DataWise
Environmental Monitoring, Inc.

Version 10

Chapter 1
Overview
And
Installation

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Chapter 1 Contents

This manual is designed to provide the user with easy access to chapters. The following chapter titles in purple are hyperlinked. Hold down Control and left click on the title to go to that page.

Introduction

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The *DataWise®* software suite is a complete Supervisory Control and Data Acquisition (SCADA), database management, data presentation and visualization package.

DataWise® Version 10
• Was designed by professional meteorologists and hydrologists with years of operational experience
• Is implemented and maintained by a team of database and user-interface experts.

DataWise® Version 10 software was developed using the **guidelines** listed below which were strictly followed:

1. All sensor data and sensor meta-data is kept in a relational database. MySQL is the preferred relational database, however many other ODBC-compliant databases can be used including MS-SQL, SQL-Lite, and Oracle.

2. For speed and reliability, most data acquisition modules are written in the C and C++.

3. All user-interfaces and data displays are browser-based. All GIS-based maps, plots, and reports are written using a combination of Php, HTML5, and JavaScript. This allows for the relative ease in modifying applications or developing new ones using readily available, open source tools. This also allows user-access to the server from any computer on the same network as the computer running the *DataWise® Version 10* software suite. The same user access is also available for public access provided the server has an externally viewable IP address. Unauthorized access to any displays or specific functions are password protected.

4. Multiple instances of *DataWise® Version 10* can be installed on the same computer.

5. Data acquisition modules can be distributed across a network, whether on an intranet or the internet. This allows for one type of data acquisition, for example ALERT2, to be performed on the primary computer and GOES data be collected on a computer which can connect to the primary computer via a TCP/IP socket.

6. Third-party data acquisition applications can be written and added to the *DataWise® Version 10* software suite without modification in any way to the existing software.

Data Acquisition Capabilities

The *DataWise® Version 10* software suite is able receive data using the following protocols. Additionally, in protocols that support it, controls and commands can be issued.

1) Legacy ALERT over RS-232 or UDP or TCP sockets from a serial to IP converter.
2) ALERT2 over RS-232 or UDP or TCP sockets from a serial to IP converter.
3) Road Weather Information Systems (RWIS) using the NTCIP protocol.
4) Road Weather Information Systems (RWIS) using the High Sierra Electronics IceSight2020e protocol.
5) GOES data from Direct Readout Ground Sites or LRIT receive sites.
6) GOES data using DCP Data Services protocol over TCP/IP.
7) High Sierra Low Water Crossing (LWC) Protocol over RS-232 or UDP or TCP sockets from a serial to IP converter.
8) Modbus ASCII, Modbus RTU, and Modbus TCP.
9) Most data loggers via radio and dial-up, including but not limited to Campbell, Sutron, Design Analysis, and Coastal Environmental.
10) Receiving or distributing data via the SHEF (Standard Hydrologic Exchange Format)

Supervisory Control Capabilities

DataWise® Version 10 software suite has intelligent controls built right in.
- Controls are user defined using IF-THEN-ELSE rules and can be configured to activate when one or several conditions have been met.
- Typical controls include Low Water Crossing Gates, Flashers, Sirens, Signs, Pumps and Cameras.

Data Quality Control

A modified version of the U.S. Army Corps of Engineers DatChk data checking and validation logic has been implemented.
For each type of **validation checking** performed, one of three possible flags is set:
- ➢ pass
- ➢ question
- ➢ fail

The types of checking performed are:
- Absolute value check, both a maximum value and a minimum value.
- Rate of change check, both a positive and negative value.
- Constant value check.
- Duration magnitude check.

Alarm Detection and Delivery Mechanisms

The following alarm conditions can be detected**:**
1) Values above a specified threshold (e.g., high water).
2) Values below a specified threshold (e.g., freezing road surface).
3) Values rising faster than a specified threshold (e.g., high rainfall rates or rising water levels).
4) Values falling faster than a specified threshold.
5) Stations that have stopped reporting.
6) Sensors whose data values are outside of an allowable range.
7) Sensors whose data values are changing too rapidly.
8) Sensors whose data values have stayed above or below a specified value for too long.
9) Sensors whose data values are not changing.
10) Sensors whose data values are not consistent with nearby sensors.
11) Multiple sensors in alarm state conditions.

The following alarm delivery mechanisms are provided:
1) Simple onscreen visual displays.
2) Simple computer speaker tones.
3) Audible wave files.
4) Alarms delivered via e-mail.
5) Alarms delivered via SMS (standard text message) and MMS messages.
6) Voice alarms using VOIP (Voice over IP).
7) Browser push notifications
8) Contact closures to activate sirens.
9) Pagers

Hydrologic and Hydraulic Analysis and Forecasting Tools Included Are:

1) The capability of writing data in real-time to HEC-DSS databases.
2) The capability of writing historical data to HEC-DSS databases.
3) The capability of implementing the HEC DatChk data screening and quality checking on HEC-DSS databases.
4) Seamless integration of HEC models and the Sacramento Soil Moisture Accounting Model

The Primary User Interface is Via a GIS-Based User Interface

1) Tabular and statistical reports are accessible directly from this interface and update in realtime.

2) Realtime updating alarm notifications are shown directly on the map.

3) Multiple realttime updating timeseries plots can be displayed directly on the map in separate windows.

4) Multiple layers can be placed on maps, including NWS radar, QPF, cloud layers, and watershed and political boundaries.

Steps for Installing *DataWise®* Version 10

For most installations, **DataWise®** Environmental Monitoring, Inc. personnel will perform the initial installation and setup. However, the installation process is quite straightforward and documented below:

Step 1. Install a Web Server

Since all user-interaction with **DataWise®** Version 10 is browser-based, a suitable web server must be installed. This should be done before proceeding with any further steps. The web server can be Apache or IIS or Nginx. All have been tested. If using Apache, it can be downloaded from the internet and installed separately or it can be downloaded as part of WAMP (Windows, Apache, MySQL, and Php) or XAMPP , or LAMP under Linux. If running Mac OS-X, Apache, MySQL, and Php come pre-installed.

> *If one of the all-inclusive installation packages is used, steps 2 and 3 below can be skipped*

Step 2. Install PHP

This step can be skipped if Step 1 was performed using WAMP, XAMPP, or LAMP. Instructions for downloading and installing PHP are well documented on the php.net web site. Insure that the Apache web server is properly configured to interpret PHP scripts. The Apache web server should be restarted after installing Php. To test if Php has been properly installed, copy phpinfo.php from the Php directory on the installation media into the document root of the Apache installation and then go to URL http://localhost/phpinfo.php. A display similar to the image below.

PHP Version 5.3.14

System	Windows NT DATAWISETOWER 6.1 build 7601 (Windows 7 Home Premium Edition Service Pack 1) i586
Build Date	Jun 13 2012 18:50:12
Compiler	MSVC9 (Visual C++ 2008)
Architecture	x86
Configure Command	cscript /nologo configure.js "--enable-snapshot-build" "--disable-isapi" "--enable-debug-pack" "--without-mssql" "--without-pdo-mssql" "--without-pi3web" "--with-pdo-oci=C:\php-sdk\oracle\instantclient10\sdk,shared" "--with-oci8=C:\php-sdk\oracle\instantclient10\sdk,shared" "--with-oci8-11g=C:\php-sdk\oracle\instantclient11\sdk,shared" "--enable-object-out-dir=../obj/" "--enable-com-dotnet" "--with-mcrypt=static" "--disable-static-analyze"
Server API	Apache 2.0 Handler
Virtual Directory Support	enabled
Configuration File (php.ini) Path	C:\windows
Additional .ini files parsed	(none)
PHP API	20090626
PHP Extension	20090626
Zend Extension	220090626
Zend Extension Build	API220090626,TS,VC9
PHP Extension Build	API20090626,TS,VC9
Debug Build	no
Thread Safety	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	disabled
IPv6 Support	enabled

> Output from phpinfo.php when PHP has been properly installed and configured.

> If the only output is
>
> <?php
>
> phpinfo();
>
> ?>
>
> then the php has not been properly installed. Contact ***DataWise®* Environmental Monitoring, Inc.** for support.

Step 3. Install a Relational Database

This step can be skipped if Step 1 was performed using WAMP, XAMPP, or LAMP. Non-MySQL databases can be used but their installation is not covered here. Instructions for downloading and installing MySQL can be found at dev.mysql.com/downloads and www.mysql.com/downloads.

Step 4. Create an Empty Database

The empty database can have any valid name. The installation program must have read, write, and create privileges.

Step 5. Create an ODBC Connection Point to the Newly Created Database.

In order to connect to the database created in Step 4, the *DataWise®* executables currently require a 32-bit ODBC connector. If the installation is on a 64-bit Windows-based computer, the proper ODBC configuration application is \Windows\SysWOW64\odbcad32.exe.

Step 6. **Install the *DataWise®* Version 10 Core Applications.**

The core applications are the compiled C and C++ programs that perform the data acquisition, database management, alarm detection and delivery, and controls. This software suite can be installed in any desired directory on the computer that the *DataWise®* software is to be installed on.

To install, execute the program **DataWiseInstall** from the DataWiseV10 directory on the installation media.

The program will prompt for the following:

1) **The target directory** which is the full path to the directory on the server in which to install the *DataWise®* Version 10 core applications. The target directory will be created if it does not already exist.

2) **The name of the ODBC data source and associated login credentials**. Once entered, the required tables will be created in the relational database specified by the ODBC connection in Step 5. The core components of *DataWise®* will have been installed. A description of the tables created is given in **Appendix A**. Not all tables will be used in every installation as many of them are specific for the type of data acquisition being performed.

3) **The password** to use for the initial administrative account named "superuser". This will be the administrative account for the user-interface applications to be installed in Step 7.

Data acquisition sources and station and sensor storage elements should be defined, before the *DataWise®* software suite is ready to receive and process data. These steps will be described in **Specifying Data Acquisition Functionality**.

Under Windows, a service will be created (**Setting Up User Accounts**) named DataWiseCopy1 unless multiple copies of the *DataWise®* software suite will be installed on the same server, in which case the name of the created service will be enumerated from 1.

Step 7. Install the *DataWise®* Version 10 User-Interface Applications.

The user-interface applications are a suite of PHP, HTML, and Javascript files that provide for user interaction via a browser with the database.

To install the user-interface applications, execute the program **InterfaceInstall** from the DataWiseWeb directory on the installation media. The installation program will the prompt for:

1) The complete path to the directory in the web server document root to install the user-interface (e.g., C:/Apache24/htdocs/datawise/).

2) The hostname of the computer in which the SQL is running. Usually this will be **localhost**.

3) The name of the SQL specified in **Step 4**.

4) The login credentials for the RDB.

5) The Php TimeZone (e.g., 'America/Los_Angeles'). Refer to http://php.net/manual/en/timezones.php for a list.

6) The initial center latitude of the map in decimal degrees (negative in the southern hemisphere).

7) The initial center longitude of the map in decimal degrees (negative in the western hemisphere).

8) The initial Google Maps zoom factor.

9) The map category for displaying rainfall. This is usually category 3, but read the documentation on map display categories. The category can be changed later by editing the file config_database.php in the config sub-directory of the directory specified in step 1 and changing the value of $RainCat.

10) The same path that was entered in step 1 of Step 6 - 1.

11) The complete path of the directory in which the *DataWise®* **Version 10** Core application was installed.

Step 8. Install the *DataWise®* Version 10 Mobile Application.

The mobile application is a suite of PHP, HTML, and JavaScript files that provide for user interaction with the database using a mobile device.

To install the mobile application, execute the program **MobileInstall** from the DataWiseMobile directory on the installation media.

The installation program will the prompt for:
        1) The complete path to the target directory (e.g., /Apache24/htdocs/dwmobile/)
        2) The sub-directory name specified in step 1 of **<u>Section VIII</u>**. (e.g., datawise, not the complete path)

Interacting with *DataWise*® Version 10

After the user-interface applications have been installed, there will be three URL's available for users to display and modify system parameters (applications that allow modification are password protected).

The default URL's (replace localhost with the IP address or name of the server when accessing remotely) are:

1) Mobile devices (this URL is also fully functional on desktops)
   http://localhost/dwmobile/index.php
        This interface is read-only.

2) Viewing data in a GIS-based interface on desktops
   http://localhost/datawise/index.php
        This interface is read-only.

3) Allowing modification of parameters and for extensive reports and graphic displays
   http://localhost/datawise/dwmenu/index.php
        This interface is password protected.

Where:
   1) 'localhost' should be replaced with the computer name or IP address when accessing remotely.

   2) If a name other than 'datawise' was specified in step 1 of **Section VIII**, replace 'datawise' with that name.

   3)If a name other than 'dwmobile' was specified in step 1 of **Section IX**, replace 'dwmobile' with that name.

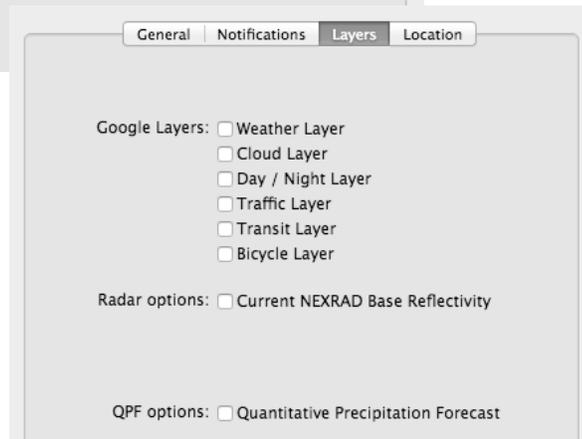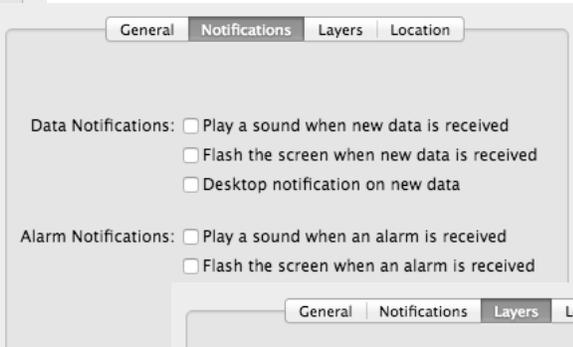Note: If the system performs automated or manual controls, a fourth URL will be provided:
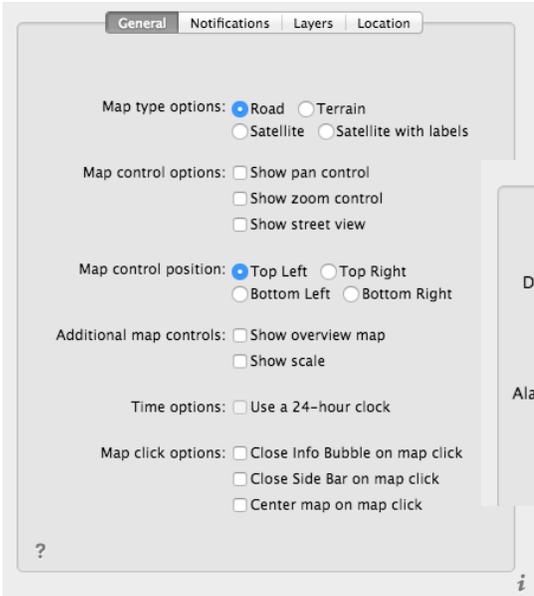   http://localhost/datawise/dwcontrol.php

> Note that user interface http://localhost/datawise/dwmenu/index.php is password protected with 3 levels of access, read, write, and administrator.

Customizing Preferences

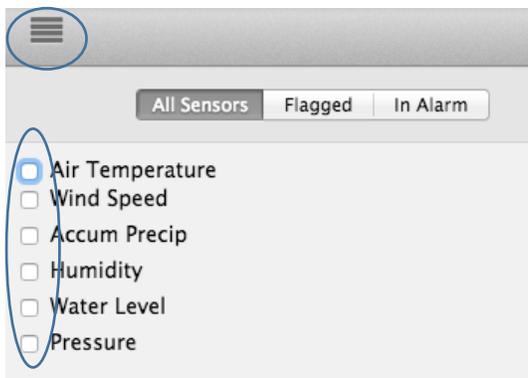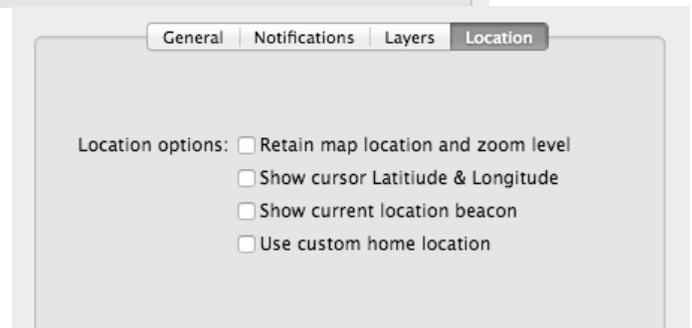**In the upper right-hand corner these symbols lead to Alarms, Home, and Preferences.**

Choose Preferences to customize your website's accessible features. Click on the boxes to select those features that refer best for your needs.

General | Notifications | Layers | Location

Map type options: ● Road ○ Terrain
○ Satellite ○ Satellite with labels

Map control options: ☐ Show pan control
☐ Show zoom control
☐ Show street view

Map control position: ● Top Left ○ Top Right
○ Bottom Left ○ Bottom Right

Additional map controls: ☐ Show overview map
☐ Show scale

Time options: ☐ Use a 24-hour clock

Map click options: ☐ Close Info Bubble on map click
☐ Close Side Bar on map click
☐ Center map on map click

?   *i*

All customization is editable.

General | Notifications | Layers | Location

Data Notifications: ☐ Play a sound when new data is received
☐ Flash the screen when new data is received
☐ Desktop notification on new data

Alarm Notifications: ☐ Play a sound when an alarm is received
☐ Flash the screen when an alarm is received

General | Notifications | Layers | Location

Google Layers: ☐ Weather Layer
☐ Cloud Layer
☐ Day / Night Layer
☐ Traffic Layer
☐ Transit Layer
☐ Bicycle Layer

Radar options: ☐ Current NEXRAD Base Reflectivity

QPF options: ☐ Quantitative Precipitation Forecast

On the left side, click on the bars to open and close the sidebar and customize the sidebar.

General | Notifications | Layers | Location

Location options: ☐ Retain map location and zoom level
☐ Show cursor Latitiude & Longitude
☐ Show current location beacon
☐ Use custom home location

All Sensors | Flagged | In Alarm

☐ Air Temperature
☐ Wind Speed
☐ Accum Precip
☐ Humidity
☐ Water Level
☐ Pressure

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