THOROUGHBRED®
SOFTWARE INTERNATIONAL, INC.

TS ODBC DATASERVER™

Reference Manual

Version 8.9.1

Thoroughbred Software International, Inc.

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INTRODUCTION

TS ODBC DataServer is an integral part of the Thoroughbred Software network solution. With this product, applications that implement Microsoft's ODBC (Open Database Connectivity) standard can access live Thoroughbred data files. It will grant read-only or read/write access depending on product, allowing you to report on the data without making any changes to any existing application source code.

The primary requirement is that any Thoroughbred data to be exposed to an ODBC-enabled application must be described in the Thoroughbred Dictionary. Refer to the *Thoroughbred Dictionary-IV Reference Manual* for more information.

Operating System Support: UNIX, Linux, and Windows
For specific information, please contact your Thoroughbred Sales Representative.

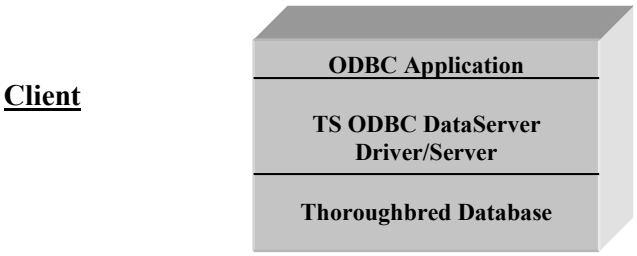
Components

Below are listed the components of TS ODBC DataServer:

- Thoroughbred ODBC driver - On the Single-Tier system this component incorporates both the client and server functions. (Single- and Multiple-Tier).
- Thoroughbred Server - This component accesses Thoroughbred data files (Multiple-Tier only).
- Dictionary-IV based TS ODBC DataServer Expose Utility - This component defines the content of the data sources (Single- and Multiple-Tier).

The TS ODBC DataServer is shipped in one of two models: Single-Tier or Multiple-Tier. The Multiple-Tier ships in one of two ways: one for Windows Client systems and one to allow a Windows Server to function as a client. The latter, called TS ODBC Gateway for Windows Server, is designed to allow access to Thoroughbred data via ODBC on servers operating as either Terminal or Web servers.

TS ODBC DataServer (Single-Tier)

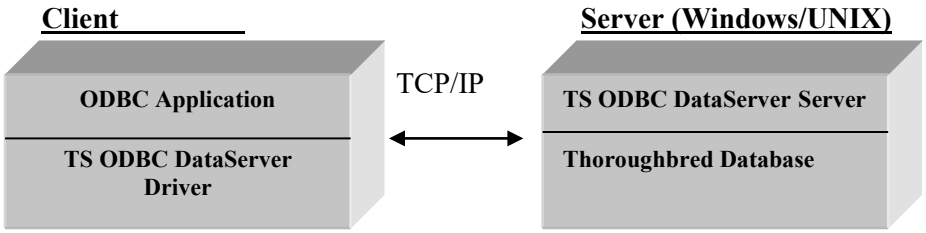


In the TS ODBC DataServer (Single-Tier), the Client, Server, and Expose Utility all reside on the same platform. An example would be a Windows PC.

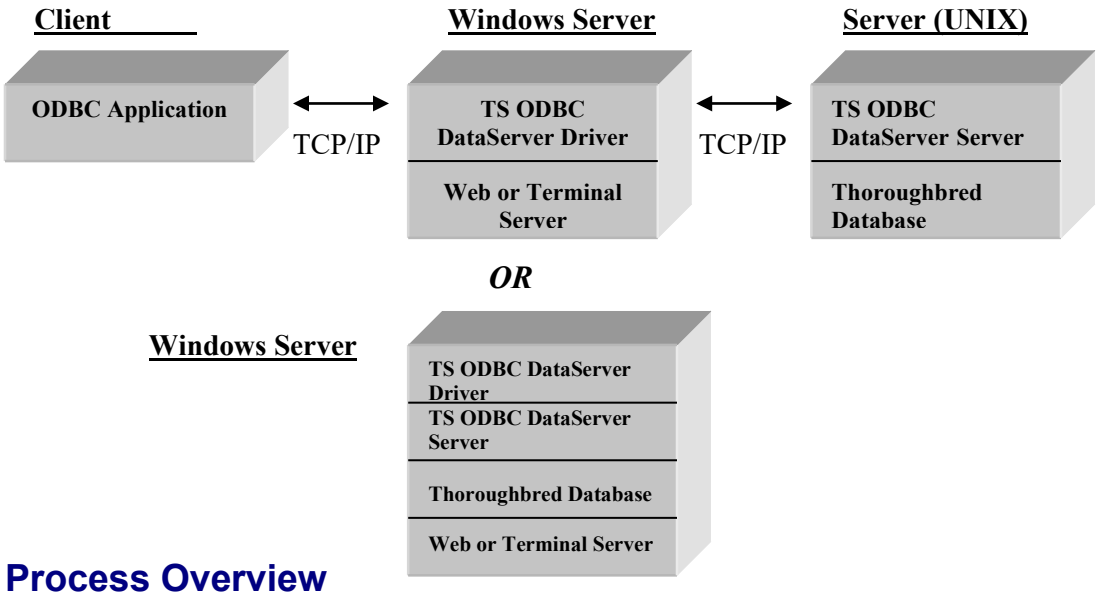
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TS ODBC DataServer (Multiple-Tier)

In the standard version of the Multiple-Tier TS ODBC DataServer, the TS ODBC driver resides on the Client platform. It is connected by a LAN to the Server platform. The Thoroughbred Server resides on the server platform. The function of the client is to define the name of the data source used by the ODBC application and the name of the server where the Thoroughbred data is stored. The Expose Utility is executed from the Server system to generate the list of Links that will be available to the ODBC application.



In the TS ODBC Gateway for Windows Server version of the Multiple-Tier product, the Client process resides on the Windows Server, which will also host the Terminal Server or Web Server process. The workstations accessing this server with either the Terminal Server client or a web browser do not need the ODBC client software installed. The Windows Server will interface with the TS ODBC DataServer server process to access the Thoroughbred data.



Process Overview

The process to get your Thoroughbred data to appear in an ODBC-enabled application starts with a successful installation of the TS ODBC DataServer components. Once completed, the TS ODBC DataServer Expose Utility is executed to create the Data Source entries from Thoroughbred data definitions. For Single-Tier installations the expose process is executed on the workstation system. For Multiple-Tier installations it is executed on the server system.

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Following the expose process, the Thoroughbred Administrator is executed to add the Data Source from each workstation that will interface with ODBC-enabled applications. This process is run for both the Single- and Multiple-Tier installations. Once the Data Source is created, the Thoroughbred data will be available for use in any ODBC-enabled application.

Quick Start Steps

Single-Tier installation outline

To install the Single-Tier version, use the following procedure:

1. Install the Client Software. Please refer to the *Installation and Activation Guide*.
2. Expose the Thoroughbred data. Please refer to *How to Expose Thoroughbred Data*.
3. Add the data source to the client platform. Please refer to *Configuring a Data Source* section in *TS ODBC DataServer Utilities*.

Multiple-Tier installation outline

To install the Multiple-Tier version, which includes the TS ODBC Gateway for Windows, use the following procedure:

1. Install the Multiple-Tier Server. Please refer to the *Installation and Activation Guide*.
2. Install the Client on the workstation. Please refer to the *Installation and Activation Guide*.
3. Expose the Thoroughbred data. Please refer to *How to Set Up Thoroughbred Data*.
4. Add the data source to the client platform. Please refer to *Configuring a Data Source* in *TS ODBC DataServer Utilities*.

Name Resolution

Before proceeding with the installation, verify that name resolution is implemented. The TS ODBC Data Server requires name resolution to allow forward and reverse resolution of server and client names. The details of implementation are beyond the scope of this manual. Please contact your Network Administrators or Thoroughbred Consulting Services for assistance in this area.

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MANAGING THE SERVER PROCESS

UNIX Server

Starting the server process

To start the server process, move to the installation directory and perform the following:

```
cd /usr/local/tsodbc

./tfodbcd
```

As an alternative, the server process can be started at system boot and stopped at shutdown. Follow the appropriate procedures for the operating system under which the server is installed.

Stopping the server process

The server process can be stopped using the following command:

```
kill -9 'process-id'
```

The process-id is derived from the output of the **ps** command. Locate the tfodbcd process and note the value in the PID column. This is the value to use with the **[kill]** command.

Change the Default TCP/IP Port (Multiple-Tier only)

Should a conflict arise with the default TCP/IP port (20223), the server can be configured to communicate with the client system on a user specified port number. To enable this, start the server process with the following syntax:

```
tfodbcd -p port-number
```

where *port-number* represents an available TCP/IP port number.

Installing the Thoroughbred ODBC SERVER Service

To install the Thoroughbred ODBC SERVER service, the *loadservice.sh* script will copy service file from the TSODBC directory to the appropriate system directory or the service files can be loaded manually.

To install the Thoroughbred ODBC SERVER service via the script, run the following as root:

cd /usr/local/tsodbc/TSODBC
./loadservice.sh

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To manually install the Thoroughbred ODBC SERVER service:

```
# cp /usr/local/tsodbc/TSODBC/tsodbc.systemd /etc/systemd/system/tsodbc.service
# systemctl daemon-reload
```

The service file defaults to running the Thoroughbred ODBC SERVER from the /usr/local/tsodbc directory, listening on port 20223. If the Thoroughbred ODBC SERVER has been installed into a different directory or needs to listen on a different port, change the tsodbc.systemd file before installing the service.

These service files are available starting with release level 8.9.0.

Starting the service

To start the Thoroughbred ODBC SERVER service:

```
# systemctl start tsodbc
```

To have the Thoroughbred ODBC SERVER service start automatically when the system boots:

```
# systemctl enable tsodbc
```

Stopping the server

To stop the Thoroughbred ODBC SERVER service:

```
# systemctl stop tsodbc
```

To prevent the Thoroughbred ODBC SERVER service from starting automatically when the system boots:

```
# systemctl disable tsodbc
```

Windows Server

This section outlines the procedures for starting, stopping, and viewing the service following the install.

Starting the service

The service is managed using the Services applet from the Control Panel.

From the **Start Menu**, select **Control Panel → Administrative Tools → Services**. Locate the TS ODBC DataServer Manager Service. Click the **Start** button. A Service Control dialog will display while the system starts the service. Once started, the status field will be changed to "Started".

Stopping the service

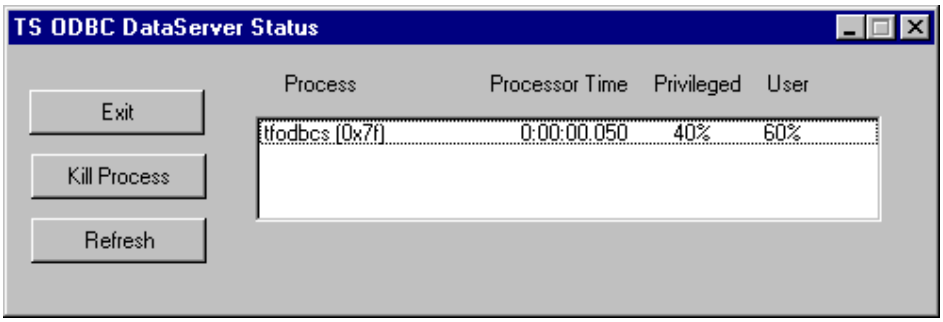
From the **Start Menu**, select **Control Panel → Administrative Tools → Services**. Locate the TS ODBC DataServer Manager Service. Click the **Stop** button. A Service Control dialog will display.

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View Running Process

This utility can be used to display process information for the TS ODBC DataServer server and associated processes.

To execute the utility, from the Start Menu, choose the **Thoroughbred Software** program group and click **TS ODBC DataServer Process Viewer**. A screen similar to the following is displayed:



The following options are available:

Exit: Closes the viewer

Kill Process: This will stop the selected process. To select a process, point to the desired process and click. **Warning**: Killing a process in the manner should only take place after all normal methods have been exhausted. Refer to the *Managing the Server Process* section in this manual.

Refresh: This list is not dynamic. Click this option to refresh the view data.

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HOW TO SET UP THOROUGHBRED DATA

After the Thoroughbred TS ODBC DataServer software is loaded, the TS ODBC DataServer Expose Utility is executed to build the information that will be used by the ODBC driver to access Thoroughbred data. This process will produce a set of data that will be used by the server. This data is generated from the Dictionary-IV format and link definitions. When Thoroughbred data is made available for access via ODBC applications, it is considered exposed.

This section explains how to configure and execute the TS ODBC DataServer Expose Utility. The section titled *Technical Information and Troubleshooting* details the technical information for the Expose Utility and a set of troubleshooting steps to resolve errors.

This utility should be installed and executed from only one place on a system. Because of the nature of the configuration data, conflicts will occur if multiple non-concurrent or concurrent sessions are run. However, multiple data environments (i.e. different IPL files) will be supported which will allow data from various environments to be exposed while running the utility from one central location.

Important Upgrade Information for Version 1.0 to 1.1 and above

While existing Data Sources will function completely with this version of the Expose Utility, updating the Data Sources will allow the exposed data to be processed by the latest conversion procedures. Specifically, this will impact any system where Link Names contain combinations of upper and lowercase letters.

To perform the update, execute the **Expose Utility** and select the **Data Source**. Once the Exposed Link View displays, press **F1**. This updates all the exposed Links.

You only need to run the update once for any Data Source.

How to use TS ODBC DataServer Expose Utility

To ensure proper operation of this utility, exit all ODBC applications that are referencing Thoroughbred data sources. For Multiple-Tier installations, this utility should be run from only one point on the server system. Multiple environments may result in Expose Utility data file conflicts.

The function keys common to all Thoroughbred products are available:

F4 Cancels an operation or process. When no operation or process is running under the TS ODBC DataServer screen, pressing this key will return you to the Dictionary-IV Control Menu.

F6 Displays a context-sensitive pop-up Help window.

To use the TS ODBC DataServer Expose Utility, log on to Dictionary-IV. In the **Selection:** field of any menu, type:

```
ODBC
```

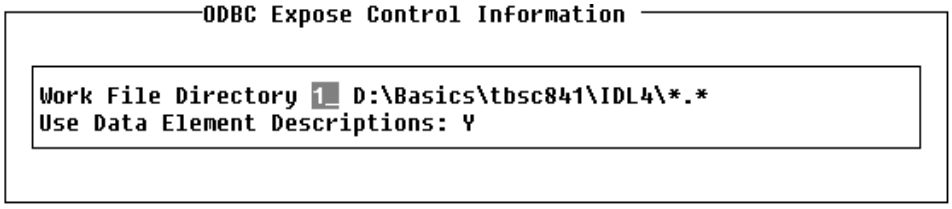
and press the **Enter** key.

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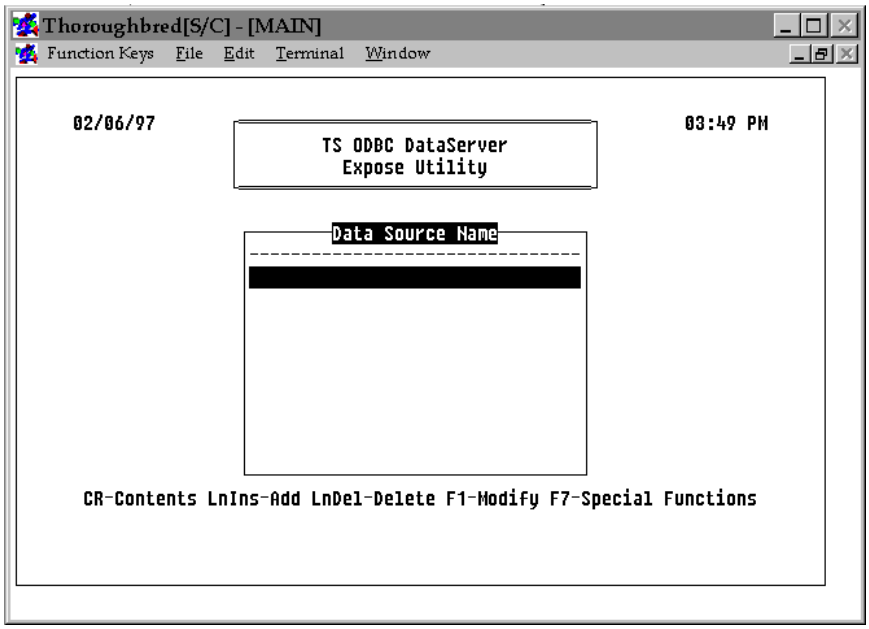
If the system responds with the message **"Not found",** run ODGLOB. This will update the global menu IDGLOBAL. When complete, retry the entry.

Alternatively, the program OD101 can be executed from Console Mode or a menu selection.

If this is the initial execution of the utility, the ODBC Expose Control Information screen will be displayed.



For instructions, please refer to the information on Control File maintenance in the section titled *Special functions*. If this is not the first execution of the utility, the TS ODBC DataServer Expose Utility screen will be displayed:



The TS ODBC DataServer Expose Utility contains the Data Source Name window, which displays a list of the configured Data Sources. The keys listed just below the Data Source Name window launch processes:

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LnIns or **Line Insert** key, executes a process to add a Data Source. When selected, an entry screen will be displayed containing the following fields:



Data Source Name: Any name up to 32 characters in length. This name will be used to reference the Exposed Link data in the ODBC applications.

Data Source Description: A description of the Data Source.

Following the entry of this data, the system will proceed to the ODBC Exposed Links window.

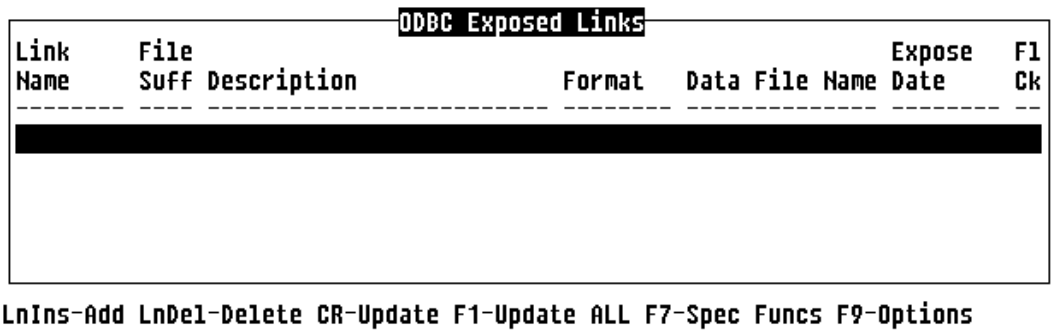
LnDel or **Line Delete** key, will delete the selected Data Source. It will remove the Data Source information from the Thoroughbred environment only. The ODBC.INI or Registry entry will not be deleted. Refer to the documentation for the Thoroughbred Administrator for more information about removing Data Sources.

CR or **Enter** key, for Contents, is used to modify the definitions in the Data Source and will proceed directly to the ODBC Exposed Links window.

F1 for Modify, is used to modify the Data Source parameters. It executes a process similar to the one employed by the Add option, except that the Data Source Name is not modifiable.

F7 displays a menu of special functions. For more information refer to the section titled *Special functions*.

Following an **Add** or **Contents** option from the Data Source Name window the ODBC Exposed Link window is displayed.



The keys listed just below the ODBC Exposed Links window launch processes:

LnIns or **Line Insert** key, exposes a link to ODBC and adds an entry for the link to the ODBC Exposed Links window. This process is described in the section titled *How to expose links to ODBC*.

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LnDel or **Line Delete** key, unexposes a link from ODBC and deletes the entry for the link from the ODBC Exposed Links window. This process is described in the section titled *How to unexpose a link*.

CR or **Enter** key, updates the Data Source for a link already exposed to ODBC. This process is described in the section titled *How to update an exposed link*.

F1 will update the Data Source with all links already exposed to ODBC. This process is the same as the **CR** option, but it will update all links.

F4 exits the ODBC exposed Links window and builds the Data Source and UDD.

F7 displays a menu of special functions. For more information, please refer to the section titled *Special functions*.

F9 displays a menu of diagnostic functions. For more information, please refer to the sections on Options later in this section.

How to expose links to ODBC

Use the following procedure to expose data to ODBC. After you successfully expose a Link, it is added to the ODBC Exposed Links window. The name that will be used to reference a Link from the ODBC application, or the Table Name, is derived in a number of ways.

- The Link name itself.
- All ODBC applications at one level or another use SQL to retrieve the data. If the Link name contains characters not valid for access via SQL statements, the Link name will be converted to conform to SQL acceptable characters. Refer to sections titled *Character and Column Name Conversion* and *Table Name Construction* for details about conversions.

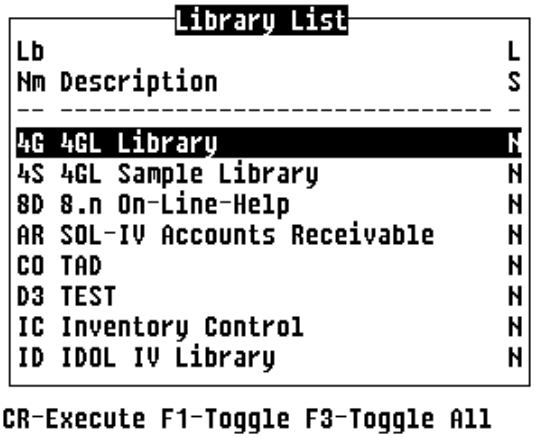
The resultant Table Name may be defined in the Dictionary-IV Link Header using the Server Table Name field. The first 17 characters of this field will be used. This field must be defined prior to adding links to the Data Source. Refer to the appropriate Dictionary-IV instructions for modifying a link header.

Refer to the section titled *Options - Link/Table Name XREF* for instructions for viewing the Table Names associated with each link.

NOTE: If you have links that reference file suffixes these must be defined in the Expose Utility using the process outlined in the section titled *Security*.

1. Press the **LnIns** or **Line Insert** key. The Library List window will be displayed. A list of libraries that contain links you can expose to ODBC will be displayed.

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The following keystroke options are available:

CR or **Enter** key, selects the current library and continues the process.

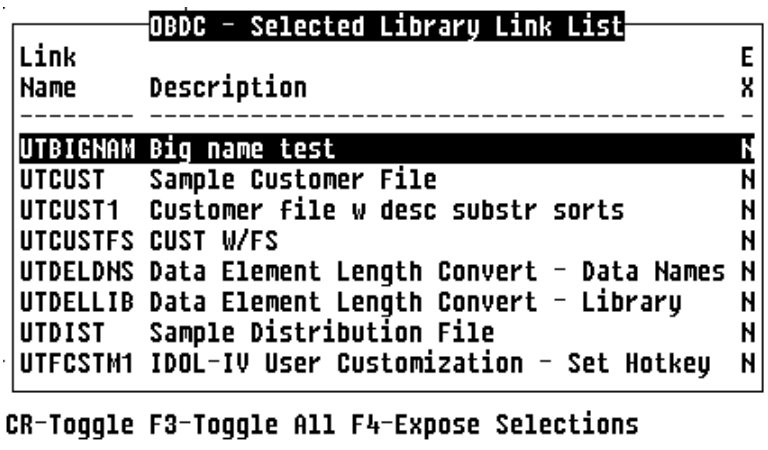
F1 toggles the state of the selected library. You can expose multiple libraries at one time. The current toggle state is displayed in the **LS** (library selected) column.

F3 toggles the state of all listed libraries. The current toggle state is displayed in the **LS** (library selected) column.

F4 cancels the process and returns to the ODBC Exposed Links window.

2. Select the libraries that contain the links you plan to expose.

3. Press the **Enter** key. The ODBC - Selected Library Link List window will be displayed. It displays a list of all the links in the selected libraries that you can expose to ODBC. Only links that contain valid information in the format and data file fields will be listed. Links that reference Indexed files are not supported.



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The following keystroke options are available:

CR or **Enter** key, toggles the **EX** (expose) value of the selected link between **Y** and **N**.
F3 toggles the **EX** value for all links in the view
F4 exits the process and returns you to the Library List window.

4. By default, each listed link has an **EX** (expose) value of **N**. If a link is to be exposed to ODBC, select the link and press the **CR** key to change the **EX** value from **N** to **Y**.

5. Press the **F4** key. The following message will be displayed:

```
Update ODBC information for selected items (Y/N)?
```

Y Update the information.
N Cancel the process and return to the Library List window.

6. Type **Y** and press the **Enter** key.

7. The ODBC Exposed Links window will be redisplayed. Press **F4** to process the Data Source. Should a link name not appear as expected, refer to the section titled *Error Messages,* Conditions section.

   The process generates a pop-up window that displays the ODBC creation status. After the information in the links is updated, the names of the links will be placed in the ODBC Exposed Links window. You will return to the TS ODBC DataServer Expose Utility screen.

How to unexpose a link

Use the following procedure to unexpose a link from ODBC. Once unexposed, the link will be removed from the ODBC Exposed Links window.

1. In the Exposed Link window, select the link you plan to unexpose from ODBC.

2. Press the **LnDel** or **Line Delete** key. The following message will be displayed:

```
Disable ODBC access for link-name (Y/N)?
```

Y Unexpose the link.
N Cancel the process.

3. Type **Y** and press the **Enter** key.

4. The ODBC Exposed Link window will be redisplayed. Press **F4** to process the Data Source.

   The process generates a pop-up window that displays the ODBC creation status. After the link is unexposed, the link entry will be deleted from the ODBC Exposed Links window. You will return to the TS ODBC DataServer Expose Utility screen.

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How to update an exposed link

Use the following procedure to update the ODBC information for an already exposed link if the format or sort information in Dictionary-IV has changed. An update rereads the dictionary information. No changes are made to the physical data or the definitions.

1. In the Exposed Link window, select the link you plan to update.

2. Press the **Enter** key. The following message will be displayed:

   Update ODBC information for *link-name* **(Y/N)?**

   Y Update the ODBC information for the exposed link.
   N Cancel the process.

3. Type **Y** and press the **Enter** key.

4. The ODBC Exposed Link window will be redisplayed. Press **F4** to process the Data Source and build the UDD.

   The process generates a pop-up window that displays the ODBC creation status. After the information for the link is updated, you will return to the TS ODBC DataServer Expose Utility screen.

Special functions

To select TS ODBC DataServer special functions, press the **F7** key at the main Expose Utility window or the Exposed Links view. A pop-up menu will display the following options:

```
Control File maintenance
File Suffix maintenance
Release Notes
```

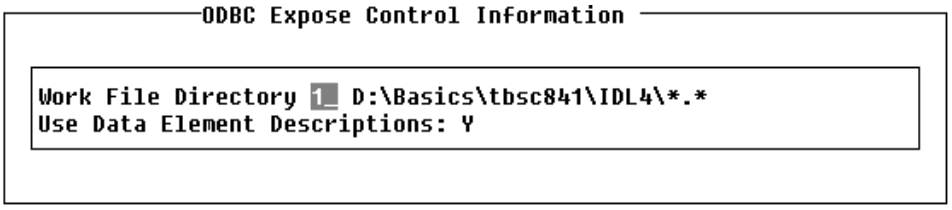
Control File Maintenance

Control File maintenance is a process to maintain system configuration information.

To perform control file maintenance, use the following procedure:

1. Select the **Control File maintenance** option.

2. Press the **Enter** key. The ODBC Expose Control Information window will be displayed.



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3. Enter the appropriate information for each field:

   The **Work File Directory** is the directory where the data and work files associated with this utility are stored.

   Any valid directory number will be accepted. Once a directory number is entered, it is validated against the directories configured in the IPLINPUTfile. If found, the description is displayed, otherwise the cursor remains on the field.

   The **Use Data Element Descriptions** field is used to control the values for the column names displayed on the ODBC applications. A **Y** will use the current languages data element descriptions. An **N** will use the format element names. If **Y** is selected but no descriptions are defined, the system will default to the format element names.

4. After entry of the **Use Data Element Descriptions** option, the following message will be displayed:

   ```
   Is the displayed information correct (Y/N)?
   ```

   Y The information is accurate.
   N Cancel the process and return to the ODBC Expose Control Information window.

5. Type **Y** and press the **Enter** key. You will return to the TS ODBC DataServer Expose Utility screen.

File Suffix Maintenance

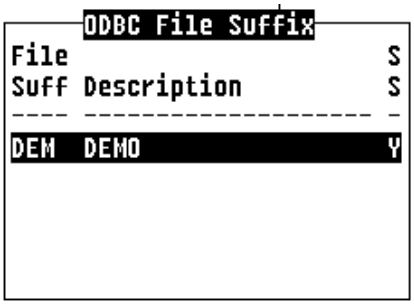
File suffix maintenance is a process to maintain file suffixes. In order to access data files whose links are defined using file suffixes, a separate entry is necessary in the exposed link data for each suffix. This process allows the suffixes used by Dictionary-IV based applications to be used by the utility as it exposes links.

Refer to the section titled *Table Name Construction* for an explanation of how file suffixes are used and the impact on table names.

To perform file suffix maintenance, use the following procedure:

1. Select the **File Suffix maintenance** option.

2. Press the **Enter** key. The ODBC File Suffix window will be displayed.



   This window contains a list of file suffixes.

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3. Use the following keystroke options to perform file suffix maintenance:

   F1 toggles the **SS** (suffix selected) value of the selected file suffix between **Y** and **N**. Suffixes with a **Y** value for the **SS** column will be used during the expose process. This allows the processing of a different set of file suffixes for each link.

   LnIns or **Line Insert** key, enables you to add a file suffix to the file suffix list. Use the following procedure:

   1. Press the **LnIns** or **Line Insert** key. A window will display the **File Suffix: Description:** fields.

   2. Type a valid file suffix name in the **File Suffix:** field and a description of the file suffix in the **Description:** field.

   3. Press the **CR** or **Enter** key. The following message will be displayed:

      `Is the displayed information correct (Y/N)?`

      Y yes, the information is accurate.
      N no, cancel the process and return to the ODBC File Suffix window.

   4. Type **Y** and press the **Enter** key. An entry for the file suffix will be added to the list in the ODBC File Suffix window.

   LnDel or **Line Delete** key, enables you to remove a file suffix from the file suffix list. Use the following procedure:

   1. Press the **LnDel** or **Line Delete** key. The following message will be displayed:

      `Delete file suffix `*`name`*` (Y/N)?`

      Y yes, delete the file suffix name from the list.
      N no, cancel the process and return to the ODBC File Suffix window.

   2. Type **Y** and press the **Enter** key. The entry for the file suffix will be deleted from the list in the ODBC File Suffix window.

   F4 exits the process and returns you to the TS ODBC DataServer Expose Utility screen.

Release Notes

The Release Notes option contains a list of software changes and enhancements.

Options - Integrity Check

A program has been supplied to check the data referenced by the exposed links. Its primary operation is to verify that the data matches the defined format, especially where field separators are used.

If errors occur during access to the Thoroughbred data via an ODBC application, execute this utility to determine if the problem is related to data errors.

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For files that contain multiple record types, refer to the section titled *Options – Selection Criteria* to define the Selection Criteria prior to running this process since the Integrity Check uses these rules to select only the appropriate records for a particular format.

The Integrity Check produces two types of output: Type 1 and Type 2.

Type 1 output includes information that lists the fields whose physical data is greater in length than the data element length defined in the format.

Type 2 output shows records that have bad dates or data that does not match the data type defined in the format. Also included in this output are records that contain more field separators than defined in the format.

To execute this program, use the **Arrow** keys to move to the link to be checked and press **F9**. A pop-up menu displays the following options:

```
Integrity Check
Integrity Check Results
Selection Criteria
Selection Criteria Report
Link/Table Name XREF
```

Select **Integrity Check** to run the check program. If the file contains over 100 records a status screen appears that counts the number of records checked. Depending upon the number of records in the file, the program may run for an extended period of time.

After all the records are checked, the ODBC Exposed Links view is displayed. The **Fl Ck** field contains the status generated by the check program:

OK all records pass the check.

ER data file cannot be opened.

BD invalid dates exist in the data file.

B1 invalid dates and bad records exist in the data file.

is a number between 1 and 99, which specifies the number of bad records found by the check program. A value of ** means that more than 99 bad records exist.

NM invalid numerics exist in data file.

ND data file contains both invalid dates and invalid numerics.

To display the list of the exceptions, highlight the link that was checked and press the **F9** key. A pop-up menu displays. Select **Integrity Check Results**. A second pop-up menu displays.

```
Field Length Results
Data Record Results
```


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To view the Type 1 exceptions, select **Field Length Results**. This process displays a view of any field in the data file that contains data greater in length than the format specifies. The column **Defnd Lngth** refers to the length defined in the format and **Data Lngth** refers to the actual length of the physical data in that field.

To correct this type of problem, the format needs to be modified so that the field in question is defined to be large enough to hold the data; or, the physical data must be analyzed and modified to conform to the format definition.

If there are any Type 1 exceptions, make the appropriate corrections and rerun the **Integrity Check** since these errors may have caused some Type 2 errors to occur.

To view the Type 2 exceptions, select **Data Record Results**. A list of exceptions for the link displays. The listed information includes the data file name, the primary key and the field that contains the data mismatch. In the case of concatenated fields, the field name is the first field of the concatenation.

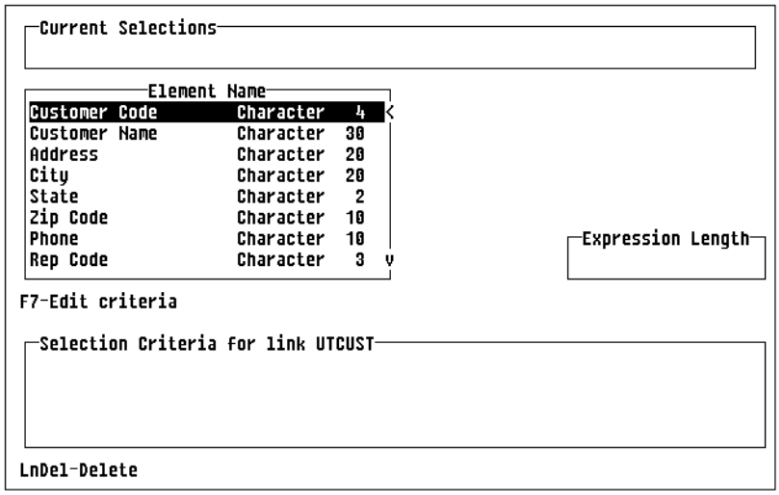
To correct this type of problem (if the Type 1 fixes, above did not do so), either delete the bad records, rewrite the records to match the format or modify the format to conform to the data.

Options - Selection Criteria

This section describes the procedure for defining selection criteria for data files that contain multiple record types. These files are sometimes called multi-format files. In order for an ODBC application to distinguish one record type from another, it is necessary to define a rule by which the system can determine which records associate with a particular format. This information is then processed as a **WHERE** clause.

NOTE: If the formats for the data file are defined with a key field that contains a default value and a security code of 3,0 and is the first element in the format, it is not necessary to define a rule. The rule for this type of multi-format definition will be defined automatically by the Expose Utility when the Link is exposed and it will appear in the Selection Criteria for Link window.

To define a rule, choose **Selection Criteria** from the Options (**F9**) menu. The following screen displays:



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The screen is divided into the following areas:

- **Current Selections:** Displays the components of the current condition being defined.
- **Element Name:** Lists all the elements in the format. The display shows either the data element names or the data element descriptions depending upon the value for the **Use Data Element Descriptions** field in the Control File. For more information refer to the section titled *Security*.
- **Operator:** Lists the available operators for defining a condition.
- **Expression Length:** This window contains the current length of the condition each time a condition is saved. There is a 432-character limit. Therefore, only enter conditions that may be described in 432 characters or less. Any condition added that results in a total condition length exceeding 432 characters, is not saved.
- **Selection Criteria for link XXXXXXXX:** Displays the current set of defined conditions.

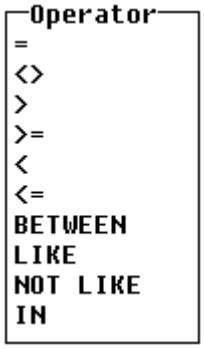
Available function keys are:

F3	Can be used to move to the previous section from the **Current Selections** or **Operator** sections.
F4	Moves directly to save processing (Step 6 below) if any new conditions are entered. Otherwise, it returns to the **ODBC Exposed Link** view.
F6	Displays on-line help.
F7	Moves processing to the **Select Criteria for link XXXXXXXX** section (while in the Element Name section), where previously defined conditions can be deleted.
Line Delete	Deletes the condition highlighted by the cursor. Only available in the **Select Criteria for link XXXXXXXX** section. See the **Delete a Condition** section.

To add a Condition:

The procedure for defining a condition is described below. If conditions already exist, proceed to Step 6.

1. Select a data element name. It displays in the **Current Selections** window and the cursor moves to the **Operator** window.



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2. Select an operator. The selected operator displays in the **Current Selections** window and the cursor moves to the **Current Selections** window for input of the rule value.

3. Enter a value. The format of the value depends on the operator and type of field selected. For date fields (SQL Dates, type 5 or 8), enter the value in the following standard SQL format:

   {d 'YYYY-MM-DD'}

   For example, to enter the date 9/9/99 into the value field use {d '1999-09-09'}.

   For numeric and string fields, refer to the following table:

Operator	Values for Numeric Elements	Values for String Elements
=, <>, >, >=, <, <=	Any numeric value.	Any string value enclosed in single or double quotes. Length of string should not exceed field length.
BETWEEN,	Two numeric values separated by an AND. For example, 0 AND 10	Two strings each enclosed in either single or double quotes separated by an AND. For example, "AAAA" AND "ZZZZ"
LIKE, NOT LIKE	N/A	Any string enclosed in single or double quotes. Wildcard characters can be used to match one or more characters. To match a single character use the _ character and to match a group of 0 or more characters use the %.
IN	Any numeric value. Multiple values should be separated by a space.	Any string enclosed in single or double quotes. Multiple values should be separated by a space. Length of string should not exceed length of field.

4. Following the entry of all test values, the system prompts:

   ```
   Is the displayed information correct (Y/N)?
   ```

   N returns to the element name screen. Return to Step 1.
   Y proceeds to step 5.

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5. The system prompts:

   ```
   Enter more conditions (Y/N)?
   ```

   N proceeds to Step 7.
   Y proceeds to Step 6.

6. The system prompts:

   ```
   Select logical operator AND
   ```

   Press **Enter** to select the appropriate operator. The condition is posted to the **Selection Criteria** screen. Return to Step 1.

7. Once all the conditions have been entered, the system prompts:

   ```
   Save selection criteria (Y/N)?
   ```

   N aborts the selection criteria entry screen and returns to the ODBC Exposed Links view.
   Y saves the conditions and returns to the ODBC Exposed Links view.

To delete a condition:

1. From the **Element Name** section press **F7**. The first condition in the **Selection Criteria for link XXXXXXXX** section is highlighted. Use the **Up** and **Down Arrow** keys to choose the condition to delete, followed by the **Line Delete** key. The system prompts

   ```
   Are you sure you want to delete (Y/N)?
   ```

   Y deletes the condition. Proceed to Step 1 in the *To Add a Condition* section.
   N returns to the Element Name window.

Options - Selection Criteria Report

This report has been included to provide a way to review the defined selection criteria either on screen or as a hard copy. The report includes all conditions for all **Data Sources**.

To print the report, select **Selection Criteria Report** from the Options (**F9**) menu.

Options - Link/Table Name XREF

Under certain conditions, the **Expose Utility** may require the use of a name other than the standard Dictionary-IV link name for the ODBC table. The reasons for this are outlined in the section titled *Table Name Construction*.

To display the list of table names associated with a link, select **Link/Table Name XREF** from the Options (**F9**) menu. A list displays that shows the links for the **Data Source** selected and the associated table names that reference these links in the ODBC application.

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Security

Security is a major issue especially in the accessing multi-user applications. With ad hoc ODBC-enabled query tools available, it is important to ensure that only authorized users are able to query and modify your application's data.

This section describes:

- User connection security.
- Table, column, and row security for users once they are allowed to connect.

User Connection

TS ODBC enforces database-user connection security. The security features are comprehensive and flexible and should cover virtually all user requirements for connection level security. For complete details on OPENworkshop or Dictionary-IV security, see the appropriate reference manual.

A Client Connection requesting access to a Thoroughbred DataSource requires a Dictionary-IV login. The ODBC Driver will attempt to determine an automatic login and password prior to prompting the user using one of the methods below:

- Values may be included as keywords parameters on the connect string received from a client application (i.e. MS Access includes the user name from the command line or 'Admin').
- The workstation login name.

If a login and password cannot be found, or the above fails authentication, the ODBC Driver prompts for them. For more information, see the *User Login and Authentication* section.

A connect request is sent to the server with whatever information is available. The server will complete the connection and return the result of the login procedure below. The ODBC Driver will request any missing information from the user and send the results to the server. This is repeated until all needed information is verified or the user cancels.

User Login and Authentication

If the automatic login fails, the user will be prompted for a login and password. The Login dialog box prompts for either **User-ID** (if OPENworkshop security is active) or **Operator Code** (if Dictionary-IV passwords are active).

If the user is prompted for a User-ID, it will be validated against the OPENworkshop security file (typically a UNIX login). If OPENworkshop security is active and the User-ID and a Shadow Password file exist, it will be used for password validation. Otherwise, the Operator Code will be used for validation and the Operator Code password will be checked. For more information, go to the **View user ids** option from the OPENworkshop Security Menu or see the *OPENworkshop Reference Manual*.

Each OPENworkshop User-ID is linked to a Dictionary-IV Operator Code.

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LINK (Tables) Security

The following tests are performed, if either OPENworkshop security or Dictionary-IV security password is active.

- Link password
- Operator Access codes (type 0 and type 1)
- Terminal Access is ignored (type 0 and type 1)
- Group Access – user must be member of group

Notes:

- Group codes with an appended R have read-only access, group codes without have read/write access. Read-only access will cause UPDATE, INSERT, and DELETE to fail because of improper permissions.

  Example:
  Security set to: [100R,200,300R]
  Users in group 100 and 300 have read-only access.
  Users in group 200 have read/write access.
  All others have no access.

- Link definitions that include I/O triggers will be considered read-only.

DATANAME (Column) Security

Dataname Security does not require the Dictionary-IV security being active. If security is inactive or there is no security value (Format) for a dataname, '0,0' will be used as the security value. If group codes are present and the user is a member of one of the groups, the group security code is used instead. The effect of the Dataname Security on each ODBC operation is:

- RETRIEVING the column is filled with blanks or zero if display mode is 1 or 2.
- UPDATING the column is protected if security mode is 1 or 3.
- INSERTING the column can only be set to the default value when security-mode is 2 or 3.

Notes:

- If the Dataname Security includes a password, the user will be prompted.
- Datanames defined with a POST-PROCESS cannot be updated.

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RECORD LEVEL (Row) Security

Record level security can only be used when OPENworkshop security is active. Record level security is indicated by a security-mode 4 (Format) on a two-character column. If group codes are present ant the user is a member of one of the groups, the group security code is used instead. The effect of Record level security on each ODBC operation is:

- RETRIEVING/UPDATING only records with matching values are selected.
- INSERTING only records with matching values can be added.

Technical Information and Troubleshooting

This section includes discussion of a number of features of the Expose Utility. In addition, a list of the errors that may be encountered during the execution of the utility is detailed.

Character and Column Name Conversion

During the expose process each table name (derived from the link name) and column name is edited to ensure that it will conform to SQL syntax standards. To this end, the following conversions will take place:

- Only the characters 0-9, A-Z and a-z are valid for column and table names. All other characters will be converted to an “X” except for the “#” sign which will be replaced with an “N” and the “%” which will be replaced with a “P”.
- The first character of a column or table name must be a letter. Any numbers in this position will be replaced with letters. 0 will be replaced with A, 1 with B and so on.
- Columns that may be misread as SQL reserved words will be modified to avoid misinterpretation. For example, a column called DATE will be replaced with a column called DATEX. The list of reserved words can be found in the data file ODDRESWD, which is referenced via Dictionary-IV with the link odLRESWD.

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Table Name Construction

The section titled *Character and Column Name Conversion* lists the general rules for dealing with special and valid characters used for table names. This section describes the conventions and constraints used to build table names from the Dictionary-IV Link names. In most cases, the table name used during ODBC access corresponds character-for-character with the Dictionary-IV defined Link Name. However, in a number of circumstances, this is not true.

File Suffixes

When file suffixes are defined for a link, the number of tables generated corresponds to the number of file suffixes defined. This is due to the one-to-one relationship between tables and physical data a file that is expected by the ODBC rules. The resultant table name consists of the **Link Name + File Suffix**. For example, link **UTCUST** defined with suffixes **DEM** and **CMP** results in two tables, **UTCUSTDEM** and **UTCUSTCMP**. Beginning with version 8.8.0, File Suffix Methods defined in the link have been disabled. Should this functionality be required, it may be enabled by adding PRM ODBCFS to the appropriate IPL file.

Upper/Lower Case Characters

While upper and lowercase characters are valid in link names, some restrictions are implied by the SQL engine. Since SQL is case insensitive, two links that contain the same characters but differ in case only trigger a modification to one link's resultant table name. That is, links **UTCUST** and **UTcust** are exposed with table names **UTCUST** and **UTCUST1**.

Table Name from Link Header

The resultant Table Name may be defined in the Dictionary-IV Link Header using the Server Table Name field. The first 17 characters of this field will be used. This field must be defined prior to adding links to the Data Source. Refer to the Dictionary-IV instructions for modifying a link header.

Sorts

A number of the constructs supported in Dictionary-IV for sort definitions are not valid in SQL. Sorts defined with any of the following items will not be exposed. The client application will still be able to sort the data in any way that it supports, but there may be a performance consequence.

- Sorts defined with substrings of columns.
- Descending sorts.

Log file

The Expose Utility will update a log file, **tsexp.log,** when any of the events described in the sections titled *How to unexpose a link* and *How to update an exposed link* occur. This log will be found in the directory specified by the WORK-FILE-DIRECTORY field in the Control file. The information in this file consists of warnings and will not prevent the Data Source from operating.

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TSODBC.INI

This file is maintained by the Expose Utility. It is located in the appropriate system directory for the Single-Tier AND Windows server products and in **/usr/lib/basic** for the UNIX server Tier product. It is organized in sections by IPL files, base directories, and Data Sources. Each Data Source section contains the IPL file name and base directory information used by the server process to locate the data files and IDDBD. The format of the file is:

```
[IPL]
A001=/opt/tbred/basic/IPLINPUT
[PWD]
A001=/opt/tbred/basic/
[OEFILES]
IPL=/opt/tbred/basic/IPLINPUT
PWD=/opt/tbred/basic/
LOG=15,/usr/lib/basic/OEFILES.LOG
[UTFILES]
IPL=/opt/tbred/basic/IPLINPUT
PWD=/opt/tbred/basic/
LOG=15,/usr/lib/basic/UTFILES.LOG
```

```
[IPL]
A001=
[PWD]
A001=C:\ProgramData\Thoroughbred Software\Tbsc\
[OEFILES]
PWD= C:\ProgramData\Thoroughbred Software\Tbsc\
[UTFILES]
PWD= C:\ProgramData\Thoroughbred Software\Tbsc\
```

On Windows, the TSODBC.INI file is created in the base directory, for example, C:\ProgramData\Thoroughbred Software\Tbsc. To change the location of the TSODBC.INI file to the Thoroughbred System directory, create the ODBCEXU.INI file in the IDL4 directory of the base directory with the following:

```
[OS]
Name=C:\ProgramData\Thoroughbred Software
```

DataSources

The IPL= line refers to the name of the IPL file used and the PWD= line lists the corresponding base or home directory for any relative paths configured in the IPL file. There will be a separate section in the TSODBC.INI file for each Data Source defined.

There are a number of other lines that can be manually configured in the file specific to each Data Source. Be aware that running the Expose Utility may remove any manually entered line.

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LOG=log-flag[,log-file-name] controls logging for the Data Source. The log-flags controls the information to be logged:

1 Log Thoroughbred File handler API calls
2 Log ISAM API calls
4 Log ODBC API calls
8 Log network packets
16 Log server client statistics

The log-file-name, if specified, contains the name of the log file for the Data Source. If not defined, messages will be written to the TSODBC.LOG file.

TXT= mval controls the amount of data returned for text fields. Valid values for mval range form 200 to 32767. Note this value does not control the length of the data returned. Each ODBC application has its own maximum value that can be returned for text fields. This configures the value that the TS ODBC Server will reserve for the data returned.

TIM=mval can be specified in TSODBC.INI to force termination when a connection has been idle for mval minutes. Minutes cannot exceed 4 digits. A message is written to TSODBC.LOG that includes the Data Source Name and the User Login.

IPLPRM=N can be specified to ignore the IPLPRM file for the Data Source.

Error Messages

The following is a list of error messages or conditions that may occur during the Expose Utility execution.

Messages

- "Cannot locate windows system directory"
  This message will occur if the **WINDIR** environment variable has not been set.

- "Cannot access the TSODBC.INI file"
  Check permissions on the file.

- "Control file locked by another user"
  The Expose Utility can only be executed by one user at a time.

- "No hierarchical directory configured"
  A hierarchical directory must be set up in the IPL file. Refer to the *Thoroughbred Basic Customization and Tuning Guide* for details.

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Conditions

The link does not appear in the Exposed Link window. This will occur for one of the following reasons:

- Bad format.
- No format defined in the link.
- No key fields defined.
- No data file defined in the link.

API Interface to Expose Process

This section describes the method for creating Data Sources outside of the ODBC Expose Utility so that the expose functionality can be integrated into an existing application program or a customized front-end.

Setup

- *Control Information*

  The API requires the control information that is normally defined during the execution of the ODBC Expose Utility through Control File Maintenance, to be defined prior to execution. This includes the following information:

Element Name	Description	Single-Tier Defaults	Multiple-Tier Defaults
CONTROL-KEY	Control record key. This is always 'CTL'	'CTL'	'CTL'
WORK-FILE-DIRECTORY	Directory number for the Expose Utility data files	Directory containing IDDBD	Directory containing IDDBD
DN-DESC	Flag to determine whether to use Data Element names or Data Element Descriptions	'Y'	'Y'

The data file ODDCTLPR has been defined to hold this information. This file contains the fields described above and can be accessed using the link odLCTLPR. Use either single- or multi-record maintenance to populate this data. All fields are mandatory. If this file is missing, the default values, listed above, will be used. Invalid information will result in API execution termination.

NOTE: This file will be created automatically when it is accessed for the first time.

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- *File Suffixes*

  In order for the required file suffix information to be used during the Expose process, the file ODDFSUFF must be populated. This file, accessible via the link odLFSUFF, contains three fields: The file suffix, the file suffix description and the use/no use flag. The file suffix and use/no use flag are required. During the Create (see C function in the *Execution* section) process, this file is read. Any file suffix records with a use/no use flag value of "Y" will be used to build expose records.

  NOTE: This file will be created when it is accessed for the first time.

- *Selected Link List*

  This file, ODDLKSLT, contains a list of links to be used in place of the entire library. It is accessible from the link odLLKSLT. If this file is found, the records contained therein will be used during the C and U functions. The file contains two fields: The Link Name and a use/no use flag. Only the records containing a use/no use flag value of "Y" will be used to build expose records.

  NOTE: This file will be created automatically when it is accessed for the first time.

  The file may contain links from one or more libraries.

  Without this file present on the system, the expose process will default to the list of all links defined in the library specified in API$[2]. Only the links that fit the Expose Criteria will be exposed. Refer to the section titled *Error Messages*, Conditions section.

- *Table Name*

  By default, the resultant Table Name is derived from the Link Name. Alternatively, the Table Name can be configured by entering a value into the Server Table Name field in the Dictionary-IV Link Header. Note that only the first 17 characters will be used.

Execution

The following describes the syntax and parameters that need to be initialized for calling the API.

Syntax: `CALL "ODAPI",API$[ALL]`

Parameters:

`API$[0]` - Execution Status
`.` - Execution successful
- Error value (See the section titled *Security*.)

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API$[1] - Function:

C - Create New DSN specified in API$[3]. If API$[2] is blank, uses list from ODDLKSLT and File suffixes from ODDFSUFF.

U - Update DSN specified in API$[3]. If API$[4] is blank, uses list from ODDLKSLT and File Suffix from API$[5]

D - Delete Link from DSN. Uses link(s) from API$[4].

G - Generate DSN specified in API$[3].

X - Delete DSN specified in API$[3].

API$[2] - Library

The 2-character name of the Dictionary-IV library that contains the links to expose.

API$[3] - DSN Name

A string value up to 32 characters in length.

API$[4] - Link Name for Update, Delete

May contain one or more links. A comma separates multiple links.

API$[5] - File Suffix

Used in conjunction with the D and U functions. No file suffix specification is necessary for the C function. Values will be derived from the ODDFSUFF file.

It is advised that API$[0] be checked following each call to the API to verify that the process completed successfully. In addition, the log file ‘tsexp.log’ should be reviewed. This file will contain details about changes that were made to elements, tables, and sorts during the expose process. It will also list any links that were not exposed and the reasons.

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Example Usage

- Create a new DSN

Option 1 - Creates a DSN called TESTDSN with all valid links from the UT library.

```
API$[1]=”C”,
API$[2]=”UT”,
API$[3]=”TESTDSN”,
API$[4]=””,
API$[5]=””
```

Option 2 - Creates a DSN called TESTDSN. In this case the file ODDLKSLT must contain the list of links to be exposed.

```
API$[1]=”C”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=””,
API$[5]=””
```

- Update a DSN

Option 1 - Updates a DSN called TESTDSN for links UTCUST and UTSALHSH.

```
API$[1]=”U”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=”UTCUST,UTSALHSH”,
API$[5]=””
```

Option 2 - Updates the DSN called TESTDSN with all links from the ODDLKSLT file.

```
API$[1]=”U”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=””,
API$[5]=””
```

Option 3 - Updates a DSN called TESTDSN for link UTLHELPT using File Suffix DEM

```
API$[1]=”U”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=”UTLHELPT”,
API$[5]=”DEM”
```


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- Delete Link from DSN

Deletes links UTCUST and UTSALHSH from the DSN TESTDSN.

```
API$[1]=”D”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=”UTCUST,UTSALHSH”,
API$[5]=””
```

- Generate DSN

Generates the DSN called TESTDSN and produces the UDD.

```
API$[1]=”G”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=””,
API$[5]=””
```

- Delete DSN

Deletes the DSN called TESTDSN.

```
API$[1]=”X”,
API$[2]=””,
API$[3]=”TESTDSN”,
API$[4]=””,
API$[5]=””
```


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Errors

The following is a listing of the error values that may be returned in API$[0]:

101 - Cannot access the DSN master, ODDDSNNM.
102 - Cannot find key “CTL” in Control File.
103 - Cannot read from the DSN master, ODDDSNNM.

110 - No hierarchical directory defined in the IPL file.
111 - No system directory Environment variable set (Windows error only).
112 - Cannot access file TSODBC.INI.
113 - Invalid function value in API$[1].
114 - Occurs when there is no Selected Link file (ODDLKSLT) and no library is set in API$[2].
115 - No DSN specified in API$[3].
116 - No Link specified in API$[4].

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SUPPORTED SQL SYNTAX

LIMIT

In addition to the syntax outlined here: http://syware.com/products/odbc_driver_kit/drdbdr3.php, the TS ODBC DataServer driver supports the following syntax:

LIMIT {[offset,] row_count | row_count [OFFSET offset]}

This can be used to restrict the number of rows returned or to a specific number of records starting at a specific record. Note that the offset is 0-based.

Examples:

To return the first 20 rows:

SELECT * FROM UTCUST LIMIT 20

To return 10 rows starting with the 5th record:

SELECT * FROM UTCUST LIMIT 4,10

This can also be coded as

SELECT * FROM UTCUST LIMIT 10 OFFSET 4

Date/Time

Starting with version 8.8.0, time is now supported in WHERE clauses. The syntax is similar to the way dates are specified.

{d ‘YYYY-MM-DD’}

To specify a date with time:

{ts 'YYYY-MM-DD HH:MI:SS'}

To specify just the time:

{t 'HH:MI:SS'}

The syntax used depends on how the date field is defined within the dictionary.

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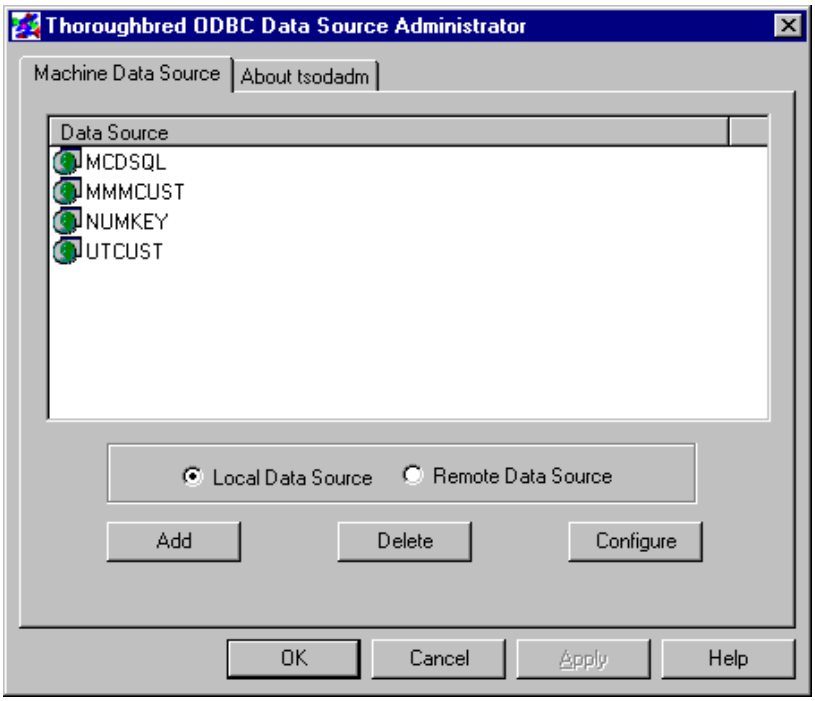
TS ODBC DataServer Utilities

Thoroughbred ODBC Administrator

Configuring a Data Source

Following the execution of the Expose Utility, the data source(s) are added to a client system by using the Thoroughbred ODBC Administrator. This program will collect the appropriate information and update the system registry so that ODBC-compliant applications can access the Thoroughbred data.

To execute the program from the Start menu, select **TS ODBC DataServer Client→ Thoroughbred ODBC Administrator**. The following screen will be displayed:



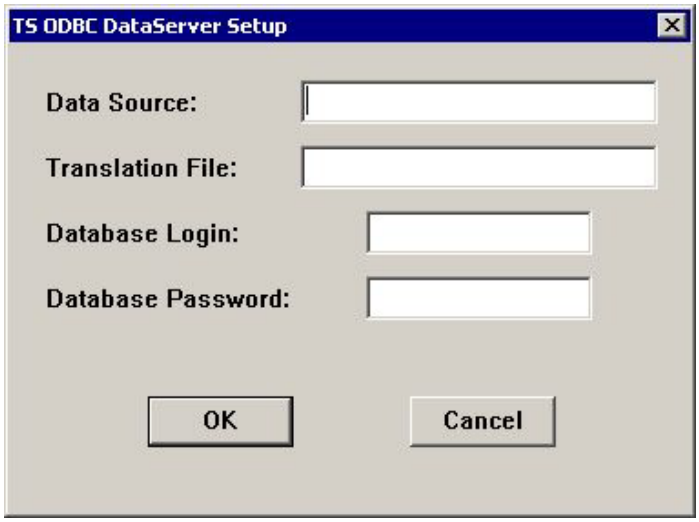
The main tab contains a section that selects the mode for data source configuration. Available modes are Local (Single-Tier) or Remote (Multiple-Tier).

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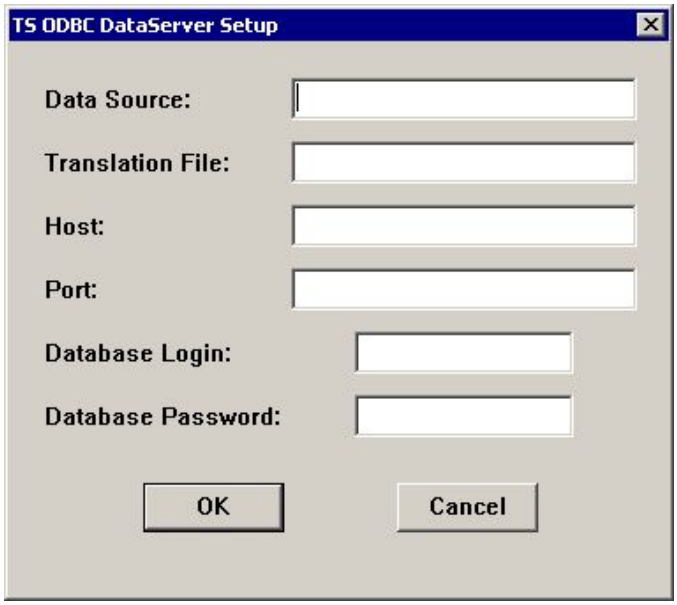
The three buttons on the main tab execute the following processes:

Add – When selected will present one of the following set-up screens depending upon the mode selected:

Single-Tier



Multiple-Tier



These screens contain the following entry fields:

Data Source – This must be the name of the Data Source created using the Expose Utility. Note that a Data Source name may not be created as both a Single-Tier and Multiple-Tier data source. That is, a name may appear in the local or remote list but not both.

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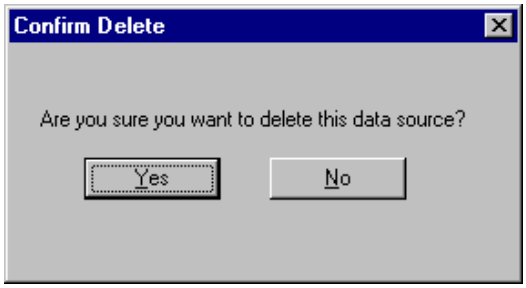
Translation File – The full pathname of a .TXT file that contains the rules for character translation. Refer to the *How to Build a Translation File* section found later in this section.

Host – (Multiple-Tier only) The name of the server where the data resides.

Port – (Multiple-Tier only) The TCP/IP port number on which the server listens for requests. By default, both the client and server will communicate on port 20223. Therefore, this field may be left blank if there is no conflict with this port number on the server system. If a conflict exists, the port that the server uses for communication can be changed. Refer to the *Change the Default TCP/IP Port* section found later in this section.

Database Login and Database Password – Login and Password information may be entered which the ODBC Driver will use to login to the DataServer. Password information is displayed as several asterisks.

Delete – To delete a Data Source, select the mode, then click to highlight the Data Source to delete and click the delete button. The system will present the following dialog:



Yes – The system will delete the data source and return to the main Administrator menu. This will not affect any data in the Expose Utility.

No – The system will take no action and return to the main Administrator menu.

Configure – Depending upon the mode selected either the Single-Tier or the Multiple-Tier setup screen for the selected data source will be displayed (see Add mode above). Make the desired changes and click OK to save the changes.

NOTE: The data source name cannot be modified.

How to Build a Translation File

The Thoroughbred ODBC Driver can translate the data it transmits and receives from the server. The translation is controlled by rules stored in a Translation File. This file contains two sections, Output to Database and Input from Database, where the rules are listed. Usually, the sections are mirrors of each other.

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A rule consists of a “search for” character list, an equal sign and a “replace with” character list. The “search for” list must contain at least one character that can be either a literal enclosed in single or double quotes or hexadecimal characters enclosed in dollar signs. The “search for” and “replace with” lists do not have to be the same length. The maximum length of a rule is 160 characters.

Comments may be included after *, # or ! characters.

The following are sample Translation Files that could be used with data files that contain $5D$ and $7D$ to represent characters from another keyboard:

```
File C:\TSODBC4\EUR.TXT

#
#  Translation File European Keyboard/Display
#
[OUTPUT to DATABASE]
"Ä" = $5D$
"ä"  = $7D$

[INPUT from DATABASE]
$5D$ = "Ä"
$7D$ = "ä"
```

```
#  File C:\TSODBC4\USA.TXT

#
#  Translation File ASCII Keyboard/Display
#
[OUTPUT to DATABASE]
"A" = $5D$
"a"  = $7D$

[INPUT from DATABASE]
$5D$ = "A"
$7D$ = "a"
```

Using the example files, two clients with different keyboards and displays can access the same data.

The Translation File can be specified in the Translation File field of the Thoroughbred ODBC Administrator. The full pathname must be included. When the data source is saved, the translation rules are checked for errors and the information is stored in the client registry. Saving the information in the registry improves the performance of the TS ODBC DataServer Driver. However, if the Translation File is modified, the data source must be resaved via the Thoroughbred Administrator in order for the new translation rules to take effect.

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If the rules checking process discovers an error one of the following messages may be displayed:

! Cannot access Translation File. Translation is disabled.

This message occurs when either the translation file cannot be opened or a section name does not contain matching brackets.

! Error in Translation File line NN. Translation is disabled.

This message indicates a problem in line NN of the file. The cause can be:

- Missing or unmatched delimiters
- An invalid or odd number of hexadecimal digits
- A line exceeding the maximum 160 characters
- An empty “search for” list
- A section name that did not begin in position 1
- Comments not preceded by a comment character

Change the Default TCP/IP Port (Multiple-Tier only)

Should a conflict arise with the default TCP/IP port (20223), the server can be configured to communicate with the client system on a user specified port number. To enable this, start the server process with the following syntax:

`tfodbcd -p port-number`

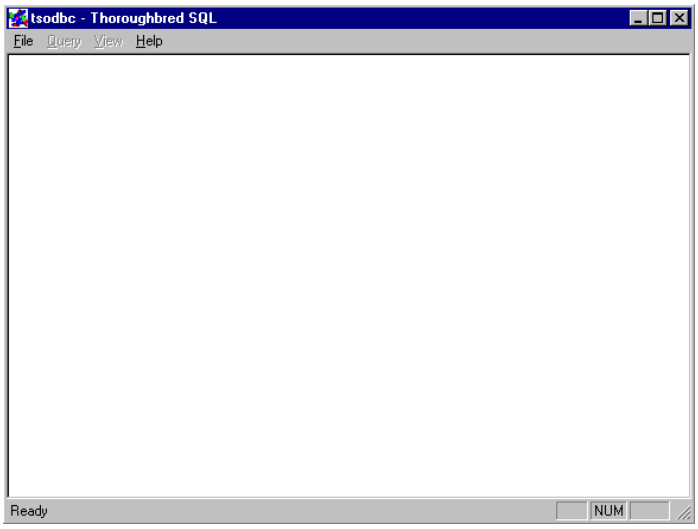
where *port-number* represents an available TCP/IP port value.

Then enter the same port number in the Port Number field when defining the Remote Data Source through the Thoroughbred ODBC Administrator on the client system.

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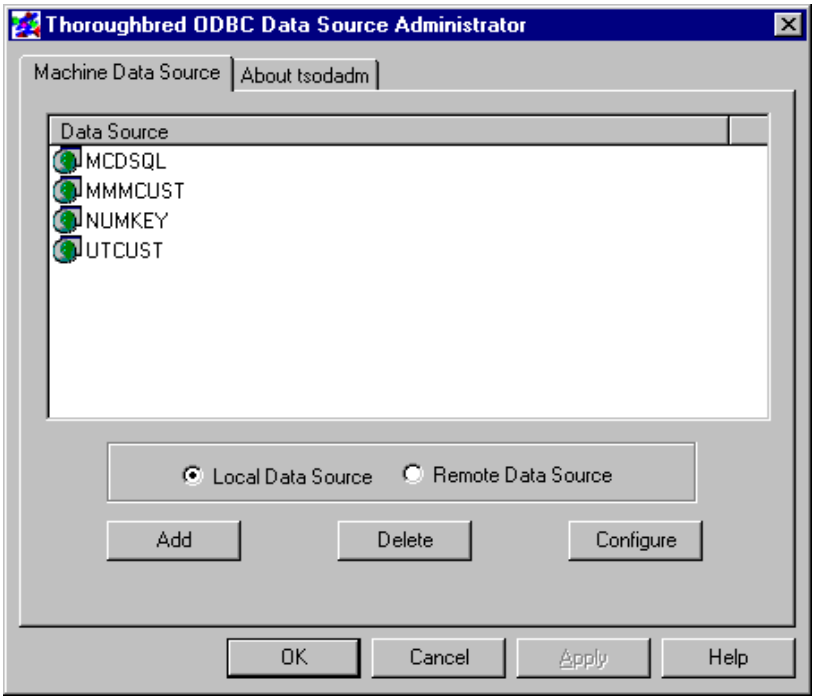
Thoroughbred ODBC Query

This utility is provided to test the Data Source setup once it has been created or modified. It is intended to be used as a diagnostic tool only. The result set is limited to the first 100 records that satisfy the query. To execute the program from the Start menu, select **TS ODBC DataServer Client → Thoroughbred ODBC Query**. The following screen will be displayed:



Accessing Data

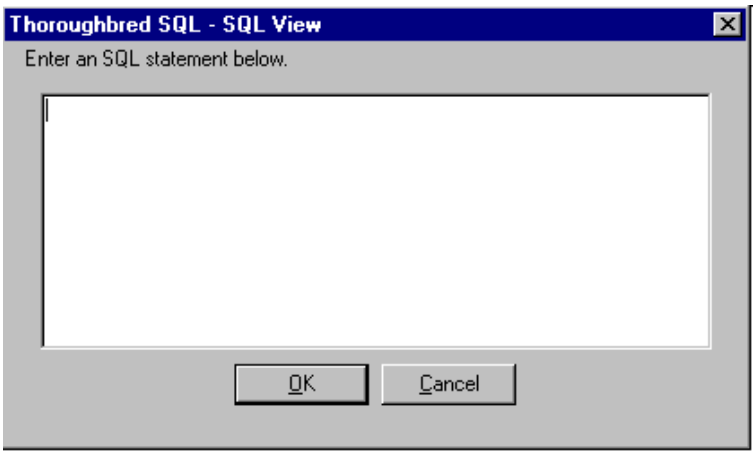
The first step is to open a Data Source. Select the **File** menu and the **Open Data Source** menu item. The following screen will be displayed:



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If the data source to test uses the Single-Tier driver select **Local Data Source** to display the list of defined Single-Tier data sources. To test a Multiple-Tier data source, select the **Remote Data Source** option to display the list of defined Multiple-Tier data sources.

To select a data source to test, highlight it and click OK. The following screen will be displayed:



Enter any valid SQL statement to query a table or tables defined in the selected data source. After the statement is complete, click OK. The results of the query will be displayed in the Results window. You can toggle between the Results and Query windows by selecting the View menu and selecting the desired item.

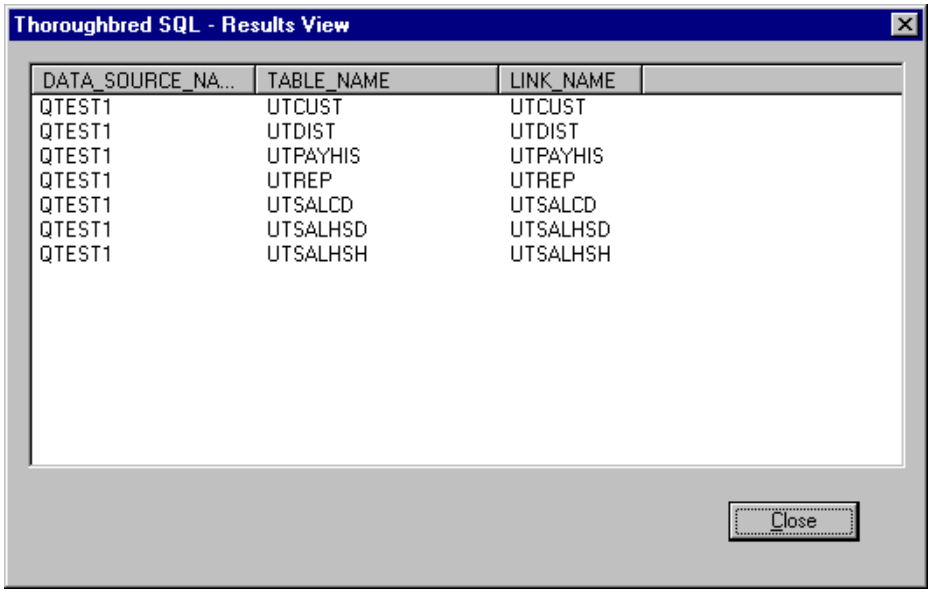
Each data source contains a table, called ODLQTBLE, which can be used to display the list of tables that the data source contains.

To view this list, enter the following command in the SQL View window:

```
SELECT * FROM ODLQTBLE
```

then click **OK.** A screen similar to the following will be displayed:

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The data displayed includes the data source name, table name and Dictionary-IV link name. The values in the table name column can be used for other query functions.

SQL Examples

The following SQL syntax examples can be used to verify a connection to the data source. This is not intended to demonstrate all of the capabilities of SQL. The examples are included solely for the purposes of using this tool for diagnosing the connection between the client and server systems.

The simplest statement, an example of which was used in the previous section, is constructed as follows:

```
SELECT * FROM ODLQTBLE
```

In this statement, the * represents all fields (columns) in the table. The result would contain all data for all fields found in the table **ODLTBLE**. This statement can also be entered as:

```
SELECT DATA_SOURCE_NAME, TABLE_NAME, LINK_NAME FROM ODLQTBLE
```

In this example, the * has been logically expanded to list the field names. To display a subset of the fields in a table enter:

```
SELECT TABLE_NAME FROM ODLQTBLE
```

The result set will contain only the table name data from the ODLQTBLE table.

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Handling Errors

Based on the error returned, one of the following actions may be required:

- Correct the SQL statement.
- Modify the data source to correct server information.
- For Multiple-Tier data sources, check the TCP/IP connection between the server and the client system.

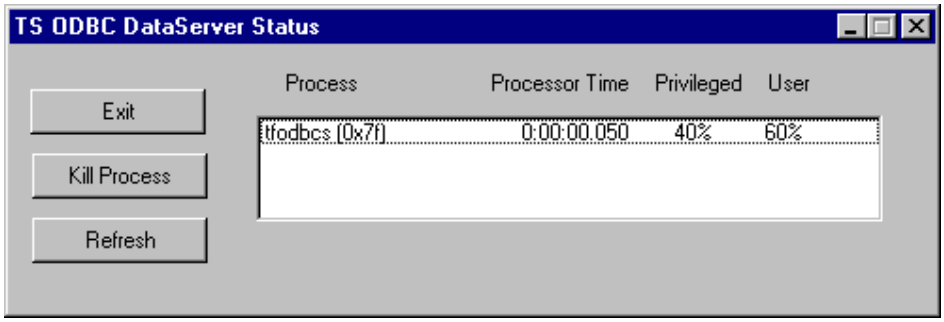
Saving and Retrieving Queries

This product also contains a feature to save and retrieve SQL statements from a file. After entering a SQL statement in the Query window, select the **Query** option from the menu and choose **Save**. A dialog will be displayed that gives the option to select a directory and to save the query. To retrieve the SQL statement later, select the Query menu and choose **Open**. A similar dialog will appear to allow the file containing the SQL statement to be opened. Once opened, the SQL statement will appear in the Query window.

Server Process Viewer (Windows Server only)

This utility can be used to display process information for the TS ODBC DataServer server and associated processes.

To execute the utility, from the Start Menu, select the Thoroughbred Software program group and click TS ODBC DataServer Process Viewer. A screen similar to the following is displayed:



The following options are available:

Exit: Closes the viewer

Kill Process: This will stop the selected process. To select a process, point to the desired process and click. **Warning**: Killing a process in the manner should only take place after all normal methods have been exhausted. Refer to the *Managing the Server Process* section in this manual.

Refresh: This list is not dynamic. Click this option to refresh the view data.

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TS ODBC DATASERVER ERROR CODE LISTING

Error Num	Internal Name	Description	Reasons for occurring
1	ISAM_EOF	No data found	
2	ISAM_TRUNCATION	Data truncated	
3	ISAM_NOTSUPPORTED	Not supported	
4	ISAM_ERROR	File access error	This is similar to the Transoft 913. Look for problems with TSODBC.INI, server process not started, invalid IPL configuration, missing data files or problems with name resolution.
5	ISAM_NETERROR	Communication error	Relates to a TCP/IP configuration problem
6	ISAM_NETVERSION	Client/server version mismatch error	
7	ISAM_NET_ISAM	Communications parameter error	
8	ISAM_MAXUSERS	Too many users	May occur because the ODBC application has cached a login and the user has exceeded the number of licenses. This generally occurs when using Access or SQL Server.
9	Used internally between client and server.		
10	ISAM_DUPLICATE	Duplicate record already exists	
11	ISAM_LOGIN_FAILED	Login failed	
12	ISAM_PSSWD_FAILED	Password verification failed	
13	ISAM_ACCESS_DENIED	Access table was denied	
14	ISAM_READ_ONLY	Access to table is read-only	
15	ISAM_READ_ONLY_INST	This server is installed read-only	
16	ISAM_INVALID_VALUE	Valid Value Test failed for column: %p	%p should be substituted with a table or column name
17	ISAM_INPUT_REQUIRED	Input is required for column: %p	%p should be substituted with a table or column name
18	ISAM_INVALID_DELETE	Cannot delete protected record	
19	ISAM_NO_DELETES	ODBC cannot delete records from table: %p	%p should be substituted with a table or column name

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20	ISAM_POST_PROCESS_1	Post Processing prevents changes to column: %p	%p should be substituted with a table or column name
21	ISAM_POST_PROCESS_2	ODBC cannot insert into tables with Post Processing	
22	ISAM_NO_TRIGGERS	ODBC cannot update tables that contain I/O triggers	
1001	ERR_MEMALLOCFAIL	Memory allocation error	
1002	ERR_DATATRUNCATED	Data truncated	
1003	ERR_NOTSUPPORTED	Not supported	
1004	ERR_INVALIDCURSORNAME	Invalid cursor name	
1005	ERR_CURSORNAMEINUSE	Cursor name in use	
1006	ERR_CONNECTIONINUSE	Connection in use	
1007	ERR_CURSORSTATE	Invalid cursor state	
1008	ERR_INVALIDCOLUMNID	Invalid column id	
1009	ERR_NOTCONVERTABLE	Conversion error	
1010	ERR_NOTCAPABLE	Driver not capable	
1011	ERR_OUTOFRANGE	Out of range	
1012	ERR_ASSIGNMENTERROR	Assignment error	This can be generated from bad/invalid data in the data file. (Characters in numeric fields).
1013	ERR_UNEXPECTEDEND	Unexpected end of SQL statement	
1014	ERR_ELEMENTTOOBIG	Lexical element too large: %s	
1015	ERR_EXPECTEDOTHER	Expected lexical element not found: %s	
1016	ERR_MALFORMEDNUMBER	Malformed number: %s	
1017	ERR_UNEXPECTEDTOKEN	Unexpected extra token: %s	
1018	ERR_BADESCAPE	Malformed escape clause: %s	
1019	ERR_INTERNAL	Internal error	
1020	ERR_ISAM	File access error	
1021	ERR_COLUMNNOTFOUND	Column not found: %s	
1022	ERR_TABLENOTFOUND	Table not found: %s	
1023	ERR_UNKNOWNTYPE	Data type of parameter cannot be determined	
1024	ERR_INVALIDOPERAND	Invalid operand for operator: %s	

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1025	ERR_INVALIDTABLENAME	Invalid table name: %s	
1026	ERR_ORDINALTOOLARGE	ORDER BY ordinal greater than select list count	
1027	ERR_ORDERBYTOOLARGE	ORDER BY contains too many columns	
1028	ERR_ORDERBYCOLUMNONLY	Cannot ORDER BY an expression	
1029	ERR_UNEQUALINSCOLS	Unequal number of insert columns and insert values	
1030	ERR_INVALIDINSVAL	Insert value must be a simple value	
1031	ERR_INVALIDINVAL	Value in an IN expression must be a simple value	
1032	ERR_ALIASINUSE	Table alias used multiple times: %s	
1033	ERR_COLUMNONLIST	Column on list multiple times: %s	
1034	ERR_INVALIDCOLNAME	Invalid column name: %s	
1035	ERR_NOSUCHTYPE	No such type: %s	
1036	ERR_BADPARAMCOUNT	Invalid number of parameters for type: %s	
1037	ERR_COLUMNFOUND	Column found in multiple tables: %s	
1038	ERR_NODATAFOUND	No data found	
1039	ERR_INVALIDCONNSTR	Invalid connection string	
1040	ERR_UNABLETOCONNECT	Unable to connect	
1041	ERR_PARAMETERMISSING	Parameter missing	
1042	ERR_DESCOUTOFRANGE	Descriptor type out of range	
1043	ERR_OPTOUTOFRANGE	Option type out of range	
1044	ERR_INFOUTOFRANGE	Info type out of range	
1045	ERR_CANTORDERBYONTHIS	Unable to ORDER BY this column: %s	
1046	ERR_SORT	Unable to do ORDER BY	
1047	ERR_GROUPBYTOOLARGE	GROUP BY contains too many columns	
1048	ERR_CANTGROUPBYONTHIS	Unable to GROUP BY this column: %s	
1049	ERR_AGGNOTALLOWED	Aggregate function not allowed in this context: %s	

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1050	ERR_NOSELECTSTAR	SELECT * not allowed if there is a GROUP BY	
1051	ERR_GROUPBY	Unable to do GROUP BY	
1052	ERR_NOGROUPBY	HAVING specified without a GROUP BY	
1053	ERR_ZERODIVIDE	Division by zero	
1054	ERR_PARAMINSELECT	Parameter cannot be used in select list	
1055	ERR_CONCATOVERFLOW	String concatenation overflow	
1056	ERR_INVALIDINDEXNAME	Invalid index name: %s	
1057	ERR_TOOMANYINDEXCOLS	To many key columns for index	
1058	ERR_SCALARNOTFOUND	Scalar function not found: %s	
1059	ERR_SCALARBADARG	Invalid argument to scalar function: %s	
1060	ERR_SCALARNOTSUPPORTED	Scalar function not supported: %s	
1061	ERR_TXNINPROGRESS	Transaction still active	
1062	ERR_DDLENCOUNTERD	DDL statement encountered within a transaction	
1063	ERR_DDLIGNORED	DDL statement has been ignored	
1064	ERR_DDLCAUSEDACOMMIT	Transaction committed before DDL statement was executed	
1065	ERR_DDLSTATEMENTLOST	Prepared DDL statement deleted (due to commit) before it could be executed.	
1066	ERR_MULTICOLUMNSELECT	SELECT sub-query returns more than one column.	
1067	ERR_NOTSINGLESELECT	SELECT sub-query returned more than one row.	
1068	ERR_BADPARAMNUMBER	Invalid parameter number.	
1069	ERR_OPTIONCHANGED	Option value changed.	
1070	ERR_KEYSET	Unable to create keyset.	
1071	ERR_BADFETCHTYPE	Fetch type out of range.	
1072	ERR_INVALIDBOOKMARK	Invalid bookmark value.	
1073	ERR_INVALIDROWVAL	Row value out of range.	

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1074	ERR_INVALIDCURPOS	Invalid cursor position.	
1075	ERR_READONLY	Cursor is read-only.	
1076	ERR_NOTASSIGNABLE	Cannot assign value to an expression.	
1077	ERR_NOTANOPTION	Optional feature not implemented.	
1078	ERR_NOTPREPARED	Associated statement is not prepared.	
1079	ERR_FUNCSEQUENCE	Function sequence error.	
1080	ERR_CANTMODIRD	Cannot modify an implementation row descriptor.	
1081	ERR_AUTODESCR	Invalid use of an automatically allocated descriptor handle.	
1082	ERR_INVALIDATTRVAL	Invalid attribute value.	
1083	ERR_INVALIDDESCFLDID	Invalid descriptor field identifier.	
1084	ERR_INVALIDATTRID	Invalid attribute identifier.	
1085	ERR_OPTFEATURE	Optional feature not implemented.	
1086	ERR_RESULTISNULL	Indicator variable required but not supplied.	
1087	ERR_INVALIDDESCRIDX	Invalid descriptor index.	
1088	ERR_NOTINROWSET	Cannot position to a row you added to the row set.	

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