access the manuals in an easy-to-use, HTML-based format.

Some documentation may be provided in PDF format, which you can access through the PDF directory on the SyBooks CD. To read or print the PDF files, you need Adobe Acrobat Reader.

Refer to the SyBooks Installation Guide on the Getting Started CD, or the README.txt file on the SyBooks CD for instructions on installing and starting SyBooks.
The Sybase Product Manuals Web site is an online version of the SyBooks CD that you can access using a standard Web browser. In addition to product manuals, you will find links to EBFs/Maintenance, Technical Documents, Case Management, Solved Cases, newsgroups, and the Sybase Developer Network.

To access the Sybase Product Manuals Web site, go to Product Manuals at http://www.sybase.com/support/manuals/.

### Conventions

The formatting conventions used in this manual are:

<table>
<thead>
<tr>
<th>Formatting example</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieve and Update</td>
<td>When used in descriptive text, this font indicates:</td>
</tr>
<tr>
<td></td>
<td>• Command, function, and method names</td>
</tr>
<tr>
<td></td>
<td>• Keywords such as true, false, and null</td>
</tr>
<tr>
<td></td>
<td>• Datatypes such as integer and char</td>
</tr>
<tr>
<td></td>
<td>• Database column names such as emp_id and t_name</td>
</tr>
<tr>
<td></td>
<td>• User-defined objects such as dw_emp or w_main</td>
</tr>
<tr>
<td>variable or file name</td>
<td>When used in descriptive text and syntax descriptions, oblique font indicates:</td>
</tr>
<tr>
<td></td>
<td>• Variables, such as myCounter</td>
</tr>
<tr>
<td></td>
<td>• Parts of input text that must be substituted, such as pblname.pbd</td>
</tr>
<tr>
<td></td>
<td>• File and path names</td>
</tr>
<tr>
<td>File&gt;Save</td>
<td>Menu names and menu items are displayed in plain text. The greater than symbol (&gt;) shows you how to navigate menu selections. For example, File&gt;Save indicates “select Save from the File menu.”</td>
</tr>
<tr>
<td>dw_l.Update()</td>
<td>Monospace font indicates:</td>
</tr>
<tr>
<td></td>
<td>• Information that you enter in a dialog box or on a command line</td>
</tr>
<tr>
<td></td>
<td>• Sample script fragments</td>
</tr>
<tr>
<td></td>
<td>• Sample output fragments</td>
</tr>
</tbody>
</table>

### If you need help

Each Sybase installation that has purchased a support contract has one or more designated people who are authorized to contact Sybase Technical Support. If you cannot resolve a problem using the manuals or online help, please have the designated person contact Sybase Technical Support or the Sybase subsidiary in your area.
PART 1

Introduction to Database Connections

This part introduces data connections in PowerBuilder. It helps you understand how to connect to a database in the PowerBuilder development environment.
CHAPTER 1

Understanding Data Connections

About this chapter

This chapter gives an overview of the concepts and procedures for connecting to a database in the PowerBuilder development environment.

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How to find the information you need

When you work with PowerBuilder, you can connect to a database in the development environment or in an application script.

This book describes how to connect to your database in the PowerBuilder development environment.

For information about connecting to a database in a PowerBuilder application script, see Application Techniques.

Basic connection procedure

The following table gives an overview of the connection procedure and indicates where you can find detailed information about each step.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Details</th>
<th>See</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Optional) Get an introduction to database connections in PowerBuilder</td>
<td>If necessary, learn more about how PowerBuilder connects to a database in the development environment</td>
<td>Chapter 1 (this chapter)</td>
</tr>
</tbody>
</table>
## How to find the information you need

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
<th>Details</th>
<th>See</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Prepare to use the data source or database before connecting to it for the first time in PowerBuilder</td>
<td>Outside PowerBuilder, install the required network, database server, and database client software and verify that you can connect to the database</td>
<td>For ODBC data sources: Chapter 2, “Using the ODBC Interface”&lt;br&gt;For JDBC data sources: Chapter 3, “Using the JDBC Interface”&lt;br&gt;For OLE DB data sources: Chapter 4, “Using the OLE DB Interface”&lt;br&gt;For ADO.NET data sources: Chapter 5, “Using the ADO.NET Interface”&lt;br&gt;For native database interfaces: Chapter 6, “Using Native Database Interfaces”</td>
</tr>
<tr>
<td>3</td>
<td>Install the ODBC driver, OLE DB data provider, ADO.NET data provider, or native database interface</td>
<td>Install the driver, database provider, or native database interface required to access your data</td>
<td>For a list of what is supported on your platform: “Supported Database Interfaces” in online Help</td>
</tr>
<tr>
<td>4</td>
<td>Define the data source (ODBC connections and some OLE DB drivers)</td>
<td>Create the required configuration for a data source accessed through ODBC</td>
<td>For ODBC data sources: Chapter 2, “Using the ODBC Interface”</td>
</tr>
<tr>
<td>5</td>
<td>Define the database interface</td>
<td>Create the database profile</td>
<td>For ODBC data sources: Chapter 2, “Using the ODBC Interface”&lt;br&gt;For JDBC data sources: Chapter 3, “Using the JDBC Interface”&lt;br&gt;For OLE DB data sources: Chapter 4, “Using the OLE DB Interface”&lt;br&gt;For ADO.NET data sources: Chapter 5, “Using the ADO.NET Interface”&lt;br&gt;For native database interfaces: Chapter 6, “Using Native Database Interfaces”&lt;br&gt;For PowerBuilder components: Chapter 15, “Making Database Connections in PowerBuilder Components”</td>
</tr>
<tr>
<td>6</td>
<td>Define the EAServer connection</td>
<td>Create an EAServer profile</td>
<td>Chapter 15, “Making Database Connections in PowerBuilder Components”</td>
</tr>
<tr>
<td>7</td>
<td>Connect to the data source or database</td>
<td>Access the data in PowerBuilder</td>
<td>Chapter 12, “Managing Database Connections”</td>
</tr>
</tbody>
</table>
Accessing data in PowerBuilder

There are several ways to access data in the PowerBuilder development environment:

- Through one of the standard database interfaces such as ODBC, JDBC, ADO.NET, or OLE DB
- Through one of the native database interfaces

A standard database interface communicates with a database through a standard-compliant driver (in the case of ODBC and JDBC) or data provider (in the case of OLE DB and ADO.NET). The standard-compliant driver or data provider translates the abstract function calls defined by the standard’s API into calls that are understood by a specific database. To use a standard interface, you need to install the standard’s API and a suitable driver or data provider. Then, install the standard database interface you want to use to access your DBMS by selecting the interface in the PowerBuilder Setup program.

PowerBuilder currently supports the following standard interfaces:

- Open Database Connectivity (ODBC)
- Java Database Connectivity (JDBC)
- Microsoft’s Universal Data Access Component OLE DB
- Microsoft’s ADO.NET
A native database interface communicates with a database through a direct connection. It communicates to a database using that database’s native API.

To access data through one of the native database interfaces, you must first install the appropriate database software on the server and client workstations at your site. Then, install the native database interface that accesses your DBMS by selecting the interface in the PowerBuilder Setup program.

For example, if you have the appropriate Sybase Adaptive Server® Enterprise server and client software installed, you can access the database by installing the Adaptive Server Enterprise database interface.

PowerBuilder loads the libraries used by a database interface when it connects to the database. PowerBuilder does not automatically free the database interface libraries when it disconnects.

Although memory use is somewhat increased by this technique (since the loaded database interface libraries continue to be held in memory), the technique improves performance and eliminates problems associated with the freeing and subsequent reloading of libraries experienced by some database connections.

If you want PowerBuilder to free database interface libraries on disconnecting from the database (as it did prior to PowerBuilder 8), you can change its default behavior:

<table>
<thead>
<tr>
<th>To change the default behavior for</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections in the development environment</td>
<td>Select the Free Database Driver Libraries On Disconnect check box on the General tab of the System Options dialog box</td>
</tr>
<tr>
<td>Runtime connections</td>
<td>Set the FreeDBLibraries property of the Application object to TRUE on the General tab of the Properties view in the Application painter or in a script</td>
</tr>
</tbody>
</table>

**EAServer components**

This behavior cannot be controlled when components are deployed to EAServer.
CHAPTER 1  Understanding Data Connections

Accessing the EAS Demo DB

PowerBuilder includes a standalone SQL Anywhere® database called the EAS Demo DB. Unless you clear this option in the setup program, the database is installed automatically. You access tables in the EAS Demo DB when you use the PowerBuilder tutorial.

A SQL Anywhere database is considered an ODBC data source, because you access it with the SQL Anywhere ODBC driver.

Using database profiles

What is a database profile?

A database profile is a named set of parameters stored in your system registry that defines a connection to a particular database in the PowerBuilder development environment. You must create a database profile for each data connection.

What you can do

Using database profiles is the easiest way to manage data connections in the PowerBuilder development environment. For example, you can:

- Select a database profile to connect to or switch between databases
- Edit a database profile to customize a connection
- Delete a database profile if you no longer need to access that data
- Import and export database profiles to share connection parameters quickly

For more information

For instructions on using database profiles, see Chapter 12, “Managing Database Connections.”

About creating database profiles

You work with two dialog boxes when you create a database profile in PowerBuilder: the Database Profiles dialog box and the interface-specific Database Profile Setup dialog box.

Using the Database painter to create database profiles

You can also create database profiles from the Database painter’s Objects view.
Database Profiles dialog box

The Database Profiles dialog box uses an easy-to-navigate tree control format to display your installed database interfaces and defined database profiles. You can create, edit, and delete database profiles from this dialog box.

When you run the PowerBuilder Setup program, it updates the Vendors list in the PowerBuilder® section in the HKEY_LOCAL_MACHINE registry key with the interfaces you install. The Database Profiles dialog box displays the same interfaces that appear in the Vendors list.

Where the Vendors list is stored
The Sybase\PowerBuilder\11.5\Vendors key in HKEY_LOCAL_MACHINE\SOFTWARE is used for InfoMaker® as well as PowerBuilder.

For detailed instructions on using the Database Profiles dialog box to connect to a database and manage your profiles, see Chapter 12, “Managing Database Connections.”

Using database profiles
Each database interface has its own Database Profile Setup dialog box where you can set interface-specific connection parameters. For example, if you install the Adaptive Server® Enterprise ASE interface and then select it and click New in the Database Profiles dialog box, the Database Profile Setup - Adaptive Server Enterprise dialog box displays, containing settings for the connection options that apply to this interface.

The Database Profile Setup dialog box groups similar connection parameters on the same tab page and lets you easily set their values by using check boxes, drop-down lists, and text boxes. Basic (required) connection parameters are on the Connection tab page, and additional connection options (DBParm parameters and SQLCA properties) are on the other tab pages.

As you complete the Database Profile Setup dialog box in PowerBuilder, the correct PowerScript® connection syntax for each selected option is generated on the Preview tab. You can copy the syntax you want from the Preview tab into a PowerBuilder application script.

For some database interfaces, you might not need to supply values for all boxes in the Database Profile Setup dialog box. If you supply the profile name and click OK, PowerBuilder displays a series of dialog boxes to prompt you for additional information when you connect to the database.
Using database profiles

This information can include:
User ID or login ID
Password or login password
Database name
Server name

For some databases, supplying only the profile name does not give PowerBuilder enough information to prompt you for additional connection values. For these interfaces, you must supply values for all applicable boxes in the Database Profile Setup dialog box.

For information about the values you should supply for your connection, click Help in the Database Profile Setup dialog box for your interface.

Creating a database profile

To create a new database profile for a database interface, you must complete the Database Profile Setup dialog box for the interface you are using to access the database.

❖ To create a database profile for a database interface:

1. Click the Database Profile button in the PowerBar.

   The Database Profiles dialog box displays, listing your installed database interfaces. To see a list of database profiles defined for a particular interface, click the plus sign to the left of the interface name or double-click the interface name to expand the list.

2. Highlight an interface name and click New.

   The Database Profile Setup dialog box for the selected interface displays. For example, if you select the SYC interface, the Database Profile Setup - Adaptive Server Enterprise dialog box displays.

Client software and interface must be installed
To display the Database Profile Setup dialog box for your interface, the required client software and native database interface must be properly installed and configured. For specific instructions for your database interface, see the chapter on using the interface.
3 On the Connection tab page, type the profile name and supply values for any other basic parameters your interface requires to connect. For information about the basic connection parameters for your interface and the values you should supply, click Help.

**About the DBMS identifier**

You do not need to specify the DBMS identifier in a database profile. When you create a new profile for any installed database interface, PowerBuilder generates the correct DBMS connection syntax for you.

4 (Optional) On the other tab pages, supply values for any additional connection options (DBParm parameters and SQLCA properties) to take advantage of DBMS-specific features that your interface supports. For information about the additional connection parameters for your interface and the values you should supply, click Help.

5 (Optional) Click the Preview tab if you want to see the PowerScript connection syntax that PowerBuilder generates for each selected option. You can copy the PowerScript connection syntax from the Preview tab directly into a PowerBuilder application script. For instructions on using the Preview tab to help you connect in a PowerBuilder application, see the section on using Transaction objects in Application Techniques.

6 Click OK to save your changes and close the Database Profile Setup dialog box. (To save your changes on a particular tab page without closing the dialog box, click Apply.)

The Database Profiles dialog box displays, with the new profile name highlighted under the appropriate interface. The database profile values are saved in the system registry in `HKEY_CURRENT_USER\Software\Sybase\PowerBuilder\11.5\DatabaseProfiles\PowerBuilder`. You can look at the registry entry or export the profile as described in “Importing and exporting database profiles” on page 165 to see the settings you made. The NewLogic parameter is set to True by default. This setting specifies that the password is encrypted using Unicode encoding.
What to do next

For instructions on preparing to use and then defining an ODBC data source, see Chapter 2, “Using the ODBC Interface.”

For instructions on preparing to use and then defining a JDBC database interface, see Chapter 3, “Using the JDBC Interface.”

For instructions on preparing to use and then defining an OLE DB data provider, see Chapter 4, “Using the OLE DB Interface.”

For instructions on preparing to use and then defining an ADO.NET data provider, see Chapter 5, “Using the ADO.NET Interface.”

For instructions on preparing to use and then defining a native database interface, see Chapter 6, “Using Native Database Interfaces.”
PART 2

Working with Standard Database Interfaces

This part describes how to set up and define database connections accessed through one of the standard database interfaces.
CHAPTER 2

Using the ODBC Interface

About this chapter
This chapter gives an introduction to the ODBC interface and then describes how to prepare to use the data source, how to define the data source, and how to define the ODBC database profile. It also describes how to use the Sybase SQL Anywhere ODBC driver.

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For more information
This chapter gives general information about preparing to use and defining each ODBC data source. For more detailed information:

- Use the online Help provided by the driver vendor, as described in “Displaying Help for ODBC drivers” on page 27. This Help provides important details about using the data source.
- Check to see if there is a technical document that describes how to connect to your ODBC data source. Any updated information about connectivity issues is available from the Sybase Support and Downloads Web site at http://www.sybase.com/support.

About the ODBC interface

You can access a wide variety of ODBC data sources in PowerBuilder. This section describes what you need to know to use ODBC connections to access your data in PowerBuilder.
About the ODBC interface

What is ODBC?

The ODBC API

The **Open Database Connectivity (ODBC)** is a standard application programming interface (API) developed by Microsoft. It allows a single application to access a variety of data sources for which ODBC-compliant drivers exist. The application uses Structured Query Language (SQL) as the standard data access language.

The ODBC API defines the following:

- A library of ODBC function calls that connect to the data source, execute SQL statements, and retrieve results
- A standard way to connect and log in to a DBMS
- SQL syntax based on the X/Open and SQL Access Group (SAG) CAE specification (1992)
- A standard representation for datatypes
- A standard set of error codes

Accessing ODBC data sources

Applications that provide an ODBC interface, like PowerBuilder, can access data sources for which an ODBC driver exists. An **ODBC data source driver** is a dynamic link library (DLL) that implements ODBC function calls. The application invokes the ODBC driver to access a particular data source.

Accessing Unicode data

Using the ODBC interface, PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases but does not convert data between Unicode and ANSI/DBCS. When character data or command text is sent to the database, PowerBuilder sends a Unicode string. The driver must guarantee that the data is saved as Unicode data correctly. When PowerBuilder retrieves character data, it assumes the data is Unicode.

A Unicode database is a database whose character set is set to a Unicode format, such as UTF-8, UTF-16, UCS-2, or UCS-4. All data must be in Unicode format, and any data saved to the database must be converted to Unicode data implicitly or explicitly.

A database that uses ANSI (or DBCS) as its character set might use special datatypes to store Unicode data. Columns with these datatypes can store **only** Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.
CHAPTER 2  Using the ODBC Interface

Using ODBC in PowerBuilder
What you can do

The following ODBC connectivity features are available in PowerBuilder:

• Connect to a SQL Anywhere standalone database (including the EAS Demo DB) using the SQL Anywhere ODBC driver and the ODBC interface

• Create and delete local SQL Anywhere databases

  For instructions, see the Users Guide.

• In all editions except PowerBuilder Desktop, use Level 1 or later ODBC-compliant drivers obtained from vendors other than Sybase to access your data

  See “Obtaining ODBC drivers” on page 22.

• Use Microsoft’s ODBC Data Source Administrator to define ODBC data sources

  See “Defining ODBC data sources” on page 24.

Components of an ODBC connection
How an ODBC connection is made

When you access an ODBC data source in PowerBuilder, your connection goes through several layers before reaching the data source. It is important to understand that each layer represents a separate component of the connection, and that each component might come from a different vendor.

Because ODBC is a standard API, PowerBuilder uses the same interface to access every ODBC data source. As long as a driver is ODBC compliant, PowerBuilder can access it through the ODBC interface to the ODBC Driver Manager. The development environment and the ODBC interface work together as the application component.

Figure 2-1 shows the general components of an ODBC connection.
Table 2-1 gives the provider and a brief description of each ODBC component shown in the diagram.

Table 2-1: Provider and function of ODBC connection components

<table>
<thead>
<tr>
<th>Component</th>
<th>Provider</th>
<th>What it does</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Sybase</td>
<td>Calls ODBC functions to submit SQL statements, catalog requests, and retrieve results from a data source. PowerBuilder uses the same ODBC interface to access all ODBC data sources.</td>
</tr>
<tr>
<td>ODBC Driver Manager</td>
<td>Microsoft</td>
<td>Installs, loads, and unloads drivers for an application.</td>
</tr>
<tr>
<td>Driver</td>
<td>Driver vendor</td>
<td>Processes ODBC function calls, submits SQL requests to a particular data source, and returns results to an application. If necessary, translates an application’s request so that it conforms to the SQL syntax supported by the back-end database. See “Types of ODBC drivers” next.</td>
</tr>
</tbody>
</table>
When PowerBuilder is connected to an ODBC data source, you might see messages from the ODBC driver that include the words *single-tier* or *multiple-tier*. These terms refer to the two types of drivers defined by the ODBC standard.

**Single-tier driver**

A single-tier ODBC driver processes both ODBC functions and SQL statements. In other words, a single-tier driver includes the data access software required to manage the data source file and catalog tables. An example of a single-tier ODBC driver is the Microsoft Access driver.

*Figure 2-2: Single-tier ODBC driver*
About the ODBC interface

Multiple-tier driver

A multiple-tier ODBC driver processes ODBC functions, but sends SQL statements to the database engine for processing. Unlike the single-tier driver, a multiple-tier driver does not include the data access software required to manage the data directly.

An example of a multiple-tier ODBC driver is the Sybase SQL Anywhere driver.

*Figure 2-3: Multi-tier ODBC driver*
Ensuring the proper ODBC driver conformance levels

You can access data in PowerBuilder Enterprise or PowerBuilder Professional with ODBC drivers obtained from vendors other than Sybase, such as DBMS vendors.

An ODBC driver obtained from another vendor must meet certain conformance requirements to ensure that it works properly with PowerBuilder. This section describes how to make sure your driver meets these requirements.

What are ODBC conformance levels?

PowerBuilder can access many data sources for which ODBC-compliant drivers exist. However, ODBC drivers manufactured by different vendors might vary widely in the functions they provide.

To ensure a standard level of compliance with the ODBC interface, and to provide a means by which application vendors can determine whether a specific driver provides the functions they need, ODBC defines conformance levels for drivers in two areas:

- **API** Deals with supported ODBC function calls
- **SQL grammar** Deals with supported SQL statements and SQL datatypes

**API conformance levels**

ODBC defines three API conformance levels, in order of increasing functionality:

- **Core** A set of core API functions that corresponds to the functions in the ISO Call Level Interface (CLI) and X/Open CLI specification
- **Level 1** Includes all Core API functions and several extended functions usually available in an OLTP relational DBMS
- **Level 2** Includes all Core and Level 1 API functions and additional extended functions

To ensure the proper ODBC driver API conformance level:

- Sybase recommends that the ODBC drivers you use with PowerBuilder meet *Level 1 or higher* API conformance requirements. However, PowerBuilder might also work with drivers that meet Core level API conformance requirements.
SQL conformance levels

ODBC defines three SQL grammar conformance levels, in order of increasing functionality:

- **Minimum**  A set of SQL statements and datatypes that meets a basic level of ODBC conformance
- **Core**  Includes all Minimum SQL grammar and additional statements and datatypes that roughly correspond to the X/Open and SAG CAE specification (1992)
- **Extended**  Includes all Minimum and Core SQL grammar and an extended set of statements and datatypes that support common DBMS extensions to SQL

❖ **To ensure the proper ODBC driver SQL conformance level:**

- Sybase recommends that the ODBC drivers you use with PowerBuilder meet *Core or higher* SQL conformance requirements. However, PowerBuilder might also work with drivers that meet Minimum level SQL conformance requirements.

### Obtaining ODBC drivers

You can use the ODBC driver for the SQL Anywhere® developer edition from Sybase, provided with PowerBuilder, to access data.

PowerBuilder Enterprise and PowerBuilder Professional also let you access data with *any* Level 1 or higher ODBC-compliant drivers obtained from a vendor other than Sybase. In most cases, these drivers will work with PowerBuilder.

### Using ODBC drivers with PowerBuilder Desktop

If you already have version 2.0 or later of any of the following Microsoft ODBC drivers installed and properly configured, you can use these drivers with PowerBuilder Desktop to connect to your data source:

- Microsoft Access (*.MDB)
- Microsoft Btrieve (*.DDF)
- Microsoft dBASE (*.DBF)
- Microsoft Excel (*.XLS)
- Microsoft FoxPro (*.DBF)
- Microsoft Paradox (*.DB)
- Microsoft Text (*.CSV, *.TXT)
CHAPTER 2  Using the ODBC Interface

Getting help with ODBC drivers

To ensure that you have up-to-date and accurate information about using your ODBC driver with PowerBuilder, get help as needed by doing one or more of the following:

<table>
<thead>
<tr>
<th>To get help on</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the ODBC Data Source Administrator</td>
<td>Click the Help button on each tab.</td>
</tr>
<tr>
<td>Completing the ODBC setup dialog box for your driver</td>
<td>Click the Help button (if present) in the ODBC setup dialog box for your driver.</td>
</tr>
<tr>
<td>Using SQL Anywhere</td>
<td>See the SQL Anywhere documentation.</td>
</tr>
<tr>
<td>Using an ODBC driver obtained from a vendor other than Sybase</td>
<td>See the vendor’s documentation for that driver.</td>
</tr>
<tr>
<td>Troubleshooting your ODBC connection</td>
<td>Check for a technical document that describes how to connect to your ODBC data source. Updated information about connectivity issues is available on the Sybase Support and Downloads Web site at <a href="http://www.sybase.com/support">http://www.sybase.com/support</a>.</td>
</tr>
</tbody>
</table>

Preparing ODBC data sources

The first step in connecting to an ODBC data source is preparing the data source. This ensures that you are able to connect to the data source and use your data in PowerBuilder.

You prepare to use a data source outside PowerBuilder before you start the product, define the data source, and connect to it. The requirements differ for each data source, but in general, preparing to use a data source involves the following steps.

❖ To prepare to use an ODBC data source with PowerBuilder:
  1 If network software is required to access the data source, make sure it is properly installed and configured at your site and on the client workstation.
  2 If database software is required, make sure it is properly installed and configured on your computer or network server.
  3 Make sure the required data files are present on your computer or network server.
Defining ODBC data sources

4. Make sure the names of tables and columns you want to access follow standard SQL naming conventions.

Avoid using blank spaces or database-specific reserved words in table and column names. Be aware of the case-sensitivity options of the DBMS. It is safest to use all uppercase characters when naming tables and columns that you want to access in PowerBuilder.

5. If your database requires it, make sure the tables you want to access have unique indexes.

6. Install both of the following using the PowerBuilder Setup program:
   - The ODBC driver that accesses your data source
   - The ODBC interface

Defining ODBC data sources

Each ODBC data source requires a corresponding ODBC driver to access it. When you define an ODBC data source, you provide information about the data source that the driver requires in order to connect to it. Defining an ODBC data source is often called configuring the data source.

After you prepare to use the data source, you must define it using Microsoft’s ODBC Data Source Administrator utility. This utility can be accessed from the Control Panel in Windows or PowerBuilder’s Database painter.

The rest of this section describes what you need to know to define an ODBC data source in order to access it in the PowerBuilder development environment.

How PowerBuilder accesses the data source

When you access an ODBC data source in PowerBuilder, there are several initialization files and registry entries on your computer that work with the ODBC interface and driver to make the connection.
PBODB115 initialization file

Contents

PBODB115.INI is installed in the \Sybase\Shared\PowerBuilder directory. PowerBuilder uses PBODB115.INI to maintain access to extended functionality in the back-end DBMS, for which ODBC does not provide an API call. Examples of extended functionality are SQL syntax or DBMS-specific function calls.

Editing

In most cases, you do not need to edit PBODB115.INI. In certain situations, however, you might need to add functions to PBODB115.INI for your back-end DBMS.

For instructions, see the Appendix, “Adding Functions to the PBODB115 Initialization File.”

ODBCINST registry entries

Contents

The ODBCINST initialization information is located in the \HKEY_LOCAL_MACHINE\SOFTWARE\ODBC\ODBCINST.INI registry key. When you install an ODBC-compliant driver, ODBCINST.INI is automatically updated with a description of the driver.

This description includes:

• The DBMS or data source associated with the driver
• The drive and directory of the driver and setup DLLs (for some data sources, the driver and setup DLLs are the same)
• Other driver-specific connection parameters

Editing

You do not need to edit the registry key directly to modify connection information. If your driver uses the information in the ODBCINST.INI registry key, the key is automatically updated when you install the driver. This is true whether the driver is supplied by Sybase or another vendor.

ODBC registry entries

Contents

ODBC initialization information is located in the \HKEY_CURRENT_USER\SOFTWARE\ODBC\ODBC.INI registry key. When you define a data source for a particular ODBC driver, the driver writes the values you specify in the ODBC setup dialog box to the ODBC.INI registry key.
The ODBC.INI key contains subkeys named for each defined data source. Each subkey contains the values specified for that data source in the ODBC setup dialog box. The values might vary for each data source but generally include the following:

- Database
- Driver
- Optional description
- DBMS-specific connection parameters

**Editing**

Do not edit the ODBC subkey directly to modify connection information. Instead, use a tool designed to define ODBC data sources and the ODBC configuration automatically, such as the ODBC Data Source Administrator.

**Database profiles registry entry**

**Contents**

Database profiles for all data sources are stored in the registry in

```
HKEY_CURRENT_USER\SOFTWARE\Sybase\PowerBuilder\11.5\DatabaseProfiles.
```

**Editing**

You should not need to edit the profiles directly to modify connection information. These files are updated automatically when PowerBuilder creates the database profile as part of the ODBC data source definition.

You can also edit the profile in the Database Profile Setup dialog box or complete the Database Preferences dialog box in PowerBuilder to specify other connection parameters stored in the registry. (For instructions, see Chapter 13, “Setting Additional Connection Parameters.”)

**Example**

The following example shows a portion of the database profile for an EAS Demo DB data source:

```
DBMS=ODBC
DBParm=ConnectString='DSN=EAS Demo DB V115 DB;UID=dba;PWD=00c61737'
Prompt=0
```

This registry entry example shows the two most important values in a database profile for an ODBC data source:

- **DBMS** The DBMS value (ODBC) indicates that you are using the ODBC interface to connect to the data source.
DBParm  The ConnectString DBParm parameter controls your ODBC data source connection. The connect string must specify the DSN (data source name) value, which tells ODBC which data source you want to connect to. When you select a database profile to connect to a data source, ODBC looks in the ODBC.INI registry key for a subkey that corresponds to the data source name in your profile. ODBC then uses the information in the subkey to load the required libraries to connect to the data source. The connect string can also contain the UID (user ID) and PWD (password) values needed to access the data source.

Defining multiple data sources for the same data

When you define an ODBC data source in PowerBuilder, each data source name must be unique. You can, however, define multiple data sources that access the same data, as long as the data sources have unique names.

For example, assume that your data source is a SQL Anywhere database located in C:\SQLAnywhere\SALES.DB. Depending on your application, you might want to specify different sets of connection parameters for accessing the database, such as different passwords and user IDs.

To do this, you can define two ODBC data sources named Sales1 and Sales2 that specify the same database (C:\SQLAnywhere\SALES.DB) but use different user IDs and passwords. When you connect to the data source using a profile created for either of these data sources, you are using different connection parameters to access the same data.

Displaying Help for ODBC drivers

The online Help for ODBC drivers in PowerBuilder is provided by the driver vendors. It gives help on:

- Completing the ODBC setup dialog box to define the data source
- Using the ODBC driver to access the data source
Help for any ODBC driver

Use the following procedure to display vendor-supplied Help when you are in the ODBC setup dialog box for ODBC drivers.

❖ To display Help for any ODBC driver:

- Click the Help button in the ODBC setup dialog box for your driver.

A Help window displays, describing features in the setup dialog box.

Selecting an ODBC translator

What is an ODBC translator?

Some ODBC drivers allow you to specify a translator when you define the data source. An ODBC translator is a DLL that translates data passing between an application and a data source. Typically, translators are used to translate data from one character set to another.

What you do

Follow these steps to select a translator for your ODBC driver.

❖ To select a translator when using an ODBC driver:

1 In the ODBC setup dialog box for your driver, display the Select Translator dialog box.

   The way you display the Select Translator dialog box depends on the driver and Windows platform you are using. Click Help in your driver’s setup dialog box for instructions on displaying the Select Translator dialog box.

   In the Select Translator dialog box, the translators listed are determined by the values in your ODBCINST.INI registry key.

2 From the Installed Translators list, select a translator to use.

   If you need help using the Select Translator dialog box, click Help.

3 Click OK.

   The Select Translator dialog box closes and the driver performs the translation.
Defining the ODBC interface

To define a connection through the ODBC interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup - ODBC dialog box. You can then select this profile at any time to connect to your data source in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.

Sybase SQL Anywhere

This section describes how to prepare and define a Sybase SQL Anywhere data source in order to connect to it using the SQL Anywhere ODBC driver.

Name change

For versions 6 through 9, the SQL Anywhere database server was called Adaptive Server® Anywhere (ASA).

SQL Anywhere includes two database servers—a personal database server and a network database server. For information about using Sybase SQL Anywhere, see the SQL Anywhere documentation.

Supported versions for SQL Anywhere

The SQL Anywhere ODBC driver supports connection to local and remote databases created with the following:

- PowerBuilder running on your computer
- SQL Anywhere version 10.x
- ASA version 9.x
- ASA version 8.x
- ASA version 7.x
- ASA version 6.x
- SQL Anywhere version 5.x
Basic software components for SQL Anywhere

Figure 2-5 shows the basic software components required to connect to a SQL Anywhere data source in PowerBuilder.

Figure 2-5: Components of a SQL Anywhere connection

Preparing to use the SQL Anywhere data source

Before you define and connect to a SQL Anywhere data source in PowerBuilder, follow these steps to prepare the data source.

❖ To prepare a SQL Anywhere data source:

1. Make sure the database file for the SQL Anywhere data source already exists. You can create a new database by:
• Launching the Create SQL Anywhere Database utility. You can access this utility from the Utilities folder for the ODBC interface in the Database profile or Database painter when PowerBuilder is running on your computer.

This method creates a local SQL Anywhere database on your computer, and also creates the data source definition and database profile for this connection. (For instructions, see the Users Guide.)

• Creating the database some other way, such as with PowerBuilder running on another user’s computer or by using SQL Anywhere outside PowerBuilder. (For instructions, see the SQL Anywhere documentation.)

2 Make sure you have the log file associated with the SQL Anywhere database so that you can fully recover the database if it becomes corrupted.

If the log file for the SQL Anywhere database does not exist, the SQL Anywhere database engine creates it. However, if you are copying or moving a database from another computer or directory, you should copy or move the log file with it.

Defining the SQL Anywhere data source

When you create a local SQL Anywhere database, PowerBuilder automatically creates the data source definition and database profile for you. Therefore, you need only use the following procedure to define a SQL Anywhere data source when you want to access a SQL Anywhere database not created using PowerBuilder on your computer.

❖ To define a SQL Anywhere data source for the SQL Anywhere driver:

1 Select Create ODBC Data Source from the list of ODBC utilities in the Database Profiles dialog box or the Database painter.

2 Select User Data Source and click Next.

3 On the Create New Data Source page, select the SQL Anywhere driver and click Finish.
The ODBC Configuration for SQL Anywhere dialog box displays:

4 You must supply the following values:
   - Data source name on the ODBC tab page
   - User ID and password on the Login tab page
   - Database file on the Database tab page

   Use the Help button to get information about fields in the dialog box.

5 (Optional) To select an ODBC translator to translate your data from one character set to another, click the Select button on the ODBC tab.

   See “Selecting an ODBC translator” on page 28.

6 Click OK to save the data source definition.

Specifying a Start Line value

When the SQL Anywhere ODBC driver cannot find a running personal or network database server using the PATH variable and Database Name setting, it uses the commands specified in the Start Line field to start the database servers.
CHAPTER 2 Using the ODBC Interface

Specify one of the following commands in the Start Line field on the Database tab page, where  \( n \) is the version of SQL Anywhere you are using.

<table>
<thead>
<tr>
<th>Specify this command</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>dbeng(n).exe</td>
<td>Start the personal database server and the database specified in the Database File box</td>
</tr>
<tr>
<td>rteng(n).exe</td>
<td>Start the restricted runtime database server and the database specified in the Database File box</td>
</tr>
</tbody>
</table>

For information on completing the ODBC Configuration For SQL Anywhere dialog box, see the SQL Anywhere documentation.

Support for Transact-SQL special timestamp columns

When you work with a SQL Anywhere table in the DataWindow®, Data Pipeline, or Database painter, the default behavior is to treat any column named timestamp as a SQL Anywhere Transact-SQL special timestamp column.

You can create a Transact-SQL special timestamp column in a SQL Anywhere table.

♦ To create a Transact-SQL special timestamp column in a SQL Anywhere table in PowerBuilder:

1. Give the name timestamp to any column having a timestamp datatype that you want treated as a Transact-SQL special timestamp column. Do this in one of the following ways:
   - In the painter – Select timestamp as the column name. (For instructions, see the Users Guide.)
   - In a SQL CREATE TABLE statement – Follow the “CREATE TABLE example” next.

2. Specify timestamp as the default value for the column. Do this in one of the following ways:
   - In the painter – Select timestamp as the default value for the column. (For instructions, see the Users Guide.)
   - In a SQL CREATE TABLE statement – Follow the “CREATE TABLE example” next.
If you are working with the table in the Data Pipeline painter, select the initial value exclude for the special timestamp column from the drop-down list in the Initial Value column of the workspace.

You must select exclude as the initial value to exclude the special timestamp column from INSERT or UPDATE statements.

For instructions, see the *Users Guide*.

The following `CREATE TABLE` statement defines a SQL Anywhere table named `timesheet` containing three columns: `employee_ID` (integer datatype), `hours` (decimal datatype), and `timestamp` (timestamp datatype and timestamp default value):

```sql
CREATE TABLE timesheet (
    employee_ID INTEGER,
    hours DECIMAL,
    timestamp TIMESTAMP default timestamp
)
```

If you want to change the default behavior, you can specify that PowerBuilder *not* treat SQL Anywhere columns named `timestamp` as Transact-SQL special timestamp columns.

❖ **To specify that PowerBuilder *not* treat columns named `timestamp` as a Transact-SQL special timestamp column:**

- Edit the Sybase SQL Anywhere section of the PBODB115 initialization file to change the value of `SQLSrvrTSName` from `'Yes'` to `'No'`.

After making changes in the initialization file, you must reconnect to the database to have them take effect. See the Appendix, “Adding Functions to the PBODB115 Initialization File.”

**What to do next**

For instructions on connecting to the ODBC data source, see “Connecting to a database” on page 157.
CHAPTER 3 Using the JDBC Interface

About this chapter
This chapter describes the JDBC interface and explains how to prepare to use this interface and how to define the JDBC database profile.

Contents

<table>
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<th>Page</th>
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<td>About the JDBC interface</td>
<td>35</td>
</tr>
<tr>
<td>Preparing to use the JDBC interface</td>
<td>39</td>
</tr>
<tr>
<td>Defining the JDBC interface</td>
<td>41</td>
</tr>
</tbody>
</table>

For more information
For more detailed information about JDBC, go to the Java Web site at http://java.sun.com/products/jdbc/overview.html.

About the JDBC interface

You can access a wide variety of databases through JDBC in PowerBuilder. This section describes what you need to know to use JDBC connections to access your data in PowerBuilder.

What is JDBC?

The JDBC API

Java Database Connectivity (JDBC) is a standard application programming interface (API) that allows a Java application to access any database that supports Structured Query Language (SQL) as its standard data access language.

The JDBC API includes classes for common SQL database activities that allow you to open connections to databases, execute SQL commands, and process results. Consequently, Java programs have the capability to use the familiar SQL programming model of issuing SQL statements and processing the resulting data. The JDBC classes are included in Java 1.1+ and Java 2 as the java.sql package.
About the JDBC interface

The JDBC API defines the following:

- A library of JDBC function calls that connect to a database, execute SQL statements, and retrieve results
- A standard way to connect and log in to a DBMS
- SQL syntax based on the X/Open SQL Call Level Interface or X/Open and SQL Access Group (SAG) CAE specification (1992)
- A standard representation for datatypes
- A standard set of error codes

How JDBC APIs are implemented

JDBC API implementations fall into two broad categories: those that communicate with an existing ODBC driver (a JDBC-ODBC bridge) and those that communicate with a native database API (a JDBC driver that converts JDBC calls into the communications protocol used by the specific database vendor). The PowerBuilder implementation of the JDBC interface can be used to connect to any database for which a JDBC-compliant driver exists.

The PowerBuilder JDB interface

A Java Virtual Machine (JVM) is required to interpret and execute the bytecode of a Java program. The PowerBuilder JDB interface supports the Sun Java Runtime Environment (JRE) versions 1.2 and later.

Using the JDBC interface

You can use the JDBC interface to develop several types of components and/or applications in PowerBuilder:

- **Thin client/server applications**  If a client is already running a JVM (in a running Web browser or inside the operating system), the use of the JDBC interface to access a database does not require the client-side installation and administration of a database driver, which is required when using ODBC.

- **DataWindow objects to be used in a DataWindow Web control for ActiveX**  Using the JDBC interface does not require the installation of a database driver on the client, since the JDBC driver can be downloaded with the Web ActiveX in a CAB file.

- **Transactional components to be deployed on EAServer that access a database through the EAServer JDBC interface**  Using the JDBC interface allows a PowerBuilder transactional component to share the same transaction as another component.
Components of a JDBC connection

In PowerBuilder when you access a database through the JDBC interface, your connection goes through several layers before reaching the database. It is important to understand that each layer represents a separate component of the connection, and that each component might come from a different vendor.

Because JDBC is a standard API, PowerBuilder uses the same interface to access every JDBC-compliant database driver.

Figure 3-1 shows the general components of a JDBC connection.

**Figure 3-1: Components of a JDBC connection**

The JDBC DLL

PowerBuilder provides the `pbjdbc115.dll`. This DLL runs with the Sun Java Runtime Environment (JRE) versions 1.1 and later.

PowerBuilder Java package

PowerBuilder includes a small package of Java classes that gives the JDBC interface the level of error-checking and efficiency (SQLException catching) found in other PowerBuilder interfaces. The package is called `pbjdbc12115.jar` and is found in `Sybase\Shared\PowerBuilder`.
The Java Virtual Machine (JVM) is a component of Java development software. When you install PowerBuilder, the Sun Java Development Kit (JDK), including the Java Runtime Environment (JRE), is installed on your system in Sybase\Shared\PowerBuilder. For PowerBuilder 11.5, JDK 1.5 is installed. This version of the JVM is started when you use a JDBC connection or any other process that requires a JVM and is used throughout the PowerBuilder session.

If you need to use a different JVM, see the instructions in “Preparing to use the JDBC interface” on page 39. For more information about how the JVM is started, see the chapter on deploying your application in Application Techniques.

The JDBC interface can communicate with any JDBC-compliant driver including Sybase jConnect™ for JDBC and the Oracle and IBM Informix JDBC drivers. These drivers are native-protocol, all-Java drivers—that is, they convert JDBC calls into the SQL syntax supported by the databases.

Accessing Unicode data

Using the ODBC interface, PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases but does not convert data between Unicode and ANSI/DBCS. When character data or command text is sent to the database, PowerBuilder sends a Unicode string. The driver must guarantee that the data is saved as Unicode data correctly. When PowerBuilder retrieves character data, it assumes the data is Unicode.

A Unicode database is a database whose character set is set to a Unicode format, such as UTF-8, UTF-16, UCS-2, or UCS-4. All data must be in Unicode format, and any data saved to the database must be converted to Unicode data implicitly or explicitly.

A database that uses ANSI (or DBCS) as its character set might use special datatypes to store Unicode data. Columns with these datatypes can store only Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.

**JDBC registry entries**

When you access data through the PowerBuilder JDBC interface, PowerBuilder uses an internal registry to maintain definitions of SQL syntax, DBMS-specific function calls, and default DBParm parameter settings for the back-end DBMS. This internal registry currently includes subentries for SQL Anywhere, Adaptive Server Enterprise, and Oracle databases.
In most cases you do not need to modify the JDBC entries. However, if you do need to customize the existing entries or add new entries, you can make changes to the system registry by editing the registry directly or executing a registry file. Changes you introduce in the system registry override the PowerBuilder internal registry entries. See the `egreg.txt` file in `Sybase\Shared\PowerBuilder` for an example of a registry file you could execute to change entry settings.

**Supported versions for JDBC**

The PowerBuilder JDBC interface uses the `pbjdbc115.dll` to access a database through a JDBC driver.

To use the JDBC interface to access the jConnect driver, use jConnect Version 4.2 or higher. For information on jConnect, see your Sybase documentation.

To use the JDBC interface to access the Oracle JDBC driver, use Oracle 8 JDBC driver Version 8.0.4 or higher. For information on the Oracle JDBC driver, see your Oracle documentation.

**Supported JDBC datatypes**

Like ODBC, the JDBC interface compiles, sorts, presents, and uses a list of datatypes that are native to the back-end database to emulate as much as possible the behavior of a native interface.

**Preparing to use the JDBC interface**

Before you define the interface and connect to a database through the JDBC interface, follow these steps to prepare the database for use:

1. Configure the database server for its JDBC connection and install its JDBC-compliant driver and network software.
2. Install the JDBC driver.
3. Set or verify the settings in the CLASSPATH environment variable and the Java tab of the System Options dialog box.
Preparing to use the JDBC interface

<table>
<thead>
<tr>
<th>Step 1: Configure the database server</th>
<th>You must configure the database server to make JDBC connections as well as install the JDBC driver and network software.</th>
</tr>
</thead>
<tbody>
<tr>
<td>❖ To configure the database server for its JDBC connection:</td>
<td>1. Make sure the database server is configured to make JDBC connections. For configuration instructions, see your database vendor’s documentation.</td>
</tr>
<tr>
<td></td>
<td>2. Make sure the appropriate JDBC driver software is installed and running on the database server. The driver vendor’s documentation should provide the driver name, URL format, and any driver-specific properties you need to specify in the database profile. For notes about the jConnect driver, see “Configuring the jConnect driver” on page 40.</td>
</tr>
<tr>
<td></td>
<td>3. Make sure the required network software (such as TCP/IP) is installed and running on your computer and is properly configured so that you can connect to the database server at your site. You must install the network communication driver that supports the network protocol and operating system platform you are using. For installation and configuration instructions, see your network or database administrator.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Install the JDBC driver</th>
<th>In the PowerBuilder Setup program, select the Typical install, or select the Custom install and select the JDBC driver.</th>
</tr>
</thead>
</table>

| Step 3: Verify or set the settings in the CLASSPATH variable and Java tab | Verify that the settings in the PATH and CLASSPATH environment variables or the Classpaths list on the Java tab of the PowerBuilder System Options dialog box point to the appropriate, fully qualified file names, or set them. If you are using the JDK installed with PowerBuilder, you do not need to make any changes to these environment variables. If you are using JDK 1.2 or later, you do not need to include any Sun Java VM packages in your CLASSPATH variable, but your PATH environment variable must include an entry for the Sun Java VM library, jvm.dll (for example, path\JDK15\JRE\bin\client). |

| Configuring the jConnect driver | If you are using the Sybase jConnect driver, make sure to complete the required configuration steps such as installing the JDBC stored procedures in Adaptive Server databases. Also, verify that the CLASSPATH environment variable on your computer or the Classpaths list on the Java tab of the PowerBuilder System Options dialog box includes an entry pointing to the location of the jConnect driver. |
For example, if you are using jConnect 6.05, you should include an entry similar to the following:

C:\Program Files\Sybase\jConnect-6.05\classes\jconn3.jar

For more information about configuring jConnect, see the jConnect for JDBC documentation.

---

**Defining the JDBC interface**

**Defining the profile**

To define a connection through the JDBC interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup - JDBC dialog box. You can then select this profile at any time to connect to your database in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.

To provide maximum flexibility (as provided in the JDBC API), the JDBC interface supports database connections made with different combinations of connection parameters:

- **Driver name, URL, and Properties** You should specify values for this combination of connection parameters if you need to define driver-specific properties. When properties are defined, you must also define the user ID and password in the properties field.

  For example, when connecting to the jConnect driver, enter the following values in the Driver-Specific Properties field:

  SQLINITSTRING=set TextSize 32000;
  user=sys;password=manager;

- **Driver name, URL, User ID, and Password** You should specify values for this combination of connection parameters if you do not need to define any driver-specific properties.

  Driver Name: com.sybase.jdbc3.jdbc.SybDriver
  URL: jdbc:sybase:Tds:localhost:2638
  Login ID: dba
  Password: sql
Defining the JDBC interface

- **Driver name and URL** You should specify values for this combination of connection parameters when the user ID and password are included as part of the URL.

  For example, when connecting to the Oracle JDBC driver, the URL can include the user ID and password:

  jdbc:oracle:thin:userid/password@host:port:dbname

**Specifying properties when connecting to jConnect**

If you plan to use the blob datatype in PowerBuilder, you should be aware that jConnect imposes a restriction on blob size. Consequently, before you make your database connection from PowerBuilder, you might want to reset the blob size to a value greater than the maximum size you plan to use.

To set blob size, define the jConnect property SQLINITSTRING in the Driver-Specific Properties box on the Connection page. The SQLINITSTRING property is used to define commands to be passed to the back-end database server:

  SQLINITSTRING=set TextSize 32000;

Remember that if you define a property in the Driver-Specific Properties box, you must also define the user ID and password in this box.
CHAPTER 4 Using the OLE DB Interface

About this chapter
This chapter describes the OLE DB interface and explains how to prepare to use this interface and how to define the OLE DB database profile.

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<table>
<thead>
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<td>About the OLE DB interface</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Defining the OLE DB interface</td>
<td>49</td>
</tr>
</tbody>
</table>

For more information
This chapter gives general information about using the OLE DB interface. For more detailed information:

- Use the online Help provided by the data provider vendor.
- Check to see if there is a technical document that describes how to connect to your OLE DB data provider. Any updated information about connectivity issues is available from Sybase Support and Downloads Web site at http://www.sybase.com/support.

About the OLE DB interface
You can access a wide variety of data through OLE DB data providers in PowerBuilder. This section describes what you need to know to use OLE DB connections to access your data in PowerBuilder.

Supported OLE DB data providers
For a complete list of the OLE DB data providers supplied with PowerBuilder and the data they access, see “Supported Database Interfaces” in the online Help.
What is OLE DB?

OLE DB is a standard application programming interface (API) developed by Microsoft. It is a component of Microsoft’s Data Access Components software. OLE DB allows an application to access a variety of data for which OLE DB data providers exist. It provides an application with uniform access to data stored in diverse formats, such as indexed-sequential files like Btrieve, personal databases like Paradox, productivity tools such as spreadsheets and electronic mail, and SQL-based DBMSs.

The OLE DB interface supports direct connections to SQL-based databases.

Applications like PowerBuilder that provide an OLE DB interface can access data for which an OLE DB data provider exists. An OLE DB data provider is a dynamic link library (DLL) that implements OLE DB function calls to access a particular data source.

The PowerBuilder OLE DB interface can connect to any OLE DB data provider that supports the OLE DB object interfaces listed in Table 4-1. An OLE DB data provider must support these interfaces in order to adhere to the Microsoft OLE DB 2.0 specification.

<table>
<thead>
<tr>
<th>Table 4-1: Required OLE DB interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAccessor</td>
</tr>
<tr>
<td>IColumnsInfo</td>
</tr>
<tr>
<td>ICommand</td>
</tr>
<tr>
<td>ICommandProperties</td>
</tr>
<tr>
<td>ICommandText</td>
</tr>
<tr>
<td>IDbCreateCommand</td>
</tr>
<tr>
<td>IDbCreateSession</td>
</tr>
</tbody>
</table>

In addition to the required OLE DB interfaces, PowerBuilder also uses the OLE DB interfaces listed in Table 4-2 to provide further functionality.

<table>
<thead>
<tr>
<th>Table 4-2: Additional OLE DB interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLE DB interface</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>ICommandPrepare</td>
</tr>
<tr>
<td>IDbInfo</td>
</tr>
<tr>
<td>IDbCommandWithParameters</td>
</tr>
<tr>
<td>IErrorInfo</td>
</tr>
<tr>
<td>IErrorRecords</td>
</tr>
</tbody>
</table>
Accessing Unicode data

Using the OLE DB interface, PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases but does not convert data between Unicode and ANSI/DBCS. When character data or command text is sent to the database, PowerBuilder sends a Unicode string. The data provider must guarantee that the data is saved as Unicode data correctly. When PowerBuilder retrieves character data, it assumes the data is Unicode.

A Unicode database is a database whose character set is set to a Unicode format, such as UTF-8, UTF-16, UCS-2, or UCS-4. All data must be in Unicode format, and any data saved to the database must be converted to Unicode data implicitly or explicitly.

A database that uses ANSI (or DBCS) as its character set might use special datatypes to store Unicode data. Columns with these datatypes can store only Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.

<table>
<thead>
<tr>
<th>OLE DB interface</th>
<th>Use in PowerBuilder</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIndexDefinition</td>
<td>Creating indexes for the extended attribute system tables. Also creating indexes in the Database painter. If this interface is not supported, PowerBuilder looks for index definition syntax in the \podb\115.ini file.</td>
</tr>
<tr>
<td>IMultipleResults</td>
<td>Providing information.</td>
</tr>
<tr>
<td>IRowsetChange</td>
<td>Populating the extended attribute system tables when they are created. Also, for updating blobs.</td>
</tr>
<tr>
<td>IRowsetUpdate</td>
<td>Creating the extended attribute system tables.</td>
</tr>
<tr>
<td>ISQLErrorInfo</td>
<td>Providing error information.</td>
</tr>
<tr>
<td>ISupportErrorInfo</td>
<td>Providing error information.</td>
</tr>
<tr>
<td>ITableDefinition</td>
<td>Creating the extended attribute system tables and also for creating tables in the Database painter. If this interface is not supported, the following behavior results:</td>
</tr>
<tr>
<td></td>
<td>• PowerBuilder looks for table definition syntax in the \podb\115.ini file</td>
</tr>
<tr>
<td></td>
<td>• PowerBuilder catalog tables cannot be used</td>
</tr>
<tr>
<td></td>
<td>• DDL and DML operations, like modifying columns or editing data in the database painter, do not function properly</td>
</tr>
<tr>
<td>ITransactionLocal</td>
<td>Supporting transactions. If this interface is not supported, PowerBuilder defaults to AutoCommit mode.</td>
</tr>
</tbody>
</table>
Components of an OLE DB connection

When you access an OLE DB data provider in PowerBuilder, your connection goes through several layers before reaching the data provider. It is important to understand that each layer represents a separate component of the connection, and that each component might come from a different vendor.

Because OLE DB is a standard API, PowerBuilder uses the same interface to access every OLE DB data provider. As long as an OLE DB data provider supports the object interfaces required by PowerBuilder, PowerBuilder can access it through the OLE DB interface.

Figure 4-1 shows the general components of a OLE DB connection.

Figure 4-1: Components of an OLE DB connection

Obtaining OLE DB data providers

PowerBuilder Enterprise lets you access data with any OLE DB data provider obtained from a vendor other than Sybase if that data provider supports the OLE DB object interfaces required by PowerBuilder. In most cases, these drivers work with PowerBuilder. However, Sybase might not have tested the drivers to verify this.
Supported versions for OLE DB

The OLE DB interface uses a DLL named PBOLE115.DLL to access a database through an OLE DB data provider.

Required OLE DB version
To use the OLE DB interface to access an OLE DB database, you must connect through an OLE DB data provider that supports OLE DB version 2.0 or later. For information on OLE DB specifications, see the Microsoft documentation at http://msdn.microsoft.com/en-us/library/default.aspx.

Preparing to use the OLE DB interface

Before you define the interface and connect to a data provider through OLE DB:

1. Install and configure the database server, network, and client software.
2. Install the OLE DB interface and the OLE DB data provider that accesses your data source.
3. Install Microsoft’s Data Access Components software on your machine.
4. If required, define the OLE DB data source.

You must install and configure the database server and install the network software and client software.

❖ To install and configure the database server, network, and client software:

1. Make sure the appropriate database software is installed and running on its server.
   
   You must obtain the database server software from your database vendor. For installation instructions, see your database vendor’s documentation.

2. Make sure the required network software (such as TCP/IP) is installed and running on your computer and is properly configured so that you can connect to the data server at your site. You must install the network communication driver that supports the network protocol and operating system platform you are using.

   For installation and configuration instructions, see your network or data source administrator.
Preparing to use the OLE DB interface

3 If required, install the appropriate client software on each client computer on which PowerBuilder is installed.

**Client software requirements**
To determine client software requirements, see your database vendor’s documentation.

---

**Step 2: Install the OLE DB interface and data provider**

In the PowerBuilder Setup program, select the Custom install and select the OLE DB provider that accesses your database. You can install one or more of the OLE DB data providers shipped with PowerBuilder, or you can install data providers from another vendor later.

The PowerBuilder OLE DB interface requires the functionality of the Microsoft Data Access Components (MDAC) version 2.8 or higher software. Version 2.8 is distributed with Windows XP Service Pack 2 and Windows Server 2003.

To check the version of MDAC on your computer, you can download and run the MDAC Component Checker utility from the MDAC Downloads page at http://msdn.microsoft.com/en-us/data/aa937730.aspx.

On the Windows Vista operating system, Windows Data Access Components (DAC) 6.0 includes some changes to work with Vista but is otherwise functionally equivalent to MDAC 2.8.

---

**Step 3: Install the Microsoft Data Access Components software**

Several Microsoft OLE DB data providers are automatically installed with MDAC, including the providers for SQL Server (SQLOLEDB) and ODBC (MSDASQL).

---

**Step 4: Define the OLE DB data source**

Once the OLE DB data provider is installed, you might have to define the OLE DB data source the data provider will access. How you define the data source depends on the OLE DB data provider you are using and the vendor who provided it.

If you are connecting to an ODBC data provider (such as Microsoft’s OLE DB Provider for ODBC), you must define the ODBC data source as you would if you were using a direct ODBC connection. To define an ODBC data source, use Microsoft’s ODBC Data Source Administrator. You can access this utility from the Control Panel in Windows or from the Database painter or Database Profile Setup dialog box in PowerBuilder.
## Defining the OLE DB interface

### Using the OLE DB Database Profile Setup

To define a connection through the OLE DB interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup – OLE DB dialog box. You can then select this profile anytime to connect to your data in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.

### Specifying connection parameters

You must supply values for the Provider and Data Source connection parameters. Select a data provider from the list of installed data providers in the Provider drop-down list. The Data Source value varies depending on the type of data source connection you are making. For example:

- If you are using Microsoft’s OLE DB Provider for ODBC to connect to the EAS Demo DB, you select MSDASQL as the Provider value and enter the actual ODBC data source name (for example, EAS Demo DB) as the Data Source value.

- If you are using Microsoft’s OLE DB Provider for SQL Server, you select SQLOLEDB as the Provider value and enter the actual server name as the Data Source value. You must also use the Extended Properties field to provide the database name (for example, Database=Pubs) since you can have multiple instances of a database.

### Using the Data Link API

The Data Link option allows you to access Microsoft’s Data Link API, which allows you to define a file or use an existing file that contains your OLE DB connection information. A Data Link file is identified with the suffix .udl. If you use a Data Link file to connect to your data source, all other settings you make in the OLE DB Database Profile Setup dialog box are ignored.

To launch this option, select the File Name check box on the Connection tab and double-click on the button next to the File Name box. (You can also launch the Data Link API in the Database painter by double-clicking on the Manage Data Links utility included with the OLE DB interface in the list of Installed Database Interfaces.)

Defining the OLE DB interface
CHAPTER 5

Using the ADO.NET Interface

About this chapter
This chapter describes the ADO.NET interface and explains how to prepare to use this interface and how to define an ADO.NET database profile.

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<tr>
<td>Defining the ADO.NET interface</td>
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</tr>
</tbody>
</table>

For more information
This chapter gives general information about using the ADO.NET interface. For more detailed information:

- Use the online Help provided by the data provider vendor.
- Check to see if there is a technical document that describes how to connect to your ADO.NET data provider. Any updated information about connectivity issues is available from the Sybase Customer Service and Support Web site at http://www.sybase.com/support.

About ADO.NET

ADO.NET is a set of technologies that provides native access to data in the Microsoft .NET Framework. It is designed to support an n-tier programming environment and to handle a disconnected data architecture. ADO.NET is tightly integrated with XML and uses a common data representation that can combine data from disparate sources, including XML.

One of the major components of ADO.NET is the .NET Framework data provider, which connects to a database, executes commands, and retrieves results.
Microsoft provides .NET Framework data providers for SQL Server and OLE DB with the .NET Framework, and data providers for ODBC and Oracle can be downloaded from the Microsoft Web site. You can also obtain .NET Framework data providers from other vendors, such as the .NET Framework Data Provider for Adaptive Server Enterprise from Sybase.

To connect to a database using the PowerBuilder ADO.NET database interface, you must use a .NET Framework data provider.

Using the ADO.NET interface, PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases but does not convert data between Unicode and ANSI/DBCS. When character data or command text is sent to the database, PowerBuilder sends a Unicode string. The data provider must guarantee that the data is saved as Unicode data correctly. When PowerBuilder retrieves character data, it assumes the data is Unicode.

A Unicode database is a database whose character set is set to a Unicode format, such as UTF-8, UTF-16, UCS-2, or UCS-4. All data must be in Unicode format, and any data saved to the database must be converted to Unicode data implicitly or explicitly.

A database that uses ANSI (or DBCS) as its character set might use special datatypes to store Unicode data. Columns with these datatypes can store only Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.

About the PowerBuilder ADO.NET database interface

You can use the PowerBuilder ADO.NET database interface to connect to a data source such as Adaptive Server® Enterprise, Oracle, and Microsoft SQL Server, as well as to data sources exposed through OLE DB and XML, in much the same way as you use the PowerBuilder ODBC and OLE DB database interfaces.

Performance
You might experience better performance if you use a native database interface. The primary purpose of the ADO.NET interface is to support shared connections with other database constructs such as the .NET DataGrid in Sybase DataWindow .NET.
Components of an ADO.NET connection

When you access a database using ADO.NET in PowerBuilder, your connection goes through several layers before reaching the database. It is important to understand that each layer represents a separate component of the connection, and that components might come from different vendors.

The PowerBuilder ADO.NET interface consists of a driver (pbado115.dll) and a server (either Sybase.PowerBuilder.Db.dll or Sybase.PowerBuilder.DbExt.dll). The server has dependencies on a file called pbrth115.dll. These DLLs must be deployed with an application that connects to a database using ADO.NET. For Oracle 10g or Adaptive Server 15 or later, use Sybase.PowerBuilder.DbExt.dll. For earlier versions and other DBMSs, use Sybase.PowerBuilder.Db.dll.

The DataWindow .NET database interface for ADO.NET supports the ADO.NET data providers listed in Table 5-1.

Table 5-1: Supported ADO.NET data providers

<table>
<thead>
<tr>
<th>Data Provider</th>
<th>Namespace</th>
</tr>
</thead>
<tbody>
<tr>
<td>.NET Framework Data Provider for OLE DB</td>
<td>System.Data.OleDb</td>
</tr>
<tr>
<td>.NET Framework Data Provider for SQL Server</td>
<td>System.Data.SqlClient</td>
</tr>
<tr>
<td>Oracle Data Provider for .NET (ODP.NET)</td>
<td>Oracle.DataAccess.Client</td>
</tr>
<tr>
<td>Sybase ADO.NET Data Provider for Adaptive Server Enterprise (ASE)</td>
<td>Sybase.Data.AseClient</td>
</tr>
</tbody>
</table>

Additional .NET Framework data providers may be supported in future releases. Please see the release bulletin for the latest information.
Figure 5-1 shows the general components of an ADO.NET connection using the OLE DB .NET Framework data provider.

**Figure 5-1: Components of an ADO.NET OLE DB connection**

![Diagram of ADO.NET OLE DB connection components]

Figure 5-2 shows the general components of an ADO.NET connection using a native ADO.NET data provider.
OLE DB data providers

When you use the .NET Framework data provider for OLE DB, you connect to a database through an OLE DB data provider, such as Microsoft's SQLOLEDB or MSDAORA or a data provider from another vendor.

The .NET Framework Data Provider for OLE DB does not work with the MSDASQL provider for ODBC, and it does not support OLE DB version 2.5 interfaces.

You can use any OLE DB data provider that supports the OLE DB interfaces listed in Table 5-2 with the OLE DB .NET Framework data provider. For more information about supported providers, see the topic on .NET Framework data providers in the Microsoft .NET Framework Developer's Guide.
Preparing to use the ADO.NET interface

The PowerBuilder ADO.NET interface supports connection to SQL Anywhere, Adaptive Server Enterprise, Microsoft SQL Server, Oracle, Informix, and Microsoft Access with the OLE DB .NET Framework data provider.

After you install the data provider, you might need to define a data source for it.

<table>
<thead>
<tr>
<th>OLE DB object</th>
<th>Required interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLE DB Services</td>
<td>IDbInitialize</td>
</tr>
<tr>
<td>DataSource</td>
<td>IDbInitialize</td>
</tr>
<tr>
<td></td>
<td>IDbCreateSession</td>
</tr>
<tr>
<td></td>
<td>IDbProperties</td>
</tr>
<tr>
<td></td>
<td>IPersist</td>
</tr>
<tr>
<td>Session</td>
<td>ISessionProperties</td>
</tr>
<tr>
<td></td>
<td>IOpenRowset</td>
</tr>
<tr>
<td>Command</td>
<td>ICommandText</td>
</tr>
<tr>
<td></td>
<td>ICommandProperties</td>
</tr>
<tr>
<td>MultipleResults</td>
<td>IMultipleResults</td>
</tr>
<tr>
<td>RowSet</td>
<td>IRowset</td>
</tr>
<tr>
<td></td>
<td>IAccessor</td>
</tr>
<tr>
<td></td>
<td>IColumnsInfo</td>
</tr>
<tr>
<td></td>
<td>IRowsetInfo (only required if DBTYPE_HCHAPTER is supported)</td>
</tr>
<tr>
<td>Error</td>
<td>IErrorInfo</td>
</tr>
<tr>
<td></td>
<td>IErrorRecords</td>
</tr>
</tbody>
</table>

Preparing to use the ADO.NET interface

Before you define the interface and connect to a database using ADO.NET:

1. Install and configure the database server, network, and client software.
2. Install the ADO.NET interface.
3. Install Microsoft’s Data Access Components version 2.6 or higher software on your machine.
Step 1: Install and configure the data server

You must install and configure the database server and install the network software and client software.

❖ **To install and configure the database server, network, and client software:**

1. Make sure the appropriate database software is installed and running on its server.
   
   You must obtain the database server software from your database vendor. For installation instructions, see your database vendor’s documentation.

2. Make sure the required network software (such as TCP/IP) is installed and running on your computer and is properly configured so that you can connect to the data server at your site. You must install the network communication driver that supports the network protocol and operating system platform you are using.
   
   For installation and configuration instructions, see your network or data source administrator.

3. If required, install the appropriate client software on each client computer on which PowerBuilder is installed.

**Client software requirements**

To determine client software requirements, see your database vendor’s documentation.

---

Step 2: Install the ADO.NET interface

In the PowerBuilder Setup program, select the Custom install and select the ADO.NET database interface.

Step 3: Install the Microsoft Data Access Components software

The PowerBuilder ADO.NET interface requires the functionality of the Microsoft Data Access Components (MDAC) version 2.8 or higher software. Version 2.8 is distributed with Windows XP Service Pack 2 and Windows Server 2003.

To check the version of MDAC on your computer, you can download and run the MDAC Component Checker utility from the MDAC Downloads page at http://msdn.microsoft.com/en-us/data/aa937730.aspx.

On the Windows Vista operating system, Windows Data Access Components (DAC) 6.0 includes some changes to work with Vista but is otherwise functionally equivalent to MDAC 2.8.
OLE DB data providers installed with MDAC

Several Microsoft OLE DB data providers are automatically installed with MDAC, including the providers for SQL Server (SQLOLEDB) and ODBC (MSDASQL).

Defining the ADO.NET interface

Using the ADO.NET Database Profile Setup

To define a connection using the ADO.NET interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup – ADO.NET dialog box. You can then select this profile at any time to connect to your data in PowerBuilder.

For information on how to define a database profile, see “Using database profiles” on page 7.

Specifying connection parameters

You must supply a value for the Namespace and DataSource connection parameters and for the User ID and Password. When you use the System.Data.OleDb namespace, you must also select a data provider from the list of installed data providers in the Provider drop-down list.

The Data Source value varies depending on the type of data source connection you are making. For example, if you are using Microsoft’s OLE DB Provider for SQL Server, you select SQLOLEDB as the Provider value and enter the actual server name as the Data Source value. In the case of Microsoft SQL Server, you must also use the Extended Properties field to provide the database name (for example, Database=Pubs) since you can have multiple instances of a database.

Using the Data Link API with OLE DB

The Data Link option allows you to access Microsoft’s Data Link API, which allows you to define a file or use an existing file that contains your OLE DB connection information. A Data Link file is identified with the suffix .udl.

To launch this option, select the File Name check box on the Connection page and double-click the button next to the File Name box. (You can also launch the Data Link API in the Database painter by double-clicking the Manage Data Links utility included with the OLE DB interface in the list of Installed Database Interfaces.)

For more information on using the Data Link API, see Microsoft’s Universal Data Access Web site at http://msdn.microsoft.com/en-us/data/default.aspx.
Using a Data Link file versus setting the database parameters
If you use a Data Link file to connect to your data source, all other
database-specific settings you make in the ADO.NET Database Profile Setup
dialog box are ignored.

Getting identity column values
You can use the standard `select @@identity` syntax to obtain the value of an
identity column. You can also use an alternative syntax, such as `select
scope_identity()`, by adding sections to a .NET configuration file for your
application.

The following example shows the general structure of a configuration file with
a database configuration section and one custom configuration section:

```xml
<configuration>
  <configSections>
    <sectionGroup name="dbConfiguration">
      <section name="mycustomconfig"
        type="Sybase.PowerBuilder.Db.DbConfiguration,
        Sybase.PowerBuilder.Db"
      />
    </sectionGroup>
  </configSections>

  <dbConfiguration>
    <mycustomconfig dbParm="optional_value"
      getIdentity="optional_syntax"
    />
  </dbConfiguration>
</configuration>
```

❖ To add a database configuration section to a .NET configuration file:

1. In the `<configSections>` section of the configuration file, add a
   `<sectionGroup>` element with the name “dbConfiguration”. This name is
case sensitive.

   `<configSections>` must appear at the beginning of the configuration file,
before the `<runtime>` section if any.
Defining the ADO.NET interface

2 In the dbConfiguration <sectionGroup> element, add one or more <section> elements.

   For each section, specify a name of your choice and a type. The type is the strong name of the assembly used to parse this section of the configuration file.

3 Close the <section> and <configSections> elements and add a <dbConfiguration> element.

4 For each section you defined in step 2, add a new element to the <dbConfiguration> element.

   For example, if you defined a section called config1, add a config1 element. Each element has two attributes: dbParm and getIdentity. You can set either or both of these attributes.

   The dbParm value sets the value of the DBParm parameter of the transaction object. It has a maximum length of 1000 characters. If you set a value for a parameter in the configuration file, any value that you set in code or in the Database Profile Setup dialog box is overridden.

   The getIdentity value specifies the syntax used to retrieve the value of an identity column. It has a maximum length of 100 characters. If you do not specify a value for getIdentity, the select @@identity syntax is used.

Sample configuration file

This sample configuration file for PowerBuilder 11.5 is called pb115.exe.config. It contains three custom configurations. The <myconfig> element sets both the dbParm and getIdentity attributes. <myconfig1> sets getIdentity only, and <myconfig2> sets dbParm only. The <runtime> section is in the configuration file that ships with PowerBuilder but would not be included in the configuration file that you ship with your application, which would have the same name as your application with the extension exe.config. For .NET Web Forms targets, you add the custom configurations to the web.config file.

<configuration>
  <configSections>
    <sectionGroup name="dbConfiguration">
      <section name="myconfig"
      />
      <section name="myconfig1"
      />
    </sectionGroup>
  </configSections>
</configuration>
<section name="myconfig2"
type="Sybase.PowerBuilder.Db.DbConfiguration,
Sybase.PowerBuilder.Db"
/>
</sectionGroup>
</configSections>

<runtime>
<assemblyBinding xmlns="urn:schemas-microsoft-com:asm.v1">
<dependentAssembly>
<assemblyIdentity name="Sybase.PowerBuilder.Db"/>
<codeBase href="file:///C:/Program Files/
Sybase/PowerBuilder 11.5/DotNET/bin/
Sybase.PowerBuilder.Db.dll"/>
</dependentAssembly>
<dependentAssembly>
<assemblyIdentity name="Sybase.PowerBuilder.WebService.WSDL"/>
<codeBase href="file:///C:/Program Files/
Sybase/PowerBuilder 11.5/DotNET/bin/
Sybase.PowerBuilder.WebService.WSDL.dll"/>
</dependentAssembly>
<dependentAssembly>
<codeBase href="file:///C:/Program Files/
Sybase/PowerBuilder 11.5/DotNET/bin/
Runtime.dll"/>
</dependentAssembly>
<probing privatePath="DotNET/bin"/>
</assemblyBinding>
</runtime>

<dbConfiguration>
<myconfig dbParm="disablebind=1"
getIdentity="select scope_identity()"
/>
<myconfig1 getIdentity="select scope_identity()"
/>
<myconfig2 dbParm="Namespace='Oracle.DataAccess.Client',
DataSource='ora10gen',DisableBind=1,
NCharBind=1,ADORelease='10.1.0.301'"
Specifying the custom configuration to be used

On the System tab page in the Database Profile Setup dialog box for ADO.NET or in code, specify the name of the custom configuration section you want to use as the value of the DbConfigSection parameter. For example:

```sql
Sqlca.DBParm="DbConfigSection='myconfig'"
```

If you set any parameters in the profile or in code that are also set in the configuration file, the value specified in the configuration file takes precedence.

The configuration file must be present in the same directory as the executable file and must have the same name with the extension .config.
This part describes how to set up and define database connections accessed through one of the native database interfaces.
CHAPTER 6

Using Native Database Interfaces

About this chapter

This chapter describes native database interfaces. The following chapters explain how to prepare to use the database and define any unique database interface parameters so that you can access your data.

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About native database interfaces

The native database interfaces provide native connections to many databases and DBMSs. This chapter describes how the native database interfaces access these databases.

The native database interfaces are not provided with the Desktop and Professional editions of PowerBuilder. You can upgrade to PowerBuilder Enterprise to use the native database interfaces.

For a complete list of the supported native database interfaces, see “Supported Database Interfaces” in online Help.

A native database interface is a direct connection to your data in PowerBuilder.

Each native database interface uses its own interface DLL to communicate with a specified database through a vendor-specific database API. For example, the SQL Native Client interface for Microsoft SQL Server uses a DLL named PBSNC115.DLL to access the database, whereas the Oracle 11g database interface accesses the database through PBORA115.DLL.

In contrast, a standard database interface uses a standard API to communicate with the database. For example, PowerBuilder can use a single-interface DLL (PBODB115.DLL) to communicate with the ODBC Driver Manager and corresponding driver to access any ODBC data source.
Components of a database interface connection

When you use a native database interface to access a database, your connection goes through several layers before reaching the data. Each layer is a separate component of the connection and each component might come from a different vendor.

**Figure 6-1: Components of a database connection**

For diagrams showing the specific components of your connection, see “Basic software components” in the chapter for your native database interface.
CHAPTER 6   Using Native Database Interfaces

Using a native database interface

You perform several basic steps to use a native database interface to access a database.

The first step in connecting to a database through a native database interface is to prepare to use the database. Preparing the database ensures that you will be able to access and use your data in PowerBuilder.

You must prepare the database outside PowerBuilder before you start the product, then define the database interface and connect to it. The requirements differ for each database—but in general, preparing a database involves four basic steps.

❖ To prepare to use your database with PowerBuilder:

1 Make sure the required database server software is properly installed and configured at your site.

2 If network software is required, make sure it is properly installed and configured at your site and on the client computer so that you can connect to the database server.

3 Make sure the required database client software is properly installed and configured on the client computer. (Typically, the client computer is the one running PowerBuilder.)

   You must obtain the client software from your database vendor and make sure that the version you install supports all of the following:
   - The operating system running on the client computer
   - The version of the database that you want to access
   - The version of PowerBuilder that you are running

4 Verify that you can connect to the server and database you want to access outside PowerBuilder.

For specific instructions to use with your database, see “Preparing to use the database” in the chapter for your native database interface.

❖ To prepare to use your database with PowerBuilder:

1 Make sure the required database server software is properly installed and configured at your site.

2 If network software is required, make sure it is properly installed and configured at your site and on the client computer so that you can connect to the database server.

3 Make sure the required database client software is properly installed and configured on the client computer. (Typically, the client computer is the one running PowerBuilder.)

   You must obtain the client software from your database vendor and make sure that the version you install supports all of the following:
   - The operating system running on the client computer
   - The version of the database that you want to access
   - The version of PowerBuilder that you are running

4 Verify that you can connect to the server and database you want to access outside PowerBuilder.

For specific instructions to use with your database, see “Preparing to use the database” in the chapter for your native database interface.
For general instructions, see “About creating database profiles” on page 7. For instructions about defining database interface parameters unique to a particular database, see “Preparing to use the database” in the chapter for your database interface.

For more information

The following chapters give general information about using each native database interface. For more detailed information:

- Check to see if there is a technical document that describes how to connect to your database. Any updated information about connectivity issues is available from the Sybase Support and Downloads Web site at http://www.sybase.com/support.

- Ask your network or system administrator for assistance when installing and setting up the database server and client software at your site.
CHAPTER 7
Using Adaptive Server Enterprise

About this chapter
This section describes how to use the Adaptive Server Enterprise database interfaces in PowerBuilder.

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Supported versions for Adaptive Server

You can access Adaptive Server versions 11.x, 12.x, and 15.x using the SYC Adaptive Server database interface. Use of this interface to access other Open Server™ programs is not supported. The SYC database interface uses a DLL named PBSYC115.DLL to access the database through the Open Client CT-Lib API.

You can also access Adaptive Server version 15.x using the ASE Adaptive Server database interface. Use of this interface to access other Open Server™ programs is not supported. The Adaptive Server database interface uses a DLL named PBASE115.DLL to access the database through the Open Client CT-Lib API. To use this interface, the Adaptive Server 15 client must be installed on the client computer. The ASE interface supports large identifiers with up to 128 characters.
Supported Adaptive Server datatypes

Client Library API
The Adaptive Server database interfaces use the Open Client™ CT-Library (CT-Lib) application programming interface (API) to access the database.

When you connect to an Adaptive Server database, PowerBuilder makes the required calls to the API. Therefore, you do not need to know anything about CT-Lib to use the database interface.

EAServer uses a slightly different version of the CT-Lib software. Therefore, at runtime you need to use the SYJ database interface rather than ASE or SYC to connect to an Adaptive Server database. The SYJ Database Profile Setup dialog box provides a convenient way to set the appropriate connection parameters and then copy the syntax from the Preview tab into the script for your Transaction object. The SYJ database interface uses a DLL named PBSYJ115.DLL.

You cannot use the SYJ interface, however, to connect to the database in the PowerBuilder development environment. Therefore, during the development phase (before the component has been deployed to EAServer), you must use ASE or SYC to connect to the database.

Supported Adaptive Server datatypes

The Adaptive Server interface supports the Sybase datatypes listed in Table 7-1 in DataWindow objects and embedded SQL.

Table 7-1: Supported datatypes for Adaptive Server Enterprise

<table>
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<th>Binary</th>
<th>NVarchar</th>
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<tr>
<td>BigInt (15.x and later)</td>
<td>Real</td>
</tr>
<tr>
<td>Bit</td>
<td>SmallDateTime</td>
</tr>
<tr>
<td>Char (see “Column-length limits” on page 72)</td>
<td>SmallInt</td>
</tr>
<tr>
<td>DateTime</td>
<td>SmallMoney</td>
</tr>
<tr>
<td>Decimal</td>
<td>Text</td>
</tr>
<tr>
<td>Double precision</td>
<td>Timestamp</td>
</tr>
<tr>
<td>Float</td>
<td>TinyInt</td>
</tr>
<tr>
<td>Identity</td>
<td>UniChar</td>
</tr>
<tr>
<td>Image</td>
<td>UniText (15.x and later)</td>
</tr>
<tr>
<td>Int</td>
<td>UniVarChar</td>
</tr>
</tbody>
</table>
In Adaptive Server 15.0 and later, PowerBuilder supports unsigned as well as signed bigint, int, and smallint datatypes. You can also use the following datatypes as identity columns in Adaptive Server 15.0 and later: bigint, int, numeric, smallint, tinyint, unsigned bigint, unsigned int, and unsigned smallint.

PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases. When character data or command text is sent to the database, PowerBuilder sends a DBCS string if the UTF8 database parameter is set to 0 (the default). If UTF8 is set to 1, PowerBuilder sends a UTF-8 string. The database server must be configured correctly to accept UTF-8 strings. See the description of the UTF8 database parameter in the online Help for more information.

The character set used by an Adaptive Server database server applies to all databases on that server. The nchar and nvarchar datatypes can store UTF-8 data if the server character set is UTF-8. The Unicode datatypes unichar and univarchar were introduced in Adaptive Server 12.5 to support Unicode data. Columns with these datatypes can store only Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.

In Adaptive Server 12.5.1 and later, additional support for Unicode data has been added. For more information, see the documentation for your version of Adaptive Server.

The unichar and univarchar datatypes support UTF-16 encoding, therefore each unichar or univarchar character requires two bytes of storage. The following example creates a table with one unichar column holding 10 Unicode characters:

```sql
create table unitbl (unicol unichar(10))
```

In the Database painter, the column displays as unichar(20) because the column requires 20 bytes of storage. This is consistent with the way the column displays in Sybase Central.
**Supported Adaptive Server datatypes**

However, the mapping between the Type in the Column Specifications view in the DataWindow painter and the column datatype of a table in the database is not one-to-one. The Type in the Column Specifications view shows the DataWindow column datatype and DataWindow column length. The column length is the number of characters, therefore an Adaptive Server `unichar(20)` column displays as `char(10)` in the Column Specifications view.

**Column-length limits**

Adaptive Server 12.0 and earlier have a column-length limit of 255 bytes. Adaptive Server 12.5.x and later support wider columns for `Char`, `VarChar`, `Binary`, and `VarBinary` datatypes, depending on the logical page size and the locking scheme used by the server.

In PowerBuilder, you can use these wider columns for `Char` and `VarChar` datatypes with Adaptive Server 12.5.x when the following conditions apply:

- The Release database parameter is set to 12.5 or higher.
- You are accessing the database using Open Client 12.5.x or later.

The database must be configured to use a larger page size to take full advantage of the widest limits.

For detailed information about wide columns and configuration issues, see the Adaptive Server documentation on the Product Manuals Web site at [http://www.sybase.com/support/manuals/](http://www.sybase.com/support/manuals/). For more information about the Release database parameter, see the online Help.

When you retrieve or update columns, PowerBuilder converts data appropriately between the Adaptive Server datatype and the PowerScript datatype. Similarly or identically named Adaptive Server and PowerScript datatypes do not necessarily have the same definitions. For information about the definitions of PowerScript datatypes, see the *PowerScript Reference*.

**Conversion in PowerBuilder scripts**

A double that has no fractional component is converted to a string with one decimal place if the converted string would cause Adaptive Server to have an overflow error when parsing the string. For example: the double value 12345678901234 would cause an overflow error, so PowerBuilder converts the double to the string value 12345678901234.0.
Basic software components for Adaptive Server

You must install the software components in Figure 7-1 to access an Adaptive Server database in PowerBuilder.

*Figure 7-1: Components of an Adaptive Server Enterprise connection*

Preparing to use the Adaptive Server database

Before you define the interface and connect to an Adaptive Server database in PowerBuilder, follow these steps to prepare the database for use:

1. Install and configure the required database server, network, and client software.
2. Install the Adaptive Server database interface.
Preparing an Adaptive Server database for use with PowerBuilder involves these four basic tasks.

You must install and configure the database server, network, and client software for Adaptive Server.

- **To install and configure the database server, network, and client software:**
  1. Make sure the Adaptive Server database software is installed on the server specified in your database profile.
     - You must obtain the database server software from Sybase.
     - For installation instructions, see your Adaptive Server documentation.
  2. Make sure the supported network software (for example, TCP/IP) is installed and running on your computer and is properly configured so that you can connect to the database server at your site.
     - You must install the network communication driver that supports the network protocol and operating system platform you are using. The driver is installed as part of the Net-Library client software.
     - For installation and configuration instructions, see your network or database administrator.
  3. Install the required Open Client CT-Library (CT-Lib) software on each client computer on which PowerBuilder is installed.
     - You must obtain the Open Client software from Sybase. Make sure the version of Open Client you install supports all of the following:
       - The operating system running on the client computer
       - The version of Adaptive Server that you want to access
       - The version of PowerBuilder that you are running

**Required client software versions**
To use the ASE Adaptive Server interface, you must install Open Client version 15.x or later. To use the SYC Adaptive Server interface, you must install Open Client version 11.x or later.
4 Make sure the Open Client software is properly configured so that you can connect to the database at your site.

Installing the Open Client software places the SQL.INI configuration file in the Adaptive Server directory on your computer.

SQL.INI provides information that Adaptive Server needs to find and connect to the database server at your site. You can enter and modify information in SQL.INI by using the configuration utility that comes with the Open Client software.

For information about setting up the SQL.INI or other required configuration file, see your Adaptive Server documentation.

5 If required by your operating system, make sure the directory containing the Open Client software is in your system path.

6 Make sure only one copy of each of the following files is installed on your client computer:
   - Adaptive Server interface DLL
   - Network communication DLL (for example, NLWNSCK.DLL for Windows Sockets-compliant TCP/IP)
   - Database vendor DLL (for example, LIBCT.DLL)

Step 2: Install the database interface

In the PowerBuilder Setup program, select the Typical install, or select the Custom install and select the Adaptive Server Enterprise (ASE or SYC) database interface.

If you work with PowerBuilder and EAServer, you should also select the Adaptive Server interface for EAServer (SYJ).

Step 3: Verify the connection

Make sure you can connect to the Adaptive Server database server and log in to the database you want to access from outside PowerBuilder.

Some possible ways to verify the connection are by running the following tools:

- **Accessing the database server**  Tools such as the Open Client/Open Server Configuration utility (or any Ping utility) check whether you can reach the database server from your computer.

- **Accessing the database**  Tools such as ISQL (interactive SQL utility) check whether you can log in to the database and perform database operations. It is a good idea to specify the same connection parameters you plan to use in your PowerBuilder database profile to access the database.
PowerBuilder requires you to install certain stored procedures in the sybsystemprocs database before you connect to an Adaptive Server database for the first time. PowerBuilder uses these stored procedures to get information about tables and columns from the DBMS system catalog.

Run the SQL script or scripts required to install the PowerBuilder stored procedures in the sybsystemprocs database.

For instructions, see “Installing stored procedures in Adaptive Server databases” on page 83.

Defining the Adaptive Server database interface

To define a connection through the Adaptive Server interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup - Adaptive Server Enterprise dialog box. You can then select this profile anytime to connect to your database in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.

Defining a connection for a PowerBuilder custom class user object deployed in EAServer

You cannot use the SYJ interface to connect to the database in the PowerBuilder development environment. However, the SYJ Database Profile Setup dialog box provides a convenient way to set the appropriate connection parameters and then copy the syntax from the Preview tab into the script for your Transaction object.

Using Open Client security services

The Adaptive Server interfaces provide several DBParm parameters that support Open Client 11.1.x or later network-based security services in your application. If you are using the required database, security, and PowerBuilder software, you can build applications that take advantage of Open Client security services.
What are Open Client security services?

Open Client 11.1.x or later security services allow you to use a supported third-party security mechanism (such as CyberSafe Kerberos) to provide login authentication and per-packet security for your application. Login authentication establishes a secure connection, and per-packet security protects the data you transmit across the network.

Requirements for using Open Client security services

For you to use Open Client security services in your application, all of the following must be true:

• You are accessing an Adaptive Server database server using Open Client Client-Library (CT-Lib) 11.1.x or later software.

• You have the required network security mechanism and driver.

You have the required Sybase-supported network security mechanism and Sybase-supplied security driver properly installed and configured for your environment. Depending on your operating system platform, examples of supported security mechanisms include: Distributed Computing Environment (DCE) security servers and clients, CyberSafe Kerberos, and Windows NT LAN Manager Security Services Provider Interface (SSPI).

For information about the third-party security mechanisms and operating system platforms that Sybase has tested with Open Client security services, see the Open Client documentation.

• You can access the secure server outside PowerBuilder.

You must be able to access a secure Adaptive Server server using Open Client 11.1.x or later software from outside PowerBuilder.

To verify the connection, use a tool such as ISQL or SQL Advantage to make sure you can connect to the server and log in to the database with the same connection parameters and security options you plan to use in your PowerBuilder application.

• You are using aPowerBuilder database interface.

You are using the ASE or SYC Adaptive Server interface to access the database.

• The Release DBParm parameter is set to the appropriate value for your database.
You have set the Release DBParm parameter to 11 or higher to specify that your application should use the appropriate version of the Open Client CT-Lib software.

For instructions, see Release in the online Help.

- Your security mechanism and driver support the requested service.

The security mechanism and driver you are using must support the service requested by the DBParm parameter.

### Security services DBParm parameters

If you have met the requirements described in “Requirements for using Open Client security services” on page 77, you can set the security services DBParm parameters in the Database Profile Setup dialog box for your connection or in a PowerBuilder application script.

There are two types of DBParm parameters that you can set to support Open Client security services: login authentication and per-packet security.

#### Login authentication DBParms

The following login authentication DBParm parameters correspond to Open Client 11.1.x or later connection properties that allow an application to establish a secure connection.

- Sec_Channel_Bind
- Sec_Cred_Timeout
- Sec_Deviation
- Sec_Keypub_File
- Sec_Mechanism
- Sec_Mutual_Auth
- Sec_Network_Auth
- Sec_Server_Principal
- Sec_Sess_Timeout

For instructions on setting these DBParm parameters, see their descriptions in the online Help.

#### Per-packet security DBParms

The following per-packet security DBParm parameters correspond to Open Client 11.1.x or later connection properties that protect each packet of data transmitted across a network. Using per-packet security services might create extra overhead for communications between the client and server.

- Sec_Confidential
- Sec_Data_Integrity
- Sec_Data_Origin
Sec_Replay_Detection  
Sec_Seq_Detection

For instructions on setting these DBParm parameters, see their descriptions in the online Help.

Using Open Client directory services

The Adaptive Server interfaces provide several DBParm parameters that support Open Client 11.1.x or later network-based directory services in your application. If you are using the required database, directory services, and PowerBuilder software, you can build applications that take advantage of Open Client directory services.

What are Open Client directory services?

Open Client 11.1.x or later directory services allow you to use a supported third-party directory services product (such as the Windows Registry) as your directory service provider. Directory services provide centralized control and administration of the network entities (such as users, servers, and printers) in your environment.

Requirements for using Open Client directory services

For you to use Open Client directory services in your application, all of the following must be true:

- You are accessing an Adaptive Server database server using Open Client Client-Library (CT-Lib) 11.x or later software
- You have the required Sybase-supported directory service provider software and Sybase-supplied directory driver properly installed and configured for your environment. Depending on your operating system platform, examples of supported security mechanisms include the Windows Registry and Distributed Computing Environment Cell Directory Services (DCE/CDS).
Using Open Client directory services

For information about the directory service providers and operating system platforms that Sybase has tested with Open Client directory services, see the Open Client documentation.

- You must be able to access a secure Adaptive Server server using Open Client 11.1.x or later software from outside PowerBuilder.

To verify the connection, use a tool such as ISQL or SQL Advantage to make sure you can connect to the server and log in to the database with the same connection parameters and directory service options you plan to use in your PowerBuilder application.

- You are using the ASE or SYC Adaptive Server interface to access the database.

- You must use the correct syntax as required by your directory service provider when specifying the server name in a database profile or PowerBuilder application script. Different providers require different syntax based on their format for specifying directory entry names.

For information and examples for different directory service providers, see “Specifying the server name with Open Client directory services” next.

- You have set the Release DBParm to 11 or higher to specify that your application should use the behavior of the appropriate version of the Open Client CT-Lib software.

For instructions, see Release database parameter in the online Help.

- The directory service provider and driver you are using must support the service requested by the DBParm.

Specifying the server name with Open Client directory services

When you are using Open Client directory services in a PowerBuilder application, you must use the syntax required by your directory service provider when specifying the server name in a database profile or PowerBuilder application script to access the database.

Different directory service providers require different syntax based on the format they use for specifying directory entry names. Directory entry names can be fully qualified or relative to the default (active) Directory Information Tree base (DIT base) specified in the Open Client/Server™ configuration utility.
The **DIT base** is the starting node for directory searches. Specifying a DIT base is analogous to setting a current working directory for UNIX or MS-DOS file systems. (You can specify a nondefault DIT base with the DS_DitBase DBParm. For information, see DS_DitBase in the online Help.)

This example shows typical server name syntax if your directory service provider is the Windows registry.

Node name: \SALES\software\sybase\server\SYS12
DIT base: \SALES\software\sybase\server
Server name: SYS12

❖ **To specify the server name in a database profile:**
  - Type the following in the Server box on the Connection tab in the Database Profile Setup dialog box. Do *not* start the server name with a backslash (`\`).
    ```sql
    SYS12
    ```

❖ **To specify the server name in a PowerBuilder application script:**
  - Type the following. Do *not* start the server name with a backslash (`\`).
    ```sql
    SQLCA.ServerName = "SYS12"
    ```

If you specify a value in the Server box in your database profile, this syntax displays on the Preview tab in the Database Profile Setup dialog box. You can copy the syntax from the Preview tab into your script.

This example shows typical server name syntax if your directory service provider is Distributed Computing Environment Cell Directory Services (DCE/CDS).

Node name: /.../boston.sales/dataservers/sybase/SYS12
DIT base: /.../boston.sales/dataservers
Server name: sybase/SYS12

❖ **To specify the server name in a database profile:**
  - Type the following in the Server box on the Connection tab in the Database Profile Setup dialog box. Do *not* start the server name with a slash (`/`).
    ```sql
    sybase/SYS12
    ```

❖ **To specify the server name in a PowerBuilder application script:**
  - Type the following. Do *not* start the server name with `CN=`.
    ```sql
    SQLCA.ServerName = "SYS12"
    ```
Using PRINT statements in Adaptive Server stored procedures

If you specify a value in the Server box in your database profile, this syntax displays on the Preview tab in the Database Profile Setup dialog box. You can copy the syntax from the Preview tab into your script.

Directory services DBParm parameters

If you have met the requirements described in “Requirements for using Open Client directory services” on page 79, you can set the directory services DBParsms in a database profile for your connection or in a PowerBuilder application script.

The following DBParms correspond to Open Client 11.1.x or later directory services connection parameters:

- DS_Alias
- DS_Copy
- DS_DitBase
- DS_Failover
- DS_Password (Open Client 12.5 or later)
- DS_Principal
- DS_Provider
- DS_TimeLimit

For instructions on setting these DBParms, see their descriptions in the online Help.

Using PRINT statements in Adaptive Server stored procedures

The ASE or SYC Adaptive Server database interface allows you to use PRINT statements in your stored procedures for debugging purposes.

This means, for example, that if you turn on Database Trace when accessing the database through the ASE or SYC interface, PRINT messages appear in the trace log but they do not return errors or cancel the rest of the stored procedure.
Creating a DataWindow based on a cross-database join

The ability to create a DataWindow based on a heterogeneous cross-database join is available through the use of Adaptive Server’s Component Integration Services. Component Integration Services allow you to connect to multiple remote heterogeneous database servers and define multiple proxy tables that reference the tables residing on those servers.

For information on how to create proxy tables, see the Adaptive Server documentation.

Installing stored procedures in Adaptive Server databases

This section describes how to install PowerBuilder stored procedures in an Adaptive Server Enterprise database by running SQL scripts provided for this purpose.

Sybase recommends that you run these scripts outside PowerBuilder before connecting to an Adaptive Server database for the first time through the Adaptive Server (ASE or SYC DBMS identifier) native database interface. Although the database interface will work without the PowerBuilder stored procedures created by these scripts, the stored procedures are required for full functionality.

What are the PowerBuilder stored procedure scripts?

What you do

In order to work with an Adaptive Server database in PowerBuilder, you or your system administrator should install certain stored procedures in the database before you connect to Adaptive Server from PowerBuilder for the first time.

You must run the PowerBuilder stored procedure scripts only once per database server, and not before each PowerBuilder session. If you have already installed the PowerBuilder stored procedures in your Adaptive Server database before connecting in PowerBuilder on any supported platform, you need not install the stored procedures again before connecting in PowerBuilder on a different platform.
Installing stored procedures in Adaptive Server databases

PowerBuilder stored procedures

A stored procedure is a group of precompiled and preoptimized SQL statements that performs some database operation. Stored procedures reside on the database server where they can be accessed as needed.

PowerBuilder uses these stored procedures to get information about tables and columns from the Adaptive Server system catalog. (The PowerBuilder stored procedures are different from the stored procedures you might create in your database.)

SQL scripts

PowerBuilder provides SQL script files for installing the required stored procedures in the sybsystemprocs database:

<table>
<thead>
<tr>
<th>Script</th>
<th>Use for</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBSYC.SQL</td>
<td>Adaptive Server databases</td>
</tr>
<tr>
<td>PBSYC2.SQL</td>
<td>Adaptive Server databases to restrict the Select Tables list</td>
</tr>
</tbody>
</table>

Where to find the scripts

The stored procedure scripts are located in the Server directory on the PowerBuilder CD-ROM. The Server directory contains server-side installation components that are not installed with PowerBuilder on your computer.

PBSYC.SQL script

What it does

The PBSYC.SQL script contains SQL code that overwrites stored procedures that correspond to the same version of PowerBuilder in the Adaptive Server sybsystemprocs database and then re-creates them.

The PBSYC.SQL script uses the sybsystemprocs database to hold the PowerBuilder stored procedures. This database is created when you install Adaptive Server.

When to run it

Before you connect to an Adaptive Server database in PowerBuilder for the first time using the ASE or SYC DBMS identifier, you or your database administrator must run the PBSYC.SQL script once per database server into the sybsystemprocs database.

Run PBSYC.SQL if the server at your site will be accessed by anyone using the PowerBuilder or by deployment machines.

If you or your database administrator have already run the current version of PBSYC.SQL to install PowerBuilder stored procedures in the sybsystemprocs database on your server, you need not rerun the script to install the stored procedures again.

For instructions on running PBSYC.SQL, see “How to run the scripts” on page 86.
The **PBSYC.SQL** script creates the following PowerBuilder stored procedures in the Adaptive Server **sybsystemprocs** database. The procedures are listed in the order in which the script creates them.

<table>
<thead>
<tr>
<th>PBSYC.SQL stored procedure</th>
<th>What it does</th>
</tr>
</thead>
<tbody>
<tr>
<td>sp_pb115column</td>
<td>Lists the columns in a table.</td>
</tr>
<tr>
<td>sp_pb115pkcheck</td>
<td>Determines whether a table has a primary key.</td>
</tr>
<tr>
<td>sp_pb115ftable</td>
<td>Lists the tables that reference the current table.</td>
</tr>
<tr>
<td>sp_pb115procdesc</td>
<td>Retrieves a description of the argument list for a specified stored procedure.</td>
</tr>
<tr>
<td>sp_pb115proclist</td>
<td>Lists available stored procedures and extended stored procedures. If the SystemProcs DBParm parameter is set to 1 or Yes (the default), <strong>sp_pb115proclist</strong> displays both system stored procedures and user-defined stored procedures. If SystemProcs is set to 0 or No, <strong>sp_pb115proclist</strong> displays only user-defined stored procedures.</td>
</tr>
<tr>
<td>sp_pb115text</td>
<td>Retrieves the text of a stored procedure from the SYSCOMMENTS table.</td>
</tr>
<tr>
<td>sp_pb115table</td>
<td>Retrieves information about <strong>all</strong> tables in a database, including those for which the current user has no permissions. <strong>PBSYC.SQL</strong> contains the default version of <strong>sp_pb115table</strong>. If you want to replace the default version of <strong>sp_pb115table</strong> with a version that restricts the table list to those tables for which the user has SELECT permission, you can run the <strong>PBSYC2.SQL</strong> script, described in “<strong>PBSYC2.SQL</strong> script” next.</td>
</tr>
<tr>
<td>sp_pb115index</td>
<td>Retrieves information about all indexes for a specified table.</td>
</tr>
</tbody>
</table>

**PBSYC2.SQL script**

The **PBSYC2.SQL** script contains SQL code that drops and re-creates one PowerBuilder stored procedure in the Adaptive Server **sybsystemprocs** database: a replacement version of **sp_pb115table**.

The default version of **sp_pb115table** is installed by the **PBSYC.SQL** script. PowerBuilder uses the **sp_pb115table** procedure to build a list of **all** tables in the database, including those for which the current user has no permissions. This list displays in the Select Tables dialog box in PowerBuilder.
Installing stored procedures in Adaptive Server databases

For security reasons, you or your database administrator might want to restrict the table list to display only those tables for which a user has permissions. To do this, you can run the `PBSYC2.SQL` script after you run `PBSYC.SQL`. `PBSYC2.SQL` replaces the default version of `sp_pb115table` with a new version that displays a restricted table list including only tables and views:

- Owned by the current user
- For which the current user has SELECT authority
- For which the current user’s group has SELECT authority
- For which SELECT authority was granted to PUBLIC

When to run it

If you are accessing an Adaptive Server database using the ASE or SYC DBMS identifier in PowerBuilder, you must first run `PBSYC.SQL` once per database server to install the required PowerBuilder stored procedures in the `sybsystemprocs` database.

After you run `PBSYC.SQL`, you can optionally run `PBSYC2.SQL` if you want to replace `sp_pb115table` with a version that restricts the table list to those tables for which the user has SELECT permission.

If you do not want to restrict the table list, there is no need to run `PBSYC2.SQL`.

For instructions on running `PBSYC2.SQL`, see “How to run the scripts” on page 86.

Stored procedure it creates

The `PBSYC2.SQL` script creates the following PowerBuilder stored procedure in the Adaptive Server `sybsystemprocs` database:

<table>
<thead>
<tr>
<th>Stored procedure</th>
<th>What it does</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sp_pb115table</code></td>
<td>Retrieves information about those tables in the database for which the current user has SELECT permission. This version of <code>sp_pb115table</code> replaces the default version of <code>sp_pb115table</code> installed by the <code>PBSYC.SQL</code> script.</td>
</tr>
</tbody>
</table>

How to run the scripts

You can use the ISQL or SQL Advantage tools to run the stored procedure scripts outside PowerBuilder.
Using ISQL to run the stored procedure scripts

ISQL is an interactive SQL utility that comes with the Open Client software on the Windows platforms. If you have ISQL installed, use the following procedure to run the PowerBuilder stored procedure scripts.

For complete instructions on using ISQL, see your Open Client documentation.

❖ To use ISQL to run the PowerBuilder stored procedure scripts:

1. Connect to the sybsystemprocs Adaptive Server database as the system administrator.

2. Open one of the following files containing the PowerBuilder stored procedure script you want to run:

   - PBSYC.SQL
   - PBSYC2.SQL

3. Issue the appropriate ISQL command to run the SQL script with the user ID, server name, and (optionally) password you specify. Make sure you specify uppercase and lowercase exactly as shown:

   ```
   isql /U sa /S SERVERNAME /i pathname /P { password }
   ```

   For example, if you are using PowerBuilder and are accessing the stored procedure scripts from the product CD-ROM, type either of the following (assuming D is your CD-ROM drive):

   ```
   isql /U sa /S TESTDB /i d:\server\pbsyb.sql /P
   isql /U sa /S SALES /i d:\server\pbsyc.sql /P adminpwd
   ```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sa</td>
<td>The user ID for the system administrator. Do not change this user ID.</td>
</tr>
<tr>
<td>SERVERNAME</td>
<td>The name of the computer running the Adaptive Server database.</td>
</tr>
<tr>
<td>pathname</td>
<td>The drive and directory containing the SQL script you want to run.</td>
</tr>
<tr>
<td>password</td>
<td>(Optional) The password for the sa (system administrator) user ID. The default Adaptive Server installation creates the sa user ID without a password. If you changed the password for sa during the installation, replace password with your new password.</td>
</tr>
</tbody>
</table>
Installing stored procedures in Adaptive Server databases

Using SQL Advantage to run the stored procedure scripts

SQL Advantage is an interactive SQL utility that comes with the Open Client software on the Windows platform. If you have SQL Advantage installed, use the following procedure to run the PowerBuilder stored procedure scripts.

For complete instructions on using SQL Advantage, see your Open Client documentation.

❖ To use SQL Advantage to run the PowerBuilder stored procedure scripts:

1. Start the SQL Advantage utility.
2. Open a connection to the `sybsystemprocs` Adaptive Server database as the system administrator.
3. Open one of the following files containing the PowerBuilder stored procedure script you want to run:
   
   `PBSYC.SQL`
   `PBSYC2.SQL`

4. Delete the `use sybsystemprocs` command and the `go` command at the beginning of each script.

   SQL Advantage requires that you issue the `use sybsystemprocs` command by itself, with no other SQL commands following it. When you open a connection to the `sybsystemprocs` database in step 2, you are in effect issuing the `use sybsystemprocs` command. This command should not be issued again as part of the stored procedure script.

   Therefore, to successfully install the stored procedures, you must delete the lines shown in the following table from the beginning of the PowerBuilder stored procedure script before executing the script.

<table>
<thead>
<tr>
<th>Before executing this script</th>
<th>Delete these lines</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>PBSYC.SQL</code></td>
<td><code>use sybsystemprocs</code>&lt;br&gt;<code>go</code></td>
</tr>
<tr>
<td><code>PBSYC2.SQL</code></td>
<td><code>use sybsystemprocs</code>&lt;br&gt;<code>go</code></td>
</tr>
</tbody>
</table>

5. Execute all of the statements in the SQL script.
6. Exit the SQL Advantage session.
CHAPTER 8

Using Informix

About this chapter

This chapter describes how to use the native IBM Informix database interfaces in PowerBuilder.

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<th>Page</th>
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</thead>
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<td>100</td>
</tr>
</tbody>
</table>

Supported versions for Informix

You can access the IBM Informix Dynamic Server (IDS) database version 9.x or later using the PowerBuilder IN9 and I10 native Informix database interfaces. You can also access Informix OnLine and Informix Standard Engine (SE) databases.

The IN9 interface in PBIN9115.DLL requires the Informix Client SDK 2.8.1 or later for Informix application development and Informix Connect 2.9 for runtime deployment.

The I10 interface in PBI10115.DLL requires the Informix Client SDK 2.9 or later for Informix application development and Informix Connect 2.9 or later for runtime deployment.

Restriction

You cannot use both the IN9 and I10 interfaces in a single PowerBuilder session.
For the latest information on using PowerBuilder with Informix databases, see the Sybase Support Web site at http://www.sybase.com/detail?id=47934.

**Supported Informix datatypes**

The Informix database interfaces support the Informix datatypes listed in Table 8-1 in DataWindow objects and embedded SQL.

**Table 8-1: Supported datatypes for Informix**

<table>
<thead>
<tr>
<th>Informix Datatype</th>
<th>PowerScript Datatype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blob</td>
<td>LVarChar</td>
</tr>
<tr>
<td>Boolean</td>
<td>Money</td>
</tr>
<tr>
<td>Byte (a maximum of 2^31 bytes)</td>
<td>NChar</td>
</tr>
<tr>
<td>Char</td>
<td>NVarChar</td>
</tr>
<tr>
<td>Clob</td>
<td>Real</td>
</tr>
<tr>
<td>Date</td>
<td>Serial</td>
</tr>
<tr>
<td>DateTime</td>
<td>Serial8</td>
</tr>
<tr>
<td>Decimal</td>
<td>SmallInt (2 bytes)</td>
</tr>
<tr>
<td>Float</td>
<td>Text (a maximum of 2^31 bytes)</td>
</tr>
<tr>
<td>Int8</td>
<td>Time</td>
</tr>
<tr>
<td>Integer (4 bytes)</td>
<td>VChar (1 to 255 bytes)</td>
</tr>
<tr>
<td>Interval</td>
<td></td>
</tr>
</tbody>
</table>

**Datatype conversion**

When you retrieve or update columns, PowerBuilder converts data appropriately between the Informix datatype and the PowerScript datatype. Keep in mind, however, that similarly or identically named Informix and PowerScript datatypes do not necessarily have the same definitions.

For information about the definitions of PowerScript datatypes, see the *PowerScript Reference.*
Informix DateTime datatype

The DateTime datatype is a contiguous sequence of boxes. Each box represents a component of time that you want to record. The syntax is:

$$\text{DATETIME largest\_qualifier TO smallest\_qualifier}$$

PowerBuilder defaults to Year TO Fraction(5).

For a list of qualifiers, see your Informix documentation.

❖ **To create your own variation of the DateTime datatype:**

1. In the Database painter, create a table with a DateTime column. For instructions on creating a table, see the *Users Guide*.

2. In the Columns view, select Pending Syntax from the Objects or pop-up menu.
   
   The Columns view displays the pending changes to the table definition. These changes execute only when you click the Save button to save the table definition.

3. Select Copy from the Edit or pop-up menu or click the Copy button. The SQL syntax (or the portion you selected) is copied to the clipboard.

4. In the ISQL view, modify the DateTime syntax and execute the `CREATE TABLE` statement.

   For instructions on using the ISQL view, see the *Users Guide*.

Informix Time datatype

The Informix database interfaces also support a time datatype. The time datatype is a subset of the DateTime datatype. The time datatype uses only the time qualifier boxes.

Informix Interval datatype

The interval datatype is one value or a sequence of values that represent a component of time. The syntax is:

$$\text{INTERVAL largest\_qualifier TO smallest\_qualifier}$$

PowerBuilder defaults to Day(3) TO Day. For more about interval datatypes, see your Informix documentation.
Features supported by the I10 interface

The I10 interface supports several features that are not available when you use the IN9 interface. Some of these features require a specific version of the Informix Dynamic Server database.

Accessing Unicode data

PowerBuilder can connect, save, and retrieve data in ANSI/DBCS databases using the IN9 interface, but the IN9 interface does not support Unicode databases. The Informix I10 interface supports ANSI/DBCS and Unicode databases.

The I10 native interface uses the Informix GLS (Global Language Support) API for global language support. The native interface uses three DBParms to help you set up the locale used in the current connection:

- **Client_Locale**
- **DB_Locale**
- **StrByCharset**

These parameters are available on the Regional Settings tab page in the Database Profile Setup dialog box.

**Client_Locale**

Client_Locale specifies the value of the Informix environment variable CLIENT_LOCALE. The format is language_territory.codeset. For example:

```
Client_Locale='en_us.1252'
Client_Locale='en_us.utf8'
```

The I10 interface uses this setting to access string data in an Informix database and to process SQL statements. If you do not set the DBParm, the default locale value is based on the OS locale.

**DB_Locale**

DB_Locale specifies the value of the Informix environment variable DB_LOCALE. The format is language_territory.codeset. For example:

```
DB_Locale='en_us.1252'
DB_Locale='en_us.utf8'
```
DB_LOCALE specifies the language, territory, and code set that the database server needs to correctly interpret locale-sensitive datatypes such as NChar and NVarChar in a specific database. The code set specified in DB_LOCALE determines which characters are valid in any character column, as well as in the names of database objects such as databases, tables, columns, and views. If you do not set the DBParm, the I10 interface assumes that the DB_LOCALE value is the same as the CLIENT_LOCALE value.

You can set the CLIENT_LOCALE and DB_LOCALE environment variables directly using the Informix Setnet32 utility, available in the Utilities folder for the Informix database interfaces in the Objects view in the Database painter or the Database Profiles dialog box.


StrByCharset

The StrByCharset DBParm specifies how to convert string data between PowerBuilder Unicode strings and Informix client multibyte strings. By default, string conversion for UTF-8 code sets is based on the UTF-8 code set, and string conversion for non-UTF-8 code sets is based on the current OS code page. If StrByCharset is set to 1 (true), string conversion is based on the code set specified in the DBParm Client_Locale.

Assigning an owner to the PowerBuilder catalog tables

When you use the I10 interface, you can use the PBCatalogOwner DBParm on the System tab page to assign a nondefault owner to the extended attribute system tables. For ANSI-compliant databases, the owner name that you specify must be unique but the table name does not have to be unique. You can create multiple sets of catalog tables prefaced with different user names. However, if the database is not ANSI-compliant, the table name must be unique, so that only one set of catalog tables can be created with an assigned owner name.

Support for long object names

The I10 interface supports Informix long object names with up to 128 characters.
Features supported by the I10 interface

Renaming an index

With IDS 9.2.1 and later, you can change the name of an index in the Database painter when you are connected using the I10 interface. The I10 interface uses the IDS RENAME INDEX statement to change the name of the index. You need only drop and recreate the index if you want to make other changes.

SQL statement caching

In IDS 9.2.1 and later, the database server uses the SQL statement cache (SSC) to store SQL statements across user sessions. When any user executes a statement already stored in the SQL statement cache, the database server does not parse and optimize the statement again, resulting in improved performance. The statement must be a \texttt{SELECT}, \texttt{UPDATE}, \texttt{DELETE}, or \texttt{INSERT} statement, and it cannot contain user-defined routines.

There are several ways to configure caching on the server. The \texttt{SET STATEMENT CACHE} statement takes precedence over the \texttt{STMT\_CACHE} environment variable and the \texttt{STMT\_CACHE} configuration parameter. You must enable the SQL statement cache, either by setting the \texttt{STMT\_CACHE} configuration parameter or by using the Informix onmode utility, before the \texttt{SET STATEMENT CACHE} statement can execute successfully.

You can set the StmtCache DBParm on the System tab page in the Database Profile Setup dialog box for I10 connections to turn SQL statement caching on or off on the client. However, the server must be configured to support SQL statement caching before you can access the cache from the client.


Creating and dropping indexes without locking

In IDS 10.0 and later, the SQL syntax of \texttt{CREATE INDEX} and \texttt{DROP INDEX} supports the \texttt{ONLINE} keyword to create or drop an index in an online environment where the database and its tables are continuously available. When you use the \texttt{ONLINE} keyword to create or drop an index, data definition language (DDL) operations execute without applying an exclusive lock on the table on which the specified index is defined.

If you use \texttt{CREATE INDEX ONLINE} to create an index on a table that other users are accessing, the index is not available until no users are updating the table.
If you issue DROP INDEX ONLINE to drop an index, no users can reference the index, but concurrent data manipulation language (DML) operations can use the index until the operations terminate. Dropping the index is deferred until no users are using the index.

You can set the OnlineIndex static DBParm on the System tab page in the Database Profile Setup dialog box for I10 connections to specify that the Database painter should use the ONLINE keyword when you create or drop an index.

Clustered index not supported
You cannot create a clustered index using online mode because it is not supported by IDS.

Column-level encryption
In IDS 10.0 and later, the SQL statement SET ENCRYPTION PASSWORD can improve the confidentiality of data and support data integrity by defining or resetting a password for encryption and decryption of data at the column level.

You can set the EncryptionPass and Hint static DBParms on the System tab page in the Database Profile Setup dialog box for I10 connections to specify a password and a hint to help you remember the password. The application uses built-in Informix functions to encrypt and decrypt character data.

Using multiple OUT parameters in user-defined routines
In a user-defined routine (UDR), an OUT parameter corresponds to a value returned through a pointer. Before IDS version 9.4, IDS supported no more than one OUT parameter in a UDR, and any OUT parameter was required to appear as the last item in the parameter list. IDS version 9.4 drops these restrictions, supporting multiple OUT parameters anywhere in the parameter list of the UDR. This feature is available when you use the I10 interface. It provides greater flexibility in defining UDRs, and removes the need to return collection variables in contexts where multiple returned values are required.

To return OUT parameters from a UDR, you must use statement local variables (SLVs).
In the following statement, the OUT parameter in the UDR myfunc is defined using the SLV syntax slvname#out_param_type.

```
SELECT sales FROM mytable WHERE myfunc(10, sales#money) < 1000
```

Informix does not support invoking a UDR with OUT parameters using an EXECUTE statement, therefore multiple OUT parameters are not supported in PowerBuilder remote procedure calls and embedded SQL EXECUTE PROCEDURE commands.

**Basic software components for Informix**

Figure 8-1 shows the basic software components required to access an Informix database using the native Informix database interfaces.

*Figure 8-1: Components of an Informix connection*
Preparing to use the Informix database

Before you define the database interface and connect to an Informix database in PowerBuilder, follow these steps to prepare the database for use:

1. Install and configure the required database server, network, and client software.
2. Install the native Informix IN9 or I10 database interface.
3. Verify that you can connect to the Informix server and database outside PowerBuilder.

Step 1: Install and configure the database server

You must install and configure the required database server, network, and client software for Informix.

❖ To install and configure the required database server, network, and client software:

1. Make sure the Informix database server software and database network software is installed and running on the server specified in your database profile.
   
   You must obtain the database server and database network software from Informix.
   
   For installation instructions, see your Informix documentation.

2. Install the required Informix client software on each client computer on which PowerBuilder is installed.
   
   Install Informix Connect or the Informix Client SDK (which includes Informix Connect).
   
   You must obtain the Informix client software from IBM. Make sure the version of the client software you install supports all of the following:
   
   The operating system running on the client computer
   The version of the database that you want to access
   The version of PowerBuilder that you are running
   
   For installation instructions, see your Informix documentation.

3. Make sure the Informix client software is properly configured so that you can connect to the Informix database server at your site.
Run the SetNet32 utility to configure the client registry settings. When you configure Informix Connect client software, it creates a registry entry in `HKEY_LOCAL_MACHINE\Software\Informix\SqlHosts`. The registry entry contains parameters that define your network configuration, network protocol, and environment variables. If you omit these values from the database profile when you define the native Informix database interface, they default to the values specified in the registry entry.

For instructions on configuring your Informix client software, see your Informix documentation.

If required by your operating system, make sure the directory containing the Informix client software is in your system path.

In the PowerBuilder Setup program, select the Typical install, or select the native Informix database interface in the Custom install.

Make sure you can connect to the Informix server and database you want to access from outside PowerBuilder.

To verify the connection, use any Windows-based utility (such as the Informix ilogin.exe program) that connects to the database. When connecting, be sure to specify the same parameters you plan to use in your PowerBuilder database profile to access the database.

For instructions on using `ilogin.exe`, see your Informix documentation.

**Defining the Informix database interface**

To define a connection through an Informix database interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup dialog box for Informix IN9 or I10. You can then select this profile at any time to connect to your database in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.
CHAPTER 8 Using Informix

Specifying the server name

When you specify the server name value, you must use the following format to connect to the database through the Informix interfaces:

host_name@server_name

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>host_name</td>
<td>The name of the host computer running the Informix database server. This corresponds to the Informix HOSTNAME environment variable.</td>
</tr>
<tr>
<td>server_name</td>
<td>The name of the server containing the Informix database. This corresponds to the Informix SERVER environment variable.</td>
</tr>
</tbody>
</table>

For example, to use a PowerBuilder native interface to connect to an Informix database server named server01 running on a host machine named sales, do either of the following:

- **In a database profile**  Type the host name (sales) in the Host Name box and the server name (server01) in the Server box on the Connection tab in the Database Profile Setup dialog box. PowerBuilder saves this server name as sales@server01 in the database profile entry in the system registry.

- **In a PowerBuilder script**  Type the following in your PowerBuilder application script:

  ```sql
  SQLCA.ServerName = "sales@server01"
  ```

**Tip**

If you specify a value for Host Name and Server in your database profile, this syntax displays on the Preview tab in the Database Profile Setup dialog box. You can then copy the syntax from the Preview tab into your script.
Accessing serial values in a PowerBuilder script

If you are connecting to an Informix database from a PowerBuilder script, you can obtain the serial number of the row inserted into an Informix table by checking the value of the SQLReturnData property of the Transaction object.

After an embedded SQL INSERT statement executes, SQLReturnData contains the serial number that uniquely identifies the row inserted into the table.

PowerBuilder updates SQLReturnData following an embedded SQL statement only; it does not update it following a DataWindow operation.
CHAPTER 9  Using Microsoft SQL Server

About this chapter
This chapter describes how to use the Microsoft SQL Server Native Client database interface in PowerBuilder.

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<th>Page</th>
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</tbody>
</table>

Supported versions for SQL Server

You can access Microsoft SQL Server 2000 and 2005 databases using the SQL Native Client interface. The SQL Native Client interface uses a DLL named PBSNC115.DLL to access the database. The interface uses the SQL Server 2005 Native Client (sqlncli.h and sqlncli.dll) on the client side and connects using OLE DB.

For SQL Server 2000, the SQL client SDK was provided with the Microsoft Database Access Components (MDAC). MDAC does not support new features in SQL Server 2005. To take advantage of these features, you need to use the SNC interface. The SQL Server 2005 SQL Native Client software must be installed on the client computer.
Supported SQL Server datatypes

PBODB initialization file not used
Connections made directly through OLE DB use the PBODB initialization file to set some parameters, but connections made using the SNC interface do not depend on the PBODB initialization file.

Supported SQL Server datatypes

The SQL Native Client database interface supports the datatypes listed in Table 9-1.

Table 9-1: Supported datatypes for Microsoft SQL Server 2005

<table>
<thead>
<tr>
<th>Datatype</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>Real</td>
</tr>
<tr>
<td>Bit</td>
<td>SmallDateTime</td>
</tr>
<tr>
<td>Character (fewer than 255 characters)</td>
<td>SmallInt</td>
</tr>
<tr>
<td>DateTime</td>
<td>SmallMoney</td>
</tr>
<tr>
<td>Decimal</td>
<td>Text</td>
</tr>
<tr>
<td>Float</td>
<td>Timestamp</td>
</tr>
<tr>
<td>Identity</td>
<td>TinyInt</td>
</tr>
<tr>
<td>Image</td>
<td>VarBinary(max)</td>
</tr>
<tr>
<td>Int</td>
<td>VarBinary(n)</td>
</tr>
<tr>
<td>Money</td>
<td>VarChar(max)</td>
</tr>
<tr>
<td>Numeric</td>
<td>VarChar(n)</td>
</tr>
<tr>
<td>NVarChar(max)</td>
<td>XML</td>
</tr>
<tr>
<td>NVarChar(n)</td>
<td></td>
</tr>
</tbody>
</table>

The XML datatype is a built-in datatype in SQL Server 2005 that enables you to store XML documents and fragments in a SQL Server database. The XML datatype maps to the PowerScript String datatype. You can use this datatype as a column type when you create a table, as a variable, parameter, or function return type, and with CAST and CONVERT functions.

Additional datatypes are supported for SQL Server 2008. For more information, see “Support for new datatypes in SQL Server 2008” on page 112.
Datatype conversion
When you retrieve or update columns, PowerBuilder converts data appropriately between the Microsoft SQL Server datatype and the PowerScript datatype. Keep in mind, however, that similarly or identically named SQL Server and PowerScript datatypes do not necessarily have the same definitions.

For information about the definitions of PowerScript datatypes, see the PowerScript Reference.

In SQL Server 2005, the VarChar(max), NVarChar(max), and VarBinary(max) datatypes store very large values (up to $2^{31}$ bytes). The VarChar(max) and NVarChar(max) datatypes map to the PowerScript String datatype and the VarBinary(max) datatype maps to the PowerScript Blob datatype. You can use these datatypes to obtain metadata, define new columns, and query data from the columns. You can also use them to pipeline data.

For large data values of datatypes Text, NText, Image, Varchar(max), NVarchar(max), VarBinary(max), and XML, the SNC interface supports reading data directly from the database using an embedded SQL statement.

Example 1:
```sql
select image_col into :blob_var from mytable where key_col = 1;
```

Example 2:
```sql
declare cur cursor for select id, image_col from mytable;
open cur;
fetch cur into :id_var, :blob_var;
```

If the result set contains a large datatype of type Text or Varchar(max), using ANSI encoding, you must set a maximum size for each large value using the PBMaxBlobSize database parameter. For other large datatypes, there is no limitation on the size of the data. The SNC interface retrieves all the data from the database if there is sufficient memory.

The SNC interface supports inserting and updating values of large datatypes using embedded SQL INSERT and UPDATE statements. You must set the DisableBind database parameter to 0 to enable the SNC interface to bind large data values. For example:
```sql
Insert into mytable (id, blob_col) values(1, :blob_var);
Update mytable set blob_col = :blob_var where id = 1;
```
Basic software components for Microsoft SQL Server

You must install the software components in Figure 9-1 to access a database with the SQL Native Client interface. Microsoft SQL Server Native Client software contains a SQL OLE DB provider and ODBC driver in a single DLL.

*Figure 9-1: Components of a Microsoft SQL Server connection*

Preparing to use the SQL Server database

Before you define the database interface and connect to a Microsoft SQL Server database in PowerBuilder, follow these steps to prepare the database for use:
CHAPTER 9 Using Microsoft SQL Server

Connecting to Your Database

1 Install and configure the required database server, network, and client software.

2 Install the SQL Native Client database interface.

3 Verify that you can connect to the Microsoft SQL Server server and database outside PowerBuilder.

Step 1: Install and configure the database server

You must install and configure the database server, network, and client software for SQL Server.

❖ To install and configure the database server, network, and client software:

1 Make sure the Microsoft SQL Server database software is installed and running on the server specified in your database profile.

You must obtain the database server software and required licenses from Microsoft Corporation. For installation instructions, see your Microsoft SQL Server documentation.

Upgrading from an earlier version of SQL Server

For instructions on upgrading to a later version of SQL Server or installing it alongside an earlier version, see your Microsoft SQL Server documentation.

2 If you are accessing a remote SQL Server database, make sure the required network software (for example, TCP/IP) is installed and running on your computer and is properly configured so that you can connect to the SQL Server database server at your site.

For installation and configuration instructions, see your network or database administrator.

3 Install the required Microsoft SQL Native Client software on each client computer on which PowerBuilder is installed.

You must obtain the SQL Native Client software from Microsoft. Make sure the version of the client software you install supports all of the following:

- The operating system running on the client computer
- The version of the database that you want to access
- The version of PowerBuilder that you are running

For installation instructions, see your Microsoft SQL Server documentation.
Defining the SQL Server database interface

4 Make sure the SQL Native Client client software is properly configured so that you can connect to the SQL Server database server at your site.

For configuration instructions, see your Microsoft SQL Server documentation.

5 Make sure the directory containing the SQL Native Client software is in your system path.

6 Make sure only one copy of the Sqlncli.dll file is installed on your computer.

Step 2: Install the database interface

In the PowerBuilder Setup program, select the Custom install and select the SQL Native Client database interface.

Step 3: Verify the connection

Make sure you can connect to the SQL Server server and database you want to access from outside PowerBuilder.

To verify the connection, use any Windows-based utility that connects to the database. When connecting, be sure to specify the same parameters you plan to use in your PowerBuilder database profile to access the database.

Defining the SQL Server database interface

To define a connection through the SQL Native Client interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup - SQL Native Client dialog box. You can then select this profile at any time to connect to your database in the development environment.

For information on how to define a database profile, see “Creating a database profile” on page 10. For new features that require special settings in the database profile, see “SQL Server 2005 features” on page 110. For a comparison of the database parameters you might have used with existing applications and those used with the SNC database interface, see “Migrating from the MSS or OLE DB database interfaces” next.
Migrating from the MSS or OLE DB database interfaces

In earlier releases of PowerBuilder, the MSS native interface was provided for connection to Microsoft SQL Server. This native interface was based on Microsoft DB-LIB functionality, which is no longer supported by Microsoft and is not Unicode-enabled. The MSS interface was removed in PowerBuilder 10.0.

Prior to the introduction of SQL Server 2005 and SQL Native Client, Microsoft recommended using the OLE DB database interface and MDAC to connect to SQL Server. You can continue to use this solution if you do not need to take advantage of new features in SQL Server 2005 or SQL Server 2008.

This section provides a comparison between database parameters you might have used in existing applications with the parameters you can use with the SNC database interface.

Table 9-2 shows the database parameters and preferences that could be set in the Database Profile Setup dialog box for the discontinued MSS native database interface for Microsoft SQL Server, and indicates whether they are supported by the SNC interface.

The column on the left shows the tab page in the Database Profile Setup dialog box for MSS. The parameters and preferences may be on different tab pages in the SNC profile.

Table 9-2: MSS parameters supported by SNC

<table>
<thead>
<tr>
<th>MSS</th>
<th>SNC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection tab:</strong></td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>Not supported</td>
</tr>
<tr>
<td>Lock</td>
<td>Supported (Transaction tab)</td>
</tr>
<tr>
<td>AutoCommit</td>
<td>Supported</td>
</tr>
<tr>
<td>CommitOnDisconnect</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>System tab:</strong></td>
<td></td>
</tr>
<tr>
<td>Log</td>
<td>Not supported</td>
</tr>
<tr>
<td>SystemProcs</td>
<td>Not supported</td>
</tr>
<tr>
<td>PBCatalogOwner</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Transaction tab:</strong></td>
<td></td>
</tr>
<tr>
<td>Async</td>
<td>Not supported</td>
</tr>
<tr>
<td>DBGetTime</td>
<td>Not supported</td>
</tr>
<tr>
<td>CursorLock</td>
<td>Not supported</td>
</tr>
<tr>
<td>CursorScroll</td>
<td>Not supported</td>
</tr>
<tr>
<td>StaticBind</td>
<td>Supported</td>
</tr>
</tbody>
</table>
Migrating from the MSS or OLE DB database interfaces

Table 9-3 shows the database parameters and preferences that can be set in the Database Profile Setup dialog box for the OLE DB standard interface for Microsoft SQL Server, and indicates whether they are supported by the SNC interface.

The column on the left shows the tab page in the Database Profile Setup dialog box for OLE DB. The parameters and preferences may be on different tab pages in the SNC profile.

**Table 9-3: OLE DB parameters supported by SNC**

<table>
<thead>
<tr>
<th>OLE DB</th>
<th>SNC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection tab:</strong></td>
<td></td>
</tr>
<tr>
<td>Provider</td>
<td>Not supported</td>
</tr>
<tr>
<td>DataSource</td>
<td>Supported at runtime (as SQLCA.ServerName)</td>
</tr>
<tr>
<td>DataLink</td>
<td>Supported</td>
</tr>
<tr>
<td>Location</td>
<td>Not supported</td>
</tr>
<tr>
<td>ProviderString</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>System tab:</strong></td>
<td></td>
</tr>
<tr>
<td>PBCatalogOwner</td>
<td>Supported</td>
</tr>
<tr>
<td>ServiceComponents</td>
<td>Not supported</td>
</tr>
<tr>
<td>AutoCommit</td>
<td>Supported (General tab)</td>
</tr>
<tr>
<td>CommitOnDisconnect</td>
<td>Supported (General tab)</td>
</tr>
<tr>
<td>StaticBind</td>
<td>Supported (Transaction tab)</td>
</tr>
<tr>
<td>DisableBind</td>
<td>Supported (Transaction tab)</td>
</tr>
<tr>
<td>Init_Prompt</td>
<td>Not supported</td>
</tr>
<tr>
<td>TimeOut</td>
<td>Supported</td>
</tr>
<tr>
<td>LCID</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

OLE DB database parameters supported by SNC
CHAPTER 9    Using Microsoft SQL Server

Connecting to Your Database

The SNC interface also supports the ReCheckRows and BinTxtBlob runtime-only parameters, the Encrypt, TrustServerCertificate, and SPCache parameters (on the System tab page), and the Identity parameter (on the Syntax tab page).

You can control how many stored procedures are cached with parameter information by modifying the setting of the SPCache database parameter. The default is 100 procedures. To turn off caching of stored procedures, set SPCache to 0.

For more information about database parameters supported by the SNC interface, see the Connection Reference in the online Help.

<table>
<thead>
<tr>
<th>OLE DB</th>
<th>SNC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transaction tab:</strong></td>
<td></td>
</tr>
<tr>
<td>Block</td>
<td>Supported</td>
</tr>
<tr>
<td>PBMxBlobSize</td>
<td>Supported</td>
</tr>
<tr>
<td>Mode</td>
<td>Not supported</td>
</tr>
<tr>
<td>Lock</td>
<td>Supported</td>
</tr>
<tr>
<td><strong>Syntax tab:</strong></td>
<td></td>
</tr>
<tr>
<td>DelimitIdentifier</td>
<td>Supported</td>
</tr>
<tr>
<td>IdentifierQuoteChar</td>
<td>Not supported</td>
</tr>
<tr>
<td>DateFormat</td>
<td>Supported</td>
</tr>
<tr>
<td>TimeFormat</td>
<td>Supported</td>
</tr>
<tr>
<td>DecimalSeparator</td>
<td>Supported</td>
</tr>
<tr>
<td>OJSyntax</td>
<td>Support</td>
</tr>
<tr>
<td><strong>Security tab:</strong></td>
<td></td>
</tr>
<tr>
<td>EncryptPassword</td>
<td>Not supported</td>
</tr>
<tr>
<td>CacheAuthentication</td>
<td>Not supported</td>
</tr>
<tr>
<td>PersistSensitive</td>
<td>Not supported</td>
</tr>
<tr>
<td>MaskPassword</td>
<td>Not supported</td>
</tr>
<tr>
<td>PersistEncrypted</td>
<td>Not supported</td>
</tr>
<tr>
<td>IntegratedSecurity</td>
<td>Supported (TrustedConnection on General tab)</td>
</tr>
<tr>
<td>ImpersonationLevel</td>
<td>Not supported</td>
</tr>
<tr>
<td>ProtectionLevel</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Additional database parameters

SPCache database parameter

The SNC interface also supports the ReCheckRows and BinTxtBlob runtime-only parameters, the Encrypt, TrustServerCertificate, and SPCache parameters (on the System tab page), and the Identity parameter (on the Syntax tab page).

You can control how many stored procedures are cached with parameter information by modifying the setting of the SPCache database parameter. The default is 100 procedures. To turn off caching of stored procedures, set SPCache to 0.

For more information about database parameters supported by the SNC interface, see the Connection Reference in the online Help.
SQL Server 2005 features

The SNC database interface supports several features that were introduced in SQL Server 2005. For more information about using these features, see the Microsoft SQL Server 2005 documentation.

Multiple Active Result Sets

The SNC interface supports Multiple Active Result Sets (MARS), which enable applications to have multiple default result sets open and to interleave reading from them. Applications can also execute statements such as INSERT, UPDATE, and DELETE and stored procedure calls while default result sets are open.

Encryption without validation

SQL Server 2005 always encrypts network packets associated with logging. If no certificate is provided on the server when it starts up, SQL Server generates a self-signed certificate that is used to encrypt login packets.

The SQL Native Client supports encrypting data sent to the server without validating the certificate. The TrustServerCertificate database parameter, available on the System page of the database connection profile dialog box, allows you to control this feature.

Snapshot isolation

The snapshot isolation level is designed to enhance concurrency for online transaction processing applications. Transactions that start under snapshot isolation read a database snapshot taken at start up time. Keyset, dynamic, and static server cursors in this context behave like static cursors opened within serializable transactions, but locks are not taken, which can reduce blocking on the server. The SQLCA.Lock value for snapshot isolation is SS. You can set this value in the Isolation Level field on the Transaction page of the database connection profile dialog box.

SQL Server 2008 features

PowerBuilder support for connections to SQL Server 2008 databases includes new database parameters as well as support for new SQL Server datatypes. To connect to SQL Server 2008 from PowerBuilder, you must install the SNC 10.0 driver.
CHAPTER 9  Using Microsoft SQL Server

New database parameters

Provider parameter

The Provider DBParm parameter for the SQL Native Client (SNC) interface allows you to select the SQL Server version that you want to connect to. You can set this parameter in script to SQLNCLI (for the SNC 9.0 driver that connect to SQL Server 2005) or to SQLNCLI10 (for the SNC 10.0 driver that connects to SQL Server 2008). Otherwise, you can select one of these providers on the Connection tab of the Database Profile Setup dialog box for the SNC interface.

If you do not set or select a provider, the default selection is SQLNCLI (SNC 9.0 for SQL Server 2005). This allows existing SNC interface users to be able to migrate to PowerBuilder 11.5 without any modifications. If PowerBuilder fails to connect with the SQLNCLI provider, it will attempt to connect to SQLNCLI10 provider. However, if you explicitly set the provider and the connection fails, PowerBuilder displays an error message.

Failover parameter

The FailoverPartner DBParm parameter allows you to set the name of a mirror server, thereby maintaining database availability if a failover event occurs. You can also set the name of the mirror server on the System tab of the Database Profile Setup dialog box for the SNC interface.

When failover occurs, the existing PowerBuilder connection to SQL Server is lost. The SNC driver releases the existing connection and tries to reopen it. If reconnection succeeds, PowerBuilder triggers the failover event.

The following conditions must be satisfied for PowerBuilder to trigger the failover event:

- The FailoverPartner DBParm is supplied at connect time
- The SQL Server database is configured for mirroring
- PowerBuilder is able to reconnect successfully when the existing connection is lost

When failover occurs:

- PowerBuilder returns an error code (998) and triggers the failover event
- Existing cursors cannot be used and should be closed
- Any failed database operation can be tried again
- Any uncommitted transaction is lost. New transactions must be started
Support for new datatypes in SQL Server 2008

The following table lists new SQL Server 2008 date and time datatypes and the PowerScript datatypes that they map to:

<table>
<thead>
<tr>
<th>SQL Server datatype</th>
<th>PowerScript datatype</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>Date</td>
</tr>
<tr>
<td>TIME</td>
<td>Time (Supports only up to 6 fractional seconds precision although SQL Server datatype supports up to 7 fractional seconds precision.)</td>
</tr>
<tr>
<td>DATETIME2</td>
<td>DateTime (Supports only up to 6 fractional seconds precision although SQL Server datatype supports up to 7 fractional seconds precision.)</td>
</tr>
</tbody>
</table>

The SQL Server 2008 DATETIMEOFFSET datatype is not supported in PowerBuilder 11.5.

Precision settings  When you map to a table column in a SQL Server 2008 database, PowerBuilder includes a column labeled “Dec” in the Column Specifications view of the DataWindow painter, and a text box labeled “Fractional Seconds Precision” in the Column (Object Details) view of the Database painter. These fields allow you to list the precision that you want for the TIME and DATETIME2 columns.

The precision setting is for table creation only. When retrieving or updating the data in a column, PowerBuilder uses only up to six decimal places precision for fractional seconds, even if you enter a higher precision value for the column.

Filestream datatype

The FILESTREAM datatype allows large binary data to be stored directly in an NTFS file system. Transact-SQL statements can insert, update, query, search, and back up FILESTREAM data.

The SQL Server Database Engine implements FILESTREAM as a Varbinary(max) datatype. The PowerBuilder SNC interface maps the Varbinary(max) datatype to a BLOB datatype, so to retrieve or update filestream data, use the SelectBlob or UpdateBlob SQL statements, respectively. To specify that a column should store data on the file system, you must include the FILESTREAM attribute in the Varbinary(max) column definition. For example:

```sql
CREATE TABLE FSTest (  
   GuidCol1 uniqueidentifier ROWGUIDCOL NOT NULL  
   UNIQUE DEFAULT NEWID(),  
   IntCol2 int,  
   varbinaryCol3 varbinary(max) FILESTREAM);
```
Do not use PowerScript file access functions with FILESTREAM data
You can access FILESTREAM data by declaring and using the Win32 API functions directly in PowerBuilder applications. However, existing PowerBuilder file access functions cannot be used to access FILESTREAM files. For more information about accessing FILESTREAM data using Win32 APIs, see the MSDN SQL Server Developer Center Web site at http://msdn.microsoft.com/en-us/library/bb933877(SQL.100).aspx.

Using CLR datatypes in PowerBuilder
The binary values of the .NET Common Language Runtime (CLR) datatypes can be retrieved from a SQL Server database as blobs that you could use in PowerBuilder applications to update other columns in the database. If their return values are compatible with PowerBuilder datatypes, you can use CLR datatype methods in PowerScript, dynamic SQL, embedded SQL or in DataWindow objects, because the SQL script is executed on the SQL Server side.

The CLR datatypes can also be mapped to Strings in PowerScript, but the retrieved data is a hexadecimal string representation of binary data.

You can use the above methods to work with all datatypes that are implemented as CLR datatypes, such as the HierarchyID datatype, Spatial datatypes, and User-defined types.

HierarchyID datatype
HierarchyID is a variable length, system datatype that can store values representing nodes in a hierarchical tree, such as an organizational structure. A value of this datatype represents a position in the tree hierarchy.

ISQL Usage  You can use HierarchyID columns with CREATE TABLE, SELECT, UPDATE, INSERT, and DELETE statements in the ISQL painter. For example:

```sql
CREATE TABLE Emp (  
  EmpId int NOT NULL,  
  EmpName varchar(20) NOT NULL,  
  EmpNode hierarchyid NULL)
```

To insert HierarchyID data, you can use the canonical string representation of HierarchyID or any of the methods associated with the HierarchyID datatype as shown below.

```sql
INSERT INTO Emp VALUES (1, 'Scott', hierarchyid::GetRoot());  
INSERT INTO Emp VALUES (2, 'Tom', '/1/');  
DECLARE @Manager hierarchyid  
SELECT @Manager = hierarchyid::GetRoot() FROM Emp
```
INSERT INTO Emp VALUES (2, 'Tom', @Manager.GetDescendant(NULL, NULL));
DECLARE @Employee hierarchyid
SELECT @Employee = CAST('/1/2/3/4/' AS hierarchyid)
INSERT INTO Emp VALUES (2, 'Jim', @Employee);

You cannot select the HierarchyID column directly since it has binary data, and the ISQL painter Results view does not display binary columns. However, you can retrieve the HierarchyID data as a string value using the ToString method of HierarchyID. For example:

```
SELECT EmpId, EmpName, EmpNode.ToString() FROM Emp;
```

You can also use the following methods on HierarchyID columns to retrieve its data: GetAncestor, GetDescendant, GetLevel, GetRoot, IsDescendant, Parse, and Reparent. If one of these methods returns a HierarchyID node, then use ToString to convert the data to a string. For example:

```
SELECT EmpId, EmpName, EmpNode.GetLevel() FROM Emp;
SELECT EmpId, EmpName, EmpNode.GetAncestor(1).ToString() FROM Emp;
```

HierarchyID columns can be updated using a String value or a HierarchyID variable:

```
UPDATE Emp SET EmpNode = '/1/2/' WHERE EmpId=4;
DELETE FROM Emp WHERE EmpNode = '/1/2/';
```

**PowerScript Usage** You can use HierarchyID columns in embedded SQL statements for SELECT, INSERT, UPDATE, and DELETE operations. HierarchyID data can be retrieved either as a String or as a Binary(Blob) datatype using the SelectBlob statement.

When using a String datatype to retrieve HierarchyID data, use the ToString method. Otherwise the data will be a hexadecimal representation of the binary HierarchyID value.

The following example shows how you can use HierarchyID methods in embedded SQL:

```
long id
String hid, name
SELECT EmpId, EmpName, EmpNode.ToString()
  INTO :id, :name, :hid
  FROM Emp WHERE EmpId=3;
SELECT EmpId, EmpName, EmpNode.GetLevel()
  INTO :id, :name, :hid
  FROM Emp WHERE EmpId=3;
```
Blob b
Selectblob EmpNode into :b from Emp where EmpId = 2;

**DataWindow Usage**  DataWindow objects do not directly support the HierarchyID datatype. But you can convert the HierarchyID to a string using the ToString method or an associated HierarchyID method in the data source SQL. For example:

```sql
SELECT EmpId, EmpName, EmpNode.ToString() FROM Emp;
SELECT EmpId, EmpName, EmpNode.GetLevel() FROM Emp;
```

**Spatial datatypes**

Microsoft SQL Server 2008 supports two spatial datatypes: the geometry datatype and the geography datatype. In SQL Server, these datatypes are implemented as .NET Common Language Runtime (CLR) datatypes.

Although the PowerBuilder SNC interface does not work with CLR datatypes, you can convert the spatial datatypes into strings (with the ToString function) and use them in PowerScript, in the ISQL painter, in embedded SQL, and in DataWindow objects. This is similar to the way you use the HierarchyID datatype. The SelectBlob SQL statement also lets you retrieve binary values for these datatypes.

The geography and geometry datatypes support eleven different data objects, or instance types, but only seven of these types are instantiable: Points, LineStrings, Polygons, and the objects in an instantiable GeometryCollection (MultiPoints, MultiLineStrings, and MultiPolygons). You can create and work with these objects in a database, calling methods associated with them, such as STAsText, STArea, STGeometryType, and so on. For example:

```sql
CREATE TABLE SpatialTable (id int IDENTITY (1,1),
GeomCol geometry);
INSERT INTO SpatialTable (GeomCol) VALUES (geometry::STGeomFromText('LINESTRING (100 100,20 180,180 180)',0));
select id, GeomCol.ToString() from SpatialTable;
select id, GeomCol.STAsText(),
GeomCol.STGeometryType(),
GeomCol.STArea() from SpatialTable;
```

**User-defined types**  User-defined types (UDTs) are implemented in SQL Server as CLR types and integrated with .NET. Microsoft SQL Server 2008 eliminates the 8 KB limit for UDTs, enabling the size of UDT data to expand dramatically.
Although the PowerBuilder SNC interface does not directly support UDT datatypes, you can use the ToString method to retrieve data for UDTs in the same way as for other CLR datatypes such as HierarchyId or the spatial datatypes. However, if a UDT datatype is mapped to a String datatype in PowerScript, UDT binary values will be retrieved as hexadecimal strings. To retrieve or update data in binary form (blob) from a UDT, you can use the SelectBlob or UpdateBlob SQL statements, respectively.

You can use any of the associated methods of UDT or CLR datatypes that return compatible data (such as String, Long, Decimal, and so on) for PowerBuilder applications.

**T-SQL enhancements**

**MERGE statement**

The MERGE Transact-SQL statement performs INSERT, UPDATE, or DELETE operations on a target table or view based on the results of a join with a source table. You can use MERGE statement in the ISQL painter and in PowerScript using dynamic SQL. For example

```sql
String mySQL
mySQL = "MERGE INTO a USING b ON a.keycol = b.keycol " & 
  + "WHEN MATCHED THEN " & 
  + "UPDATE SET col1 = b.col1, col2 = b.col2 " & 
  + "WHEN NOT MATCHED THEN " & 
  + "INSERT (keycol, col1, col2, col3)" & 
  + "VALUES (b.keycol, b.col1, b.col2, b.col3) " & 
  + "WHEN SOURCE NOT MATCHED THEN " & 
  + "DELETE;"
EXECUTE IMMEDIATE :Mysql;
```

**Using the MERGE statement in ISQL**

A MERGE statement must be terminated by a semicolon. By default the ISQL painter uses a semicolon as a SQL terminating character, so to use a MERGE statement in ISQL, the terminating character must be changed to a colon (:), a forward slash (/), or some other special character.

**Grouping sets**

GROUPING SETS is an extension of the GROUP BY clause that lets you define multiple groupings in the same query. GROUPING SETS produce a single result set, making aggregate querying and reporting easier and faster. It is equivalent to a UNION ALL operation for differently grouped rows.
The GROUPING SETS, ROLLUP, and CUBE operators are added to the GROUP BY clause. A new function, GROUPING_ID, returns more grouping-level information than the existing GROUPING function. (The WITH ROLLUP, WITH CUBE, and ALL syntax is not ISO compliant and is therefore deprecated.)

The following example uses the GROUPING SETS operator and the GROUPING_ID function:

```sql
SELECT EmpId, Month, Yr, SUM(Sales) AS Sales
FROM Sales
GROUP BY GROUPING SETS((EmpId, ROLLUP(Yr, Month)));
```

```sql
SELECT COL1, COL2,
SUM(COL3) AS TOTAL_VAL,
GROUPING(COL1) AS C1,
GROUPING(COL2) AS C2,
GROUPING_ID(COL1, COL2) AS GRP_ID_VALUE
FROM TEST_TBL GROUP BY ROLLUP (COL1, COL2);
```

You can use the GROUPING SETS operator in the ISQL painter, in PowerScript (embedded SQL and dynamic SQL) and in DataWindow objects (syntax mode).

**Row constructors**

Transact-SQL now allows multiple value inserts within a single INSERT statement. You can use the enhanced INSERT statement in the ISQL painter and in PowerScript (embedded SQL and dynamic SQL). For example:

```sql
INSERT INTO Employees VALUES ('tom', 25, 5),
('jerry', 30, 6), ('bok', 25, 3);
```

When including multiple values in a single INSERT statement with host variables, you must set the DisableBind DBParm to 1. If you use literal values as in the above example, you can insert multiple rows in a single INSERT statement regardless of the binding setting.

**Compatibility level**

In SQL Server 2008, the ALTER DATABASE statement allows you to set the database compatibility level (SQL Server version), replacing the sp_dbcmptlevel procedure. You can use this syntax in the ISQL painter and in PowerScript (dynamic SQL). For example:

```sql
ALTER DATABASE <database_name>
SET COMPATIBILITY_LEVEL = {80 | 90 | 100}
```

80 = SQL Server 2000
90 = SQL Server 2005
100 = SQL Server 2008
Notes on using the SNC interface

Compatibility level affects behaviors for the specified database only, not for the entire database server. It provides only partial backward compatibility with earlier versions of SQL Server. You can use the database compatibility level as an interim migration aid to work around differences in the behaviors of different versions of the database.

Table hints

The FORCESEEK table hint overrides the default behavior of the query optimizer. It provides advanced performance tuning options, instructing the query optimizer to use an index seek operation as the only access path to the data in the table or view that is referenced by the query. You can use the FORCESEEK table hint in the ISQL painter, in PowerScript (embedded SQL and dynamic SQL), and in DataWindow objects (syntax mode). For example:

```
Select ProductID, OrderQty from SalesOrderDetail
     with (FORCESEEK);
```

Unsupported SQL Server 2008 features

The PowerBuilder SNC interface does not support the User-Defined Table Type (a user-defined type that represents the definition of a table structure) that was introduced in SQL Server 2008.

Notes on using the SNC interface

Using the DBHandle PowerScript function

The DBHandle function on the Transaction object returns the IUnknown* interface of the current session object. You can use this interface to query any interface in the session object. The interface is not locked by pIUnknown->Addref() in PowerBuilder, therefore you should not call the pIUnknown->Release() to free the interface after using it.

SQL batch statements

The SNC interface supports SQL batch statements. However, they must be enclosed in a BEGIN...END block or start with the keyword DECLARE:

- Enclosed in a BEGIN...END block:

  ```
  BEGIN
  INSERT INTO t_1 values(1, 'sfdfs')
  INSERT INTO t_2 values(1, 'sfdfs')
  SELECT * FROM t_1
  SELECT * FROM t_2
  ```
- Starting with the keyword DECLARE:

```
DECLARE @p1 int, @p2 varchar(50)
SELECT @p1 = 1
EXECUTE sp_4 @p1, @p2 OUTPUT
SELECT @p2 AS 'output'
```

You can run the batch of SQL statements in the Database painter or in PowerScript. For example:

```
String batchSQL //contains a batch of SQL statements
DECLARE my_cursor DYNAMIC CURSOR FOR SQLSA ;
PREPARE SQLSA FROM :batchSQL ;
OPEN DYNAMIC my_cursor ;

//first result set
FETCH my_cursor INTO . . .

//second result set
FETCH my_cursor INTO . .

CLOSE my_cursor ;
```

**Connection pooling**

The SNC interface pools connections automatically using OLE DB pooling. To disable OLE DB pooling, type the following in the Extended Properties box on the Connection tab page in the Database Profile Setup dialog box:

```
OLE DB Services=-4
```

You can also type the following statement in code:

```
ProviderString='OLE DB Services=-4')
```

**Triggers and synonyms in the Database painter**

In the Objects view for SNC profiles in the Database painter, triggers display for tables in the Tables folder and Microsoft SQL Server 2005 synonyms display for tables and views.
Notes on using the SNC interface
CHAPTER 10 Using Oracle

About this chapter
This chapter describes how to use the native Oracle database interfaces in PowerBuilder.

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Supported versions for Oracle

PowerBuilder provides three Oracle database interfaces. These interfaces use different DLLs and access different versions of Oracle.

Table 10-1: Supported native database interfaces for Oracle

<table>
<thead>
<tr>
<th>Oracle interface</th>
<th>DLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>O90 Oracle 9i</td>
<td>PBO90115DLL</td>
</tr>
<tr>
<td>O10 Oracle 10g</td>
<td>PBO10115.DLL</td>
</tr>
<tr>
<td>ORA Oracle 11g</td>
<td>PBORA115.DLL</td>
</tr>
</tbody>
</table>

Support for the O84 Oracle8i interface is discontinued in PowerBuilder 11.5.
Supported Oracle datatypes

For more information

The ORA database interface allows you to connect to Oracle 11g servers using Oracle 11g Database Client or Oracle 11g Instant Client. It includes partial support for the XMLType datatype that it maps to the PowerBuilder String datatype. It also supports session and connection pooling, load balancing, the Oracle Client Cache, setting of an application driver name, and access through a proxy. Oracle 11g clients can also connect to Oracle9i or Oracle 10g servers.

The O10 database interface allows you to connect to Oracle 10g servers using Oracle 10g Database Client or Oracle 10g Instant Client. It supports BINARY_FLOAT and BINARY_DOUBLE datatypes and increased size limits for CLOB and NCLOB datatypes. Oracle 10g clients can connect to Oracle9i or Oracle 10g servers; they cannot connect to Oracle8i or earlier servers.

Supported Oracle datatypes

The Oracle database interfaces support the Oracle datatypes listed in Table 10-2 in DataWindow objects and embedded SQL.

Table 10-2: Supported datatypes for Oracle

| Binary_Float (Oracle 10g and later only) | LongRaw |
| Binary_Double (Oracle 10g and later only) | NChar |
| BFILE | Number |
| Blob | NVarChar2 |
| Char | Raw |
| CLOB | TimeStamp |
| Date | VarChar |
| Float | VarChar2 |
| Long | XMLType (partial support, ORA driver only) |

The ORA driver adds support for the XMLType datatype that was introduced with Oracle 9i. However, you cannot use this datatype with embedded SQL statements or in a DataWindow object.
PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases, but it does not convert data between Unicode and ANSI/DBCS. When character data or command text is sent to the database, PowerBuilder sends a Unicode string. The driver must guarantee that the data is saved as Unicode data correctly. When PowerBuilder retrieves character data, it assumes the data is Unicode.

A Unicode database is a database whose character set is set to a Unicode format, such as UTF-8, UTF-16, UCS-2, or UCS-4. All data must be in Unicode format, and any data saved to the database must be converted to Unicode data implicitly or explicitly.

A database that uses ANSI (or DBCS) as its character set might use special datatypes to store Unicode data. These datatypes are NCHAR and NVARCHAR2. Columns with this datatype can store only Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.

A constant string is regarded as a char type by Oracle and its character set is NLS_CHARACTERSET. However, if the datatype in the database is NCHAR and its character set is NLS_NCHAR_CHARACTERSET, Oracle performs a conversion from NLS_CHARACTERSET to NLS_NCHAR_CHARACTERSET. This can cause loss of data. For example, if NLS_CHARACTERSET is WE8ISO8859P1 and NLS_NCHAR_CHARACTERSET is UTF8, when the Unicode data is mapped to WE8ISO8859P1, the Unicode data is corrupted.

If you want to access Unicode data using NCHAR and NVARCHAR2 columns or stored procedure parameters, use PowerBuilder variables to store the Unicode data in a script using embedded SQL to avoid using a constant string, and force PowerBuilder to bind the variables.

By default, the Oracle database interfaces bind all string data to internal variables as the Oracle CHAR datatype to avoid downgrading performance. To ensure that NCHAR and NVARCHAR2 columns are handled as such on the server, set the NCharBind database parameter to 1 to have the drivers bind string data as the Oracle NCHAR datatype.

For example, suppose table1 has a column c1 with the datatype NVARCHAR2. To insert Unicode data into the table, set DisableBind to 0, set NCharBind to 1, and use this syntax:

```sql
string var1
insert into table1 (c1) values(:var1);
```
Supported Oracle datatypes

If an Oracle stored procedure has an NCHAR or NVARCHAR2 input parameter and the input data is a Unicode string, set the BindSPIInput database parameter to 1 to force the Oracle database to bind the input data. The Oracle database interfaces are able to describe the procedure to determine its parameters, therefore you do not need to set the NCharBind database parameter.

For a DataWindow object to access NCHAR and NVARCHAR2 columns and retrieve data correctly, set both DisableBind and StaticBind to 0. Setting StaticBind to 0 ensures that PowerBuilder gets an accurate datatype before retrieving.

**TimeStamp datatype**

The TimeStamp datatype in Oracle9i and later is an extension of the Date datatype. It stores the year, month, and day of the Date value plus hours, minutes, and seconds:

```
Timestamp[fractional_seconds_precision]
```

The `fractional_seconds_precision` value is optional and provides the number of digits for indicating seconds. The range of valid values for use with PowerBuilder is 0-6.

**Datatype conversion**

When you retrieve or update columns, in general PowerBuilder converts data appropriately between the Oracle datatype and the PowerScript datatype. Keep in mind, however, that similarly or identically named Oracle and PowerScript datatypes do not necessarily have the same definitions.

For information about the definitions of PowerScript datatypes, see the *PowerScript Reference*.

**Number datatype converted to decimal**

When a DataWindow object is defined in PowerBuilder, the Oracle datatype `number(size,d)` is mapped to a decimal datatype. In PowerBuilder, the precision of a decimal is 18 digits. If a column’s datatype has a higher precision, for example `number(32,30)`, inserting a number with a precision greater than 18 digits produces an incorrect result when the number is retrieved in a DataWindow. For example, 1.8E-17 displays as 0.000000000000000018, whereas 1.5E-25 displays as 0.

You might be able to avoid this problem by using a different datatype, such as float, for high precision number columns in the Oracle DBMS. The float datatype is mapped to the `number` datatype within the DataWindow’s source.
Basic software components for Oracle

You must install the software components in Figure 10-1 to access an Oracle database in PowerBuilder.

*Figure 10-1: Components of an Oracle connection*
Preparing to use the Oracle database

Preparing to use the Oracle database

Before you define the database interface and connect to an Oracle database in PowerBuilder, follow these steps to prepare the database for use:

1. Install and configure the required database server, network, and client software.

2. Install the native Oracle database interface for the version of Oracle you want to access.

3. Verify that you can connect to the Oracle server and database outside PowerBuilder.

4. (ORA driver only) Determine whether you want to use connection pooling or session pooling.

Preparing an Oracle database for use with PowerBuilder involves these basic tasks.

Step 1: Install and configure the database server

You must install and configure the database server, network, and client software for Oracle.

❖ To install and configure the database server, network, and client software:

1. Make sure the Oracle database software is installed on your computer or on the server specified in your database profile.

   For example, with the Oracle O90 interface you can access an Oracle9i or Oracle 10g database server.

   You must obtain the database server software from Oracle Corporation.

   For installation instructions, see your Oracle documentation.

2. Make sure the supported network software (such as TCP/IP) is installed and running on your computer and is properly configured so that you can connect to the Oracle database server at your site.

   The Hosts and Services files must be present on your computer and properly configured for your environment.

   You must obtain the network software from your network vendor or database vendor.

   For installation and configuration instructions, see your network or database administrator.
3 Install the required Oracle client software on each client computer on which PowerBuilder is installed.

You must obtain the client software from Oracle Corporation. Make sure the client software version you install supports all of the following:

- The operating system running on the client computer
- The version of the database that you want to access
- The version of PowerBuilder that you are running

Oracle 10g Instant Client is free client software that lets you run applications without installing the standard Oracle client software. It has a small footprint and can be freely redistributed.

4 Make sure the Oracle client software is properly configured so that you can connect to the Oracle database server at your site.

For information about setting up Oracle configuration files, see your Oracle Net documentation.

5 If required by your operating system, make sure the directory containing the Oracle client software is in your system path.

Step 2: Install the database interface

In the PowerBuilder Setup program, select the Typical install or select the Custom install and select the Oracle database interfaces you require.

For a list of the Oracle database interfaces available, see “Supported versions for Oracle” on page 121.

Step 3: Verify the connection

Make sure you can connect to the Oracle database server and log in to the database you want to access from outside PowerBuilder.

Some possible ways to verify the connection are by running the following Oracle tools:

- **Accessing the database server** Tools such as Oracle TNSPING (or any other ping utility) check whether you can reach the database server from your computer.

- **Accessing the database** Tools such as Oracle SQL*Plus check whether you can log in to the Oracle database you want to access and perform database operations. It is a good idea to specify the same connection parameters you plan to use in your PowerBuilder database profile to access the database.
Oracle client interface (OCI) pooling for PowerBuilder applications is created when you connect to an Oracle server for the first time. The pooling is identified by the server name and character set which are passed in the DBPARM parameters SQLCA.ServerName and NLS_Charset, respectively. If two Oracle connections are connected to the same Oracle server but use different character sets, the connections must reside in different connection or session pools. All pooling-related DBPARM parameters must be set before the initial database connection from PowerBuilder.

Session pooling means that the application creates and maintains a group of stateless sessions to the database. These sessions are passed to thin clients as requested. If no session is available, a new one is created. When the client is done with the session, the client releases it to the pool. With session pooling, the number of sessions in the pool can increase dynamically.

Session pooling does not support external authentication using an OS account. If a Login ID is not specified in a database connection using an existing session pool, the Login ID of the session pooling creator is used for the connection.

### CNNPool parameter maintained for backward compatibility

The O90 and O10 database drivers that you can use in PowerBuilder to connect to the 9.x and 10.x versions of the Oracle DBMS support connection pooling with the DBPARM parameter CNNPool. For backward compatibility purposes, this parameter is also supported by the ORA driver that you use with Oracle 11g. However, if the Pooling parameter is used with this driver, the CNNPool parameter is ignored.

### Deciding on pooling type

Table 10-3 describes the circumstances under which you should make your pooling selection.

<table>
<thead>
<tr>
<th>Choose</th>
<th>When database sessions are</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session pooling</td>
<td>Stateless (reusable by middle tier threads) and the number of back-end server processes can cause database scaling problems.</td>
</tr>
<tr>
<td>Connection pooling</td>
<td>Stateful (not reusable by middle tier threads) and the number of back-end server processes can cause database scaling problems. The number of physical connections and back-end server processes is reduced by using connection pooling. Therefore many more database sessions can be utilized for the same back-end server configuration.</td>
</tr>
</tbody>
</table>
CHAPTER 10 Using Oracle

Connecting to Your Database

Setting pooling parameters The database profile dialog box for an Oracle 11g connection includes a Pooling tab that lets you select the pooling parameters listed in Table 10-4.

Table 10-4: Pooling parameters for the ORA driver

<table>
<thead>
<tr>
<th>Pooling parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pooling Type</td>
<td>You can select Session Pooling, Connection Pooling, or None (default). Sets the Pooling DBParm.</td>
</tr>
<tr>
<td>Runtime Connection Load Balancing</td>
<td>This check box selected by default. It is ignored when you select Connection Pooling or None for the Pooling Type. Sets the RTConnBalancing DBParm.</td>
</tr>
<tr>
<td>Homogeneous Session</td>
<td>This check box is not selected by default and is valid for session pooling only. When selected, all sessions in the pool are authenticated with the user name and password in effect when the session pool was created. The user name and password in later connection requests are ignored. Proxy sessions cannot be created in homogeneous session mode. Sets the SessionHomogeneous DBParm.</td>
</tr>
<tr>
<td>Minimum Number of Sessions</td>
<td>Integer for the minimum number of database connection sessions; value is 1 by default. Sets the CSMin DBParm. This value is ignored when the SessionHomogeneous DBParm is set to false.</td>
</tr>
<tr>
<td>Maximum Number of Sessions</td>
<td>Integer for the maximum number of database connection sessions; value is 100 by default. Sets the CSMax DBParm.</td>
</tr>
<tr>
<td>Increment</td>
<td>Integer for database connection increments per session; value is 1 by default. Sets the CSIncr DBParm. This value is ignored when the SessionHomogeneous DBParm is set to false.</td>
</tr>
<tr>
<td>Pool Creator</td>
<td>User name used to create the connection or session pool when the pool is not already created. Sets the PoolCreator DBParm to a string for the user name prior to the database connection. If you do not provide a value for the PoolCreator DBParm, the Transaction object’s LogID and LogPass properties are used to create the pooling.</td>
</tr>
</tbody>
</table>

Stateful (not reusable by middle tier threads) and the number of back-end server processes will never be large enough to cause scaling issues for the database.

EAServer components and MTS components do not support either type of pooling for Oracle databases.
Defining the Oracle database interface

To define a connection through an Oracle database interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup dialog box for your Oracle interface. You can then select this profile at any time to connect to your database in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.

Specifying the Oracle server connect descriptor

To connect to an Oracle database server that resides on a network, you must specify the proper connect descriptor in the Server box on the Connection tab of the Database Profile Setup dialog box for your Oracle interface. The connect descriptor specifies the connection parameters that Oracle uses to access the database.

For help determining the proper connect descriptor for your environment, see your Oracle documentation or system administrator.

The syntax of the connect descriptor depends on the Oracle client software you are using.

If you are using Net9 or later, the syntax is:

\[ \text{OracleServiceName} \]

If you are using SQL*Net version 2.x, the syntax is:

\[ @ \text{ TNS: OracleServiceName} \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@</td>
<td>The at (@) sign is required</td>
</tr>
<tr>
<td>TNS</td>
<td>The identifier for the Oracle Transparent Network Substrate (TNS) technology</td>
</tr>
</tbody>
</table>
CHAPTER 10  Using Oracle

Net9 example  To use Net9 client software to connect to the service named ORA9, type the following connect descriptor in the Server box on the Connection tab of the Database Profile Setup dialog box for Oracle9i and later: ORA9.

Using Oracle stored procedures as a data source

This section describes how you can use Oracle stored procedures.

What is an Oracle stored procedure?

Oracle defines a stored procedure (or function) as a named PL/SQL program unit that logically groups a set of SQL and other PL/SQL programming language statements together to perform a specific task.

Stored procedures can take parameters and return one or more result sets (also called cursor variables). You create stored procedures in your schema and store them in the data dictionary for use by multiple users.

What you can do with Oracle stored procedures

Ways to use Oracle stored procedures

You can use an Oracle stored procedure in the following ways in your PowerBuilder application:

- As a data source for DataWindow objects
- Called by an embedded SQL DECLARE PROCEDURE statement in a PowerBuilder application (includes support for fetching against stored procedures with result sets)
- Called as an external function or subroutine in a PowerBuilder application by using the RPCFUNC keyword when you declare the procedure
For information about the syntax for using the DECLARE PROCEDURE statement with the RPCFUNC keyword, see the PowerScript Reference.

**Procedures with a single result set** You can use stored procedures that return a single result set in DataWindow objects and embedded SQL, but not when using the RPCFUNC keyword to declare the stored procedure as an external function or subroutine.

**Procedures with multiple result sets** You can use procedures that return multiple result sets only in embedded SQL. Multiple result sets are not supported in DataWindows, reports, or with the RPCFUNC keyword.

---

**Using Oracle stored procedures with result sets**

**Overview of basic steps**

The following procedure assumes you are creating the stored procedure in the ISQL view of the Database painter in PowerBuilder.

❖ **To use an Oracle stored procedure with a result set:**

1. Set up the ISQL view of the Database painter to create the stored procedure.
2. Create the stored procedure with a result set as an IN OUT (reference) parameter.
3. Create DataWindow objects that use the stored procedure as a data source.

When you create a stored procedure in the ISQL view of the Database painter, you must change the default SQL statement terminator character to one that you do not plan to use in your stored procedure syntax.

The default SQL terminator character for the Database painter is a semicolon (;). If you plan to use a semicolon in your Oracle stored procedure syntax, you must change the painter’s terminator character to something other than a semicolon to avoid conflicts. A good choice is the backquote (`) character.

❖ **To change the default SQL terminator character in the Database painter:**

1. Connect to your Oracle database in PowerBuilder as the System user.
   
   For instructions, see “Defining the Oracle database interface” on page 130.
2. Open the Database painter.
3 Select Design>Options from the menu bar.

   The Database Preferences dialog box displays. If necessary, click the
   General tab to display the General property page.

4 Type the character you want (for example, a backquote) in the SQL
   Terminator Character box.

5 Click Apply or OK.

   The SQL Terminator Character setting is applied to the current connection
   and all future connections (until you change it).

Creating the stored procedure

After setting up the Database painter, you can create an Oracle stored
procedure that has a result set as an IN OUT (reference) parameter.
PowerBuilder retrieves the result set to populate a DataWindow object.

There are many ways to create stored procedures with result sets. The
following procedure describes one possible method that you can use.

For information about when you can use stored procedures with single and
multiple result sets, see “What you can do with Oracle stored procedures” on
page 131.

❖ To create Oracle stored procedures with result sets:

1 Make sure your Oracle user account has the necessary database access and
   privileges to access Oracle objects (such as tables and procedures).

   Without the appropriate access and privileges, you will be unable to create
   Oracle stored procedures.

2 Assume the following table named tt exists in your Oracle database:

   a  b       c
   1 Newman sydate
   2 Everett sydate

3 Create an Oracle package that holds the result set type and stored
   procedure. The result type must match your table definition.

   For example, the following statement creates an Oracle package named
   spm that holds a result set type named rctl and a stored procedure named
   proc1. The tt%ROWTYPE attribute defines rctl to contain all of the
   columns in table tt. The procedure proc1 takes one parameter, a cursor
   variable named rc1 that is an IN OUT parameter of type rctl.

   CREATE OR REPLACE PACKAGE spm
   IS TYPE rctl IS REF CURSOR
Using Oracle stored procedures as a data source

4 Create the Oracle stored procedure separately from the package you defined.

The following examples show how to create two stored procedures: `spm_proc1` (returns a single result set) and `spm_proc2` (returns multiple result sets).

The `IN OUT` specification means that PowerBuilder passes the cursor variable (`rc1` or `rc2`) by reference to the Oracle procedure and expects the procedure to open the cursor. After the procedure call, PowerBuilder fetches the result set from the cursor and then closes the cursor.

**spm_proc1 example for DataWindow objects** The following statements create `spm_proc1` which returns one result set. You can use this procedure as the data source for a DataWindow object in PowerBuilder.

```sql
CREATE OR REPLACE PROCEDURE spm_proc1(rc1 IN OUT spm.rctl)
AS
BEGIN
  OPEN rc1 FOR SELECT * FROM tt;
END;
```

**spm_proc2 example for embedded SQL** The following statements create `spm_proc2` which returns two result sets. You can use this procedure only in embedded SQL.

```sql
CREATE OR REPLACE PROCEDURE spm_proc2 (rc1 IN OUT spm.rctl, rc2 IN OUT spm.rctl)
AS
BEGIN
  OPEN rc1 FOR SELECT * FROM tt ORDER BY 1;
  OPEN rc2 FOR SELECT * FROM tt ORDER BY 2;END;
```

**Error checking**
If necessary, check the Oracle system table `public.user_errors` for a list of errors.

Creating the DataWindow object

After you create the stored procedure, you can define the DataWindow object that uses the stored procedure as a data source.

You can use Oracle stored procedures that return a single result set in a DataWindow object. If your stored procedure returns multiple result sets, you must use embedded SQL commands to access it.
The following procedure assumes that your Oracle stored procedure returns only a single result set.

❖ To create a DataWindow object using an Oracle stored procedure with a result set:

1. Select a presentation style on the DataWindow page of the New dialog box and click OK.
2. Select the Stored Procedure icon and click OK.
   The Select Stored Procedure wizard page displays, listing the stored procedures available in your database.
3. Select the stored procedure you want to use as a data source, and click Next.
4. Complete the wizard to define the DataWindow object.
   When you preview the DataWindow object or call Retrieve, PowerBuilder fetches the result set from the cursor in order to populate the DataWindow object. If you selected Retrieve on Preview on the Choose Data Source page in the wizard, the result set displays in the Preview view when the DataWindow opens.

Using a large-object output parameter

You can define a large object (LOB) as an output parameter for an Oracle stored procedure or function to retrieve large-object data. There is no limit on the number of LOB output arguments that can be defined for each stored procedure or function.

In Oracle 10g, the maximum size of LOB datatypes has been increased from 4 gigabytes minus 1 to 4 gigabytes minus 1 multiplied by the block size of the database. For a database with a block size of 32K, the maximum size is 128 terabytes.
Using Oracle user-defined types

PowerBuilder supports SQL CREATE TYPE and CREATE TABLE statements for Oracle user-defined types (objects) in the ISQL view of the Database painter. It correctly handles SQL SELECT, INSERT, UPDATE, and DELETE statements for user-defined types in the Database and DataWindow painters.

This means that using the Oracle native database interfaces in PowerBuilder, you can:

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<td>(Compute tab in SQL Toolbox)</td>
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Example

Here is a simple example that shows how you might create and use Oracle user-defined types in PowerBuilder.

For more information about Oracle user-defined types, see your Oracle documentation.

❖ To create and use Oracle user-defined types:

1. In the ISQL view of the Database painter, create two Oracle user-defined types: ball_stats_type and player_type.

   Here is the Oracle syntax to create ball_stats_type. Notice that the ball_stats object of type ball_stats_type has a method associated with it called get_avg.

   ```sql
   CREATE OR REPLACE TYPE ball_stats_type AS OBJECT
   (bat_avg NUMBER(4,3), rbi NUMBER(3), MEMBER FUNCTION
   get_avg RETURN NUMBER, PRAGMA RESTRICT_REFERENCES
   (get_avg, WNDs, RNPS, WNPS));
   CREATE OR REPLACE TYPE BODY ball_stats_type AS
   MEMBER FUNCTION get_avg RETURN NUMBER IS
   BEGIN
   RETURN ;
   END;
   ```

PowerBuilder
Here is the Oracle SQL syntax to create player_type. Player_type
references the user-defined type ball_stats_type. PowerBuilder supports
such nesting graphically in the Database, DataWindow, and Table painters
(see step 3).

CREATE TYPE player_type AS OBJECT (player_no
     NUMBER(2), player_name VARCHAR2(30), ball_stats
     ball_stats_type);

2 In the Database painter, create a table named lineup that references these
user-defined types.

Here is the Oracle SQL syntax to create the lineup table and insert a row.
Lineup references the player_type user-defined type.

CREATE TABLE lineup (position NUMBER(2) NOT NULL,
                    player player_type);
INSERT INTO lineup VALUES (1, player_type (15,
                         'Dustin Pedroia', ball_stats_type (0.317, 50)));

3 Display the lineup table in the Database or DataWindow painter.

PowerBuilder uses the following structure->member notation to display
the table:

    lineup
    =======
    position
    player->player_no
    player->player_name
    player->ball_stats->bat_avg
    player->ball_stats->rbi

4 To access the get_avg method of the object ball_stats contained in the
object column player, use the following structure->member notation when
defining a computed column for the DataWindow object. For example,
when working in the DataWindow painter, you could use this notation on
the Compute tab in the SQL Toolbox:

    player->ball_stats->get_avg()
Support for HA event notification

Oracle Real Application Clusters (RAC) is a cluster database that uses a shared cache architecture. In Oracle 10g Release 2, a High Availability (HA) client connected to an RAC database can register a callback to indicate that it wants the server to notify it in case of a database failure event that affects a connection made by the client.

To take advantage of this feature, PowerBuilder users can script the DBNotification event of the Transaction object. For more information, see the description of the DBNotification event and the HANotification database parameter in the online Help.

ORA driver support for Oracle 11g features

In addition to support for Oracle 11g session pooling and connection pooling, the ORA driver adds support for other 11g features.

Client result cache

The PowerBuilder ORA driver supports Oracle Client Cache, however this feature depends on your Oracle Server and Client configuration. You can configure the Oracle Client Cache with an init.ora or sqlnet.ora file. Cached queries are annotated with "/**+ result_cache */" hints to indicate that results are stored in the query result cache. You enable OCI statement caching from PowerBuilder applications with the StatementCache DBPARM parameter.

Application driver name

An OCI application can choose its own name and set it as a diagnostic aid. The AppDriverName DPBARM parameter allows you to set your own client driver name for the PowerBuilder ORA interface. The maximum length of the name is 8 characters. You can display the client driver name with the V$SESSION_CONNECT_INFO or GV$SESSION_CONNECT_INFO dynamic performance view queries.

Client access through a proxy (Oracle 10.2 feature)

The PowerBuilder ORA driver supports the proxy authentication feature that was introduced in Oracle 10.2. With proxy authentication, the end user typically authenticates to a middle tier (such as a firewall), that in turn logs into the database on the user's behalf—as a proxy user. After logging into the database, the proxy user can switch to the end user's identity and perform operations using the authorization accorded to that user.
The ConnectAs DBParm parameter allows you to take advantage of this proxy connection feature. For example, if the user’s Transaction object LogID is “Scott” and you set the ConnectAs DBParm parameter to “John”, the OCI client logs in to database as the proxy user (“Scott”), then switches to the end user identity (“John”).

If you are using connection or session pooling, the proxy user name is the connection or session pooling creator (which you can provide in the PoolCreator and PoolPwd DBParm parameters), and the Transaction object’s LogID is ignored. No proxy session can be created if pooling is set to HomogeneousSession mode.

**Limitation on proxy connection without pooling**

When using a proxy connection without pooling, you must set the NLS_Charset DBPARM to “Local” or to another non-Unicode character set. If you do not change the “Unicode” default value for this DBPARM, the connection fails because the Oracle Client Interface does not accept a Unicode name string for its proxy client attribute.

**Load balancing**

The Oracle Real Application Clusters (RAC) database option allows a single database to be hosted in multiple instances on multiple nodes of the database server. This adds high availability and failover capacity to the database. Availability is improved since, if one node fails, another node can assume its workload. All instances have access to the whole database. The shared disk method of clustering databases used by the RAC option increases scalability because nodes can be added or freed as required.

In RAC environments, session pools can use service metrics received from the RAC load balancing advisory to balance application session requests. The work requests coming into the session pool can then be distributed across the instances of RAC based on current service performance.

**Connect time load balancing**

Balancing of work requests occur at two different times: connect time and runtime. Connect time load balancing occurs when a session is first created by the application. This ensures that sessions that are part of the pool are well distributed across RAC instances, and that sessions on each of the instances get a chance to execute work.

For session pools that support services at one instance only, the first available session in the pool is adequate. When the pool supports services that span multiple instances, there is a need to distribute the work requests across instances so that the instances that are providing better service or have greater capacity get more requests.
**Runtime connection load balancing**  Runtime connection load balancing basically routes work requests to the sessions in a session pool that best serve the work. Runtime connection load balancing is enabled by default when an Oracle 11.1 or higher client is connected to a 10.2 or higher Oracle server using OCI session pooling.

The DBPARM parameter, RTConnBalancing, supports the runtime connection load balancing feature. It is available only when the Pooling parameter is set to Session Pooling, and it can be set before connection only. By default, when you select Session Pooling for the pooling type, the RTConnBalancing value is true.
CHAPTER 11  Using DirectConnect

About this chapter

This chapter describes how to use the DirectConnect™ interface in PowerBuilder.

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Using the DirectConnect interface

The DirectConnect interface uses Sybase’s Open Client CT-Library (CT-Lib) API to access a database through Sybase middleware data access products such as the DirectConnect for OS/390 component of MainFrame Connect and Open ServerConnect™.

Accessing Unicode data

PowerBuilder can connect, save, and retrieve data in both ANSI/DBCS and Unicode databases. When character data or command text is sent to the database, PowerBuilder sends a DBCS string if the UTF8 database parameter is set to 0 (the default). If UTF8 is set to 1, PowerBuilder sends a UTF-8 string.

The database server must have the UTF-8 character set installed. See the description of the UTF-8 database parameter in the online Help for more information.

A Unicode database is a database whose character set is set to a Unicode format, such as UTF-8, UTF-16, UCS-2, or UCS-4. All data must be in Unicode format, and any data saved to the database must be converted to Unicode data implicitly or explicitly.
A database that uses ANSI (or DBCS) as its character set might use special data types to store Unicode data. Columns with these data types can store only Unicode data. Any data saved into such a column must be converted to Unicode explicitly. This conversion must be handled by the database server or client.

Connecting through the DirectConnect middleware product

Sybase DirectConnect is a data access server that provides a standardized middleware interface between your applications and your enterprise data sources. Data access services to a particular database are defined in a DirectConnect server. Since a DirectConnect server can support multiple access services, you can access multiple databases through a single server.

When you use the DirectConnect interface to connect to a particular database, your connection is routed through the access service for that database. An access service consists of a named set of configuration properties and a specific access service library.

To access DB2 data on an IBM mainframe through a DirectConnect server, you can use the DirectConnect interface to connect through either a DirectConnect for MVS access service or a DirectConnect Transaction Router Service (TRS).

TRS provides fast access to a DB2/MVS database by using remote stored procedures. The DirectConnect interface supports both versions of the TRS library: TRSLU62 and TRSTCP.

The DirectConnect server operates in two modes: SQL transformation and passthrough. The DirectConnect interface for DB2/MVS uses passthrough mode, which allows your PowerBuilder application to have direct access to the capabilities of the DB2/MVS data source.

Connecting through the Open ServerConnect middleware product

Sybase’s Open ServerConnect supports mainframe applications that retrieve and update data stored on the mainframe that Sybase client applications can execute. Client applications can connect directly to a DB2/MVS database through an Open ServerConnect application residing on the mainframe, eliminating the need for an intermediate gateway like DirectConnect. (This type of connection is also known as a gateway-less connection.) In addition, an Open ServerConnect application presents mainframe Remote Procedure Calls (RPCs) as database stored procedures to the client application.
To access DB2 data on an IBM mainframe through Open ServerConnect, you can use the DirectConnect interface to connect through Open ServerConnect for IMS and MVS.

Selecting the type of connection

To select how PowerBuilder accesses the database, use the Choose Gateway drop-down list on the Connection tab of the DirectConnect Database Profile Setup dialog box and select one of the following:

- Access Service
- Gatewayless
- TRS

All the DBParm parameters defined for the DirectConnect interface are applicable to all three connections except the following:

- HostReqOwner applies to Access Service and Gatewayless only
- Request, ShowWarnings, and SystemOwner apply to Access Service only
- UseProcSyntax applies to Gatewayless only

See the online help for the complete list of DBParm parameters applicable to the DirectConnect interface.

Supported versions for the DirectConnect interface

The DirectConnect interface uses a DLL named PBDIR115.DLL to access a database through either DirectConnect or Open ServerConnect.

To access a DB2/MVS database through the access service, it is strongly recommended that you use DirectConnect for MVS access service version 11.1.1p4 or later.

To access a DB2/MVS database through TRS, it is strongly recommended that you use DirectConnect TRS version 11.1.1p4 or later.

For information on DirectConnect for MVS and TRS, see your DirectConnect documentation.
To access a DB2/MVS database through Open ServerConnect, it is strongly recommended that you use Open ServerConnect IMS and MVS version 4.0 or later.

For information on Open ServerConnect for MVS, see your Open ServerConnect documentation.

---

**Supported DirectConnect interface datatypes**

The DirectConnect interface supports the PowerBuilder datatypes listed in Table 11-1 in DataWindow objects and embedded SQL.

**Table 11-1: Supported datatypes for DirectConnect**

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<th>Datatype</th>
<th>Datatype</th>
</tr>
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<tbody>
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<td>Char (fewer than 255 characters)</td>
<td>Long VarChar</td>
</tr>
<tr>
<td>Char for Bit Data</td>
<td>Real</td>
</tr>
<tr>
<td>Date</td>
<td>SmallInt</td>
</tr>
<tr>
<td>Decimal</td>
<td>Time</td>
</tr>
<tr>
<td>Double Precision</td>
<td>Timestamp (DateTime)</td>
</tr>
<tr>
<td>Float</td>
<td>VarChar</td>
</tr>
<tr>
<td>Integer</td>
<td>VarChar for Bit Data</td>
</tr>
</tbody>
</table>
Basic software components for the DirectConnect interface

Figure 11-1 shows the basic software components required to access a database using the DirectConnect interface and the DirectConnect middleware data access product.

*Figure 11-1: Components of a DirectConnect connection using DirectConnect middleware*

- Development environment
- PBDIRvnn.DLL
  - Database interface DLL
  - Database client software
  - Sybase Open Client CT-Library (CT-Lib) API
  - Any supported network protocol
- Sybase DirectConnect Server
  - Middleware
- Sybase Mainframe Connect
  - Mainframe
  - Network layer
- Database

Supplied by Sybase

Supplied by Sybase vendor or database vendor

Supplied by Sybase
Preparing to use the database with DirectConnect

Figure 11-2 shows the basic software components required to access a database using the DirectConnect interface and the Open ServerConnect middleware data access product.

Figure 11-2: Components of a DirectConnect connection using Open ServerConnect middleware

Preparing to use the database with DirectConnect

Before you define the interface and connect to a database through the DirectConnect interface, follow these steps to prepare the database for use:

1. Install and configure the Sybase middleware data access products, network, and client software.
CHAPTER 11  Using DirectConnect

2 Install the DirectConnect interface.

3 Verify that you can connect to your middleware product and your database outside PowerBuilder.

4 Create the extended attribute system tables outside PowerBuilder.

You must install and configure the Sybase middleware data access product, network, and client software.

❖ To install and configure the Sybase middleware data access product, network, and client software:

1 Make sure the appropriate database software is installed and running on its server.

   You must obtain the database server software from your database vendor.

   For installation instructions, see your database vendor’s documentation.

2 Make sure the appropriate DirectConnect access service software is installed and running on the DirectConnect server specified in your database profile or

   Make sure the appropriate Open ServerConnect software is installed and running on the mainframe specified in your database profile.

3 Make sure the required network software (such as TCP/IP) is installed and running on your computer and is properly configured so you that can connect to the DirectConnect server or mainframe at your site.

   You must install the network communication driver that supports the network protocol and operating system platform you are using.

   For installation and configuration instructions, see your network or database administrator.

4 Install the required Open Client CT-Library (CT-Lib) software on each client computer on which PowerBuilder is installed.

   You must obtain the Open Client software from Sybase. Make sure the version of Open Client you install supports both of the following:

   - The operating system running on the client computer
   - The version of PowerBuilder that you are running

Open Client required
To use the DirectConnect interface, you must install Open Client.
Preparing to use the database with DirectConnect

For information about Open Client, see your Open Client documentation.

5  Make sure the Open Client software is properly configured so you can connect to the middleware data access product at your site.

Installing the Open Client software places the SQL.INI configuration file in the SQL Server directory on your computer. SQL.INI provides information that SQL Server uses to find and connect to the middleware product at your site. You can enter and modify information in SQL.INI with the configuration utility or editor that comes with the Open Client software.

For information about editing the SQL.INI file, see “Editing the SQL.INI file” on page 149. For more information about setting up SQL.INI or any other required configuration file, see your SQL Server documentation.

6  If required by your operating system, make sure the directory containing the Open Client software is in your system path.

7  Make sure only one copy of each of the following files is installed on your client computer:
   - DirectConnect interface DLL
   - Network communication DLL (such as NLWNSCK.DLL for Windows Sockets-compliant TCP/IP)
   - Open Client DLLs (such as LIBCT.DLL and LIBCS.DLL)

   **Step 2: Install the interface**
   In the PowerBuilder Setup program, select the Typical install, or select the Custom install and select the Direct Connect Interface (DIR).

   **Step 3: Verify the connection**
   Make sure you can connect to your middleware product and your database and log in to the database you want to access from outside PowerBuilder.

   Some possible ways to verify the connection are by running the following tools:

   - **Accessing the database server**  Tools such as the Open Client/Open Server Configuration utility (or any Ping utility) check whether you can reach the database server from your computer.

   - **Accessing the database**  Tools such as ISQL or SQL Advantage (interactive SQL utilities) check whether you can log in to the database and perform database operations. It is a good idea to specify the same connection parameters you plan to use in your PowerBuilder database profile to access the database.
Step 4: Create the extended attribute system tables

PowerBuilder uses a collection of five system tables to store extended attribute information. When using the DirectConnect interface, you must create the extended attribute system tables outside PowerBuilder to control the access rights and location of these tables.

Run the DB2SYSPB.SQL script outside PowerBuilder using the SQL tool of your choice.

For instructions, see “Creating the extended attribute system tables in DB2 databases” on page 150.

Editing the SQL.INI file

Make sure the SQL.INI file provides an entry about either the access service being used and the DirectConnect server on which it resides or the Open ServerConnect program being used and the mainframe on which it resides.

For the server object name, you need to provide the exact access service name as it is defined in the access service library configuration file on the DirectConnect server. You must also specify the network communication DLL being used, the TCP/IP address or alias used for the DirectConnect server on which the access service resides, and the port on which the DirectConnect server listens for requests:

```
[access_service_name]
query=network_dll,server_alias,server_port_no
```

PowerBuilder users must also specify the access service name in the SQLCA.ServerName property of the Transaction object.

Defining the DirectConnect interface

To define a connection through the DirectConnect interface, you must create a database profile by supplying values for at least the basic connection parameters in the Database Profile Setup - DirectConnect dialog box. You can then select this profile anytime to connect to your database in the development environment.

For information on how to define a database profile, see “Using database profiles” on page 7.
Creating the extended attribute system tables in DB2 databases

This section describes how PowerBuilder creates the extended attribute system tables in your DB2 database to store extended attribute information. It then explains how to use the `DB2SYSPB.SQL` script to create the extended attribute system tables outside PowerBuilder.

You can use the `DB2SYSPB.SQL` script if you are connecting to the IBM DB2 family of databases through any of the following database interfaces:

- ODBC interface
- Sybase DirectConnect interface

Creating the extended attribute system tables

When you create or modify a table in PowerBuilder, the information you provide is stored in five system tables in your database. These system tables contain extended attribute information such as the text to use for labels and column headings, validation rules, display formats, and edit styles. (These system tables are different from the system tables provided by your DB2 database.)

By default, the extended attribute system tables are created automatically the first time a user connects to the database using PowerBuilder.

When you use the DirectConnect interface

When you use the DirectConnect interface, the extended attribute system tables are *not* created automatically. You must run the `DB2SYSPB.SQL` script to create the system tables as described in “Using the DB2SYSPB.SQL script” on page 151.

❖ To ensure that the extended attribute system tables are created with the proper access rights:

- Make sure the first person to connect to the database with PowerBuilder has sufficient authority to create tables and grant permissions to PUBLIC.

This means that the first person to connect to the database should log in as the database owner, database administrator, system user, system administrator, or system owner, as specified by your DBMS.
CHAPTER 11  Using DirectConnect

Using the DB2SYSPB.SQL script

Why do this
If you are a system administrator at a DB2 site, you might prefer to create the extended attribute system tables outside PowerBuilder for two reasons:

- The first user to connect to the DB2 database using PowerBuilder might not have the proper authority to create tables.
- When PowerBuilder creates the extended attribute system tables, it places them in the default tablespace. This might not be appropriate for your needs.

When using the DirectConnect interface
You must create the extended attribute system tables outside PowerBuilder if you are using the DirectConnect interface. You need to decide which database and tablespace should store the system tables. You might also want to grant update privileges only to specific developers or groups.

What you do
To create the extended attribute system tables, you run the DB2SYSPB.SQL script outside PowerBuilder. This script contains SQL commands that create and initialize the system tables with the table owner and tablespace you specify.

Where to find DB2SYSPB.SQL
The DB2SYSPB.SQL script is in the Server directory on the PowerBuilder CD-ROM. This directory contains server-side installation components and is not installed with PowerBuilder on your computer.

You can access the DB2SYSPB.SQL script directly from your computer’s CD-ROM drive or you can copy it to your computer.

Use the following procedure from the database server to create the extended attribute system tables in a DB2 database outside PowerBuilder. This procedure assumes you are accessing the DB2SYSPB.SQL script from the product CD in your computer’s CD-ROM drive and the drive letter is Z.

To create the extended attribute system tables in a DB2 database outside PowerBuilder:
1. Log in to the database server or gateway as the system administrator.
2. Insert the PowerBuilder CD-ROM into the computer’s CD-ROM drive.
3 Use any text editor to modify Z:\Server\DB2SYSPB.SQL for your environment. You can do any of the following:
   • Change all instances of PBOwner to another name.

   **Specifying SYSIBM is prohibited**
   You cannot specify SYSIBM as the table owner. This is prohibited by DB2.

   • Change all instances of database.tablespace to the appropriate value.
   • Add appropriate SQL statement delimiters for the tool you are using to run the script.
   • Remove comments and blank lines if necessary.

   **PBCatalogOwner**
   If you changed PBOwner to another name in the DB2SYSPB.SQL script, you must specify the new owner name as the value for the PBCatalogOwner DBParm parameter in your database profile. For instructions, see PBCatalogOwner in the online Help.

4 Save any changes you made to the DB2SYSPB.SQL script.

5 Execute the DB2SYSPB.SQL script from the database server or gateway using the SQL tool of your choice.
PART 4

Working with Database Connections

This part describes how to establish, manage, and troubleshoot database connections.
CHAPTER 12

Managing Database Connections

About this chapter

After you install the necessary database software and define the database interface, you can connect to the database from PowerBuilder. Once you connect to the database, you can work with the tables and views stored in that database.

This chapter describes how to connect to a database in PowerBuilder, maintain database profiles, and share database profiles.

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Terminology

In this chapter, the term database refers to both of the following unless otherwise specified:

- A database or DBMS that you access with a standard database interface and appropriate driver
- A database or DBMS that you access with the appropriate native database interface

About database connections

This section gives an overview of when database connections occur in PowerBuilder. It also explains why you should use database profiles to manage your database connections.
When database connections occur

Connections in PowerBuilder

PowerBuilder connects to your database when you:

- Open a painter that accesses the database
- Compile or save a PowerBuilder script containing embedded SQL statements (such as a CONNECT statement)
- Execute an application that accesses the database
- Invoke a DataWindow control function that accesses the database while executing an application

How PowerBuilder determines which database to access

PowerBuilder connects to the database you used last when you open a painter that accesses the database. PowerBuilder determines which database you used last by reading a setting in the registry.

What's in this book

This book describes how to connect to your database when you are working in the PowerBuilder development environment.

For instructions on connecting to a database in a PowerBuilder application, see Application Techniques.

Using database profiles

What is a database profile?

A database profile is a named set of parameters stored in the registry that defines a connection to a particular database in the PowerBuilder development environment.

Why use database profiles?

Creating and using database profiles is the easiest way to manage your database connections in PowerBuilder because you can:

- Select a database profile to establish or change database connections. You can easily connect to another database anytime during a PowerBuilder session. This is particularly useful if you often switch between different database connections.
- Edit a database profile to modify or supply additional connection parameters.
- Use the Preview tab page to test a connection and copy the connection syntax to your application code.
- Delete a database profile if you no longer need to access that data.
- Import and export profiles.
Because database profiles are created when you define your data and are stored in the registry, they have the following benefits:

- They are always available to you.
- Connection parameters supplied in a database profile are saved until you edit or delete the database profile.

### Connecting to a database

To establish or change a database connection in PowerBuilder, use a database profile. You can select the database profile for the database you want to access in the Database Profiles dialog box. For how to create a database profile, see “Creating a database profile” on page 10.

**Using the Database painter to select a database profile**

You can also select the database profile for the database you want to access from the Database painter’s Objects view. However, this method requires more system resources than using the Database Profiles dialog box.

### Selecting a database profile

You can select a database profile from the Database Profiles dialog box.

- **To connect to a database using the Database Profiles dialog box:**
  1. Click the Database Profile button in the PowerBar or select Tools>Database Profile from the menu bar.

**Database Profile button**

If your PowerBar does not include the Database Profile button, use the customize feature to add the button to the PowerBar. Having the Database Profile button on your PowerBar is useful if you frequently switch connections between different databases. For instructions on customizing toolbars, see the *Users Guide*.

The Database Profiles dialog box displays, listing your installed database interfaces.
Connecting to a database

Where the interface list comes from
When you run the Setup program, it updates the Vendors list in the registry with the interfaces you install. The Database Profiles dialog box displays the same interfaces that appear in the Vendors list.

2 Click the plus sign (+) to the left of the interface you are using or double-click the name.

   The list expands to display the database profiles defined for your interface.

3 Select the name of the database profile you want to access and click Connect or display the pop-up menu for a database profile and select Connect.

   PowerBuilder connects to the specified database and returns you to the painter workspace.

Database painter Objects view

You can select a database profile from the Database painter Objects view.

❖ To connect to a database using the Database painter:

   1 Click the Database painter button in the PowerBar.

      The Database painter displays. The Objects view lists your installed database interfaces.

Where the interface list comes from
When you run the Setup program, it updates the Vendors list in the registry with the interfaces you install. The Database painter Objects view displays the same interfaces that appear in the Vendors list.

2 Click the plus sign (+) to the left of the interface you are using or double-click the name.

   The list expands to display the database profiles defined for your interface.

3 Select the name of the database profile you want to access and click the Connect button, or display the pop-up menu for a database profile and select Connect.
What happens when you connect

When you connect to a database by selecting its database profile, PowerBuilder writes the profile name and its connection parameters to the registry key

\[ HKEY_CURRENT_USER\Software\Sybase\PowerBuilder\11.5\DatabaseProfiles\PowerBuilder. \]

Each time you connect to a different database, PowerBuilder overwrites the “most-recently used” profile name in the registry with the name for the new database connection.

When you open a painter that accesses the database, you are connected to the database you used last. PowerBuilder determines which database this is by reading the registry.

The three-letter abbreviation for the database interface followed by the name of the database profile displays in PowerBuilder's main title bar. If you are working with a DataWindow, this visual cue makes it easier to check that you are using the right connection.

For example, if you open the PowerBuilder Code Examples workspace and connect to the EAS Demo database, the title bar displays “pbexamples - ODB [EAS Demo DB V115] - PowerBuilder.”

Specifying passwords in database profiles

Your password does not display when you specify it in the Database Profile Setup dialog box.

However, when PowerBuilder stores the values for this profile in the registry, the actual password does display, in encrypted form, in the DatabasePassword or LogPassword field.

To suppress password display in the profile registry entry, do the following when you create a database profile.

❖ **To suppress password display in the profile registry entry:**

1. Select the Prompt For Database Information check box on the Connection tab in the Database Profile Setup dialog box.

   This tells PowerBuilder to prompt for any missing information when you select this profile to connect to the database.
Maintaining database profiles

2. Leave the Password box blank. Instead, specify the password in the dialog box that displays to prompt you for additional information when you connect to the database.

What happens

When you specify the password in response to a prompt instead of in the Database Profile Setup dialog box, the password does not display in the registry entry for this profile.

For example, if you do not supply a password in the Database Profile Setup - Adaptive Server Enterprise dialog box when creating a database profile, the Client Library Login dialog box displays to prompt you for the missing information.

Using the Preview tab to connect in a PowerBuilder application

To access a database in a PowerBuilder application, you must specify the required connection parameters as properties of the Transaction object (SQLCA by default) in the appropriate script. For example, you might specify the connection parameters in the script that opens the application.

In PowerBuilder, the Preview tab in the Database Profile Setup dialog box makes it easy to generate accurate PowerScript connection syntax in the development environment for use in your PowerBuilder application script.

For instructions on using the Preview tab to help you connect in a PowerBuilder application, see the section on using Transaction objects in Application Techniques.

Maintaining database profiles

You can easily edit or delete an existing database profile in PowerBuilder.

You can edit a database profile to change one or more of its connection parameters. You can delete a database profile when you no longer need to access its data. You can also change a profile using either the Database Profiles dialog box or the Database painter.

What happens

When you edit or delete a database profile, PowerBuilder either updates the database profile entry in the registry or removes it.
Deleting a profile for an ODBC data source
If you delete a database profile that connects to an ODBC data source, PowerBuilder does not delete the corresponding data source definition from the ODBC initialization file. This lets you re-create the database profile later if necessary without having to redefine the data source.

Sharing database profiles
When you work in PowerBuilder, you can share database profiles among users.

Sharing database profiles between Sybase tools
Since the database profiles used by PowerBuilder and InfoMaker are stored in a common registry location, database profiles you create in any of these tools are automatically available for use by the others, if the tools are running on the same computer.

This section describes what you need to know to set up, use, and maintain shared database profiles in PowerBuilder.

About shared database profiles
You can share database profiles in the PowerBuilder development environment by specifying the location of a file containing the profiles you want to share. You specify this location in the Database Preferences dialog box in the Database painter.

To share database profiles among all PowerBuilder users at your site, store a profile file on a network file server accessible to all users.

When you share database profiles, PowerBuilder displays shared database profiles from the file you specify as well as those from your registry.

Shared database profiles are read-only. You can select a shared profile to connect to a database—but you cannot edit, save, or delete profiles that are shared. (You can, however, make changes to a shared profile and save it on your computer, as described in “Making local changes to shared database profiles” on page 163.)
Sharing database profiles

Setting up shared database profiles

You set up shared database profiles in the Database Preferences dialog box.

❖ To set up shared database profiles:

1. In the Database painter, select Design>Options from the menu bar to display the Database Preferences dialog box.

2. In the Shared Database Profiles box on the General tab page, specify the location of the file containing the database profiles you want to share. Do this in either of the following ways:
   • Type the location (path name) in the Shared Database Profiles box.
   • Click the Browse button to navigate to the file location and display it in the Shared Database Profiles box.

In the following example, c:\work\share.ini is the location of the file containing the database profiles to be shared:

3. Click OK.

PowerBuilder applies the Shared Database Profiles setting to the current connection and all future connections and saves the setting in the registry.
Using shared database profiles to connect

You select a shared database profile to connect to a database the same way you select a profile stored in your registry. You can select the shared profile in the Database Profiles dialog box or from the File>Connect menu.

Database Profiles
dialog box

You can select and connect to a shared database profile in the Database Profiles dialog box.

❖ To select a shared database profile in the Database Profiles dialog box:

1. Click the Database Profile button in the PowerBar or select Tools>Database Profile from the menu bar.

   The Database Profiles dialog box displays, listing both shared and local profiles. Shared profiles are denoted by a network icon and the word (Shared).

2. Select the name of the shared profile you want to access and click Connect.

   PowerBuilder connects to the selected database and returns you to the painter workspace.

Making local changes to shared database profiles

Because shared database profiles can be accessed by multiple users running PowerBuilder, you should not make changes to these profiles. However, if you want to modify and save a copy of a shared database profile for your own use, you can edit the profile and save the modified copy in your computer’s registry.
Sharing database profiles

❖ To save changes to a shared database profile in your registry:
   1. In the Database Profiles dialog box, select the shared profile you want to edit and click the Edit button.
   2. In the Database Profile Setup dialog box that displays, edit the profile values as needed and click OK.
      A message box displays, asking if you want to save a copy of the modified profile to your computer.
   3. Click Yes.
      PowerBuilder saves the modified profile in your computer’s registry.

Maintaining shared database profiles

If you maintain the database profiles for PowerBuilder at your site, you might need to update shared database profiles from time to time and make these changes available to your users.

Because shared database profiles can be accessed by multiple users running PowerBuilder, it is *not* a good idea to make changes to the profiles over a network. Instead, you should make any changes locally and then provide the updated profiles to your users.

❖ To maintain shared database profiles at your site:
   1. Make and save required changes to the shared profiles on your own computer. These changes are saved in your registry.
      For instructions, see “Making local changes to shared database profiles” on page 163.
   2. Export the updated profile entries from your registry to the existing file containing shared profiles.
      For instructions, see “Importing and exporting database profiles” on page 165.
   3. If they have not already done so, have users specify the location of the new profiles file in the Database Preferences property sheet so that they can access the updated shared profiles on their computer.
      For instructions, see “Setting up shared database profiles” on page 162.
Importing and exporting database profiles

Each database interface provides an Import Profile(s) and an Export Profile(s) option. You can use the Import option to import a previously defined profile for use with an installed database interface. Conversely, you can use the Export option to export a defined profile for use by another user.

The ability to import and export profiles provides a way to move profiles easily between developers. It also means you no longer have to maintain a shared file to maintain profiles. It is ideal for mobile development when you cannot rely on connecting to a network to share a file.

❖ To import a profile:

1. Highlight a database interface and select Import Profile(s) from the pop-up menu. (In the Database painter, select Import Profile(s) from the File or pop-up menu.)

2. From the Select Profile File dialog box, select the file whose profiles you want to import and click Save.

3. Select the profile(s) you want to import from the Import Profile(s) dialog box and click OK.

The profiles are copied into your registry. If a profile with the same name already exists, you are asked if you want to overwrite it.

❖ To export a profile:

1. Highlight a database interface and select Export Profile(s) from the pop-up menu. (In the Database painter, select Export Profile(s) from the File or pop-up menu.)

2. Select the profile(s) you want to export from the Export Profile(s) dialog box and click OK.

The Export Profile(s) dialog box lists all profiles defined in your registry regardless of the database interface for which they were defined. By default, the profiles defined for the selected database interface are marked for export.

3. From the Select Profile File dialog box, select a directory and a file in which to save the exported profile(s) and click Save.

The exported profiles can be saved to a new or existing file. If saved to an existing file, the profile(s) are added to the existing profiles. If a profile with the same name already exists, you are asked if you want to overwrite it.
About the PowerBuilder extended attribute system tables

PowerBuilder uses a collection of five system tables (formerly known as the Powersoft repository) to store extended attribute information (such as display formats, validation rules, and font information) about tables and columns in your database. You can also define extended attributes when you create or modify a table in PowerBuilder.

This section tells you how to:

- Make sure the PowerBuilder extended attribute system tables are created with the proper access rights when you log in to your database for the first time
- Display and open a PowerBuilder extended attribute system table
- Understand the kind of information stored in the PowerBuilder extended attribute system tables
- Control extended attribute system table access

Logging in to your database for the first time

By default, PowerBuilder creates the extended attribute system tables the first time you connect to a database.

To ensure that PowerBuilder creates the extended attribute system tables with the proper access rights to make them available to all users, the first person to connect to the database with PowerBuilder must log in with the proper authority.

❖ To ensure proper creation of the PowerBuilder extended attribute system tables:

- Make sure the first person to connect to the database with PowerBuilder has sufficient authority to create tables and grant permissions to PUBLIC.

This means that the first person to connect to the database should log in as the database owner, database administrator, system user, system administrator, or system owner, as specified by your DBMS.
Creating the extended attribute system tables when using the DirectConnect interface

When you are using the DirectConnect interface, the PowerBuilder extended attribute system tables are not created automatically the first time you connect to a database. You must run the DB2SYSPB.SQL script to create the system tables, as described in “Using the DB2SYSPB.SQL script” on page 151.

Displaying the PowerBuilder extended attribute system tables

PowerBuilder updates the extended attribute system tables automatically whenever you change the information for a table or column. The PowerBuilder extended attribute system tables are different from the system tables provided by your DBMS.

You can display and open PowerBuilder extended attribute system tables in the Database painter just like other tables.

❖ To display the PowerBuilder extended attribute system tables:

1. In the Database painter, highlight Tables in the list of database objects for the active connection and select Show System Tables from the pop-up menu.
About the PowerBuilder extended attribute system tables

2 The PowerBuilder extended attribute system tables and DBMS system tables display in the tables list, as follows:

- **PowerBuilder system tables** The five system tables are: pbcatcol, pbcatdtn, pbcatfmt, pbcattbl, and pbcatvld.

- **DBMS system tables** The system tables supplied by the DBMS usually have a DBMS-specific prefix (such as sys or dbo).

3 Display the contents of a PowerBuilder system table in the Object Layout, Object Details, and/or Columns views.

For instructions, see the *Users Guide*.

**Do not edit the extended attribute system tables**

Do not change the values in the PowerBuilder extended attribute system tables.
CHAPTER 12  Managing Database Connections

Contents of the extended attribute system tables

PowerBuilder stores five types of extended attribute information in the system tables as described in Table 12-1.

<table>
<thead>
<tr>
<th>System table</th>
<th>Information about</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>pbcatcol</td>
<td>Columns</td>
<td>Names, comments, headers, labels, case, initial value, and justification</td>
</tr>
<tr>
<td>pbcatedt</td>
<td>Edit styles</td>
<td>Edit style names and definitions</td>
</tr>
<tr>
<td>pbcatfmt</td>
<td>Display formats</td>
<td>Display format names and definitions</td>
</tr>
<tr>
<td>pbcattbl</td>
<td>Tables</td>
<td>Name, owner, default fonts (for data, headings and labels), and comments</td>
</tr>
<tr>
<td>pbcatvld</td>
<td>Validation rules</td>
<td>Validation rule names and definitions</td>
</tr>
</tbody>
</table>

For more about the PowerBuilder system tables, see the Appendix in the Users Guide.

Prefixes in system table names

For some databases, PowerBuilder precedes the name of the system table with a default DBMS-specific prefix. For example, the names of PowerBuilder system tables have the prefix DBO in a SQL Server database (such as DBO.pbcatcol), or SYSTEM in an Oracle database (such as SYSTEM.pbcatfmt).

The preceding table gives the base name of each system table without the DBMS-specific prefix.

Controlling system table access

To control access to the PowerBuilder system tables at your site, you can specify that PowerBuilder not create or update the system tables or that the system tables be accessible only to certain users or groups.

You can control system table access by doing any of the following:

- **Setting Use Extended Attributes**  Set the Use Extended Attributes database preference in the Database Preferences dialog box in the Database painter.
About the PowerBuilder extended attribute system tables

- **Setting Read Only**  Set the Read Only database preference in the Database Preferences dialog box in the Database painter.

- **Granting permissions on the system tables**  Grant explicit permissions on the system tables to users or groups at your site.

**Setting Use Extended Attributes or Read Only to control access**

- **To control system table access by setting Use Extended Attributes or Read Only:**
  1. Select Design>Options from the menu bar to display the Database Preferences dialog box.
2 On the General page, set values for Use Extended Attributes or Read Only as follows:

<table>
<thead>
<tr>
<th>Preference</th>
<th>What you do</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Extended Attributes</td>
<td>Clear the check box</td>
<td>Does not create the PowerBuilder system tables if they do not exist. Instead, the painter uses the appropriate default values for extended attributes (such as headers, labels, and text color). If the PowerBuilder system tables already exist, PowerBuilder does not use them when you create a new DataWindow object.</td>
</tr>
<tr>
<td>Read Only</td>
<td>Select the check box</td>
<td>If the PowerBuilder system tables already exist, PowerBuilder uses them when you create a new DataWindow object, <em>but does not update them</em>. You <em>cannot</em> modify (update) information in the system tables or any other database tables in the DataWindow painter when the Read Only check box is selected.</td>
</tr>
</tbody>
</table>

3 Click OK.

PowerBuilder applies the preference settings to the current connection and all future connections and saves them in the registry.

**Granting permissions on system tables to control access**

If your DBMS supports SQL GRANT and REVOKE statements, you can control access to the PowerBuilder system tables. The default authorization for each repository table is:

```
GRANT SELECT, UPDATE, INSERT, DELETE ON table TO PUBLIC
```

After the system tables are created, you can (for example) control access to them by granting SELECT authority to end users and SELECT, UPDATE, INSERT, and DELETE authority to developers. This technique offers security and flexibility that is enforced by the DBMS itself.
About the PowerBuilder extended attribute system tables
Setting Additional Connection Parameters

About this chapter

To fine-tune your database connection and take advantage of DBMS-specific features that your interface supports, you can set additional connection parameters at any time. These additional connection parameters include:

- Database parameters
- Database preferences

These connection parameters are described in the Database Connectivity section in the online Help.

This chapter describes how to set database parameters and database preferences in PowerBuilder.

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<td>174</td>
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<tr>
<td>Setting database parameters</td>
<td>175</td>
</tr>
<tr>
<td>Setting database preferences</td>
<td>178</td>
</tr>
</tbody>
</table>

Basic steps for setting connection parameters

This section gives basic steps for setting database parameters and database preferences in PowerBuilder.

To set database parameters:

1. Learn how to set database parameters in the development environment or in code.

   See “Setting database parameters” on page 175.
2 Determine the database parameters you can set for your database interface.
   For a table listing each supported database interface and the database
   parameters you can use with that interface, see “Database parameters and
   supported database interfaces” in the online Help.

3 Read the description of the database parameter you want to set in the
   online Help.

4 Set the database parameter for your database connection.

❖ To set database preferences:
   1 Learn how to set database preferences in the development environment or
      PowerBuilder application script.

   See “Setting database preferences” on page 178.

2 Determine the database preferences you can set for your DBMS.
   For a table listing each supported database interface and the database
   preferences you can use with that interface, see “Database parameters and
   supported database interfaces” in the online Help.

3 Read the description of the database preference you want to set in the
   online Help.

4 Set the database preference for your database connection.

About the Database Profile Setup dialog box

The interface-specific Database Profile Setup dialog box makes it easy to set
additional connection parameters in the development environment or in code.
You can:

• Supply values for connection options supported by your database interface

Each database interface has its own Database Profile Setup dialog box that
includes settings only for those connection parameters supported by the
interface. Similar parameters are grouped on the same tab page. The
Database Profile Setup dialog box for all interfaces includes the
Connection tab and Preview tab. Depending on the requirements and
features of your interface, one or more other tab pages might also display.
CHAPTER 13  Setting Additional Connection Parameters

- Easily set additional connection parameters in the development environment

  You can specify additional connection parameters (database parameters and transaction object properties) with easy-to-use check boxes, drop-down lists, and text boxes. PowerBuilder generates the proper syntax automatically when it saves your database profile in the system registry.

- Generate connection syntax for use in your PowerBuilder application script

  As you complete the Database Profile Setup dialog box in PowerBuilder, the correct connection syntax for each selected option is generated on the Preview tab. PowerBuilder assigns the corresponding database parameter or transaction object property name to each option and inserts quotation marks, commas, semicolons, and other characters where needed. You can copy the syntax you want from the Preview tab into your PowerBuilder script.

### Setting database parameters

In PowerBuilder, you can set database parameters by doing either of the following:

- Editing the Database Profile Setup dialog box for your connection in the development environment

- Specifying connection parameters in an application script

### Setting database parameters in the development environment

To set database parameters for a database connection in the PowerBuilder development environment, you must edit the database profile for that connection.

Strings containing database parameters that you specify in the Database Profile Setup dialog box for your connection can be up to 999 characters in length. This limit applies only to database parameters that you set in a database profile in the development environment. Database strings specified in code as properties of the Transaction object are not limited to a specified length.
Setting database parameters in a PowerBuilder application script

If you are developing an application that connects to a database, you must specify the required connection parameters in the appropriate script as properties of the default Transaction object (SQLCA) or a Transaction object that you create. For example, you might specify connection parameters in the script that opens the application.

One of the connection parameters you might want to specify in a script is DBParm. You can do this by:

- (Recommended) Copying DBParm syntax from the Preview tab in the Database Profile Setup dialog box into your script
- Coding PowerScript to set values for the DBParm property of the Transaction object
- Reading DBParm values from an external text file

Copying DBParm syntax from the Preview tab

The easiest way to specify DBParm parameters in a PowerBuilder application script is to copy the DBParm syntax from the Preview tab in the Database Profile Setup dialog box into your code, modifying the default Transaction object name (SQLCA) if necessary.

As you set parameters in the Database Profile Setup dialog box in the development environment, PowerBuilder generates the correct connection syntax on the Preview tab. Therefore, copying the syntax directly from the Preview tab ensures that you use the correct DBParm syntax in your code.

❖ To copy DBParm syntax from the Preview tab into your code:

1. On one or more tab pages in the Database Profile Setup dialog box for your connection, supply values for any parameters you want to set.

   For instructions, see “Setting database parameters in the development environment” on page 175.

   For information about the parameters for your interface and the values to supply, click Help.

2. Click Apply to save your changes to the current tab without closing the Database Profile Setup dialog box.

3. Click the Preview tab.

   The correct DBParm syntax for each selected option displays in the Database Connection Syntax box.
4 Select one or more lines of text in the Database Connection Syntax box and click Copy. PowerBuilder copies the selected text to the clipboard.

5 Click OK to close the Database Profile Setup dialog box.

6 Paste the selected text from the Preview tab into your code, modifying the default Transaction object name (SQLCA) if necessary.

**Coding PowerScript to set values for the DBParm property**

Another way to specify connection parameters in a script is by coding PowerScript to assign values to properties of the Transaction object. PowerBuilder uses a special nonvisual object called a Transaction object to communicate with the database. The default Transaction object is named SQLCA, which stands for SQL Communications Area.

SQLCA has 15 properties, 10 of which are used to connect to your database. One of the 10 connection properties is DBParm. DBParm contains DBMS-specific parameters that let your application take advantage of various features supported by the database interface.

❖ **To set values for the DBParm property in a PowerBuilder script:**

1 Open the application script in which you want to specify connection parameters. For instructions, see the Users Guide.

2 Use the following PowerScript syntax to specify DBParm parameters. Make sure you separate the DBParm parameters with commas, and enclose the entire DBParm string in double quotes.

   ```powerbuilder
   SQLCA.dbParm = "parameter_1, parameter_2, parameter_n"
   ```

   For example, the following statement in a PowerBuilder script sets the DBParm property for an ODBC data source named Sales. In this example, the DBParm property consists of two parameters: ConnectString and Async.

   ```powerbuilder
   SQLCA.dbParm="ConnectString='DSN=Sales;UID=PB;PWD=xyz',Async=1"
   ```

3 Compile the PowerBuilder script to save your changes. For instructions, see the Users Guide.
Setting database preferences

Reading DBParm values from an external text file

As an alternative to setting the DBParm property in a PowerBuilder application script, you can use the PowerScript ProfileString function to read DBParm values from a specified section of an external text file, such as an application-specific initialization file.

❖ To read DBParm values from an external text file:

1. Open the application script in which you want to specify connection parameters.
   For instructions, see the *Users Guide*.

2. Use the following PowerScript syntax to specify the ProfileString function with the SQLCA.DBParm property:

   ```powerscript
   SQLCA.dbParm = ProfileString(file, section, key, default)
   ```

   For example, the following statement in a PowerBuilder script reads the DBParm values from the [Database] section of the *APP.INI* file:

   ```powerscript
   SQLCA.dbParm = ProfileString("APP.INI", "Database", "dbParm", ","
   ```

3. Compile the script to save your changes.
   For instructions, see the *Users Guide*.

Setting database preferences

How to set

The way you set connection-related database preferences in PowerBuilder varies, as summarized in the following table (AutoCommit and Lock are the only database preferences that you can set in a PowerBuilder application script).

<table>
<thead>
<tr>
<th>Database preference</th>
<th>Set in development environment by editing</th>
<th>Set in PowerBuilder application by editing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AutoCommit</td>
<td>Database Profile Setup dialog box for your connection</td>
<td>Application script</td>
</tr>
<tr>
<td>Lock</td>
<td>Database Profile Setup dialog box for your connection</td>
<td>Application script</td>
</tr>
<tr>
<td>Shared Database Profiles</td>
<td>Database Preferences property sheet</td>
<td>—</td>
</tr>
</tbody>
</table>
Connecting to Your Database

CHAPTER 13 Setting Additional Connection Parameters

The following sections give the steps for setting database preferences in the development environment and (for AutoCommit and Lock) in a PowerBuilder application script.

For more information For information about using a specific database preference, see its description in the online Help.

Setting database preferences in the development environment

There are two ways to set database preferences in the PowerBuilder development environment on all supported development platforms, depending on the preference you want to set:

- Set AutoCommit and Lock (Isolation Level) in the Database Profile Setup dialog box for your connection

  **ADO.NET**
  
  For ADO.NET, Isolation is a database parameter.

- Set all other database preferences in the Database Preferences dialog box in the Database painter

Setting AutoCommit and Lock in the database profile

The AutoCommit and Lock (Isolation Level) preferences are properties of the default Transaction object, SQLCA. For AutoCommit and Lock to take effect in the PowerBuilder development environment, you must specify them before you connect to a database. Changes to these preferences after the connection occurs have no effect on the current connection.

<table>
<thead>
<tr>
<th>Database preference</th>
<th>Set in development environment by editing</th>
<th>Set in PowerBuilder application by editing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to Default Profile</td>
<td>Database Preferences property sheet</td>
<td>—</td>
</tr>
<tr>
<td>Read Only</td>
<td>Database Preferences property sheet</td>
<td>—</td>
</tr>
<tr>
<td>Keep Connection Open</td>
<td>Database Preferences property sheet</td>
<td>—</td>
</tr>
<tr>
<td>Use Extended Attributes</td>
<td>Database Preferences property sheet</td>
<td>—</td>
</tr>
<tr>
<td>SQL Terminator Character</td>
<td>Database Preferences property sheet</td>
<td>—</td>
</tr>
</tbody>
</table>
To set AutoCommit and Lock before PowerBuilder connects to your database, you specify their values in the Database Profile Setup dialog box for your connection.

❖ **To set AutoCommit and Lock (Isolation Level) in a database profile:**

1. Display the Database Profiles dialog box.
2. Click the plus sign (+) to the left of the interface you are using or double-click the interface name.
   The list expands to display the database profiles defined for your interface.
3. Select the name of the profile you want and click Edit.
   The Database Profile Setup dialog box for the selected profile displays.
4. On the Connection tab page, supply values for one or both of the following:
   - **Isolation Level** If your database supports the use of locking and isolation levels, select the isolation level you want to use for this connection from the Isolation Level drop-down list. (The Isolation Level drop-down list contains valid lock values for your interface.)
   - **AutoCommit Mode** The setting of AutoCommit controls whether PowerBuilder issues SQL statements outside (True) or inside (False) the scope of a transaction. If your database supports it, select the AutoCommit Mode check box to set AutoCommit to True or clear the AutoCommit Mode check box (the default) to set AutoCommit to False.

For example, in addition to values for basic connection parameters (Server, Login ID, Password, and Database), the Connection tab page for the following Sybase Adaptive Server Enterprise profile named Sales shows nondefault settings for Isolation Level and AutoCommit Mode.

5. (Optional) In PowerBuilder, click the Preview tab if you want to see the PowerScript connection syntax generated for Lock and AutoCommit. PowerBuilder generates correct PowerScript connection syntax for each option you set in the Database Profile Setup dialog box. You can copy this syntax directly into a PowerBuilder application script.

   For instructions, see “Copying DBParm syntax from the Preview tab” on page 176.

6. Click OK to close the Database Profile Setup dialog box.
PowerBuilder saves your settings in the database profile entry in the registry.

**Setting preferences in the Database Preferences dialog box**

To set the following connection-related database preferences, complete the Database Preferences dialog box in the PowerBuilder Database painter:

- Shared Database Profiles
- Connect to Default Profile
- Read Only
- Keep Connection Open
- Use Extended Attributes
- SQL Terminator Character

**Other database preferences**
The Database Preferences dialog box also lets you set other database preferences that affect the behavior of the Database painter itself. For information about the other preferences you can set in the Database Preferences dialog box, see the *Users Guide*.

❖ **To set connection-related preferences in the Database Preferences dialog box:**

1. Open the Database painter.
2. Select Design>Options from the menu bar.

   The Database Preferences dialog box displays. If necessary, click the General tab to display the General property page.

3. Specify values for one or more of the connection-related database preferences in the following table.
### Setting database preferences

#### Table 13-2: Connection-related database preferences

<table>
<thead>
<tr>
<th>Preference</th>
<th>Description</th>
<th>For details, see</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Database Profiles</td>
<td>Specifies the pathname of the file containing the database profiles you want to share. You can type the pathname or click Browse to display it.</td>
<td>“Sharing database profiles” on page 161</td>
</tr>
<tr>
<td>Connect to Default Profile</td>
<td>Controls whether the Database painter establishes a connection to a database using a default profile when the painter is invoked. If not selected, the Database painter opens without establishing a connection to a database.</td>
<td>Connect to Default Profile in online Help</td>
</tr>
<tr>
<td>Read Only</td>
<td>Specifies whether PowerBuilder should update the extended attribute system tables and any other tables in your database. Select or clear the Read Only check box as follows:</td>
<td>Read Only in the online Help</td>
</tr>
<tr>
<td></td>
<td>- <strong>Select the check box</strong>  Does not update the extended attribute system tables or any other tables in your database. You <em>cannot</em> modify (update) information in the extended attribute system tables or any other database tables from the DataWindow painter when the Read Only check box is selected.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Clear the check box</strong>   (Default) Updates the extended attribute system tables and any other tables in your database.</td>
<td></td>
</tr>
<tr>
<td>Keep Connection Open</td>
<td>When you connect to a database in PowerBuilder without using a database profile, specifies when PowerBuilder closes the connection. Select or clear the Keep Connection Open check box as follows:</td>
<td>Keep Connection Open in the online Help</td>
</tr>
<tr>
<td></td>
<td>- <strong>Select the check box</strong>  (Default) Stays connected to the database throughout your session and closes the connection when you exit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Clear the check box</strong>   Opens the connection only when a painter requests it and closes the connection when you close a painter or finish compiling a script</td>
<td></td>
</tr>
<tr>
<td><strong>Not used with profile</strong></td>
<td>This preference has no effect when you connect using a database profile.</td>
<td></td>
</tr>
<tr>
<td>Use Extended Attributes</td>
<td>Specifies whether PowerBuilder should create and use the extended attribute system tables. Select or clear the Use Extended Attributes check box as follows:</td>
<td>Use Extended Attributes in the online Help</td>
</tr>
<tr>
<td></td>
<td>- <strong>Select the check box</strong>  (Default) Creates and uses the extended attribute system tables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Clear the check box</strong>   Does <em>not</em> create the extended attribute system tables</td>
<td></td>
</tr>
</tbody>
</table>
4 Do one of the following:

- Click Apply to apply the preference settings to the current connection without closing the Database Preferences dialog box.
- Click OK to apply the preference settings to the current connection and close the Database Preferences dialog box.

PowerBuilder saves your preference settings in the database section of PB.INI.

### Setting AutoCommit and Lock in a PowerBuilder application script

If you are developing a PowerBuilder application that connects to a database, you must specify the required connection parameters in the appropriate script as properties of the default Transaction object (SQLCA) or a Transaction object that you create. For example, you might specify connection parameters in the script that opens the application.

AutoCommit and Lock are properties of SQLCA. As such, they are the only database preferences you can set in a PowerBuilder script. You can do this by:

- (Recommended) Copying PowerScript syntax for AutoCommit and Lock from the Preview tab in the Database Profile Setup dialog box into your script
- Coding PowerScript to set values for the AutoCommit and Lock properties of the Transaction object
- Reading AutoCommit and Lock values from an external text file

For more about using Transaction objects to communicate with a database in a PowerBuilder application, see *Application Techniques*.

### Copying AutoCommit and Lock syntax from the Preview tab

The easiest way to specify AutoCommit and Lock in a PowerBuilder application script is to copy the PowerScript syntax from the Preview tab in the Database Profile Setup dialog box into your script, modifying the default Transaction object name (SQLCA) if necessary.
As you complete the Database Profile Setup dialog box in the development environment, PowerBuilder generates the correct connection syntax on the Preview tab for each selected option. Therefore, copying the syntax directly from the Preview tab ensures that you use the correct PowerScript syntax in your script.

❖ **To copy AutoCommit and Lock syntax from the Preview tab into your script:**

1. On the Connection tab in the Database Profile Setup dialog box for your connection, supply values for AutoCommit and Lock (Isolation Level) as required.

   For instructions, see “Setting AutoCommit and Lock in the database profile” on page 179.

   For example, in addition to values for basic connection parameters (Server, Login ID, Password, and Database), the Connection tab for the following Adaptive Server profile named Sales shows nondefault settings for Isolation Level and AutoCommit Mode.

   For information about the DBParm parameters for your interface and the values to supply, click Help.

2. Click Apply to save your changes to the current tab without closing the Database Profile Setup dialog box.

3. Click the Preview tab.

   The correct PowerScript syntax for each selected option displays in the Database Connection Syntax box. For example:

   ```plaintext
   Database Connection Syntax:
   PROFILE: Sales
   SQLCA. DBHNS = "SYC Adaptive Server Enterprise"
   SQLCA. Database = "Sales"
   SQLCA. LogFlag = "on"
   SQLCA. ServerName = "ASE12"
   SQLCA. LogFlag = "on"
   SQLCA. SQLCA. DBParm = "Trace"
   SQLCA. DBParm = "Release=92.9"
   ```

4. Select one or more lines of text in the Database Connection Syntax box and click Copy.

   PowerBuilder copies the selected text to the clipboard.
5 Click OK to close the Database Profile Setup dialog box.
6 Paste the selected text from the Preview tab into your script, modifying the default Transaction object name (SQLCA) if necessary.

**Coding PowerScript to set values for AutoCommit and Lock**

Another way to specify the AutoCommit and Lock properties in a script is by coding PowerScript to assign values to the AutoCommit and Lock properties of the Transaction object. PowerBuilder uses a special nongraphic object called a **Transaction object** to communicate with the database. The default Transaction object is named SQLCA, which stands for SQL Communications Area.

SQLCA has 15 properties, 10 of which are used to connect to your database. Two of the connection properties are AutoCommit and Lock, which you can set as described in the following procedure.

❖ **To set the AutoCommit and Lock properties in a PowerBuilder script:**
1 Open the application script in which you want to set connection properties.
   For instructions, see the *Users Guide*.
2 Use the following PowerScript syntax to set the AutoCommit and Lock properties. (This syntax assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.)
   ```powerbuilder
   SQLCA.AutoCommit = value
   SQLCA.Lock = "value"
   ```
   For example, the following statements in a PowerBuilder script use the default Transaction object SQLCA to connect to a Sybase Adaptive Server Enterprise database named Test. SQLCA.AutoCommit is set to True and SQLCA.Lock is set to isolation level 3 (Serializable transactions).
   ```powerbuilder
   SQLCA.DBMS = "SYC"
   SQLCA.Database = "Test"
   SQLCA.LogID = "Frans"
   SQLCA.LogPass = "xxyyzz"
   SQLCA.ServerName = "HOST1"
   SQLCA.AutoCommit = True
   SQLCA.Lock = "3"
   ```
   For more information, see AutoCommit or Lock in the online Help.
3 Compile the script to save your changes.
   For instructions, see the *Users Guide*. 
Reading AutoCommit and Lock values from an external text file

As an alternative to setting the AutoCommit and Lock properties in a PowerBuilder application script, you can use the PowerScript ProfileString function to read the AutoCommit and Lock values from a specified section of an external text file, such as an application-specific initialization file.

❖ To read AutoCommit and Lock values from an external text file:

1. Open the application script in which you want to set connection properties.
2. Use the following PowerScript syntax to specify the ProfileString function with the SQLCA.Lock property:

   ```powerbuilder
   SQLCA.Lock = ProfileString( file, section, key, default )
   ```

   The AutoCommit property is a boolean, so you need to convert the string returned by ProfileString to a boolean. For example, the following statements in a PowerBuilder script read the AutoCommit and Lock values from the [Database] section of the APP.INI file:

   ```powerbuilder
   string ls_string
   ls_string=Upper(ProfileString("APP.INI","Database","Autocommit",""))
   if ls_string = "TRUE" then
     SQLCA.Autocommit = TRUE
   else
     SQLCA.Autocommit = FALSE
   end if
   SQLCA.Lock=ProfileString("APP.INI","Database","Lock","")
   ```

3. Compile the script to save your changes.

Getting values from the registry

If the AutoCommit and Lock values are stored in an application settings key in the registry, use the RegistryGet function to obtain them. For example:

```powerbuilder
string ls_string
RegistryGet("HKEY_CURRENT_USER\Software\MyCo\MyApp", 
    "Autocommit", RegString!, ls_string)
if Upper(ls_string) = "TRUE" then
  SQLCA.Autocommit = TRUE
else
  SQLCA.Autocommit = FALSE
end if
RegistryGet("HKEY_CURRENT_USER\Software\MyCo\MyApp", 
    "Lock", RegString!, ls_string)
```
Working with Transaction Servers

This part describes how to make database connections for transactional components.
CHAPTER 14  Troubleshooting Your Connection

About this chapter
This chapter describes how to troubleshoot your database connection in PowerBuilder by using the following tools:

- Database Trace
- SQL Statement Trace
- ODBC Driver Manager Trace
- JDBC Driver Manager Trace

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<td>213</td>
</tr>
</tbody>
</table>

Overview of troubleshooting tools

When you use PowerBuilder, there are several tools available to trace your database connection in order to troubleshoot problems.

*Table 14-1: Database trace tools*

<table>
<thead>
<tr>
<th>Use this tool</th>
<th>To trace a connection to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Trace</td>
<td><em>Any database that PowerBuilder accesses through one of the database interfaces</em></td>
</tr>
<tr>
<td>ODBC Driver Manager Trace</td>
<td><em>An ODBC data source only</em></td>
</tr>
<tr>
<td>JDBC Driver Manager Trace</td>
<td><em>A JDBC database only</em></td>
</tr>
</tbody>
</table>
Using the Database Trace tool

This section describes how to use the Database Trace tool.

About the Database Trace tool

The Database Trace tool records the internal commands that PowerBuilder executes while accessing a database. You can trace a database connection in the development environment or in a PowerBuilder application that connects to a database.

PowerBuilder writes the output of Database Trace to a log file named `DBTRACE.LOG` (by default) or to a nondefault log file that you specify. When you enable database tracing for the first time, PowerBuilder creates the log file on your computer. Tracing continues until you disconnect from the database.

Using the Database Trace tool with one connection

You can use the Database Trace tool for only one DBMS at a time and for one database connection at a time.

For example, if your application connects to both an ODBC data source and an Adaptive Server Enterprise database, you can trace either the ODBC connection or the Adaptive Server Enterprise connection, but not both connections at the same time.

How you can use the Database Trace tool

You can use information from the Database Trace tool to understand what PowerBuilder is doing internally when you work with your database. Examining the information in the log file can help you:

- Understand how PowerBuilder interacts with your database
- Identify and resolve problems with your database connection
- Provide useful information to Technical Support if you call them for help with your database connection

If you are familiar with PowerBuilder and your DBMS, you can use the information in the log to help troubleshoot connection problems on your own. If you are less experienced or need help, run the Database Trace tool before you call Technical Support. You can then report or send the results of the trace to the Technical Support representative who takes your call.
CHAPTER 14  Troubleshooting Your Connection

Contents of the Database Trace log

Default contents of the trace file

By default, the Database Trace tool records the following information in the log file when you trace a database connection:

- Parameters used to connect to the database
- Time to perform each database operation (in microseconds)
- The internal commands executed to retrieve and display table and column information from your database. Examples include:
  - Preparing and executing SQL statements such as SELECT, INSERT, UPDATE, and DELETE
  - Getting column descriptions
  - Fetching table rows
  - Binding user-supplied values to columns (if your database supports bind variables)
  - Committing and rolling back database changes
- Disconnecting from the database
- Shutting down the database interface

You can opt to include the names of DBI commands and the time elapsed from the last database connection to the completion of processing for each log entry. You can exclude binding and timing information as well as the data from all fetch requests.

Database Trace dialog box selections

The Database Trace dialog box lets you select the following items for inclusion in or exclusion from a database trace file:

- **Bind variables**  Metadata about the result set columns obtained from the database
- **Fetch buffers**  Data values returned from each fetch request
- **DBI names**  Database interface commands that are processed
- **Time to implement request**  Time required to process DBI commands; the interval is measured in thousandths of milliseconds (microseconds)
- **Cumulative time**  Cumulative total of timings since the database connection began; the timing measurement is in thousandths of milliseconds
Using the Database Trace tool

| Registry settings for DBTrace | The selections made in the Database Trace dialog box are saved to the registry of the machine from which the database connections are made. Windows registry settings for the database trace utility configuration are stored under the HKEY_CURRENT_USER\Software\Sybase\PowerBuilder11.5\DBTrace key. Registry strings under this key are: ShowBindings, FetchBuffers, ShowDBINames, Timing, SumTiming, LogFileName, and ShowDialog. Except for the LogFileName string to which you can assign a full file name for the trace output file, all strings can be set to either 0 or 1. The ShowDialog registry string can be set to prevent display of the Database Trace dialog box when a database connection is made with tracing enabled. This is the only one of the trace registry strings that you cannot change from the Database Trace dialog box. You must set ShowDialog to 0 in the registry to keep the configuration dialog box from displaying. |
| INI file settings for DBTrace | If you do not have access to the registry, you can use PB.INI to store trace file settings. Add a [DbTrace] section to the INI file with at least one of the following values set, then restart PowerBuilder:

```
[DbTrace]
ShowDBINames=0
FetchBuffers=1
ShowBindings=1
SumTiming=1
Timing=1
ShowDialog=1
LogFileName=dbtrace.log
```

The keywords are the same as in the registry and have the same meaning. When you connect to the database again, the initial settings are taken from the INI file, and when you modify them, the changes are written to the INI file.

If the file name for LogFileName does not include an absolute path, the log file is written to the following path, where `<username>` is your login ID:

```
Documents and Settings\<username>\Application Data\PowerBuilder11.5\.
```

If there are no DbTrace settings in the INI file, the registry settings are used.

| Error messages | If the database trace utility cannot open the trace output file with write access, an error message lets you know that the specified trace file could not be created or opened. If the trace utility driver cannot be loaded successfully, a message box informs you that the selected Trace DBMS is not supported in your current installation. |
Format of the Database Trace log

The specific content of the Database Trace log file depends on the database you are accessing and the operations you are performing. However, the log uses the following basic format to display output:

\[
\text{COMMAND: (time)}
\]

\[
\{\text{additional\_information}\}
\]

### Parameter | Description
---|---
COMMAND | The internal command that PowerBuilder executes to perform the database operation.
time | The number of microseconds it takes PowerBuilder to perform the database operation. The precision used depends on your operating system’s timing mechanism.
additional\_information | (Optional) Additional information about the command. The information provided depends on the database operation.

#### Example

The following portion of the log file shows the commands PowerBuilder executes to fetch two rows from a SQL Anywhere database table:

- FETCH NEXT: (0.479 MS)
  - COLUMN=400 COLUMN=Marketing COLUMN=Evans
- FETCH NEXT: (0.001 MS)
  - COLUMN=500 COLUMN=Shipping COLUMN=Martinez

If you opt to include DBI Names and Sum Time information in the trace log file, the log for the same two rows might look like this:

- FETCH NEXT: (DBI_FETCHNEXT) (1.459 MS / 3858.556 MS)
  - COLUMN=400 COLUMN=Marketing COLUMN=Evans
- FETCH NEXT: (DBI_FETCHNEXT) (0.001 MS / 3858.557 MS)
  - COLUMN=500 COLUMN=Shipping COLUMN=Martinez

For a more complete example of Database Trace output, see “Sample Database Trace output” on page 201.
Using the Database Trace tool

Starting the Database Trace tool

By default, the Database Trace tool is turned off in PowerBuilder. You can start it in the PowerBuilder development environment or in a PowerBuilder application to trace your database connection.

Turning tracing on and off
To turn tracing on or off you must reconnect. Setting and resetting are not sufficient.

Starting Database Trace in the development environment

To start the Database Trace tool in the PowerBuilder development environment, edit the database profile for the connection you want to trace, as described in the following procedure.

❖ To start the Database Trace tool by editing a database profile:

1. Open the Database Profile Setup dialog box for the connection you want to trace.
2. On the Connection tab, select the Generate Trace check box and click OK or Apply. (The Generate Trace check box is located on the System tab in the OLE DB Database Profile Setup dialog box.)

The Database Profiles dialog box displays with the name of the edited profile highlighted.

For example, here is the relevant portion of a database profile entry for Adaptive Server 12.5 Test. The setting that starts Database Trace is DBMS:

```
[Default] [value not set]
AutoCommit "FALSE"
Database "qadata"
DatabasePassword "00"
DBMS "TRACE SYC Adaptive Server Enterprise"
DbParm "Release='12.5'"
Lock ""
LogId "qalogin"
LogPassword "00171717171717"
Prompt "FALSE"
ServerName "Host125"
UserID ""
```
3 Click Connect in the Database Profiles dialog box to connect to the database.

The Database Trace dialog box displays, indicating that database tracing is enabled. You can enter the file location where PowerBuilder writes the trace output. By default, PowerBuilder writes Database Trace output to a log file named `DBTRACE.LOG`. You can change the log file name and location in the Database Trace dialog box.

The Database Trace dialog box also lets you select the level of tracing information that you want in the database trace file.

4 Select the types of items you want to include in the trace file and click OK.

PowerBuilder connects to the database and starts tracing the connection.

**Starting Database Trace in a PowerBuilder application**

In a PowerBuilder application that connects to a database, you must specify the required connection parameters in the appropriate script. For example, you might specify them in the script that opens the application.

To trace a database connection in a PowerBuilder script, you specify the name of the DBMS preceded by the word `trace` and a single space. You can do this by:

- Copying the PowerScript DBMS trace syntax from the Preview tab in the Database Profile Setup dialog box into your script
- Coding PowerScript to set a value for the DBMS property of the Transaction object
- Reading the DBMS value from an external text file

For more about using Transaction objects to communicate with a database in a PowerBuilder application, see *Application Techniques*.

One way to start Database Trace in a PowerBuilder application script is to copy the PowerScript DBMS trace syntax from the Preview tab in the Database Profile Setup dialog box into your script, modifying the default Transaction object name (SQLCA) if necessary.

As you complete the Database Profile Setup dialog box in the development environment, PowerBuilder generates the correct connection syntax on the Preview tab for each selected option, including Generate Trace. Therefore, copying the syntax directly from the Preview tab ensures that it is accurate in your script.
To copy DBMS trace syntax from the Preview tab into your script:

1. On the Connection tab (or System tab in the case of OLE DB) in the Database Profile Setup dialog box for your connection, select the Generate Trace check box to turn on Database Trace.
   
   For instructions, see “Starting Database Trace in the development environment” on page 194.

2. Click Apply to save your changes to the Connection tab without closing the Database Profile Setup dialog box.

3. Click the Preview tab.
   
   The correct PowerScript connection syntax for the Generate Trace and other selected options displays in the Database Connection Syntax box.

4. Select the SQLCA.DBMS line and any other syntax you want to copy to your script and click Copy.
   
   PowerBuilder copies the selected text to the clipboard.

5. Click OK to close the Database Profile Setup dialog box.

6. Paste the selected text from the Preview tab into your script, modifying the default Transaction object name (SQLCA) if necessary.

Another way to start the Database Trace tool in a PowerBuilder script is to specify it as part of the DBMS property of the Transaction object. The Transaction object is a special nonvisual object that PowerBuilder uses to communicate with the database. The default Transaction object is named SQLCA, which stands for SQL Communications Area.

SQLCA has 15 properties, 10 of which are used to connect to your database. One of the 10 connection properties is DBMS. The DBMS property contains the name of the database to which you want to connect.

To start the Database Trace tool by specifying the DBMS property:

- Use the following PowerScript syntax to specify the DBMS property. (This syntax assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.)

  SQLCA.DBMS = "trace DBMS_name"

For example, the following statements in a PowerBuilder script set the SQLCA properties required to connect to an Adaptive Server database named Test. The keyword trace in the DBMS property indicates that you want to trace the database connection.
CHAPTER 14    Troubleshooting Your Connection

Connecting to Your Database

As an alternative to setting the DBMS property in your PowerBuilder application script, you can use the PowerScript ProfileString function to read the DBMS value from a specified section of an external text file, such as an application-specific initialization file, or from an application settings key in the registry.

The following procedure assumes that the DBMS value read from the database section in your initialization file uses the following syntax to enable database tracing:

DBMS = trace DBMS_name

❖ To start the Database Trace tool by reading the DBMS value from an external text file:

- Use the following PowerScript syntax to specify the ProfileString function with the DBMS property:

  \[
  \text{SQLCA.DBMS} = \text{ProfileString(}file, \text{section, variable, default_value)} \]

  For example, the following statement in a PowerBuilder script reads the DBMS value from the [Database] section of the APP.INI file:

  \[
  \text{SQLCA.DBMS} = \text{ProfileString(}"APP.INI", \"Database", \"DBMS", \"\")}
  \]

  For how to get a value from a registry file instead, see “Getting values from the registry” on page 186.

Starting a trace in PowerScript with the PBTrace parameter

Instead of tracing all database commands from the start of a database connection, you can start and end a trace programmatically for specific database queries. To start a trace, you can assign the string value pair “PBTrace=1” to the transaction object DBParm property; to end a trace, you assign the string value pair “PBTrace=0”. For example, if you wanted data to be logged to the trace output for a single retrieve command, you could disable tracing from the start of the connection and then surround the retrieve call with DBParm property assignments as follows:

\[
\begin{align*}
\text{SQLCA.DBMS} & = \text{"TRACE ODBC"} \\
\text{SQLCA.DBParm} & = \text{"PBTrace=0"} \\
\text{Connect using SQLCA;}
\end{align*}
\]
Using the Database Trace tool

... SQLCA.DBParm="PBTrace=1"
dw_1.Retrieve ( )
SQLCA.DBParm="PBTrace=0"

When you first connect to a database after setting the DBMS parameter to “Trace DBMSName”, a configuration dialog box displays. The configuration parameters that you set in this dialog box are saved to the registry. Configuration parameters are retrieved from the registry when you begin tracing by assigning the DBParm parameter to "PBTrace=1".

You can start and stop the SQL statement trace utility in the same way if you set the DBMS value to “TRS DBMSName” instead of “Trace DBMSName”. For information about the SQL statement trace utility, see “Using the SQL statement trace utility” on page 203.

Stopping the Database Trace tool

Once you start tracing a particular database connection, PowerBuilder continues sending trace output to the log until you do one of the following:

- Reconnect to the same database with tracing stopped
- Connect to another database for which you have not enabled tracing

Stopping Database Trace in the development environment

❖ To stop the Database Trace tool by editing a database profile:

1 In the Database Profile Setup dialog box for the database you are tracing, clear the Generate Trace check box on the Connection tab.

2 Click OK in the Database Profile Setup dialog box.

The Database Profiles dialog box displays with the name of the edited profile highlighted.

3 Right-click on the connected database and select Re-connect from the drop-down menu in the Database Profiles dialog box.

PowerBuilder connects to the database and stops tracing the connection.

Stopping Database Trace in a PowerBuilder application

To stop Database Trace in a PowerBuilder application script, you must delete the word trace from the DBMS property. You can do this by:
• Editing the value of the DBMS property of the Transaction object
• Reading the DBMS value from an external text file
You must reconnect for the change to take effect.

Editing the DBMS property

❖ To stop Database Trace by editing the DBMS value in a PowerBuilder script:
• Delete the word `trace` from the DBMS connection property in your application script.

For example, here is the DBMS connection property in a PowerBuilder script that enables the Database Trace. (This syntax assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.)

```
SQLCA.DBMS = "trace SYC"
```

Here is how the same DBMS connection property should look after you edit it to stop tracing:

```
SQLCA.DBMS = "SYC"
```

Reading the DBMS value from an external text file

As an alternative to editing the DBMS property in your PowerBuilder application script, you can use the PowerScript ProfileString function to read the DBMS value from a specified section of an external text file, such as an application-specific initialization file.

This assumes that the DBMS value read from your initialization file does not include the word `trace`, as shown in the preceding example in “Editing the DBMS property.”

Using the Database Trace log

PowerBuilder writes the output of the Database Trace tool to a file named `DBTRACE.LOG` (by default) or to a nondefault log file that you specify. To use the trace log, you can do the following anytime:

• View the Database Trace log with any text editor
• Annotate the Database Trace log with your own comments
• Delete the Database Trace log or clear its contents when it becomes too large
Using the Database Trace tool

Viewing the Database Trace log

You can display the contents of the log file anytime during a PowerBuilder session.

❖ To view the contents of the log file:
- Open the log file in one of the following ways:
  - Use the File Editor in PowerBuilder. (For instructions, see the Users Guide.)
  - Use any text editor outside PowerBuilder.

Leaving the log file open
If you leave the log file open as you work in PowerBuilder, the Database Trace tool does not update the log.

Annotating the Database Trace log

When you use the Database Trace log as a troubleshooting tool, it might be helpful to add your own comments or notes to the file. For example, you can specify the date and time of a particular connection, the versions of database server and client software you used, or any other useful information.

❖ To annotate the log file:
1. Open the DBTRACE.LOG file in one of the following ways:
   - Use the File Editor in PowerBuilder. (For instructions, see the Users Guide.)
   - Use any text editor outside PowerBuilder.
2. Edit the log file with your comments.
3. Save your changes to the log file.

Deleting or clearing the Database Trace log

Each time you connect to a database with tracing enabled, PowerBuilder appends the trace output of your connection to the existing log. As a result, the log file can become very large over time, especially if you frequently enable tracing when connected to a database.
❖ To keep the size of the log file manageable:
   • Do either of the following periodically:
     • Open the log file, clear its contents, and save the empty file.
       Provided that you use the default DBTRACE.LOG or the same nondefault file the next time you connect to a database with tracing enabled, PowerBuilder will write to this empty file.
     • Delete the log file.
       PowerBuilder will automatically create a new log file the next time you connect to a database with tracing enabled.

Sample Database Trace output

This section gives an example of Database Trace output that you might see in the log file and briefly explains each portion of the output.

The example traces a connection with Sum Timing enabled. The output was generated while running a PowerBuilder application that displays information about authors in a publications database. The SELECT statement shown retrieves information from the Author table.

The precision (for example, microseconds) used when Database Trace records internal commands depends on your operating system’s timing mechanism. Therefore, the timing precision in your Database Trace log might vary from this example.

<table>
<thead>
<tr>
<th>Connect to database</th>
<th>Prepare SELECT statement</th>
</tr>
</thead>
</table>
| CONNECT TO TRACE SYC Adaptive Server Enterprise: DATABASE=pubs2  
LOGID=bob  
SERVER=HOST12  
DPPARM=Release='12.5.2',StaticBind=0                                                                          | PREPARE:  
SELECT authors.au_id, authors.au_lname, authors.state  
FROM authors  
WHERE ( authors.state not in ( 'CA' ) )  
ORDER BY authors.au_lname ASC (3.386 MS / 20.349 MS)
### Using the Database Trace tool

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Timing Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Get column descriptions</strong></td>
<td>DESCRIBE: (0.021 MS / 20.370 MS)</td>
</tr>
<tr>
<td></td>
<td>name=au_id,len=12,type=CHAR,pbt=1,dbt=1,ct=0,prec=0, scale=0</td>
</tr>
<tr>
<td></td>
<td>name=au_lname,len=41,type=CHAR,pbt=1,dbt=1,ct=0, prec=0,scale=0</td>
</tr>
<tr>
<td></td>
<td>name=state,len=3,type=CHAR,pbt=1,dbt=1,ct=0,prec=0, scale=0</td>
</tr>
<tr>
<td><strong>Bind memory buffers to columns</strong></td>
<td>BIND SELECT OUTPUT BUFFER (DataWindow): (0.007 MS / 20.377 MS)</td>
</tr>
<tr>
<td></td>
<td>name=au_id,len=12,type=CHAR,pbt=1,dbt=1,ct=0,prec=0, scale=0</td>
</tr>
<tr>
<td></td>
<td>name=au_lname,len=41,type=CHAR,pbt=1,dbt=1,ct=0, prec=0,scale=0</td>
</tr>
<tr>
<td></td>
<td>name=state,len=3,type=CHAR,pbt=1,dbt=1,ct=0,prec=0, scale=0</td>
</tr>
<tr>
<td><strong>Execute SELECT statement</strong></td>
<td>EXECUTE: (0.001 MS / 20.378 MS)</td>
</tr>
<tr>
<td><strong>Fetch rows from result set</strong></td>
<td>FETCH NEXT: (0.028 MS / 20.406 MS)</td>
</tr>
<tr>
<td></td>
<td>au_id=648-92-1872 au_lname=Blotchet-Hall state=OR</td>
</tr>
<tr>
<td></td>
<td>FETCH NEXT: (0.012 MS / 20.418 MS)</td>
</tr>
<tr>
<td></td>
<td>au_id=722-51-5454 au_lname=DeFrance state=IN</td>
</tr>
<tr>
<td></td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>FETCH NEXT: (0.010 MS / 20.478 MS)</td>
</tr>
<tr>
<td></td>
<td>au_id=341-22-1782 au_lname=Smith state=KS</td>
</tr>
<tr>
<td></td>
<td>FETCH NEXT: (0.025 MS / 20.503 MS)</td>
</tr>
<tr>
<td></td>
<td>*** DBI_FETCHEND *** (rc 100)</td>
</tr>
<tr>
<td><strong>Update and commit database changes</strong></td>
<td>PREPARE: UPDATE authors SET state = 'NM'</td>
</tr>
<tr>
<td></td>
<td>WHERE au_id = '648-92-1872' AND au_lname = 'Blotchet-Halls' AND state = 'OR'</td>
</tr>
<tr>
<td></td>
<td>EXECUTE: (0.001 MS / 23.788 MS)</td>
</tr>
<tr>
<td></td>
<td>GET AFFECTED ROWS: (0.001 MS / 23.789 MS)</td>
</tr>
<tr>
<td></td>
<td>^ 1 Rows Affected</td>
</tr>
<tr>
<td></td>
<td>COMMIT: (1.259 MS / 25.048 MS)</td>
</tr>
<tr>
<td><strong>Disconnect from database</strong></td>
<td>DISCONNECT: (0.764 MS / 25.812 MS)</td>
</tr>
<tr>
<td><strong>Shut down database interface</strong></td>
<td>SHUTDOWN DATABASE INTERFACE: (0.001 MS / 25.813 MS)</td>
</tr>
</tbody>
</table>
Using the SQL statement trace utility

SQL statement tracing

A separate database trace utility lets you add date and time entries to a log file for each SQL statement issued to the database, along with the syntax of the SQL statement. By default, this utility saves all log entries to a file named `PBTRSQL.log` in the initialization path directory. You can set the initialization path in the on the General tab of the System Options dialog box.

You can also change the log file location and log file name in the registry or in the DbTrace section of the `PB.INI` file in the same way you change the trace output file name for the main database trace utility (see “INI file settings for DBTrace” on page 192):

```
[DbTrace]
SqlTraceFile=c:\myApplication\tracesql.log
```

The registry string for the log file name is SqlTraceFile. It is located under the `HKEY_CURRENT_USER\Software\Sybase\PowerBuilder\11.5\DBTrace` key. If the DbTrace section in the PB.INI file has at least one entry, the registry value is ignored. The default file name is used only if both the registry value and the `PB.INI` value are not set.

You start the SQL statement trace utility in PowerScript code by invoking the driver for the DBMS that you want to use with a TRS modifier. You set the driver in the DBMS property of a connection object. For example, for the default SQLCA connection object, if you wanted to use ODBC with SQL tracing, you would code the following:

```
SQLCA.DBMS="TRS ODBC"
```

You can start and stop the SQL statement trace utility in PowerScript in the same way you start and stop the main database utility: you can start trace logging by setting the DBParm parameter to “PBTrace=1” and you can stop trace logging by setting the parameter to “PBTrace=0”.

For more information, see “Starting a trace in PowerScript with the PBTrace parameter” on page 197.

Server-side timestamps can be used instead of client-side timestamps if the connecting PowerBuilder database driver supports the `DBI_GET_SERVER_TIME` command type. Currently, server-side timestamps are available for the ASE, SYC, SYJ, and ODBC drivers.
**Using the SQL statement trace utility**

*PBTRS115.DLL* obtains the date and time from the server only once during the database connection processing. Each time a new timestamp needs to be generated, it determines the number of milliseconds that have transpired since the connection was established and computes the new server-side date and time by adding the elapsed interval to the initial connection timestamp obtained from the server.

**Log file headers**

Output to the log file is always appended. For ease of reading, the *PBTRS115.DLL* produces a banner inside the log file each time a new database connection is established. The banner lists the date and time of the database connection using the system clock on the client workstation. The DBParms for the database connection are listed immediately under the banner. If a server timestamp is used for subsequent entries in the log file, the statement “Using timestamp from DBMS server” is entered immediately under the DBParm listings.

When you are running an application with a database trace utility, one of the DBParm values should include the DisableBind parameter. You should set DisableBind to 1. Otherwise the syntax that is logged in the trace output file will contain parameter markers instead of human-readable values.

The following output shows a banner from a trace file that uses a client-side timestamp in the banner itself, and server-side timestamps elsewhere:

```sql
/*---------------------------------------------------*/
/*                 1/10/2007  16:08                  */
/*---------------------------------------------------*/
(60ec068): CONNECT TO TRS ODBC:  DBPARM=ConnectString='DSN=EAS Demo DB V115;UID=dba;PWD=sql'  SERVER=EASDemoDB115
(60ec068): Using timestamp from DBMS server. (1/10/2007 16:08:28.079)
(60ec068): PREPARE: (1/10/2007 16:08:44.513) SELECT DISTINCT "pbcattbl"."pbt_tnam" , "pbcattbl"."pbt_cmnt" FROM "pbcattbl" ORDER BY "pbcattbl"."pbt_tnam" ASC
```
CHAPTER 14  Troubleshooting Your Connection

Using the ODBC Driver Manager Trace tool

This section describes how to use the ODBC Driver Manager Trace tool.

About ODBC Driver Manager Trace

You can use the ODBC Driver Manager Trace tool to trace a connection to any ODBC data source that you access in PowerBuilder through the ODBC interface.

Unlike the Database Trace tool, the ODBC Driver Manager Trace tool cannot trace connections through one of the native database interfaces.

What this tool does

ODBC Driver Manager Trace records information about ODBC API calls (such as SQLDriverConnect, SQLGetInfo, and SQLFetch) made by PowerBuilder while connected to an ODBC data source. It writes this information to a default log file named SQL.LOG or to a log file that you specify.

What both tools do

The information from ODBC Driver Manager Trace, like Database Trace, can help you:

• Understand what PowerBuilder is doing internally while connected to an ODBC data source
• Identify and resolve problems with your ODBC connection
• Provide useful information to Technical Support if you call them for help with your database connection

When to use this tool

Use ODBC Driver Manager Trace instead of the Database Trace tool if you want more detailed information about the ODBC API calls made by PowerBuilder.

Performance considerations

Turning on ODBC Driver Manager Trace can slow your performance while working in PowerBuilder. Therefore, use ODBC Driver Manager Trace for debugging purposes only and keep it turned off when you are not debugging.

SQL.LOG file

PowerBuilder writes ODBC Driver Manager Trace output to a default log file named SQL.LOG or to a log file that you specify. The default location of SQL.LOG is in your root directory.
Starting ODBC Driver Manager Trace

By default, ODBC Driver Manager Trace is turned off in PowerBuilder. You can start it in order to trace your ODBC connection in two ways:

- Edit your database profile in the PowerBuilder development environment
- Edit a script in a PowerBuilder application

Starting ODBC Driver Manager Trace in the development environment

To start ODBC Driver Manager Trace in the PowerBuilder development environment, edit the database profile for the connection you want to trace, as described in the following procedure.

❖ To start ODBC Driver Manager Trace by editing the database profile:

1. Open the Database Profile Setup-ODBC dialog box for the ODBC connection you want to trace.
2. On the Options tab, select the Trace ODBC API Calls check box.
3. (Optional) To specify a log file where you want PowerBuilder to write the output of ODBC Driver Manager Trace, type the path name in the Trace File box or (Optional) Click Browse to display the pathname of an existing log file in the Trace File box.

   By default, if the Trace ODBC API Calls check box is selected and no trace file is specified, PowerBuilder sends ODBC Driver Manager Trace output to the default SQL.LOG file.

4. Click OK or Apply or

   Right-click on the connected database and select Re-connect from the drop-down menu in the Database Profiles dialog box.

The Database Profiles dialog box displays with the name of the edited profile highlighted.
PowerBuilder saves your settings in the database profile entry in the registry in the `HKEY_CURRENT_USER\Software\Sybase\11.5\DatabaseProfiles` key.

For example, here is the relevant portion of a database profile entry for an ODBC data source named Employee. The settings that start ODBC Driver Manager Trace (corresponding to the ConnectOption DBParm parameter) are emphasized.

```
DBMS "ODBC"
...
DbParm "ConnectString='DSN=Employee;UID=dba;
PWD=00c61737';ConnectOption='SQL_OPT_TRACE,SQL_OPT_TRACE_ON;SQL_OPT_TRACEFILE,C:\Temp\odbctrce.log'"
```

5 Click Connect in the Database Profiles dialog box to connect to the database
   or
   Right-click on the connected database and select Re-connect from the drop-down menu in the Database Profiles dialog box.

PowerBuilder connects to the database, starts tracing the ODBC connection, and writes output to the log file you specified.

**Starting ODBC Driver Manager Trace in a PowerBuilder application**

To start ODBC Driver Manager Trace in a PowerBuilder application, you must specify certain values for the ConnectOption DBParm parameter in the appropriate script. For example, you might include them in the script that opens the application.

You can specify the required ConnectOption values in a PowerBuilder script by:

- (Recommended) Copying the PowerScript ConnectOption DBParm syntax from the Preview tab in the Database Profile Setup dialog box into your script
- Coding PowerScript to set a value for the DBParm property of the Transaction object
- Reading the DBParm values from an external text file

For more about using Transaction objects to communicate with a database in a PowerBuilder application, see *Application Techniques*. 
Using the ODBC Driver Manager Trace tool

About the ConnectOption DBParm parameter

ConnectOption includes several parameters, two of which control the operation of ODBC Driver Manager Trace for any ODBC-compatible driver you are using in PowerBuilder.

Table 14-2: ConnectOption parameters for ODBC Driver Manager Trace

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| SQL_OPT_TRACE      | Purpose: Starts or stops ODBC Driver Manager Trace in PowerBuilder.  
|                    | Values: The values you can specify are:          |
|                    | • SQL_OPT_TRACE_OFF (Default) Stops ODBC Driver Manager Trace |
|                    | • SQL_OPT_TRACE_ON Starts ODBC Driver Manager Trace |

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
</table>
| SQL_OPT_TRACEFILE  | Purpose: Specifies the name of the trace file where you want to send the output of ODBC Driver Manager Trace. PowerBuilder appends the output to the trace file you specify until you stop the trace. To display the trace file, you can use the File Editor (in PowerBuilder) or any text editor (outside PowerBuilder).  
|                    | Values: You can specify any filename for the trace file, following the naming conventions of your operating system. By default, if tracing is on and you have not specified a trace file, PowerBuilder sends ODBC Driver Manager Trace output to a file named SQL.LOG.  
|                    | For information about the location of SQL.LOG on different platforms, see “About ODBC Driver Manager Trace” on page 205. |

Copying ConnectOption syntax from the Preview tab

The easiest way to start ODBC Driver Manager Trace in a PowerBuilder application script is to copy the PowerScript ConnectString DBParm syntax from the Preview tab in the Database Profile Setup - ODBC dialog box into your script, modifying the default Transaction object name (SQLCA) if necessary.

As you complete the Database Profile Setup dialog box in the development environment, PowerBuilder generates the correct connection syntax on the Preview tab. Therefore, copying the syntax directly from the Preview tab into your script ensures that it is accurate.
To copy ConnectOption syntax from the Preview tab into your script:

1. On the Options tab in the Database Profile Setup - ODBC dialog box for your connection, select the Trace ODBC API Calls check box and (optionally) specify a log file in the Trace File box to start ODBC Driver Manager Trace.

2. Click Apply to save your changes to the Options tab without closing the dialog box.

3. Click the Preview tab.

   The correct PowerScript syntax for ODBC Driver Manager Trace and other selected options displays in the Database Connection Syntax box.

   The following example shows the PowerScript syntax that starts ODBC Driver Manager Trace and sends output to the file C:\TEMP\ODBCTRCE.LOG.

   // Profile Employee
   SQLCA.DBMS = "ODBC"
   SQLCA.AutoCommit = False
   SQLCA.DBParm = "Connectstring='DSN=Employee',
                   ConnectOption='SQL_OPT_TRACE,SQL_OPT_TRACE_ON;
                   SQL_OPT_TRACEFILE,c:\temp\odbctrce.log'"

4. Select the SQLCA.DBParm line and any other syntax you want to copy to your script and click Copy.

   PowerBuilder copies the selected text to the clipboard.

5. Paste the selected text from the Preview tab into your script, modifying the default Transaction object name (SQLCA) if necessary.

Another way to start ODBC Driver Manager Trace in a PowerBuilder application script is to include the ConnectOption parameters that control tracing as values for the DBParm property of the Transaction object.

To start ODBC Driver Manager Trace by setting the DBParm property:

- In your application script, set the SQL_OPT_TRACE and (optionally) SQL_OPT_TRACEFILE ConnectOption parameters to start the trace and to specify a nondefault trace file, respectively.

For example, the following statement starts ODBC Driver Manager Trace in your application and sends output to a file named MYTRACE.LOG. Insert a comma to separate the ConnectString and ConnectOption values.
Using the ODBC Driver Manager Trace tool

This example assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.

```plaintext
SQLCAdbContext="DSN=Test;UID=PB;PWD=xyz",ConnectOption='SQL_OPT_TRACE,
SQL_OPT_TRACE_ON;SQL_OPT_TRACEFILE,C:\TRC.LOG"
```

As an alternative to setting the DBParm property in your PowerBuilder application script, you can use the PowerScript ProfileString function to read DBParm values from a specified section of an external text file, such as an application-specific initialization file.

This assumes that the DBParm value read from your initialization file includes the ConnectOption parameter to start ODBC Driver Manager Trace, as shown in the preceding example.

❖ To start ODBC Driver Manager Trace by reading DBParm values from an external text file:

- Use the following PowerScript syntax to specify the ProfileString function with the DBParm property:

  ```plaintext
  SQLCA.dbParm = ProfileString(file, section, variable, default_value)
  ```

  For example, the following statement in a PowerBuilder script reads the DBParm values from the [Database] section of the APP.INI file:

  ```plaintext
  SQLCA.dbParm = ProfileString("APP.INI","Database","DBParm","")
  ```

Stopping ODBC Driver Manager Trace

Once you start tracing an ODBC connection with ODBC Driver Manager Trace, PowerBuilder continues sending trace output to the log file until you stop tracing. After you stop tracing as described in the following sections, you must reconnect to have the changes take effect.

Stopping ODBC Driver Manager Trace in the development environment

❖ To stop ODBC Driver Manager Trace by editing a database profile:

1. Open the Database Profile Setup - ODBC dialog box for the connection you are tracing.

   For instructions, see “Starting ODBC Driver Manager Trace in the development environment” on page 206.
2 On the Options tab, clear the Trace ODBC API Calls check box. If you supplied the pathname of a log file in the Trace File box, you can leave it specified in case you want to restart tracing later.

3 Click OK in the Database Profile Setup - ODBC dialog box. The Database Profiles dialog box displays, with the name of the edited profile highlighted.

4 Click Connect in the Database Profiles dialog box or right-click on the connected database and select Re-connect from the drop-down menu in the Database Profiles dialog box. PowerBuilder connects to the database and stops tracing the connection.

**Stopping ODBC Driver Manager Trace in a PowerBuilder application**

To stop ODBC Driver Manager Trace in a PowerBuilder application script, you must change the SQL_OPT_TRACE ConnectOption parameter to SQL_OPT_TRACE_OFF. You can do this by:

- Editing the value of the DBParm property of the Transaction object
- Reading the DBParm values from an external text file

One way to change the ConnectOption value in a PowerBuilder script is to edit the DBParm property of the Transaction object.

❖ **To stop ODBC Driver Manager Trace by editing the DBParm property:**

- In your application script, edit the DBParm property of the Transaction object to change the value of the SQL_OPT_TRACE ConnectOption parameter to SQL_OPT_TRACE_OFF.

For example, the following statement starts ODBC Driver Manager Trace in your application and sends the output to a file named *MYTRACE.LOG*. (This example assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.)

```sql
SQLCA.DBParm="ConnectString='DSN=Test;UID=PB;
PWD=xyz',ConnectOption='SQL_OPT_TRACE,
SQL_OPT_TRACE_ON;SQL_OPT_TRACEFILE,C:\TRC.LOG'"
```
Using the ODBC Driver Manager Trace tool

Here is how the same statement should look after you edit it to stop ODBC Driver Manager Trace. (You can leave the name of the trace file specified in case you want to restart tracing later.)

```sql
SQLCA.DBParm="ConnectString='DSN=Test;UID=PB;
                PWD=xyz',ConnectOption='SQL_OPT_TRACE,
                SQL_OPT_TRACE_OFF;SQL_OPT_TRACEFILE,C:\TRC.LOG'"
```

As an alternative to editing the DBParm property in your PowerBuilder application script, you can use the PowerScript ProfileString function to read DBParm values from a specified section of an external text file, such as an application-specific initialization file.

This assumes that the DBParm value read from your initialization file sets the value of SQL_OPT_TRACE to SQL_OPT_TRACE_OFF, as shown in the preceding example.

Viewing the ODBC Driver Manager Trace log

You can display the contents of the ODBC Driver Manager Trace log file anytime during a PowerBuilder session.

Location of SQL.LOG
For information about where to find the default SQL.LOG file, see “About ODBC Driver Manager Trace” on page 205.

❖

To view the contents of the log file:

- Open SQL.LOG or the log file you specified in one of the following ways:
  - Use the File Editor in PowerBuilder. (For instructions, see the Users Guide.)
  - Use any text editor outside PowerBuilder.

Leaving the log file open
If you leave the log file open as you work in PowerBuilder, ODBC Driver Manager Trace does not update it.
Sample ODBC Driver Manager Trace output

This section shows a partial example of output from ODBC Driver Manager Trace to give you an idea of the information it provides. The example is part of the trace on an ODBC connection to the EAS Demo DB.

For more about a particular ODBC API call, see your ODBC documentation.

```
PB115 179:192    EXIT  SQLSetConnectOption  with return code 0 (SQL_SUCCESS)
                   HDBC 0x036e1300
                   UWORD  104 <SQL_OPT_TRACE>
                   UDWORD  1

PB115 179:192    EXIT  SQLGetInfoW  with return code 0 (SQL_SUCCESS)
                   HDBC 0x036e1300
                   UWORD  25 <SQL_DATA_SOURCE_READ_ONLY>
                   PTR 0x036e3c88 [       2] "N"
                   SWORD 512
                   SWORD * 0x0012cc32 (2)
```

Using the JDBC Driver Manager Trace tool

This section describes how to use the JDBC Driver Manager Trace tool.

About JDBC Driver Manager Trace

You can use the JDBC Driver Manager Trace tool to trace a connection to any database that you access in PowerBuilder through the JDBC interface.

Unlike the Database Trace tool, the JDBC Driver Manager Trace tool cannot trace connections through one of the native database interfaces.

What this tool does

JDBC Driver Manager Trace logs errors and informational messages originating from the Driver object currently loaded (such as Sybase’s jConnect JDBC driver) when PowerBuilder connects to a database through the JDBC interface. It writes this information to a default log file named JDBC.LOG or to a log file that you specify. The amount of trace output varies depending on the JDBC driver being used.
### Using the JDBC Driver Manager Trace tool

<table>
<thead>
<tr>
<th>What both tools do</th>
<th>The information from JDBC Driver Manager Trace, like Database Trace, can help you:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Understand what PowerBuilder is doing <em>internally</em> while connected to a database through the JDBC interface</td>
</tr>
<tr>
<td></td>
<td>• Identify and resolve problems with your JDBC connection</td>
</tr>
<tr>
<td></td>
<td>• Provide useful information to Technical Support if you call them for help with your database connection</td>
</tr>
</tbody>
</table>

| When to use this tool | Use JDBC Driver Manager Trace *instead* of the Database Trace tool if you want more detailed information about the JDBC driver. |

**Performance considerations**

Turning on JDBC Driver Manager Trace can slow your performance while working in PowerBuilder. Therefore, use JDBC Driver Manager Trace for debugging purposes only and keep it turned off when you are not debugging.

| JDBC.LOG file | PowerBuilder writes JDBC Driver Manager Trace output to a default log file named `JDBC.LOG` or to a log file that you specify. The default location of `JDBC.LOG` is a temp directory. |

### Starting JDBC Driver Manager Trace

By default, JDBC Driver Manager Trace is turned off in PowerBuilder. You can start it in order to trace your JDBC connection in two ways:

- Edit your database profile in the PowerBuilder development environment
- Edit a script in a PowerBuilder application

### Starting JDBC Driver Manager Trace in the development environment

To start JDBC Driver Manager Trace in the PowerBuilder development environment, edit the database profile for the connection you want to trace, as described in the following procedure.

---

❖ **To start JDBC Driver Manager Trace by editing the database profile:**

1. Open the Database Profile Setup - JDBC dialog box for the JDBC connection you want to trace.
2. On the Options tab, select the Trace JDBC Calls check box.
3 (Optional) To specify a log file where you want PowerBuilder to write the output of JDBC Driver Manager Trace, type the path name in the Trace File box, or click Browse to display the path name of an existing log file in the Trace File box.

By default, if the Trace JDBC Calls check box is selected and no alternative trace file is specified, PowerBuilder sends JDBC Driver Manager Trace output to the default JDBC.LOG file.

4 Click OK or Apply.

The Database Profiles dialog box displays with the name of the edited profile highlighted. PowerBuilder saves your settings in the database profile entry in the registry.

For example, here are the DBMS and DBParm string values of a database profile entry for a database named Employee. The settings that start JDBC Driver Manager Trace (corresponding to the TraceFile DBParm parameter) are emphasized.

<table>
<thead>
<tr>
<th>DBMS</th>
<th>&quot;TRACE JDBC&quot;</th>
</tr>
</thead>
</table>

5 Click Connect in the Database Profiles dialog box to connect to the database

or

Right-click on the connected database and select Re-connect from the drop-down menu in the Database Profiles dialog box.

PowerBuilder connects to the database, starts tracing the JDBC connection, and writes output to the log file you specified.
Starting JDBC Driver Manager Trace in a PowerBuilder application

To start JDBC Driver Manager Trace in a PowerBuilder application, you must specify the TraceFile DBParm parameter in the appropriate script. For example, you might include it in the script that opens the application.

You can specify the TraceFile parameter in a PowerBuilder script by:

- (Recommended) Copying the PowerScript TraceFile DBParm syntax from the Preview tab in the Database Profile Setup dialog box into your script
- Coding PowerScript to set a value for the DBParm property of the Transaction object
- Reading the DBParm values from an external text file

For more about using Transaction objects to communicate with a database in a PowerBuilder application, see Application Techniques.

About the TraceFile DBParm parameter

TraceFile controls the operation of JDBC Driver Manager Trace for any JDBC-compatible driver you are using in PowerBuilder.

The easiest way to start JDBC Driver Manager Trace in a PowerBuilder application script is to copy the PowerScript TraceFile DBParm syntax from the Preview tab in the Database Profile Setup - JDBC dialog box into your script, modifying the default Transaction object name (SQLCA) if necessary.

As you complete the Database Profile Setup dialog box in the development environment, PowerBuilder generates the correct connection syntax on the Preview tab. Therefore, copying the syntax directly from the Preview tab into your script ensures that it is accurate.

To copy TraceFile syntax from the Preview tab into your script:

1. On the Options tab in the Database Profile Setup - JDBC dialog box for your connection, select the Trace JDBC Calls check box and (optionally) specify a log file in the Trace File box to start JDBC Driver Manager Trace.

   For instructions, see “Stopping JDBC Driver Manager Trace in the development environment” on page 218.

2. Click Apply to save your changes to the Options tab without closing the dialog box.

3. Click the Preview tab.

   The correct PowerScript syntax for JDBC Driver Manager Trace and other selected options displays in the Database Connection Syntax box.
The following example shows the PowerScript syntax that starts JDBC Driver Manager Trace and sends output to the file C:\TEMP\JDBC.LOG.

```powerbuilder
// Profile Employee
SQLCA.DBMS = "TRACE JDBC"
SQLCA.DBParm = "Driver='com.sybase.jdbc3.jdbc.SybDriver',
TraceFile='c:\temp\jdbc.log'"
```

4. Select the DBParm line and any other syntax you want to copy to your script and click Copy. PowerBuilder copies the selected text to the clipboard.

5. Paste the selected text from the Preview tab into your script, modifying the default Transaction object name (SQLCA) if necessary.

Another way to start JDBC Driver Manager Trace in a PowerBuilder application script is to include the TraceFile parameter as a value for the DBParm property of the Transaction object.

❖ **To start JDBC Driver Manager Trace by setting the DBParm property:**

- In your application script, include the TraceFile parameter to start the trace and specify a nondefault trace file.

  For example, this statement starts JDBC Driver Manager Trace in your application and sends output to a file named MYTRACE.LOG. (This example assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.)

  ```powerbuilder
  SQLCA.DBParm = "Driver='com.sybase.jdbc3.jdbc.SybDriver',
  TraceFile='c:\MYTRACE.LOG'"
  ```

As an alternative to setting the DBParm property in your PowerBuilder application script, you can use the PowerScript ProfileString function to read DBParm values from a specified section of an external text file, such as an application-specific initialization file.

This assumes that the DBParm value read from your initialization file includes the TraceFile parameter to start JDBC Driver Manager Trace, as shown in the preceding example.

---

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Using the JDBC Driver Manager Trace tool

- To start JDBC Driver Manager Trace by reading DBParm values from an external text file:
  - Use the following PowerScript syntax to specify the ProfileString function with the DBParm property:
    
    ```powerscript
    SQLCA.dbParm = ProfileString(file, section, variable, default_value)
    ```

    For example, the following statement in a PowerBuilder script reads the DBParm values from the [Database] section of the APP.INI file:
    
    ```powerscript
    SQLCA.dbParm = ProfileString("APP.INI", "Database", "DBParm", ")
    ```

Stopping JDBC Driver Manager Trace

Once you start tracing a JDBC connection with JDBC Driver Manager Trace, PowerBuilder continues sending trace output to the log file until you stop tracing.

Stopping JDBC Driver Manager Trace in the development environment

- To stop JDBC Driver Manager Trace by editing a database profile:
  1. Open the Database Profile Setup - JDBC dialog box for the connection you are tracing.
     
     For instructions, see “Starting JDBC Driver Manager Trace” on page 214.
  2. On the Options tab, clear the Trace JDBC Calls check box.
     
     If you supplied the path name of a log file in the Trace File box, you can leave it specified in case you want to restart tracing later.
  3. Click OK in the Database Profile Setup - JDBC dialog box.
     
     The Database Profiles dialog box displays, with the name of the edited profile highlighted.
  4. Click Connect in the Database Profiles dialog box or right click on the connected database and select Re-connect from the drop-down menu in the Database Profiles dialog box.
     
     PowerBuilder connects to the database and stops tracing the connection.
CHAPTER 14  Troubleshooting Your Connection

Stopping JDBC Driver Manager Trace in a PowerBuilder application

To stop JDBC Driver Manager Trace in a PowerBuilder application script, you must delete the TraceFile parameter. You can do this by:

- Editing the value of the DBParm property of the Transaction object
- Reading the DBParm values from an external text file

Editing the DBParm property

One way to change the TraceFile parameter in a PowerBuilder script is to edit the DBParm property of the Transaction object.

❖ To stop JDBC Driver Manager Trace by editing the DBParm property:

- In your application script, edit the DBParm property of the Transaction object to delete the TraceFile parameter.

For example, the following statement starts JDBC Driver Manager Trace in your application and sends the output to a file named MYTRACE.LOG. (This example assumes you are using the default Transaction object SQLCA, but you can also define your own Transaction object.)

```sql
SQLCA.DBParm = "Driver='com.sybase.jdbc3.jdbc.SybDriver',
TraceFile='c:\MYTRACE.LOG'
```

Here is how the same statement should look after you edit it to stop JDBC Driver Manager Trace.

```sql
SQLCA.DBParm = "Driver='com.sybase.jdbc3.jdbc.SybDriver',
URL='jdbc:sybase:Tds:199.93.178.151:5007/tsdata'
```

Reading DBParm values

As an alternative to editing the DBParm property in your PowerBuilder application script, you can use the PowerScript ProfileString function to read DBParm values from a specified section of an external text file, such as an application-specific initialization file, or you can use RegistryGet to obtain values from a registry key.

This assumes that the DBParm is no longer read from your initialization file or registry key, as shown in the preceding example. You must disconnect and reconnect for this to take effect.
Using the JDBC Driver Manager Trace tool

Viewing the JDBC Driver Manager Trace log

You can display the contents of the JDBC Driver Manager Trace log file anytime during a PowerBuilder session.

Location of JDBC.LOG
For information about where to find the default JDBC.LOG file, see “About JDBC Driver Manager Trace” on page 213.

❖ To view the contents of the log file:
  • Open JDBC.LOG or the log file you specified in one of the following ways:
    • Use the File Editor in PowerBuilder. (For instructions, see the Users Guide.)
    • Use any text editor outside PowerBuilder.

Leaving the log file open
If you leave the log file open as you work in PowerBuilder, JDBC Driver Manager Trace does not update the log.
This chapter describes the database connections you can make if you are developing a PowerBuilder component that will be deployed to a transaction server. It also describes how to create a profile to simplify connections to EAServer.

### Deploying a component to EAServer

If you are developing a PowerBuilder custom class user object containing business logic that will be deployed to a transaction server, there are some database connectivity issues to keep in mind.

For detailed information about the files you need to deploy with applications or components you build in PowerBuilder, see the chapter on deploying your application in *Application Techniques*.

If you want the component you are developing to take advantage of EAServer’s support for connection pooling and transaction management, you must use one of the database interfaces supported by the transaction coordinator being used by EAServer. EAServer supports the Microsoft Distributed Transaction Coordinator (DTC) and the Java Transaction Service (JTS) for OTS/XA Transactions.

The default coordinator is the JTS coordinator.

---

**Setting the transaction coordinator**

The transaction coordinator is set through EAServer Manager using the Transaction tab of the Server Properties dialog box.
Supported database connections when using Shared Connection

The pseudo-coordinator shared connection is built into EAServer. In this model, all components participating in a transaction share a single connection. To use this model, all of your application data must reside on one data server, and all components that participate in a transaction must use a connection with the same user name, password and server name or the same EAServer connection cache name as defined in the CacheName DBParm. It supports the following database interfaces to connect to the database:

- ODBC database interface, which provides connectivity to a variety of databases through ODBC drivers. The same ODBC drivers shipped with PowerBuilder are also supported on EAServer.
- Sybase SYJ database interface, which provides connectivity to Adaptive Server Enterprise 11.5 or later. (Some versions of Open Client and Adaptive Server currently do not support OTS/XA transactions on Windows NT.)
- JDB database interface, which provides connectivity through Sun’s Java Virtual Machine to a JDBC driver such as Sybase jConnect.
- Oracle O90, O10, and ORA database interfaces, which provide connectivity to Oracle9i, Oracle 10g, and Oracle 11g, databases.

Supported database connections when using Microsoft DTC

Microsoft Distributed Transaction Coordinator (DTC) uses two-phase commit to coordinate transactions among multiple databases. This transaction coordinator supports the following database interfaces to connect to the database:

- ODBC database interface. Support is limited to the following ODBC drivers: Microsoft SQL Server 6.5 or later and Microsoft ODBC driver for Oracle.
- JDB database interface, which provides connectivity through Sun’s Java Virtual Machine to a JDBC driver that acts as a JDBC-ODBC bridge.
CHAPTER 15  Making Database Connections in PowerBuilder Components

Supported database connections when using OTS/XA

This option uses the Transarc Encina transaction coordinator that is built into EAServer. The Encina transaction coordinator uses two-phase commit to coordinate transactions among multiple databases. This transaction coordinator supports the following database interfaces to connect to the database:

- The SYJ database interface, which provides connectivity to Adaptive Server Enterprise 11.5 or later.
- The JDB database interface, which provides connectivity through Sun’s Java Virtual Machine (JRE 1.2 or later) to a JDBC driver that supports the Java Transaction API (JTA) such as Sybase jConnect 5.2.
- Oracle O90, O10, and ORA database interfaces, which provide connectivity to Oracle9i, Oracle 10g, and Oracle 11g databases.

Using the SYJ database interface

EAServer uses a slightly different version of the Sybase Open Client CT-Library (CT-Lib) software from PowerBuilder. Therefore, at runtime, you need to use SYJ rather than ASE or SYC to connect to an Adaptive Server Enterprise database. The SYJ Database Profile Setup dialog box provides a convenient way to set the appropriate connection parameters and then copy the syntax from the Preview tab into the script for your Transaction object.

You cannot use the SYJ interface, however, to connect to the database in the PowerBuilder development environment. Therefore, during the development phase (before the component has been deployed to EAServer), you must use ASE or SYC to connect to the database.

Note that the SYJ database interface supports only those DBParms relevant at runtime. It does not support any DBParm parameters that have to be set before PowerBuilder establishes a database connection. The following DBParms, which are included on the SYJ Profile Setup dialog box, are not supported by SYJ:

- All the DBParms on the Regional Settings tab including CharSet, Language, and Locale
- All the Directory services DBParms on the Directory Services tab
- All the Security services DBParms on the Security tab
Deploying a component to EAServer

- All the DBParms on the Network tab including AppName, Host, MaxConnect, PacketSize, and PWEncrypt
- The Release DBParm on the Connection tab
- The TableCriteria DBParm on the System tab
- The Asynchronous Operations DBParms, Async and DBGetTime, on the Transaction tab

Using the JDB database interface

When you deploy a component developed using the JDB interface to EAServer, PowerBuilder checks the version of the JVM EAServer is using against the version PowerBuilder is using. If the versions do not match, a warning is entered in the EAServer log file. PowerBuilder uses the version loaded by EAServer. The EAServer log file records errors relating to component execution. You can view its contents using the EAServer Manager File Viewer.

Specifying AutoCommit mode

For those DBMSs and database interfaces that support it (ODBC, SYJ, and JDB), AutoCommit controls whether PowerBuilder issues SQL statements outside or inside the scope of a transaction. When AutoCommit is set to False (the default), PowerBuilder issues SQL statements inside the scope of a transaction. When AutoCommit is set to True, PowerBuilder issues SQL statements outside the scope of a transaction. AutoCommit is set using the AutoCommit Mode check box on the Connection tab in the Database Profile Setup dialog box or by giving it a value in a PowerBuilder application script.

However, if the component you are developing participates in an EAServer transaction, the AutoCommit setting is ignored. Instead, EAServer determines how the component’s database operations execute as part of the transaction.
DBParm support for PowerBuilder components

There are several connection options that are relevant only to a PowerBuilder custom class user object that is deployed as a transaction server component. These DBParm parameters can be set through the EAServer tab of the Database Profile Setup dialog box for the appropriate database interface or by giving them a value in a PowerBuilder application script:

- UseContextObject
- CacheName (not applicable when using OTS/XA)
- GetConnectionOption
- ProxyUserName
- ReleaseConnectionOption
- ODBCU_CONLIB

For more information on these DBParms, refer to the online Help.
DBParm support for PowerBuilder components
The Appendix describes how to modify the PBODB115 initialization file.
Adding Functions to the PBODB115 Initialization File

About this appendix

In general, you do not need to modify the PBODB115 initialization file. In certain situations, however, you might need to add functions to the PBODB115 initialization file for connections to your back-end DBMS through the ODBC or OLE DB interface in PowerBuilder.

This appendix describes how to add functions to the PBODB115 initialization file if necessary.

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About the PBODB115 initialization file

What is the PBODB115 initialization file?

When you access data through the ODBC interface, PowerBuilder uses the PBODB115 initialization file (PBODB115.INI) to maintain access to extended functionality in the back-end DBMS for which ODBC does not provide an API call. Examples of extended functionality are SQL syntax or function calls specific to a particular DBMS.

Editing PBODB115.INI

In most cases, you do not need to modify PBODB115.INI. Changes to this file can adversely affect PowerBuilder. Change PBODB115.INI only if you are asked to do so by a Technical Support representative.

However, you can edit PBODB115.INI if you need to add functions for your back-end DBMS.

If you modify PBODB115.INI, first make a copy of the existing file. Then keep a record of all changes you make. If you call Technical Support after modifying PBODB115.INI, tell the representative that you changed the file and describe the changes you made.
Adding functions to PBODB115.INI

PBODB115.INI lists the functions for certain DBMSs that have ODBC drivers. If you need to add a function to PBODB115.INI for use with your back-end DBMS, you can do either of the following:

- **Existing sections** Add the function to the Functions section for your back-end database if this section exists in PBODB115.INI.
- **New sections** Create new sections for your back-end DBMS in PBODB115.INI and add the function to the newly created Functions section.

Adding functions to an existing section in the file

If sections for your back-end DBMS already exist in PBODB115.INI, use the following procedure to add new functions.

❖ **To add functions to an existing section in PBODB115.INI:**

1. Open PBODB115.INI in one of the following ways:
   - Use the File Editor in PowerBuilder. (For instructions, see the Users Guide.)
   - Use any text editor outside PowerBuilder.

2. Locate the entry for your back-end DBMS in the DBMS Driver/DBMS Settings section of PBODB115.INI.

For example, here is the PBODB115.INI entry for SQL Anywhere:

```plaintext
;*********************************************
;DBMS Driver/DBMS Settings see comments at end
;of file
;*********************************************
...
[SQL Anywhere]
PBSyntax='WATCOM50_SYNTAX'
PBDateTime='STANDARD_DATETIME'
PBFunctions='ASA_FUNCTIONS'
PBDefaultValues='autoincrement,current date,'  
current time,current timestamp,timestamp,
null,user'
PBDefaultCreate='YES'
PBDefaultAlter='YES'
PBDefaultExpressions='YES'
```


APPENDIX  Adding Functions to the PBODB115 Initialization File

- DelimitIdentifier='YES'
- PBDateTimeInvalidInSearch='NO'
- PBTimeInvalidInSearch='YES'
- PBQualifierIsOwner='NO'
- PBSpecialDataTypes='WATCOM_SPECIALDATATYPES'
- IdentifierQuoteChar=''''
- PBSystemOwner='sys,dbo'
- PBUseProcOwner='YES'
- SQLSrvrTSName='YES'
- SQLSrvrTSQuote='YES'
- SQLSrvrTSDelimit='YES'
- ForeignKeyDeleteRule='Disallow if Dependent Rows Exist (RESTRICT), Delete any Dependent Rows (CASCADE), Set Dependent Columns to NULL (SET NULL)'
- TableListType='GLOBAL TEMPORARY'

3 Find the name of the section in PBODB115.INI that contains function information for your back-end DBMS.

To find this section, look for a line similar to the following in the DBMS Driver/DBMS Settings entry:

PBFunctions='section_name'

For example, the following line in the DBMS Driver/DBMS Settings entry for SQL Anywhere indicates that the name of the Functions section is ASA_FUNCTIONS:

PBFunctions='ASA_FUNCTIONS'

4 Find the Functions section for your back-end DBMS in PBODB115.INI.

For example, here is the Functions section for SQL Anywhere:

;******************************************************************************
;Functions
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
[ASA_FUNCTIONS]
AggrFuncs=avg(x),avg(distinct x),count(x),
   count(distinct x),count(*),list(x),
   list(distinct x),max(x),max(distinct x),
   min(x),min(distinct x),sum(x),sum(distinct x)
Functions=abs(x),acos(x),asin(x),atan(x),
   atan2(x,y),ceiling(x),cos(x),cot(x),degrees(x),
   exp(x),floor(x),log(x),log10(x),
   mod(dividend,divisor),pi(*),power(x,y),
   radians(x),rand(),rand(x),
   remainder(dividend,divisor),round(x,y),
5 To add a new function, type a comma followed by the function name at the end of the appropriate function list, as follows:

- **Aggregate functions** Add aggregate functions to the end of the AggrFuncs list.

- **All other functions** Add all other functions to the end of the Functions list.

**Case sensitivity**
If the back-end DBMS you are using is case sensitive, be sure to use the required case when you add the function name.
The following example shows a new function for SQL Anywhere added at the end of the Functions list:

```plaintext
;*********************************************
;Functions
;*********************************************
[ASA_FUNCTIONS]
AggrFuncs=avg(x),avg(distinct x),count(x),
        count(distinct x),count(*),list(x),
        list(distinct x),max(x),max(distinct x),
        min(x),min(distinct x),sum(x),sum(distinct x)
Functions=abs(x),acos(x),asin(x),atan(x),
        atan2(x,y),ceiling(x),cos(x),cot(x),degrees(x),
        exp(x),floor(x),log(x),log10(x),
        mod(dividend,divisor),pi(*),power(x,y),
        radians(x),rand(),rand(x),...
        number(*),plan(x),traceback(*),newfunction()
```

6 Save your changes to `PBODB115.INI`.

### Adding functions to a new section in the file

If entries for your back-end DBMS do not exist in `PBODB115.INI`, use the following procedure to create the required sections and add the appropriate functions.

---

**Before you start**

For more about the settings to supply for your back-end DBMS in `PBODB115.INI`, read the comments at the end of the file.

---

To add functions to a new section in `PBODB115.INI`:

1. Open `PBODB115.INI` in one of the following ways:
   - Use the File Editor in PowerBuilder. (For instructions, see the *Users Guide*.)
   - Use any text editor outside PowerBuilder.

2. Edit the DBMS Driver/DBMS Settings section of the PBODB115 initialization file to add an entry for your back-end DBMS.
Adding functions to PBODB115.INI

Finding the name

The name required to identify the entry for your back-end DBMS in the DBMS Driver/DBMS Settings section is in PBODB115.INI.

Make sure that you:

• Follow the instructions in the comments at the end of PBODB115.INI.

• Use the same syntax as existing entries in the DBMS Driver/DBMS Settings section of PBODB115.INI.

• Include a section name for PBFunctions.

For example, here is the relevant portion of an entry for a DB2/2 database:

;***********************************************
;DBMS Driver/DBMS Settings
;***********************************************
[DB2/2]
...  
PBFunctions='DB22_FUNCTIONS'
...

3 Edit the Functions section of PBODB115.INI to add an entry for your back-end DBMS.

Make sure that you:

• Follow the instructions in the comments at the end of PBODB115.INI.

• Use the same syntax as existing entries in the Functions section of PBODB115.INI.

• Give the Functions section the name that you specified for PBFunctions in the DBMS Driver/DBMS Settings entry.

For example:

;***********************************************
;Functions
;***********************************************
[DB22_FUNCTIONS]
AggrFuncs=avg(),count(),list(),max(),min(),sum()
Functions=curdate(),curtime(),hour(),...

4 Type a comma followed by the function name at the end of the appropriate function list, as follows:

• **Aggregate functions** Add aggregate functions to the end of the AggrFuncs list.
• **All other functions**  Add all other functions to the end of the Functions list.

**Case sensitivity**
If the back-end DBMS you are using is case sensitive, be sure to use the required case when you add the function name.

The following example shows (in bold) a new DB2/2 function named `substr()` added at the end of the Functions list:

```
;****************************************************
;Functions
;****************************************************
[DB22_FUNCTIONS]
AggrFuncs=avg(),count(),list(),max(),min(),sum()
Functions=curdate(),curtime(),hour(), `substr()`
```

5 Save your changes to **PBODB115.INI**.
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