

# INSTRUCTION MANUAL



**LNDB**  
Revision: 7/10

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# LNDB

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## 1. Introduction

LNDB moves data from one LoggerNet server into a single database. The two main components of LNDB are LNDB Manager and LNDB Engine. LNDB Manager is used to set up a database and select the datalogger data tables that will be stored in the database. It also provides tools to monitor the LNDB Engine and to review the database data. LNDB Engine runs as a service and sends the selected data from the LoggerNet data cache to the database. LNDB also includes utilities for importing and exporting data.

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**NOTE**

LNDB works with only one LoggerNet server and a single database. Only one copy of LNDB can be running on a computer. If you need to work with multiple LoggerNet servers, you will need multiple copies of LNDB running on separate computers. Each will also need its own separate database.

---

### 1.1 Supported Databases

LNDB has been tested and shown to work with the following databases:

Microsoft® SQL Server® 2005 Express

Microsoft® SQL Server® 2008 Express

Microsoft® SQL Server® Compact 3.5

MySQL 5.0 and MySQL 5.1 (with MySQL 3.51.27 or 5.1.6 ODBC database driver, note that earlier versions of 5.x ODBC database drivers have known issues)

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**NOTES**

LNDB may work with other versions of these databases.

An SQL Server Compact database is limited to 4 GB in size. If you anticipate the need for a larger database, a SQL Server or MySQL database should be used.

Using a server-based database such as SQL Server or MySQL will be more robust and may give better performance.

MySQL does not support sub-second data.

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### 1.2 Supported Operating Systems

LNDB runs on Windows® XP, Windows® Vista, or Windows® 7.

## 2. Getting Started

### 2.1 Installing and Starting the LNDB Service

The first time you open LNDB, the following error message will occur indicating that the LNDB Engine Service is not running.



Once you press OK, the LNDB Engine Service Manager will open. This utility is used to install LNDB as a service and to enable/disable that service as required.

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**NOTE**

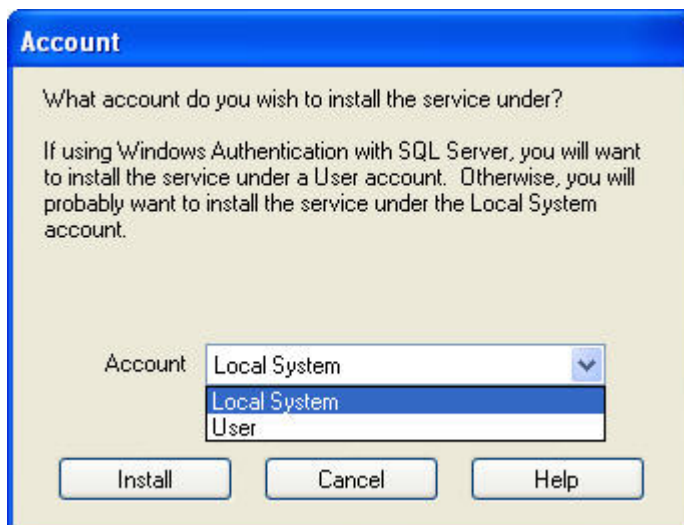
You must have administrative rights on your computer in order to run the Service Manager. If you do not have administrative rights, an error message will be displayed when the Service Manager tries to open.

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Press the **Install** button to install LNDB as a service. You will then be asked what account to install the service under.





You can choose to install the service under the Local System account or under a User account. Note that a User account is most likely necessary if you are using Windows Authentication in SQL Server. In most other cases, the Local System account can be used. If User account is chosen, you will be asked to provide a username and password.

Once the application is installed as a service, press the **Start** button on the LNDB Engine Service Manager window to start the service.





You can then press the **Close** button to close the LNDB Engine Service Manager.

Once LNDB is installed as a service, you can open the LNDB Engine Service Manager from the File | Configure LNDB Engine Service menu item or by double-clicking on the LNDB Engine Status Label on the Status Bar.

## 2.2 Selecting a LoggerNet Server

The Login to LoggerNet Server dialog box comes up automatically after LNDB is installed. It can be opened at any time from the File | Select LoggerNet Server menu item or by double-clicking on the LN Connection Status Label on the Status Bar.

This dialog box allows you to specify the computer running the LoggerNet server to which LNDB should connect. The dialog box has the following fields:

**Server Address** - This is the TCP/IP address of the computer running the LoggerNet server to which you are trying to connect. This must be the valid name of an existing computer or a TCP/IP address (in the form ###.###.###.### consisting of the IP network number, ###.###.###, and the host number, ###). If the software server resides on the same computer as the client, you can simply type in LocalHost for the server name.

### NOTE

If you have used a command line argument to change LoggerNet's default port number, you must specify this alternate port number when entering the Server Address (e.g., LocalHost:**6700** or 192.168.7.123:**6700**).

**Username** - Your username on the software server.

**Password** - Your password for the software server.

The **User Name** and **Password** fields are required only if your server administrator has set up security on your system.

Each time you start the client, you will be prompted to enter this information. However, you can save the login information by selecting the **Remember username and password** check box, or you can select the **Automatically login to this server** check box to skip this window and use the information from the last session.

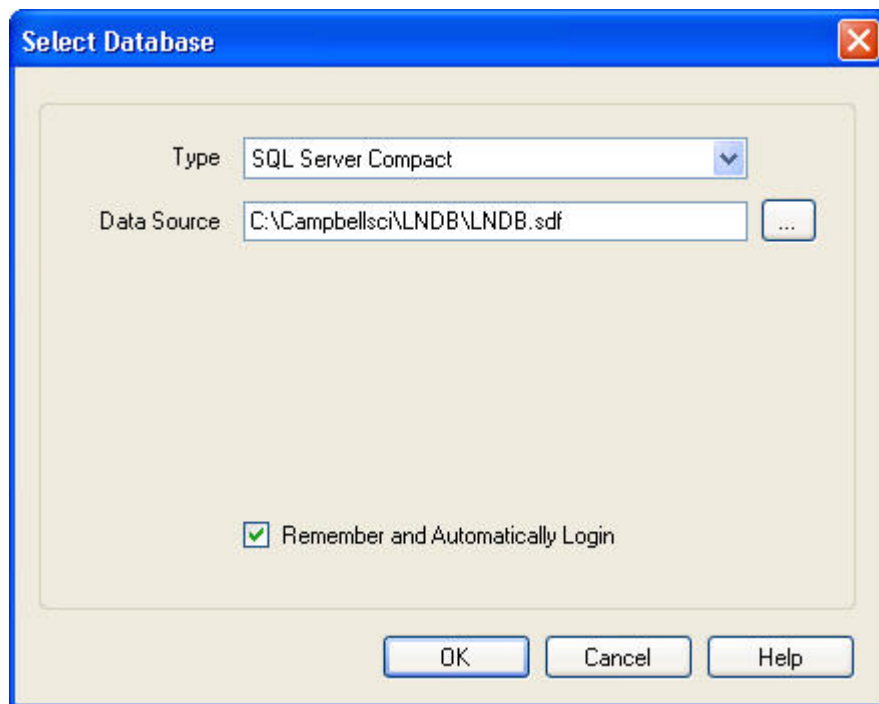
**NOTE**

All information must be saved for the LNDB Engine. The **Remember username and password** check box and the **Automatically login to this server** check box apply only to the LNDB Manager.

## 2.3 Selecting a Database

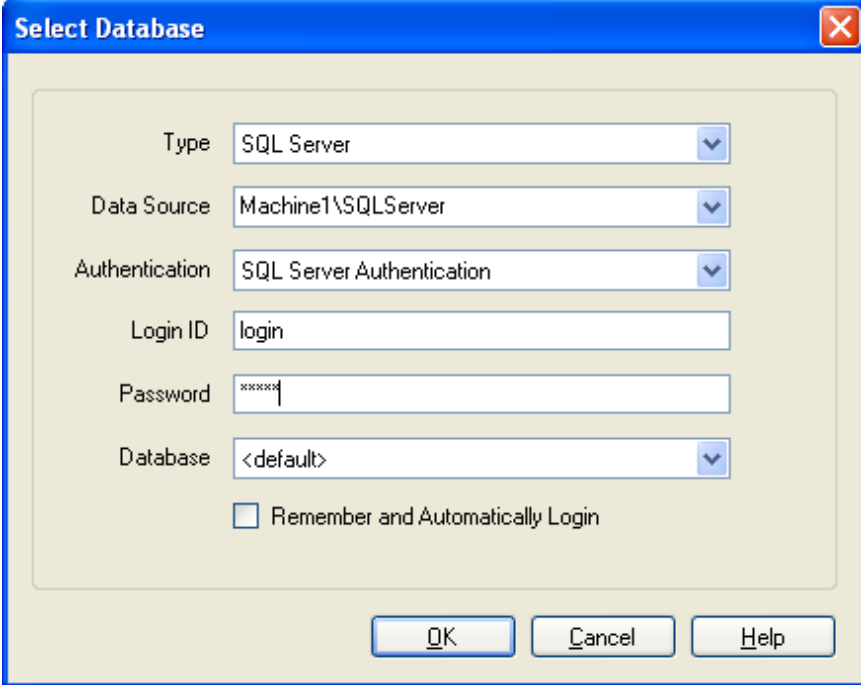
The Select Database dialog box comes up automatically the first time LNDB is opened once the service is installed and started and the server is selected. At other times, it can be opened from the File | Select Database menu item or by double-clicking on the DB Connection Status Label on the Status Bar. LNDB supports SQL Server Compact, SQL Server, and MySQL databases. Once you select a database, fill in the necessary information, and click OK, a connection attempt will be made. If the connection succeeds, the database dialog will be closed and the connection will be used for the application. If the connection fails, a message will be shown and the Select Database dialog will continue to be shown.

### 2.3.1 SQL Server Compact



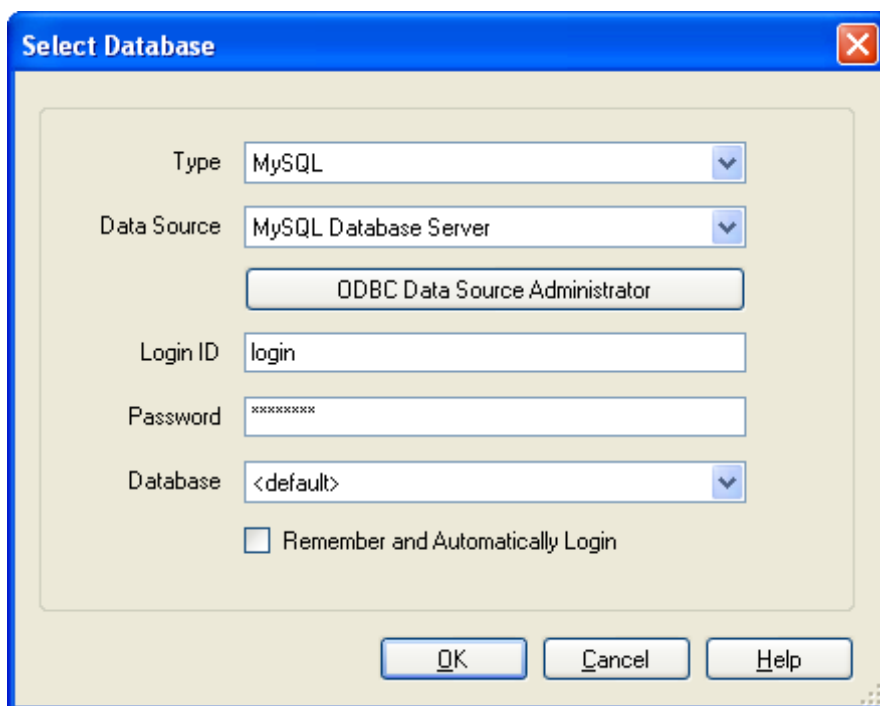
SQL Server Compact is an embedded database that just requires the selection of a filename. The default location of the database will be *<working directory>\LNDB.sdf*. LNDB does not support any encryption or security options on the SQL Server Compact database. When selecting the database within the LNDB Manager, the database will be created when the **OK** button is pressed.

### 2.3.2 SQL Server

A screenshot of a Windows-style dialog box titled "Select Database". The dialog has a blue title bar with a close button (X) in the top right corner. The main area is light beige and contains several controls: a "Type" dropdown menu set to "SQL Server", a "Data Source" dropdown menu set to "Machine1\SQLServer", an "Authentication" dropdown menu set to "SQL Server Authentication", a "Login ID" text box containing "login", a "Password" text box with masked characters "xxxxx", and a "Database" dropdown menu set to "<default>". Below these controls is a checkbox labeled "Remember and Automatically Login" which is currently unchecked. At the bottom right of the dialog are three buttons: "OK", "Cancel", and "Help".

To configure a connection to SQL Server you must select a SQL Server instance. The list of published SQL Server instances is shown in the Data Source combo box. You can also type into the Data Source combo box, because the desired server might not be published. Windows Authentication or SQL Server Authentication can be selected. Windows Authentication does not require a username and password, but rather uses Windows user accounts to authenticate valid users. SQL Server Authentication requires a login ID and Password and is independent of Windows user accounts. You can select the <default> database or select a specific database from the Database combo box.

### 2.3.3 MySQL



The MySQL connection is an ODBC connection. You must use the Windows ODBC Data Source Administrator to configure the database connection. Currently only system data sources are supported and show in the Data Source combo box. The Login ID and Password may be optional. They will be set to blank in the connection string. It has been found that when set to blank, the login id and password configured in the system data source are used. You can select the <default> database (default as configured in the data source) or select a different database.

### 2.3.4 Remember and Automatically Login

If you select the **Remember and Automatically Login** check box, the Login ID and Password will be remembered and the next time the application starts an attempt will be made to login without showing the dialog again. Regardless of whether this check box is selected, all other information (Database Type, Data Source, etc.) will be remembered for all databases.

If you do not check the **Remember and Automatically Login** check box, the username and password are still saved so the LNDB Engine can connect to the database. However, in this case, the username and password are not automatically filled in on the login dialog box.

### 3. Selecting Datalogger Tables

The first tab on the main screen is Setup. From this screen, you select the datalogger tables for which you would like to move data into the database. The right side of the screen changes depending upon whether a station or a table is highlighted in the left tree as described below.

If you check a station in the left tree, all final storage tables for the station are selected. This includes all tables except Public, Status, ports\_and\_flags, and \_\_inlocs\_\_. If a table has a conflict and is enabled for storage, its icon and its parent station's icon are overlaid with an error icon.

The toolbar at the top of the Setup tab can be used to **Select All Final Storage Tables** for all stations or to **Deselect All Tables** for all stations.

If a change is made to the setup, the **Apply** and **Cancel** buttons are enabled. Press **Apply** to save the pending edits and restart the engine. Press **Cancel** to undo the pending edits.

---

**NOTE**

If a station, table or column that is enabled for storage has an invalid name (i.e., contains ', ", or `), an icon and text indicating such is placed at the top of the screen. The issue can be resolved by changing the station name in LoggerNet's Setup Screen or by changing the table or column name in the CRBasic program.

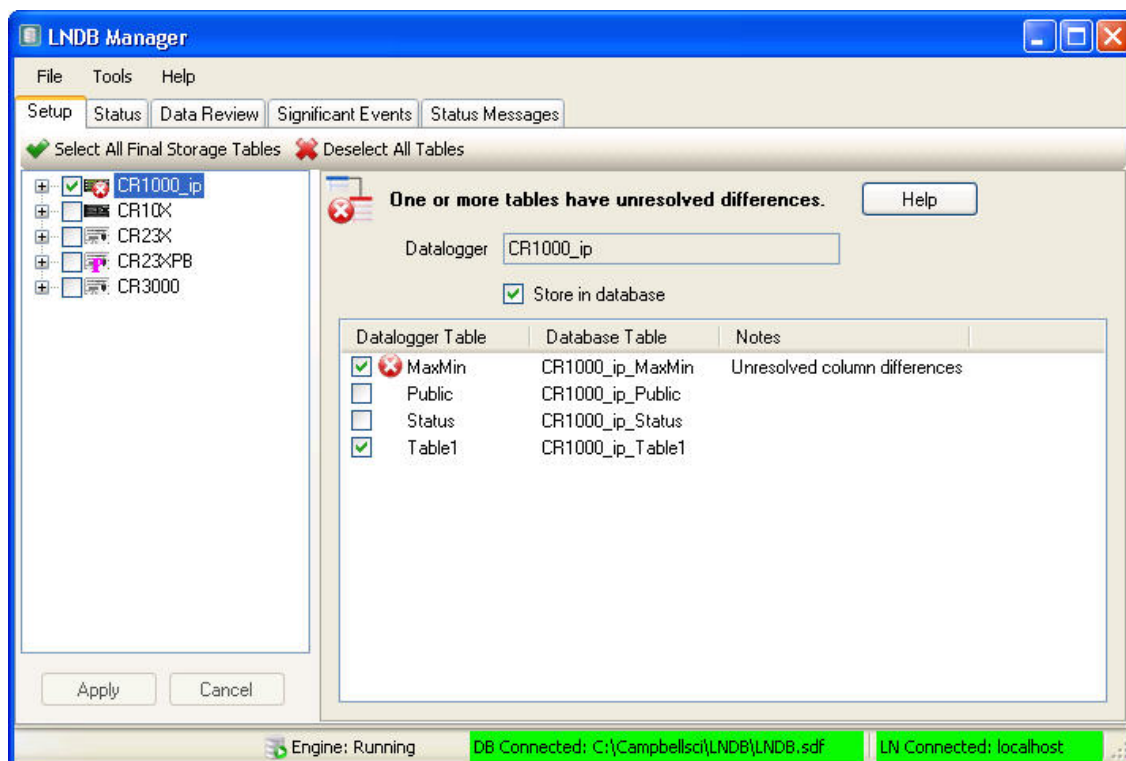
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### 3.1 Station Setup

When a station is highlighted in the left tree, the Station Setup screen is shown. On the Station Setup screen, tables can be enabled/disabled for storage by selecting/deselecting the check boxes next to the table names.

A conflict exists for a table when datalogger columns do not match database columns.

If in "Stop Storing Data" mode (see Section 4.0 Options) and conflicts exist, an icon is placed next to the table with the conflict. Also a larger icon with bold text stating there are conflicts is placed at the top of the station setup screen. To resolve a conflict, right-click on the table name on the right side of the screen and select **Resolve**. This brings up the Resolve Table dialog box which allows you to resolve the conflict. (For more information on resolving a conflict, see Section 5.)



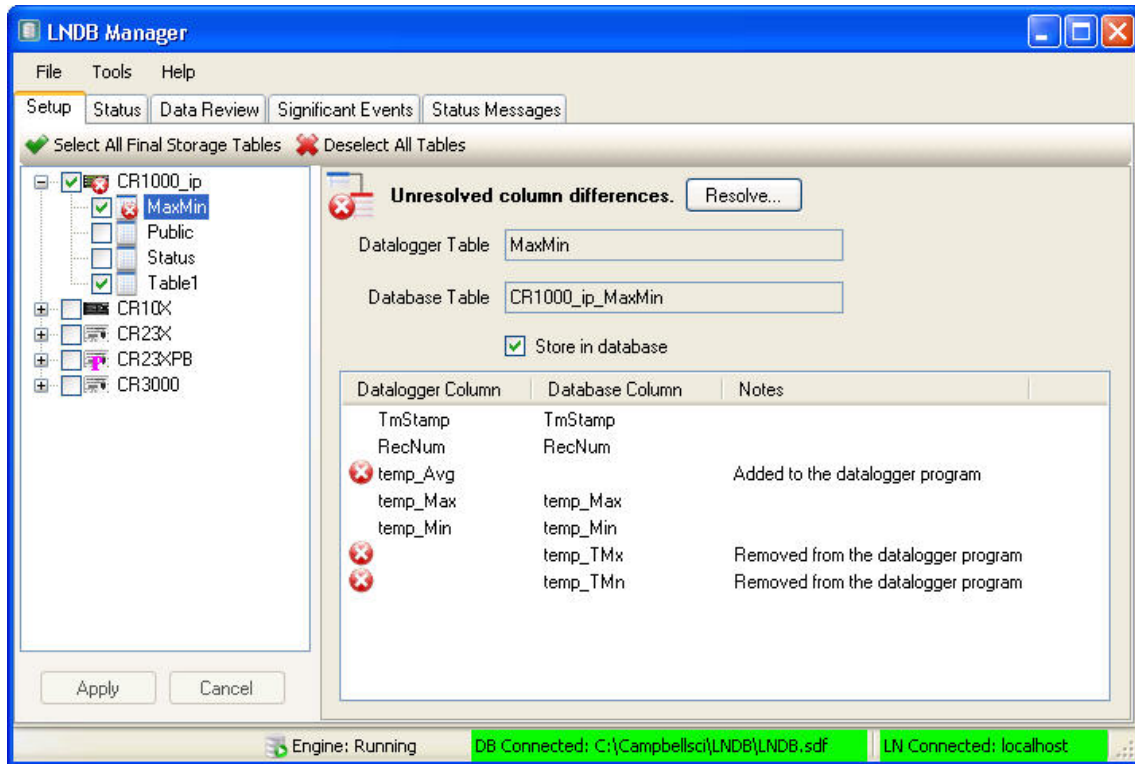
### 3.2 Table Setup

When a table is highlighted in the left tree, the right side contains the Table Setup screen. Clicking the **Store in database** check box will enable storage for the table.

The datalogger columns and database columns are listed side by side. If the database table does not currently exist, the name of the column that will be created is listed next to the datalogger column. If the database table does exist and you have chosen "Stop Storing Data" or "Modify/Archive Database Table" when table definitions change, the datalogger columns are matched up with the database columns. Blank spaces exist where there is not a corresponding datalogger or database column.

If in "Stop Storing Data" mode, the table is enabled for storage, and a conflict exists, an icon is placed next to those columns with conflicts. An icon and bold text stating there is a conflict is also placed at the top of the screen. A

**Resolve...** button is made visible and can be used to resolve the conflict. (For more information on resolving a conflict, see Section 5.)





## 4. Options

The Tools | Options menu item can be used to set the options for LNDB. The following options are available:

### When Tables Change

This tab allows you to determine what will happen when table definitions change. You can choose from the following options:

#### Stop Storing Data

Storing data to the database for the individual table stops if table definitions change. You must manually resolve the change.

#### Archive Database Table (continue storing)

The table is automatically archived when table definitions change. Following the archive, the database table is automatically recreated and LNDB begins to store data into the newly created table.

An archive consists of renaming the existing table. The new name is chosen by attaching "\_arch#" to the original name. # is chosen by starting with 1 and increasing until a table name is found that does not already exist.

#### Modify/Archive Database Table (continue storing)

When table definitions change:

New columns are added to the database table. (Previous rows are filled with NULL.)

Old columns are orphaned. (Columns are left, new records contain NULL.)

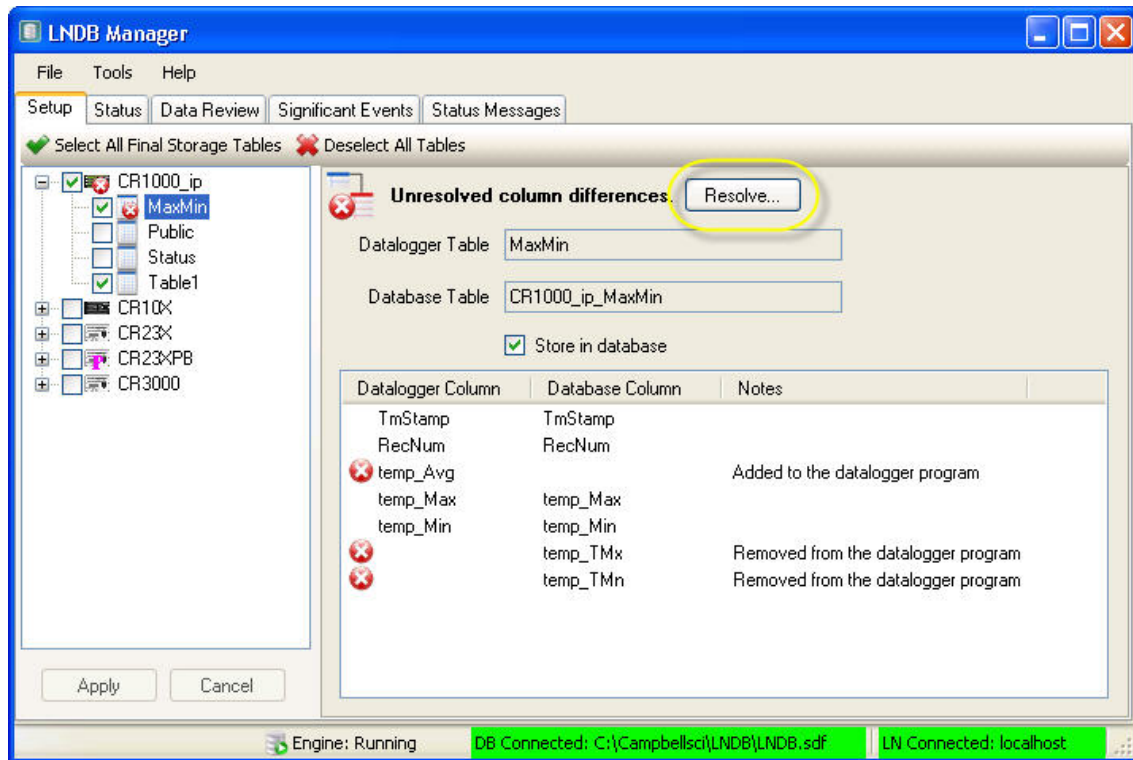
If any column's process, units, or data type change the table is archived.

### Data Review Options

This tab allows you to select the number of records to be shown in LNDB's Data Review tab. The maximum number of records to show is 100,000.

## 5. Resolving a Conflict

A conflict exists for a table when datalogger columns do not match database columns. If in "Stop Storing Data" mode (see Section 4 Options), the conflict must be manually resolved by selecting the table in the left tree of the Setup tab and then pressing the **Resolve...** button on the Table Setup screen. (Alternately, you can select the datalogger in the left tree of the Setup tab, right click on the table name on the right side of the screen, and select **Resolve**.)

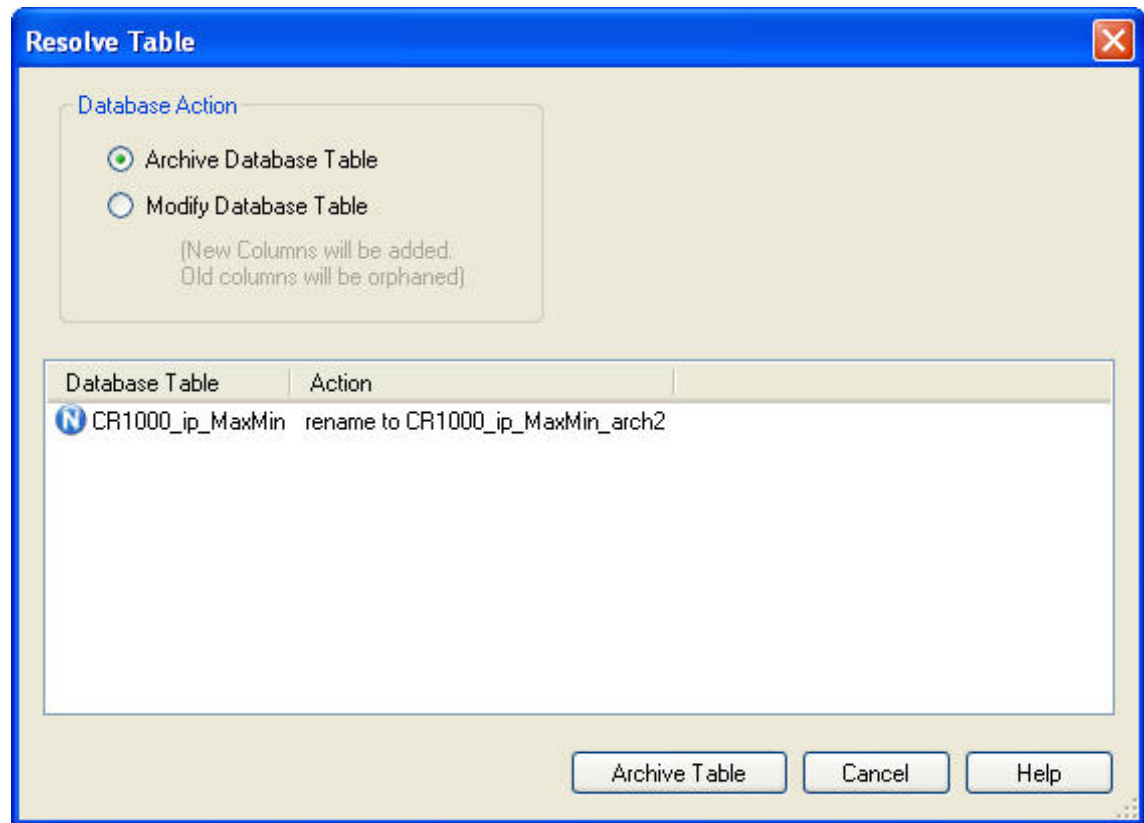


Clicking the **Resolve...** button brings up the Resolve Table dialog. You have two options:

1. Archive Database Table.
2. Modify Database Table. (This option is disabled if a column's process, units or data type has changed. The only way to resolve these conflicts is to archive the database table.)

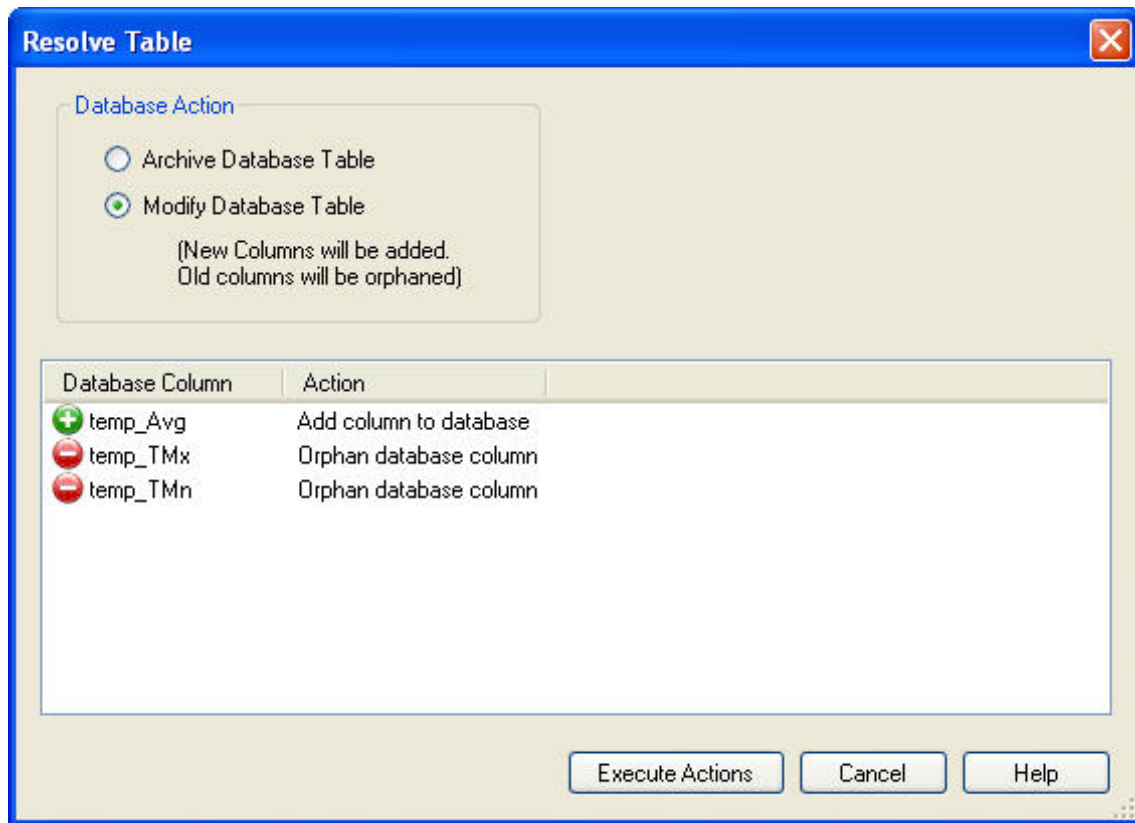
Once a conflict has been resolved, the conflict icons and bold text are removed. Storage begins (or continues) for the table once the action(s) have completed.

## 5.1 Archive Database Table



If **Archive Database Table** is selected, the database table name is shown with the action stating that the table will be renamed to a specific new name. Press the **Archive Table** button to archive the table.

## 5.2 Modify Database Table

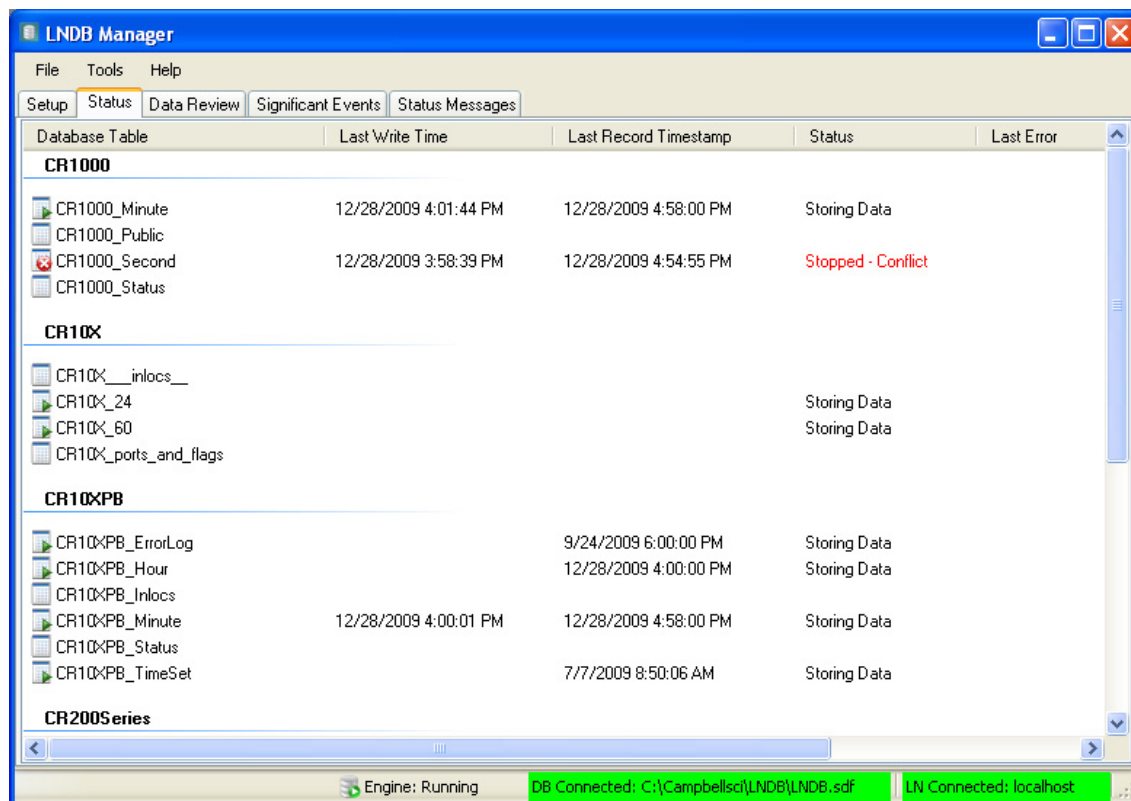


If **Modify Database Table** is selected, each column that has a conflict is shown with the proper action displayed. Each action is done when you click the **Execute Actions** button.

## 6. Checking Status and Reviewing Data

The function of the Setup Tab of LNDB's main screen is described in Section 3. The other tabs on the main screen can be used to check the status of LNDB and to review LNDB's data. The Status Bar at the bottom of the LNDB main screen can also be used to quickly check the status of the LNDB engine, database, and LoggerNet server. All of these functions are described below.

### 6.1 Status Tab



The screenshot shows the LNDB Manager application window with the 'Status' tab selected. The window has a menu bar (File, Tools, Help) and a tab bar (Setup, Status, Data Review, Significant Events, Status Messages). The main area displays a table with columns: Database Table, Last Write Time, Last Record Timestamp, Status, and Last Error. The tables are grouped by station: CR1000, CR10X, CR10XPB, and CR200Series. The status of each table is indicated in the 'Status' column.

Database Table	Last Write Time	Last Record Timestamp	Status	Last Error
<b>CR1000</b>				
CR1000_Minute	12/28/2009 4:01:44 PM	12/28/2009 4:58:00 PM	Storing Data	
CR1000_Public				
CR1000_Second	12/28/2009 3:58:39 PM	12/28/2009 4:54:55 PM	Stopped - Conflict	
CR1000_Status				
<b>CR10X</b>				
CR10X__inlocs__				
CR10X_24			Storing Data	
CR10X_60			Storing Data	
CR10X_ports_and_flags				
<b>CR10XPB</b>				
CR10XPB_ErrorLog		9/24/2009 6:00:00 PM	Storing Data	
CR10XPB_Hour		12/28/2009 4:00:00 PM	Storing Data	
CR10XPB_Inlocs				
CR10XPB_Minute	12/28/2009 4:00:01 PM	12/28/2009 4:58:00 PM	Storing Data	
CR10XPB_Status				
CR10XPB_TimeSet		7/7/2009 8:50:06 AM	Storing Data	
<b>CR200Series</b>				

At the bottom of the window, the status bar shows: Engine: Running, DB Connected: C:\Campbellsci\LNDB\LNDB.sdf, and LN Connected: localhost.

The Status tab shows the storage status for each datalogger table. The following columns are shown:

**Database Table** - The database table name for each station's table. They are grouped by station.

**Last Write Time** - The last time that data was written to the database table.

**Last Record Timestamp** - The timestamp of the last record in the database table.

**Status** - There are 3 valid values:

*Storing Data* - Data for the table is being stored.

**Stopped** - Conflict: The table has a conflict and storage has stopped.

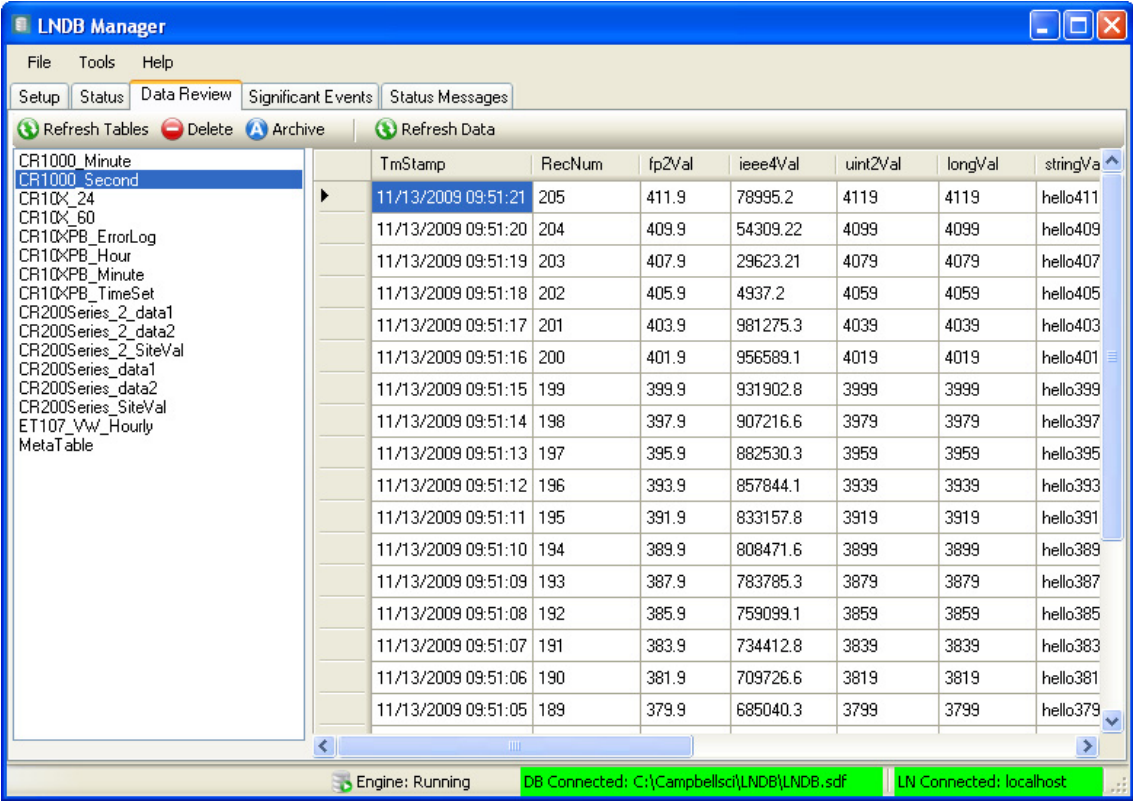
**Blank** - Not storing data for this table.

**Last Error** - The last database error (insert error, error creating a database table, or error retrieving the start conditions) for the given table. This value is only reset when you restart the engine.

The Status columns can be sorted. When you click a column other than the Database Table column, the grouping of tables by station is removed and the records are sorted. Click the Database Table column to again group the tables by station.

When the engine is stopped all engine statistics are cleared.

6.2 Data Review Tab



The Data Review tab shows tables and data from the database. When a table on the left side is selected, the data for the table is shown on the right side. You can refresh tables or data by clicking the corresponding refresh button.

## 6.2.1 Deleting or Archiving Tables

All database tables except the meta tables (LNDBStationMeta, LNDBTableMeta, and LNDBColumnMeta) can be removed by clicking the **Delete** button or archived by clicking the **Archive** button. If a meta table is selected, the **Delete** and **Archive** buttons are grayed out.

When you archive a table, you are asked for an archive name. The default name is *<basename>\_arch<number>*. *Baseline* is the first part of the name before the first "\_arch". *Number* is the smallest number that makes the table name unique. The maximum number of characters allowed for the table name is 64 for MySQL and 128 for SQL Server and SQL Server Compact.

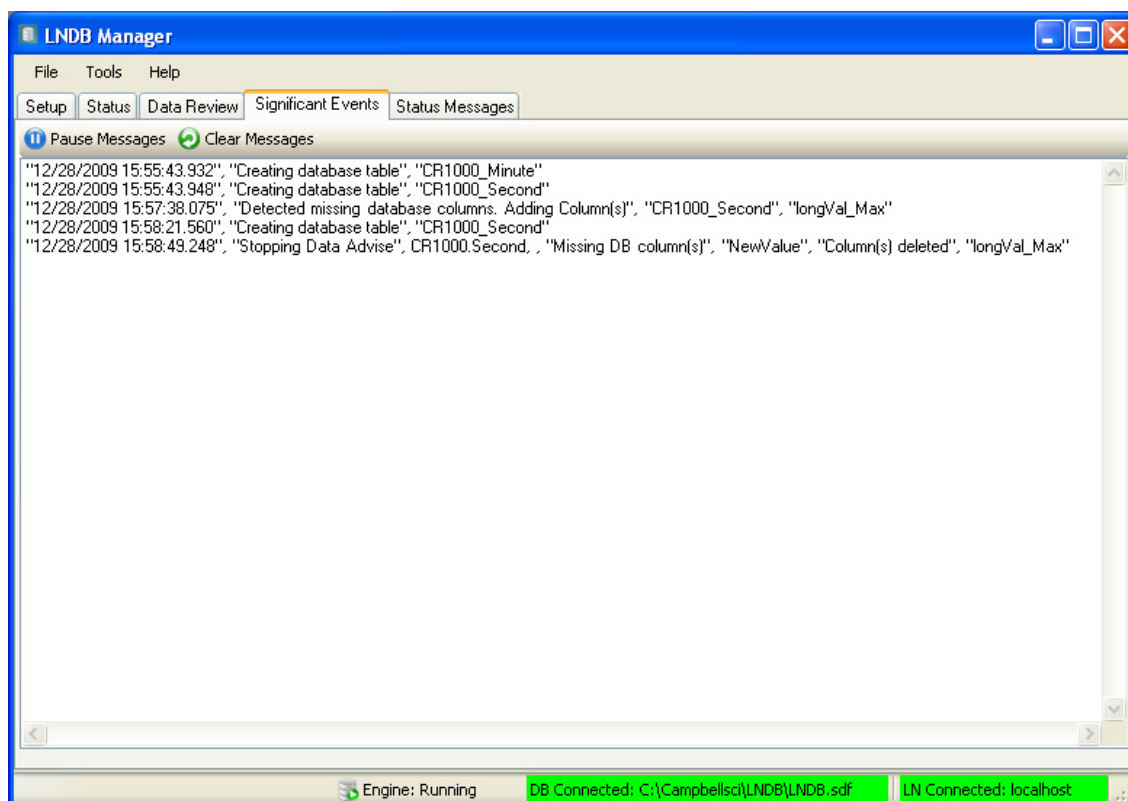
Upon completion of a Delete or Archive, any conflicts for the table are removed and storage is restarted for the table (if enabled for storage).

### NOTE

When storage begins for a newly created table, data always backfills and starts at the oldest available record. It does not start at the last record from the deleted or archived table. Therefore, a table may be recreated so quickly after deletion, that it may appear as if the table was not actually deleted.

The format of timestamp columns is based on the precision of the first two records shown. If the time has second data, it will be shown. If the time has sub-second data, it will show 3 or 7 decimal places based on the precision.

## 6.3 Significant Events Tab



The Significant Events tab shows significant messages. The messages can be paused by clicking the **Pause Messages** button. Up to 400 messages are displayed, after which the oldest is removed when new messages are added. If you close down LNDB Manager and reopen it, the messages are not lost. Clicking the **Clear Messages** button permanently removes the messages. They are not shown again the next time LNDB Manager is started.

The Significant Events include:

Database Table Created

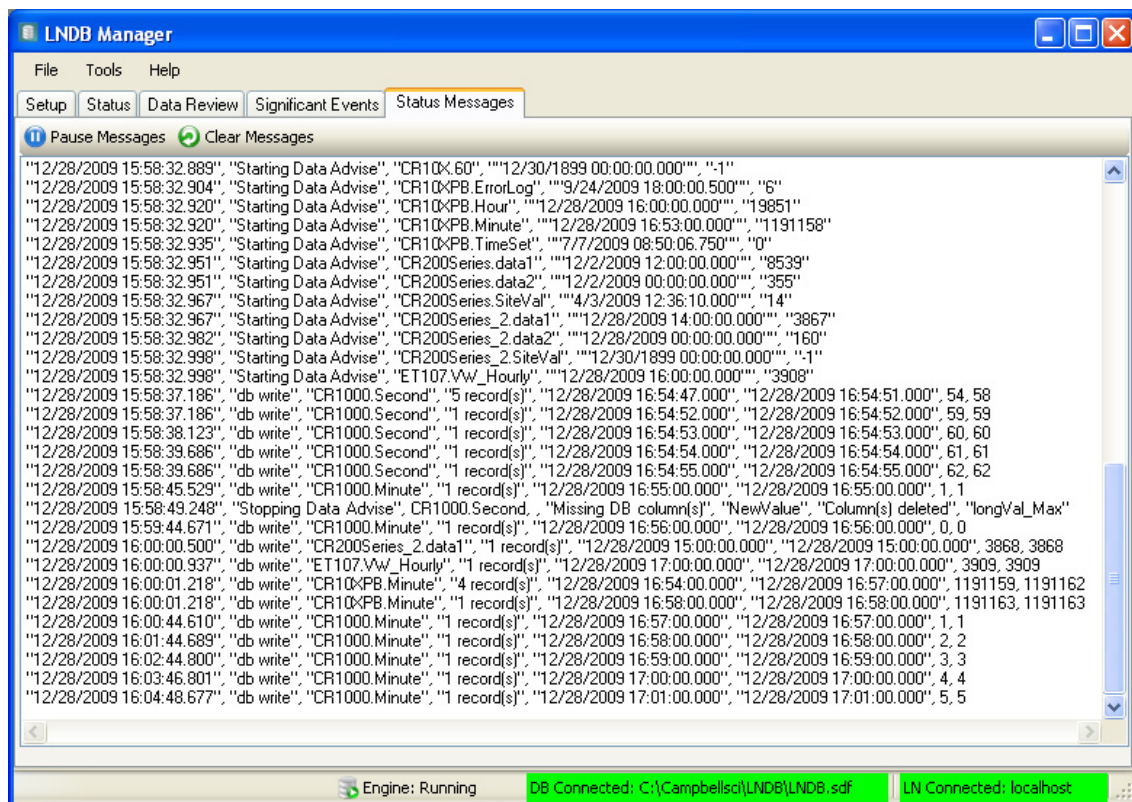
Database Table Modified

Database Table Archived

Database Table Storage Stopping due to a conflict

Insert Record Failure

## 6.4 Status Messages Tab



The Status Messages tab shows events and the state of the LNDB Engine. These include the Significant Event messages, data events, LoggerNet events, database events, etc. The **Pause Messages** button pauses the displaying of new messages. These messages are not persistent and ring at 100 messages. When LNDB Manager closes and reopens, or if you click the **Clear Messages** button, the messages clear and are not shown again.



## 6.5 Log Files

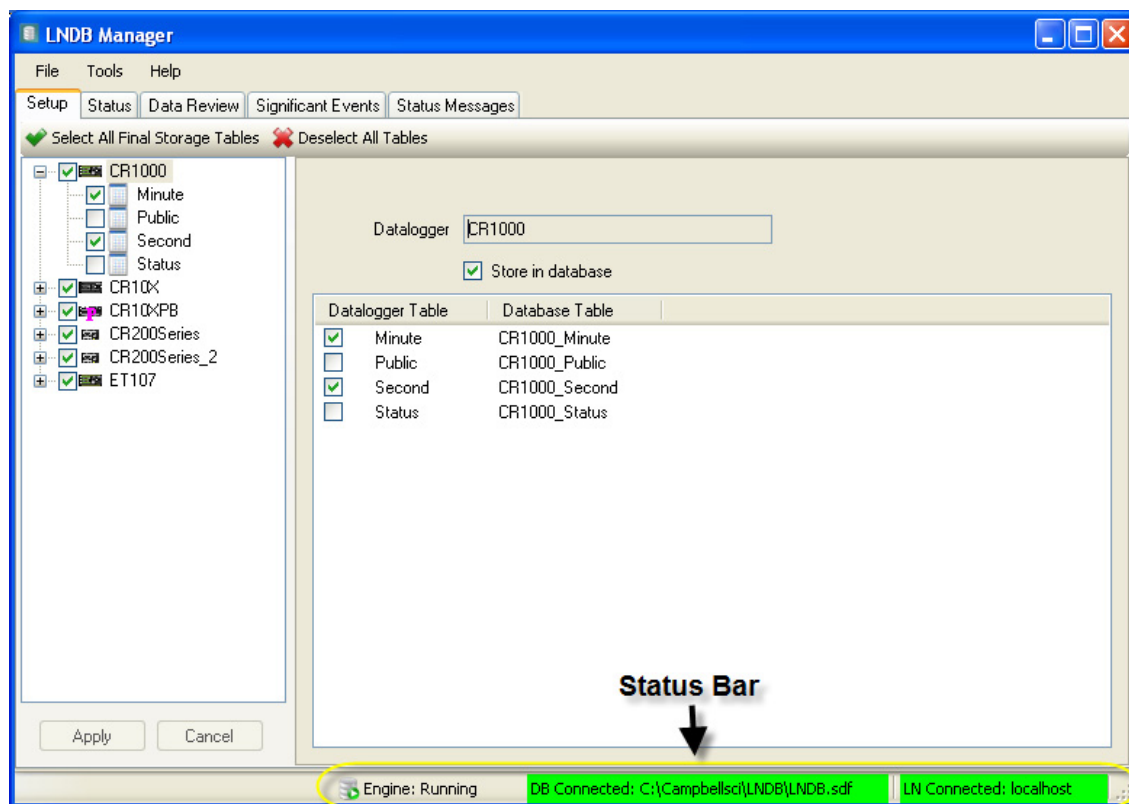
LNDB creates three log file types that are stored at <working directory>\logs. For each log file type, there can be up to ten 1MB files. Once the tenth log file reaches 1 MB, the oldest file will be overwritten with new messages. The three log file types are:

**Significant.log** - Contains the Significant Event messages. (See Section 6.3 Significant Events Tab.)

**State.log** - Contains all of the Status Messages. (See Section 6.4 Status Messages Tab.)

**<database name> \_Failed Inserts.log** - Contains SQL insert statements for all records that failed to be inserted. This log contains no error information.

## 6.6 Status Bar



The Status Bar at the bottom of the main screen has three status labels:

**LNDB Engine Status Label** - Shows the state of the LNDB Engine.

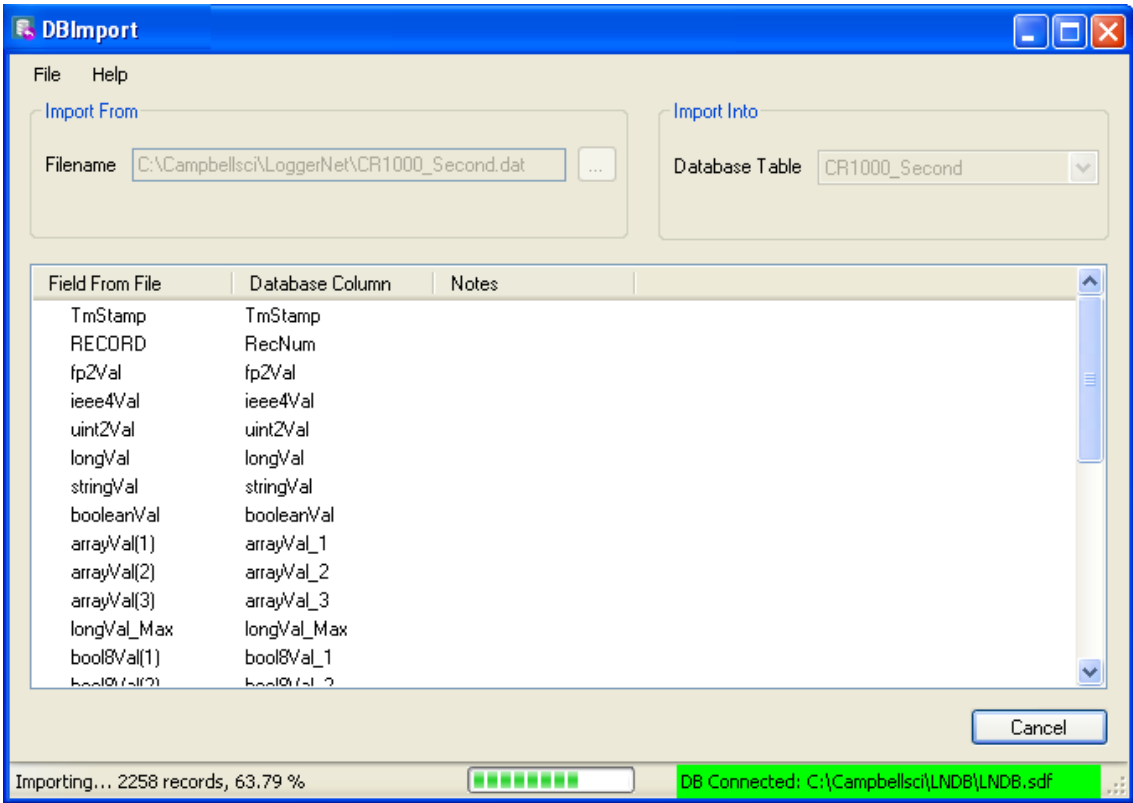
**DB Connection Status Label** - Shows the selected data source and whether the connection is not connected, connecting, or connected.

**LN Connection Status Label** - Shows the LoggerNet host and port (if not the default port 6789) and whether the connection is not connected, connecting, or connected.

You can use the Status Bar as an alternative to LNDB's File menu. Double-click on any of the Status Bar labels to bring up the corresponding dialog box (i.e., the LNDB Engine Status Label to bring up the LNDB Engine Service Manager, the DB Connection Status Label to bring up the Select Database dialog box, or the LN Connection Status Label to bring up the Login to LoggerNet Server dialog box).

## 7. Importing Data

The DBImport utility, launched from LNDB's Tools | Import Data menu item, is used to import data from a data file into a database table.



### 7.1 Database Selection

When launched for the first time, DBImport uses the database selected for LNDB. You can change this selection using DBImport's File | Select Database menu item. The DBImport database selection will then be independent of LNDB's database selection. The database selection dialog is identical to the one used in LNDB. If you select Remember and Automatically Login, the login information is only remembered for DBImport.

## 7.2 Import From

The Filename field is used to indicate the file from which data is to be imported. Only table-based data files are supported and can be imported. Press the browse button (...) to browse to the desired file.

## 7.3 Import Into

The Database Table combo box is filled with all tables from the selected database. Select the table into which the data should be imported.

## 7.4 Data File Columns vs. Database Table Columns

After a file is selected, the list of data fields from the file is placed in the list view under the heading Field From File. After a database table is selected, the list of column names from the database table is placed in the list view under the heading Database Column.

The data file fields and database columns are matched up. Data file fields that do not have a corresponding database column have an attached note indicating that the *"Database column is missing"*. Columns in the database table that do not have a corresponding data file field have a note indicating that the *"Column does not exist in file"*.

## 7.5 Import Requirements

A file can be imported if all the data file fields have a corresponding database table column. This means that there can be extra database columns that do not have a corresponding data file field. If there are data file fields that do not have corresponding database columns, a bold note next to the import button indicates *"Fields from the file are not compatible with database table columns"*. In this case, the data file cannot be imported into the database table.

No check is made to validate the columns units, process, or data type. If the data type is not compatible, the insert will likely fail and you will be notified of the failure.

## 7.6 Import

Once the data file and database table are selected, press the **Import** button to begin importing data. Data import will begin if the file is compatible with the selected database table as described above.

## 8. Exporting Data

The DBExport utility, launched from LNDB's Tools | Export Data menu item, can be used to export data from a database table into a data file.

The screenshot shows the DBExport utility window with the following settings:

- Export From:**
  - Database Table: CR1000\_ip\_MaxMin\_arch5
  - Columns: temp\_Avg, temp\_Max, temp\_TMx, temp\_Min, temp\_TMn
  - Custom Columns button
- Export Into:**
  - Filename: C:\Campbellsci\LNDB\CR1000\_ip\_MaxMin.c
  - File Format: TOA5
- Check For Missing Records:**
  - Check Time: (dropdown menu)
  - Table Interval: 0 d 00 h 01 m 00 s 000 ms
- Date - Time Range:**
  - Start:** Date: 11/18/2009, Time: 12:38:00 PM
  - End:** Date: 12/29/2009, Time: 4:10:00 PM
  - ☐ Lock Current Start - End Times
  - ☒ Include End Record
- Buttons:** Export, Abort
- Status Bar:** DB Connected: C:\Campbellsci\LNDB\LNDB.sdf

## 8.1 Database Selection

When launched for the first time, DBExport launches the database selection dialog which allows you to select the database from which to export data. The database selection dialog is identical to the one used in LNDB. If you select **Remember and Automatically Login**, the login information is only remembered for DBExport.

You can change the database selection at any time using DBExport's File | Select Database menu item or by double-clicking on the database connection status panel at the bottom of the DBExport window.

## 8.2 Export From

### Database Table

The **Database Table** combo box is filled with all tables from the selected database. Select the table from which the data should be exported.

### Columns

This list box contains a list of all data columns that will be exported. By default, the list contains all columns in the selected database table. Press the Select Columns button to select a custom set of columns. (See Section 8.6 Select Columns.)

### Date – Time Range

#### Start Date/Time and End Date/ Time

These fields are used to determine what data will be exported to the file. The Start and End controls can be set by the user. When a new database table is selected the Start time is set to the timestamp of the oldest record for the table in the database. The End time is set to the newest. The **Lock Current Start - End Times** checkbox can be used to prevent this.

#### Lock Current Start – End Times

When this check box is selected, the Start and End date/time controls will not be updated when a new table is selected. They will keep their current settings.

#### Include End Record

When this check box is selected, a record that matches the date and time specified in the **End** control will be included in the data file. If the check box is not selected, that record will not be included. To export the entire set of data this control should be checked.

## 8.3 Export Into

### Filename

The **Filename** field is used to indicate the file to which data should be exported. Press the browse button (...) to browse to the desired file.

### File Format

The **File Format** is used to select the format in which the data file should be saved. Select the desired option from the list box:

#### TOACII

Data is stored in a comma separated format. Header information for each of the columns is included.

#### TOA5 (ASCII Table Data)

Data is stored in an ASCII comma separated format. Header information for each of the data values is included, along with field names and units of measure if they are available. When this option is selected, the browse button to the right of the field is available. Pressing this button opens a window from which you can specify whether timestamps and record numbers are included with each record.

#### TOB1 (Binary Table Data)

Data is stored in a binary format. Though this format saves disk storage space, it must be converted before it is usable in other programs. When this option is selected, the browse button to the right of the field is available. Pressing this button opens a window from which you can specify whether timestamps and record numbers are included with each record.

#### CSIXML

Data is stored in XML format with Campbell Scientific defined elements and attributes. When this option is selected, the browse button to the right of the field is available. Pressing this button opens a window from which you can specify whether timestamps and record numbers are included with each record.

#### Custom\_CSV

Data is stored in a user-defined comma separated format. This option can be used to produce output files from table data dataloggers that are similar to those created by mixed array dataloggers. When this option is chosen, the Array CSV Options button becomes available, so that you can customize the data string for the CSV file. (See Section 8.7 Array Compatible CSV Options.)

## 8.4 Check for Missing Records

Select an option from this list box to determine whether DBExport checks for missing records.

### **No Checking**

DBExport does not check for missing records.

### **Check Time**

DBExport checks for missing records based on the data timestamps and the interval entered in the Table Interval field.

### **Check Record Number**

DBExport checks for missing records based on the record number sequence.

### **Check Both**

DBExport checks for missing records based on both data timestamps and record numbers.

### **Table Interval**

Specify the interval of the database table. This interval is used to check for missing records when checking based on time.

## 8.5 Export

Once the database table, data file, and other options are set, press the **Export** button to begin the export. While exporting is in process, you can press the **Abort** button to abort the export.

While export is in process, a progress bar will be displayed. Note that the displayed percentage is based on the Start and End date/times selected and the timestamp of the record currently being processed. If the Start and End date/times are in the table and there is a fairly complete set of interval data between these times, the progress will be fairly accurate. If there are gaps in the data, or if the Start and/or End date/times are not in the data, or if the data is event driven (not interval based), the progress bar may not accurately represent progress.

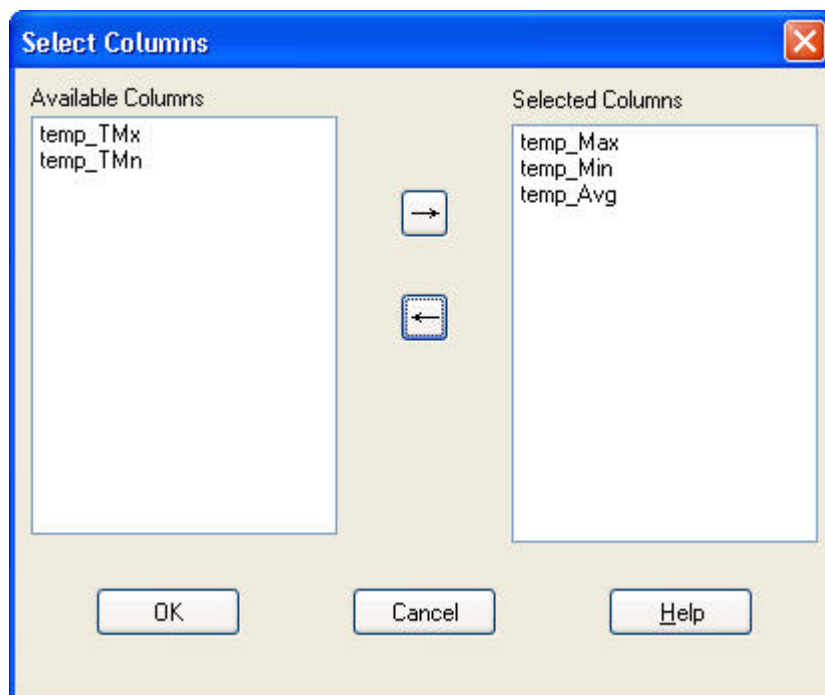
The screenshot shows the DBExport dialog box with the following settings:

- Starting export:** CR1000\_ip\_MaxMin\_arch5
- First Record. Timestamp:** 2009-11-18 12:38:00.000 **Record Number:** 0
- Export From:**
  - Database Table:** CR1000\_ip\_MaxMin\_arch5
  - Columns:** temp\_Avg, temp\_Max, temp\_TMx, temp\_Min, temp\_TMn
  - Custom Columns:** (button)
- Export Into:**
  - Filename:** C:\Campbellsci\LNDB\CR1000\_ip\_MaxMin.c
  - File Format:** TOA5
- Check For Missing Records:**
  - Check Time:** (dropdown menu)
  - Table Interval:** 0 d 00 h 01 m 00 s 000 ms
- Date - Time Range:**
  - Start:** Date: 11/18/2009, Time: 12:38:00 PM
  - End:** Date: 12/29/2009, Time: 4:10:00 PM
  - ☐ Lock Current Start - End Times
  - ☒ Include End Record
- Buttons:** Export, Abort
- Status Bar:** DB Connected: C:\Campbellsci\LNDB\LNDB.sdf



## 8.6 Select Columns

When the **Select Columns** button is pressed, the Select Columns dialog box appears.



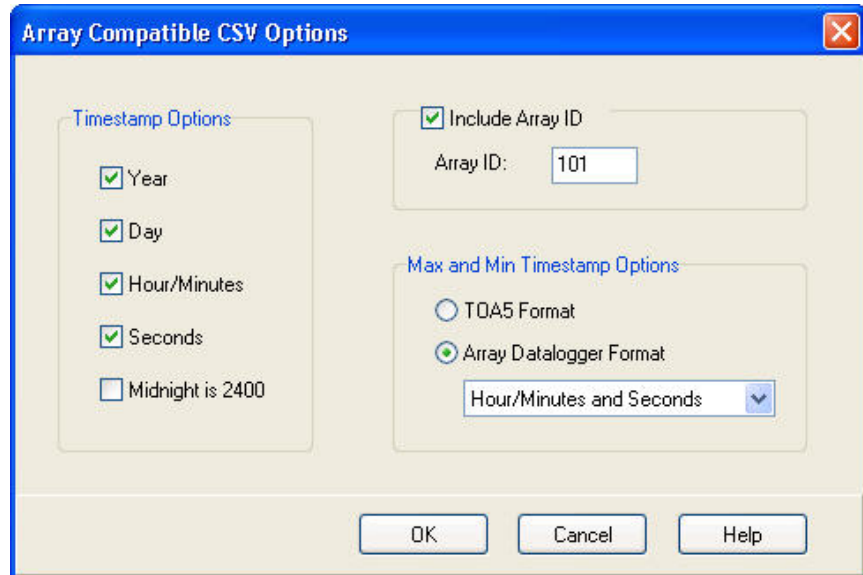
The **Available Columns** field will list all of the available data columns in the selected database table that are not currently included for export. To choose a column to be exported, highlight it and press the right arrow button or, alternately, double-click the column name. This moves the column heading into the **Selected Columns** field. When the dialog box is closed, the columns will be added to the Columns list and will be included in the export.

Columns can be reordered in the Selected Columns field by dragging and dropping them to the desired location.

Columns can be removed from the export by moving them back into the **Available Columns** field using the left arrow button.

## 8.7 Array Compatible CSV Options

When File Format is set to Custom\_CSV, the browse button next to the field can be pressed to open the Array Compatible CSV Options dialog box. This dialog box is used to customize the output file produced by DBExport. It is most often used to produce output files from table data dataloggers that are similar to those created by mixed array dataloggers.



If an array ID is desired, select the **Include Array ID** check box and enter a value into the field. The value can range from 1 to 1023. The array ID will be the first value in the array of data.

Select the appropriate timestamp options for the type of timestamp to write to the file. Each time element will be output as a separate data value in the array and the data values will be separated by a comma. Selecting **Year** will output the year represented by four digits, YYYY (e.g., 2006). The **Day** will be represented as a Julian Day. The **Hour/Minutes** will be represented by four digits (hhmm). When **Midnight is 2400** is selected, the timestamp will reflect midnight as the current date with 2400 for the Hour/Minutes. Otherwise, the timestamp will reflect midnight as the next day's date, with the Hours/Minutes as 0000.

The **Max and Min Timestamp Options** is used to determine the type of timestamp that will be used for Maximum and Minimum outputs that include a timestamp along with the value. You can choose a TOA5 format timestamp (e.g., 2008-10-27 17:17:33.7), a timestamp that includes Hours/Minutes and Seconds (produces two values, hhmm and seconds), a timestamp that includes Hours/Minutes only (hhmm), or a timestamp that includes Seconds only.

## 8.8 Representation of NULL values

When the database table being exported contains NULL values, they will be represented as described in the table below:

NAN representation of NULL values from a database					
Datalogger Data Type	NAN Value	Example	MySQL Type	SQL Server Type	SQL Server Compact Type
IEEE4	Quiet NAN	0x7FFFFFFF (2147483647)	FLOAT	REAL	REAL
LONG	Negative Max(LONG)	-2147483648	INT	INT	INT
SecNano	Jan 1 1990	0	DATETIME	DATETIME	DATETIME
BOOL	False	0	BIT(1)	BIT	BIT
USHORT	Zero	0	SMALLINT UNSIGNED	N/A	N/A
string-spec	Empty String		TEXT	NVARCHAR(MAX)	NVARCHAR(2048)

## 9. QuickReports

QuickReports, launched from LNDB's Tools | QuickReports menu item, is used to design simple reports from an LNDB database. It is very simple and quick and enables you to generate a new report with just a few mouse clicks. The report can then be printed or exported to an Acrobat file.

The QuickReports Setup dialog (see Section 9.2) is displayed every time a new report is created and presents you with a few basic options such as title, time range, database table, and up to 4 data columns. When you accept the settings in the QuickReports dialog, the report is then bound to the selected table. You can customize the report further using each component's property sheet. The report can then be saved and run as a report in the Report Preview window. The Report Preview window paginates the report and gives options to print or export to an Acrobat file.

The saved report can be loaded in RTMC Pro where it can be modified with advanced features and components. When the report is saved in RTMC Pro, it will be saved as a \*.rtmc2 project file. This file cannot be loaded in QuickReports. However, the QuickReports \*.rtmq file will not be overwritten. This file can still be loaded in QuickReports, but it will contain none of the changes made in RTMC Pro.

### 9.1 Database Selection

The Database Source Properties dialog box comes up automatically the first time QuickReports is opened. At other times, it can be opened from the File | Select Database menu item or by double-clicking on the database portion of the status bar at the bottom of the QuickReports window. This dialog box is used to set up the database source for your report.

**Source Name**

Designates the name that will be used for the database in QuickReports.

**Type**

The type of database. Choose a type from the drop-down list.

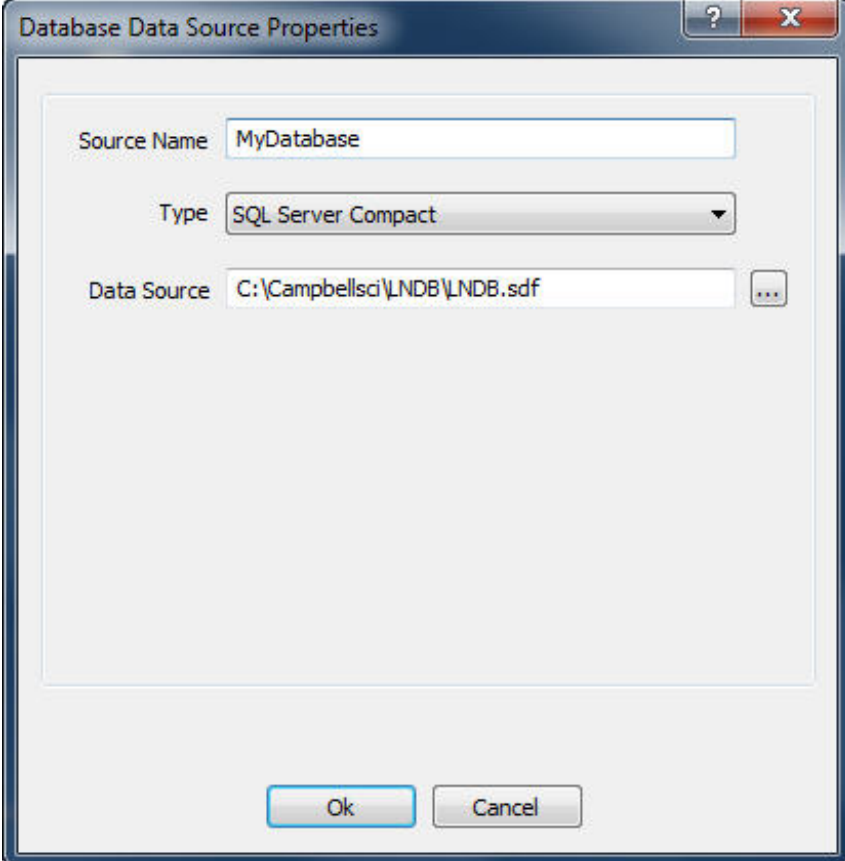
QuickReports supports the same database types as LNDB:

SQL Server Compact

SQL Server

MySQL

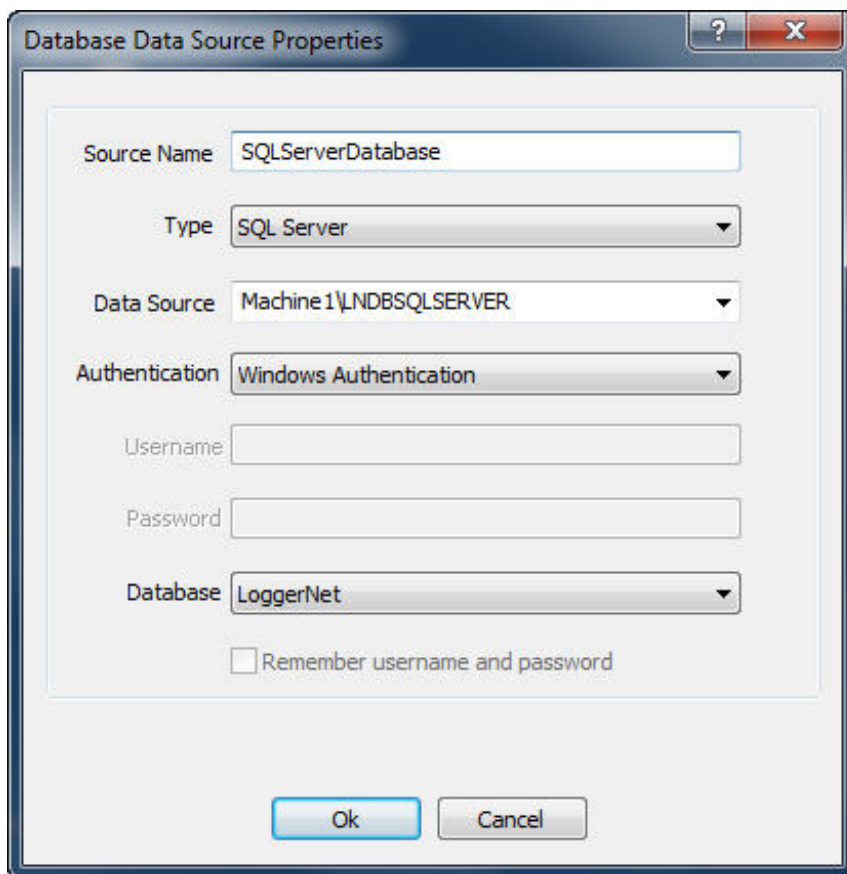
The remaining information changes depending on the database type as described below:

**SQL Server Compact**

The screenshot shows a Windows-style dialog box titled "Database Data Source Properties". It has a standard title bar with a question mark and a close button. Inside the dialog, there are three labeled fields: "Source Name" with the text "MyDatabase", "Type" with a dropdown menu showing "SQL Server Compact", and "Data Source" with the text "C:\Campbellsci\LNDB\LNDB.sdf". To the right of the "Data Source" field is a small button with three dots, typically used for file selection. At the bottom of the dialog are two buttons: "Ok" and "Cancel".

The only additional information needed for a SQL Server Compact database source is the database file to be used. Type in the name directly or press the button to the right of the field to browse to the database file.

## SQL Server



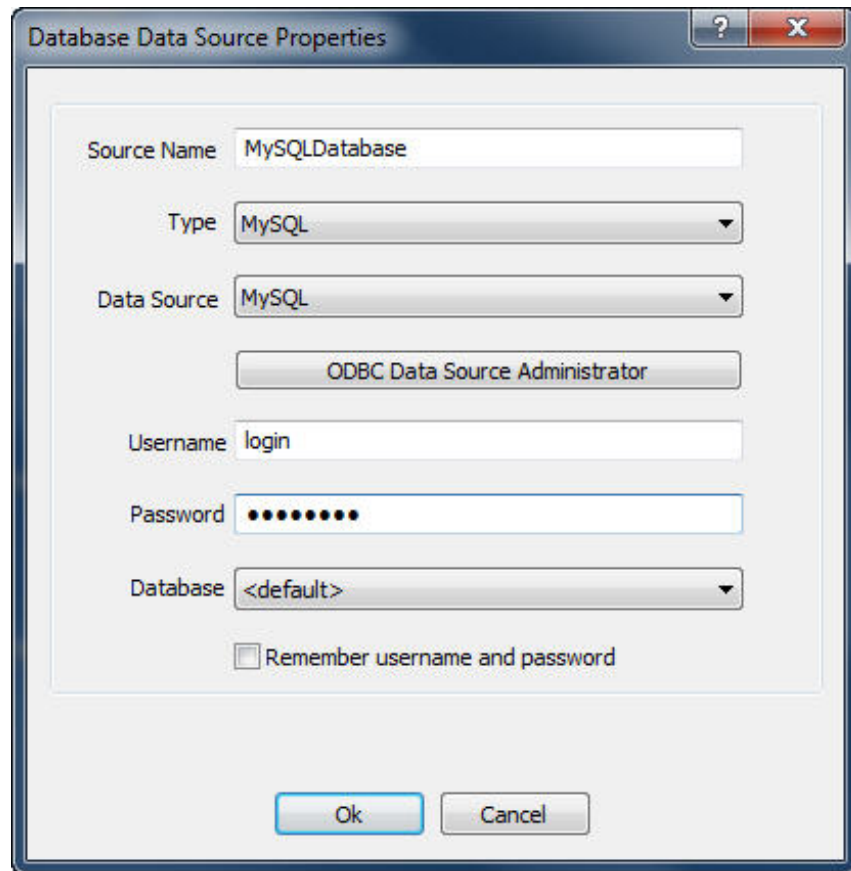
The screenshot shows the 'Database Data Source Properties' dialog box. It contains the following fields and options:

- Source Name:** A text box containing 'SQLServerDatabase'.
- Type:** A dropdown menu set to 'SQL Server'.
- Data Source:** A dropdown menu set to 'Machine1\LNDBSQLSERVER'.
- Authentication:** A dropdown menu set to 'Windows Authentication'.
- Username:** An empty text box.
- Password:** An empty text box.
- Database:** A dropdown menu set to 'LoggerNet'.
- Remember username and password:** An unchecked checkbox.
- Buttons:** 'Ok' and 'Cancel' buttons at the bottom.

To select a SQL Server database source you must select a SQL Server instance. The list of published SQL Server instances is shown in the Data Source combo box. You can also type into the Data Source combo box, because the desired server might not be published. Windows Authentication or SQL Server Authentication can be selected. Windows Authentication does not require a username and password, but rather uses Windows user accounts to authenticate valid users. SQL Server Authentication requires a login ID and Password and is independent of Windows user accounts. You can select the <default> database or select a specific database from the Database combo box.

The **Remember username and password** checkbox can be selected to save the username and password. If this check box is not selected and you are using SQL Server Authentication, you will be required to enter the username and password each time a report is opened that uses this database source.

## MySQL



The MySQL connection is an ODBC connection. You must use the Windows ODBC Data Source Administrator to configure the database connection. Currently only system data sources are supported and show in the Data Source combo box. The Username and Password may be optional. They will be set to blank in the connection string. It has been found that when set to blank, the login id and password configured in the ODBC Data Source Administrator are used. You can select the <default> database (default as configured in the data source) or select a different database.

The **Remember username and password** checkbox can be selected to save the username and password. If this check box is not selected and the username and password were not configured in the ODBC Data Source Administrator, you will be required to enter the username and password each time a report is opened that uses this database source.

## 9.2 QuickReports Setup

The QuickReports Setup window comes up automatically after a new data source has been selected. At other times, it can be opened to edit an existing report by selecting Edit | QuickReports Setup from the menu or by right-clicking on the chart and selecting QuickReports Setup. It can be opened to create a new report by selecting File | New Report from the menu.

This window allows you to designate a title for your report, select the data table that will be used for the report, select the columns of data that will be displayed, and select the date range that will be displayed.

The screenshot shows the 'QuickReports Setup' dialog box. It has a title bar with a question mark and a close button. The main area contains several fields and buttons. At the top, there's a 'Title' field with the text 'Logan Weather'. Below that is a 'Data Table' field with the text 'MySQLDatabase:LoganNW\_OneHour' and a 'Browse...' button to its right. Underneath, there are four 'Data Column' labels (1 through 4) each followed by a drop-down menu. The selected values are 'AirTemp\_Avg', 'RH', 'SlrTotalF\_Tot', and 'WindSpd\_Max'. Below these are four date/time fields: 'Begin Date' (3/15/2010 12:00:00 AM), 'End Date' (3/22/2010 12:00:00 AM), 'Oldest Available Date' (7/29/2007 4:00:00 AM), and 'Newest Available Date' (3/26/2010 10:00:00 AM). Each date field has a small calendar icon. At the bottom, there are 'OK' and 'Cancel' buttons.

### Title

Specify the title to be displayed at the top of the report.

### Data Table

Indicates the data table from which to display data values. Use the **Browse** button to open the Data Source Browser and select a table.

### Data Column 1 – Data Column 4

Use the drop-down lists to select up to 4 data values to be displayed. (Note that you can add more data values later. See Customizing Your Report below.)

### Begin Date/End Date

Enter the Begin Date/Time and End Date/Time to specify the time period for which data will be displayed. The **Oldest Available Date** and **Newest Available Date** fields indicate the date range that is in the table and able to be displayed.

**NOTES**

---

By default, the Data Grid can display a maximum of 5000 records. If your selected date range exceeds 5000 records, you will only see 5000 records in the Data Grid with a note at the bottom indicating “Max Records Exceeded”. In order to view all of the records in your date range, you will need to use the Data Grid’s property sheet to increase Max Records. (See Customizing Your Report below for more information on using property sheets to customize your report.)

When using the QuickReports Setup window to edit the date range for a report, you will lose any customization you have done to chart traces. If you wish to maintain the customization, you should edit the date range using the Report Range property sheet.

---

## 9.3 Customizing Your Report

Once you have set up a report using the QuickReports Setup dialog box, you can customize the report using each component’s property sheets. The components on a report include the Report Range, Report Title, Report Subtitle, Logo, Chart and Data Grid. A component’s property sheet can be opened by double-clicking on the component, by right-clicking on the component and selecting *<Component Name> Properties* or by choosing the component from the Edit menu. For example, to edit the properties of the chart, double-click on the chart, right-click on the chart and select Chart Properties, or select Edit | Chart Properties from the QuickReports menu.

Press the ‘?’ button at the top right of a component’s property box to bring up the online help about that component’s properties.

**NOTE**

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You can add traces to the chart using the **Add** button on the Series tab of the Chart’s property sheet. Columns can be added to the Data Grid using the **Select Columns** button on the Data Grid’s property sheet.

---

A component can be deleted from the report by right-clicking on the component and selecting Delete *<Component Name>*. For example, to delete the chart, right-click on the chart and select Delete Chart. Once a component has been deleted, it can be restored to the report by selecting Edit | Undo from the QuickReports menu.

**NOTES**

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Once a report has been closed, you will not be able to restore the component.

The Undo and Redo functions in QuickReports apply only to deleting components.

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## 9.4 Generating Your Report

Once you have set up your report and customized the components, you save and generate the report by selecting File | Save and Generate Report from the QuickReports menu. The report is saved as a \*.rtmq file.

When a report is generated you will see a preview of the report. From the toolbar on the Report Preview window you can print the report or export it to an Acrobat (PDF) file. The Report Preview window has the following toolbar icons:



Displays the first page of the report.



Displays the previous page of the report.



Displays the next page of the report.



Displays the last page of the report.



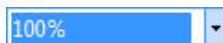
Prints the report.



Toggles the view of the report between Print Layout and Full Page Layout.



Exports the report to an Acrobat (PDF) file.



Sets the zoom level of the report preview. Choose a value from the drop-down list.



Allows you to search for a designated search string in the report. Type the desired search string in the box. Press **Find** to find the first occurrence of the search string. Press **Next** to find subsequent occurrences.

This function is only available when in Full Page Layout.



Brings up the online help for the Report Preview window.

## 10. Troubleshooting

### *Database already opened by a different user*

The "Database already opened by a different user" error can occur if Windows UAC (User Account Control) is on, an application with standard rights connects to the database first, and then a second application run as an administrator attempts to connect. With UAC on, the SQL Server CE database determines that the second application is being run by a different user. This error can be seen with the LNDB Engine, because it always runs with certain administrative rights.

To fix this problem, all connections to the database should be closed and then the connection can be attempted again. If the first application that connects is run with administrative rights, all other applications with or without administrative rights can connect.

# Appendix A. Data Type Mapping

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Datalogger data types are mapped into database data types differently depending on the type of database as described below.

## *SQL Server Compact*

Datalogger Data Type	SQL Server Compact Data Type	Notes
IEEE4	REAL	
FP2	REAL	
Long	INT	
UINT2	INT	
String	NVARCHAR(2048)	
Boolean	BIT	
Bool8	BIT	
Nsec	DATETIME	Resolution is 3ms

## *SQL Server*

Datalogger Data Type	SQL Server Data Type	Notes
IEEE4	REAL	
FP2	REAL	
Long	INT	
UINT2	INT	
String	NVARCHAR(MAX)	
Boolean	BIT	
Bool8	BIT	
Nsec	DATETIME or DATETIME2	Record Timestamp is DateTime2 (resolution is 100ns). All others are DateTime (resolution is 3ms).

**MySQL**

<b>Datalogger Data Type</b>	<b>MySQL Data Type</b>	<b>Notes</b>
IEEE4	FLOAT	MySQL FLOAT data type only stores 6 digits of precision. The datalogger stores 7.
FP2	FLOAT	
Long	INT	
UINT2	SMALLINT UNSIGNED	
String	TEXT	
Boolean	BIT(1)	
Bool8	BIT(1)	
Nsec	DATETIME	MySQL DATETIME does not support subsecond information.

# Appendix B. SQL Commands

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LNDB requires you to have rights to the following commands based on the database type:

## *SQL Server Compact*

No security available.

## *SQL Server*

Command	Usage
Alter	Used to add columns to existing data tables
Create Table	Creates meta and data tables
Drop	Delete tables (only initiated by user in LNDB Manager). Also used when creating a temporary meta table during an archive.
Delete	Deletes meta table records. (Never deletes data table records.)
Insert	Meta table and data table inserts.
sp_rename	Stored procedure used to rename a table during an archive.
Select	Meta table and data table data requests.
Update	Used to update meta table records during an archive.
References	Used when creating meta tables.

## *MySQL*

Command	Usage
Alter	Used to add Columns to existing data tables. Also used to rename data tables.
Create Table	Creates meta and data tables
Drop	Delete tables (only initiated by user in LNDB Manager). Also used when creating a temporary meta table during an archive.
Delete	Deletes meta table records. (Never deletes data table records.)
Insert	Meta Table and data table inserts.
Select	Meta Table and data table data requests.
Update	Used to update meta table records during an archive.
References	Used when creating meta tables.





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