Integrated Sensor System™ (ISS)

Soil Manager™ v.1.1 User Guide

Revised 2014/07/31

Table of Contents

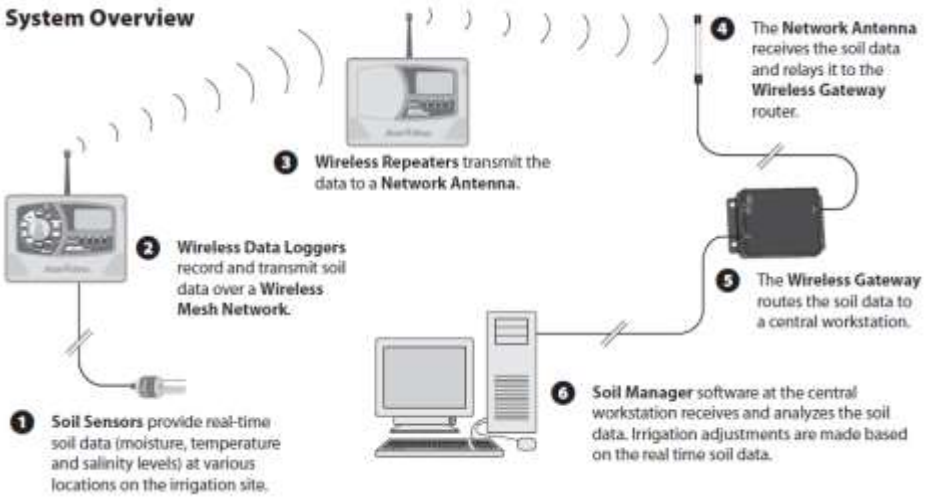
Section 1 – System Overview 4
1.1. System Overview 4
1.2. Devices and Definitions 4
1.3. Installation 5
Section 2 – Soil Manager Window 6
2.1. File Menu 7
2.2. Configurations Menu 7
2.2.1. Unit Measurements 8
2.2.2. Area Locations 9
2.2.3. Sensor Thresholds 10
2.2.4. Sampling Rate for Sensors 11
2.2.5. Email Configuration 12
2.2.6. Central Control Configuration 13
2.3. Help Menu 15
Section 3 – Dashboard 18
3.1. Dashboard Moisture Display 19
3.2. Dashboard Temperature Display 21
3.3. Dashboard Salinity Display 22
Section 4 – Diagnostics 23
4.1. Wireless Network Tree 23
4.2. Communication Logs 26
Section 5 – Sensor Graph View 27
5.1. Adjusting Y-Axis 30
5.2. Cursor 32
5.3. Annotations 32
Section 6 – Sensor Data View 35
6.1. Export to Excel 37
6.2. Annotations 38
Section 7 – Site Map 40
7.1. Panning and Zooming 41
Section 8 – Alerts 43
8.1. Sensor Data Limit Alerts 44
8.2. Power Management Alerts 45
8.3. Communication Alerts 45
Section 9 – Controlling Irrigation with Soil Moisture Data 46
9.1. Theory of Operation 46
9.2. Performing the Calibration Cycle 46
9.3. Linking a Rain Bird Central Control Program for Automatic Irrigation 55
Section 10 – Setting Wireless Network Properties 58
Section 11 – Setting ISDL Data Logger Properties 60
Section 12 – Setting ISR Data Repeater Properties 62
Section 13 – Setting Sensor Properties 64
Section 14 – Map Location Dialog 66
Section 15 – Importing Data Logger Data Into Soil Manager 69

Section 16 – Troubleshooting 71
16.1. Error indicators 71
16.2. Database errors 74
16.2.1. SQL Server Will Not Start 79
16.3. Communication Errors 80

Section 1 – System Overview

Thank you for purchasing Soil Manager™ and your new Rain Bird Integrated Sensor System™ (ISS). In this manual you will learn how to configure Soil Manager the first time and access sensor data on your way to using the information to better manage your site. In a separate manual, **Integrated Sensor System Installation - Programming and Operation Guide**, you will find the instructions to install the soil sensors, wireless data loggers and repeaters. Installing the Gateway and Soil Manager itself is described in the **Gateway and Soil Manager Installation Procedure** manual.

1.1. System Overview



Soil Manager is the software application at the central work station analyzing soil data, monitoring and controlling the ISS wireless network. Soil Manager displays soil data from individual or group of sensors and can make water budget recommendations to adjust station runtimes based on soil moisture. Soil Manager can also graph the data and send email alerts when conditions require attention. In an integrated mode, Soil Manager will also interface with the central irrigation software (Stratus LT, Stratus II, Nimbus II and Cirrus version 7.1 or newer) to automatically adjust the station runtimes based on soil moisture.

1.2. Devices and Definitions

- **Communication Port (COM Port)** – Connections on the rear or the front of the computer are attached to external devices such as printer or wireless gateway. The wireless gateway connects to a USB port. During the Gateway installation procedure this USB port is made to look and perform like a COM port, and will be referred as COM port through the rest of this document.

- **Wireless Network** – Group of field devices, wireless data logger, wireless repeater and wireless gateway, communicating with one another using a wireless signal and the same protocol

- **ISDL** – ISDL2400 Wireless Data Logger (2) (**I**ntegrated **S**ensor **D**ata **L**ogger)

- **ISR** – ISR-2400 Wireless Repeater (3) (**I**ntegrated **S**ensor **R**epeater)

- **Gateway** – ISG-2400 Wireless Gateway (5)

- **Integrated License** – Soil Manager can run without an Integrated License for soil monitoring or manual irrigation adjustment but Rain Bird central control software automated integration requires an Integrated License.

- **Stand-Alone License** – Soil Manager license allowing monitoring and manual irrigation adjustment but no automatic irrigation control integration with Rain Bird central control software.

- **Trial Mode** – Soil Manager can be started in Trial Mode when newly installed allowing up to 30 days of Stand-Alone operations.

- **Moisture Curve Calibration –** Process allowing Soil Manager to analyze a soil moisture graph. Once calibration is complete Soil Manager will be able to calculate the water budget to reach a desired moisture level.

- **% VWC** or **Volumetric Water Content** – Quantity of water contained in the soil measured as the ratio of the volume of water to the volume of soil. The highest value measured by the sensors is the moisture content at saturation which is soil specific.

- **dS/m** or **deci Siemens per meter** – Unit of measurement of soil salinity.

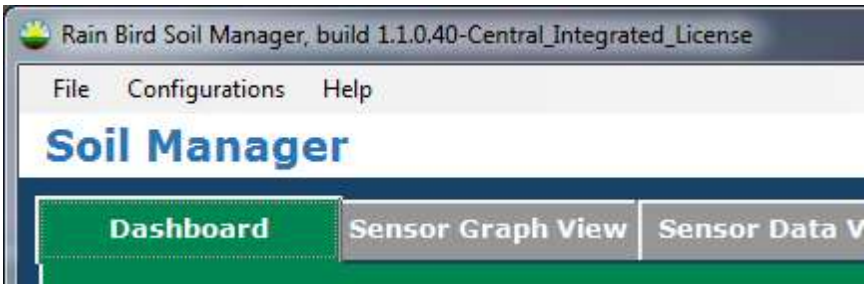
1.3. Installation

Please refer to **Gateway and Soil Manager Installation Procedure** manual to install Soil Manager, license the software, and automatically discover your ISS wireless network devices.

After normal installation, Soil Manager will start automatically when the computer is booted. To start manually, find the Rain Bird folder in the Start menu and choose Soil Manager. This opens the Soil Manager Window.

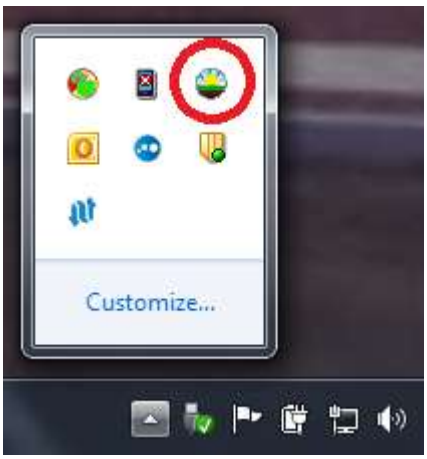
Section 2 – Soil Manager Window

The Soil Manager window provides useful information if you need technical support. The window title bar shows Soil Manager version and license information. The figure below shows Soil Manager version 1.1.0.40 running with a central integrated license (allowing Soil Manager to automatically adjust irrigation based on soil moisture data). If problems occur with configuration or operation of automatic irrigation control, verify that the Soil Manager title bar shows Central_Integrated_License. The problem could be licensing.



To save space on your Windows desktop and taskbar, Soil Manager can be minimized by clicking the appropriate icon in the title bar (circled in red below):

When minimized, Soil Manager will not appear on the taskbar with other running applications but will show an icon in the system tray in the lower right corner of the screen (circled in red below):



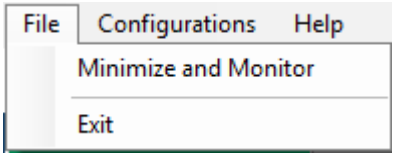
To restore Soil Manager's main window to full size, double click the icon.

While minimized Soil Manager continues to collect data taking suitable actions. If Soil Manager needs to notify you of an issue a notification balloon will appear as shown below:

Clicking the balloon will restore Soil Manager to full size and display the Alerts tab allowing you to find the issue. See Section 8 – Alerts for further details on alerts.

2.1. File Menu

The Soil Manager File menu contains only 2 items:

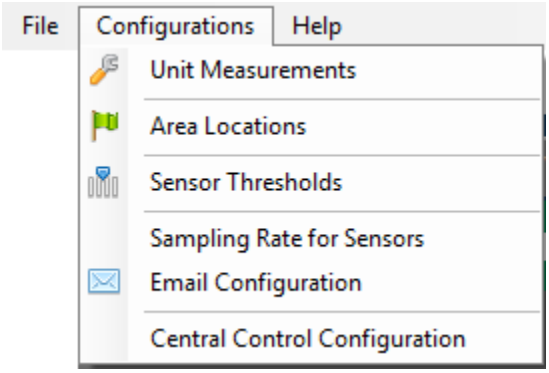


Minimize and Monitor performs the same minimize operation as described above.

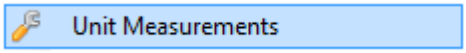
Exit will exit Soil Manager after receiving confirmation.

2.2. Configurations Menu

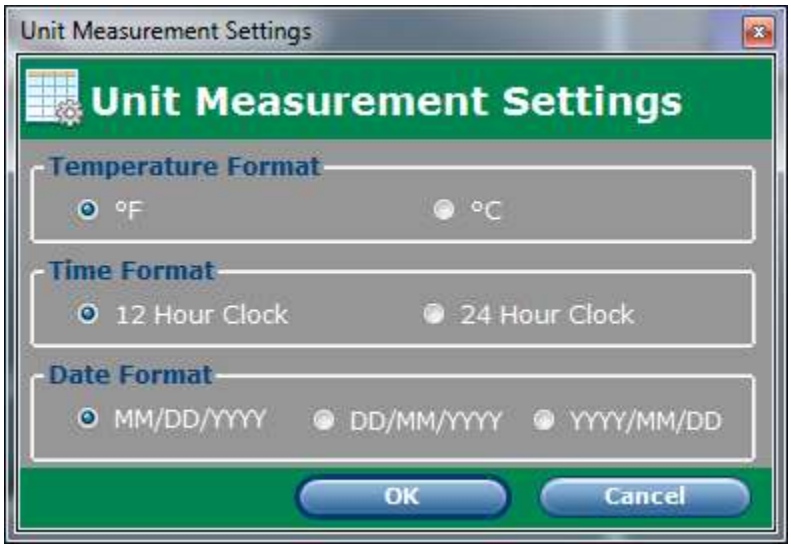
The Configurations menu contains 6 items:



2.2.1. Unit Measurements



Unit Measurements opens the Unit Measurement Settings dialog as shown below:

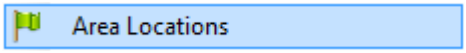


Temperature Format controls all temperature display in Soil Manager with only the exception of Communication Logs on the Diagnostic tab (see 4.2 Communication Logs) where Celcius is always used.

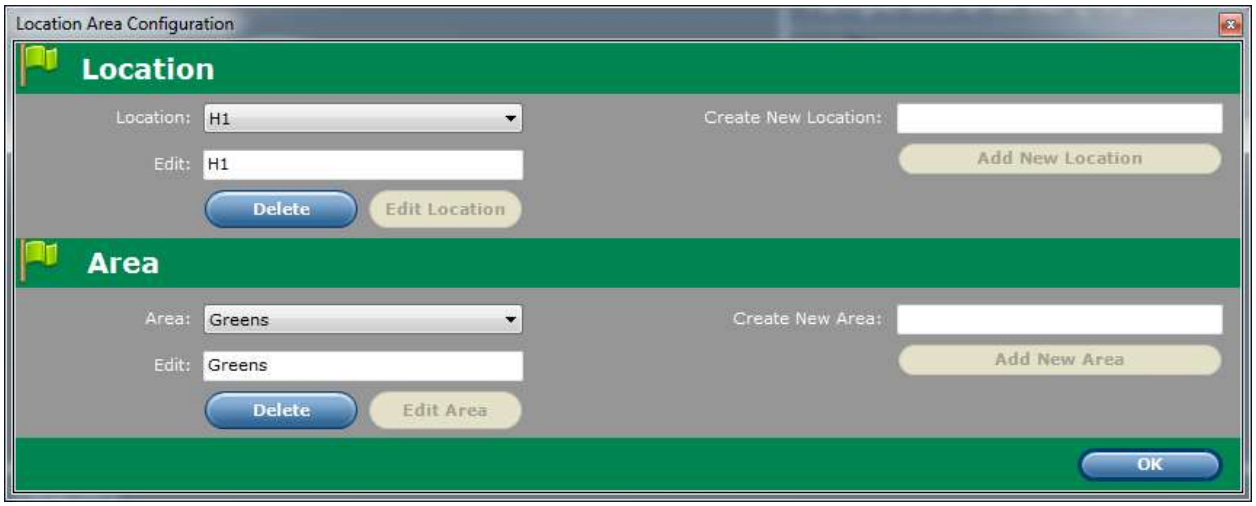
Time Format controls display of time values. Choices are 12 Hour Clock where AM and PM indicators are used and 24 Hour Clock where values range from 00:00:00 to 23:59:59.

Date Format controls display of date values. MM represents the month number, 1-12, DD represents the day number, 1-31, and YYYY represents the year number, 1-3000.

2.2.2. Area Locations



Area Locations opens the Location Area Configuration dialog where Locations, like golf hole numbers, and Areas, like golf sub-locations within a hole (greens, tees, etc.) can be configured:

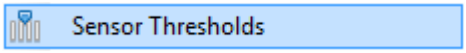


To see a complete list of configured Locations, click the Location drop-down list. To edit or delete a location, select it from the drop-down list. The name will appear in the Edit field. To delete the location entirely, click the Delete button. To edit the name, modify the text and click Edit Location. To create a new location in the list, enter the location name in Create New Location. The name must not match any existing location name. Click Add New Location to complete the addition.

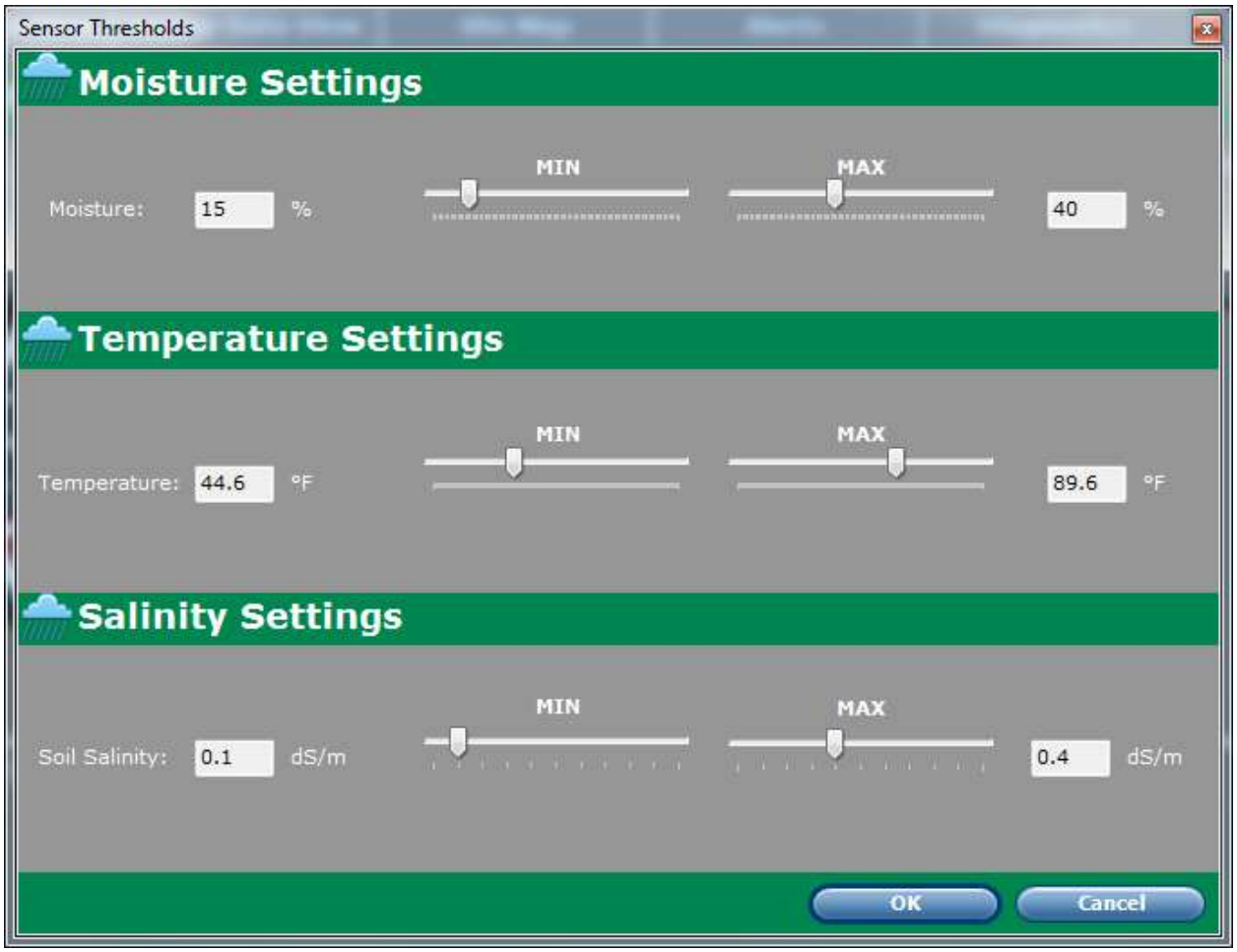
Similarly, to see a complete list of configured Areas, click the Area drop-down list. Use the Edit field, Delete and Edit Area buttons. Use the Create New Area field and Add New Area button to add new areas.

NOTE: All changes occur immediately so take care when modifying locations. The dialog cannot be Cancelled.

2.2.3. Sensor Thresholds



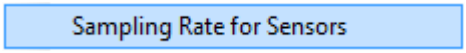
Sensor Thresholds opens the Sensor Thresholds dialog as shown below:



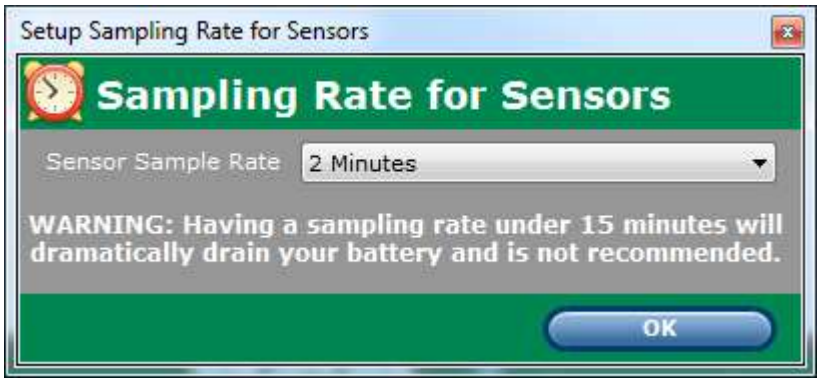
Sensor thresholds are used to detect and report field conditions requiring actions to maintain the plant material. Sensor alerts are generated in the Alerts tab (see 8.1 Sensor Data Limit Alerts for details), and out-of-range sensor values can send email notifications as well.

Separate threshold values are set for each sensor parameter, moisture, temperature and salinity. Sensor data values between MIN and MAX are considered acceptable while those below MIN or above MAX generate alerts. Values are adjusted by clicking and dragging the MIN and MAX markers to the desired value. Once all thresholds are configured, click OK to accept or Cancel to abort changes.

2.2.4. Sampling Rate for Sensors



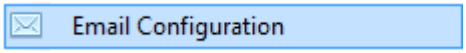
Sampling Rate for Sensors opens the Setup Sampling Rate for Sensors dialog:



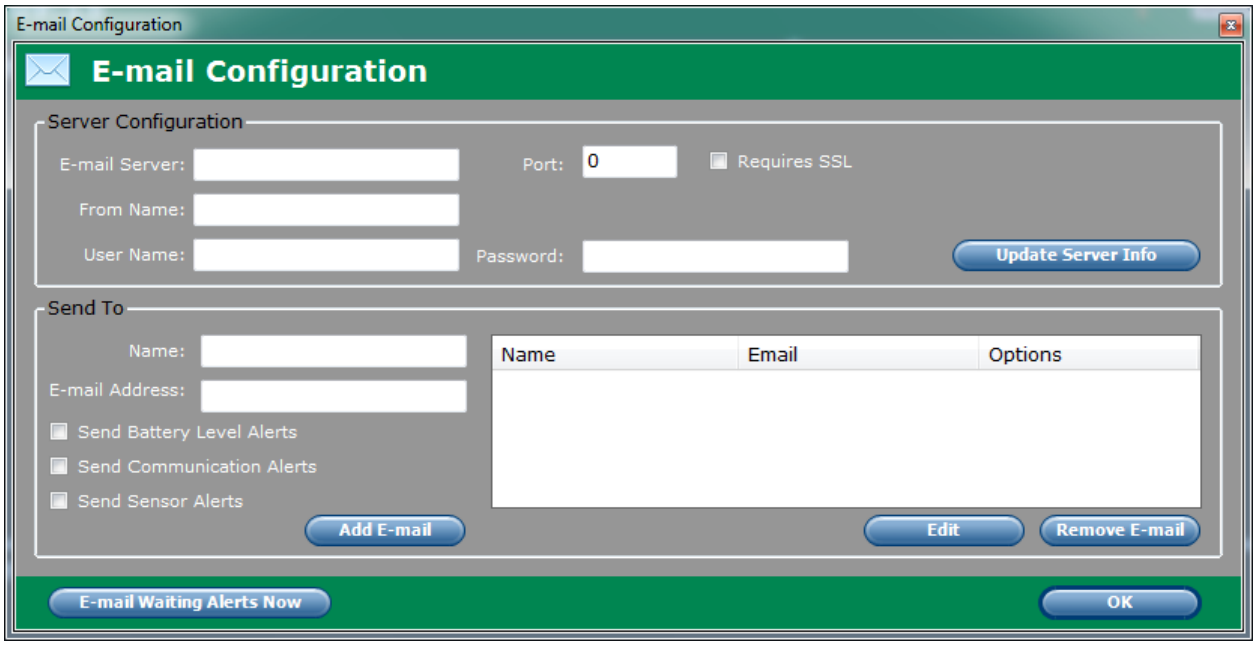
The sensor sampling rate is the frequency at which the wireless network awakens and ISDL data logger data is transmitted for each sensor to Soil Manager. Frequent sampling is desirable for short-term trend monitoring (and necessary for a time while configuring central control integration), but can drain batteries quickly. The recommended Sensor Sample Rate for stable systems is 15-20 minutes.

Although the dangers to battery usage of short sample rates are obvious, take care when setting very long sample rates also. All wireless network devices must be notified of a sampling rate change so they can awaken at the correct time. However, devices can only be notified of new sample rates by Soil Manager during wake cycles. If you set Sensor Sampling Rate to 60 minutes, network devices will not be informed of the change until the next scheduled wake cycle. **Once all devices are set for 60 minute sampling rate, it takes up to 60 minutes to change their settings again!** If you frequently change sample rates to monitor irrigation events more quickly it's advisable to choose a moderate sample rate when running normally.

2.2.5. Email Configuration



Email Configuration opens the E-mail Configuration dialog as shown below:



Soil Manager uses the information entered to send event emails. For example, Soil Manager could send an email when soil temperature is out-of-range, giving notification that a short irrigation to lower the temperature is needed. E-mail process configuration is split into 2 pieces: e-mail server and account configuration, and distribution list configuration including events sent to each member.

Server Configuration

Server configuration begins with the E-mail Server name. This is the Internet name of the SMTP mail server. Only SMTP servers are supported by Soil Manager. Consult your e-mail provider to verify the correct server name and port number, as well as whether SSL encryption is required. Similar settings would be found in your email client program (Outlook, for example), as Outgoing Mail Server (SMTP), [Server Port Numbers] Outgoing Server Port (SMTP), and Use The Following Type of Encrypted Connection. From Name is the user-readable name applied to Soil Manager e-mails. You might set this to “Soil Manager”, for example. User Name and Password are the SMTP user name and password values used to access the mail server. They correspond to Outlook’s Logon Information User Name and Password entries.

After completing the Server Configuration portion of the dialog, click Update Server Info. This will check the values for accuracy and save them.

Send To Configuration

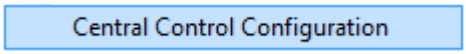
Once the server configuration is complete add members to the Soil Manager distribution list. To add new members, enter values for Name and E-mail Address, select alerts to send, and click Add E-mail. Name is the user-readable name and E-mail Address is the full address

such as xyz@yahoo.com. E-mail can be sent for battery alerts (for ISDL data logger and ISR repeater low-battery notifications), communication alerts such as missing data loggers and repeaters, and sensor alerts for sensor values out-of-range.

Once distribution list members are added, the can be edited (to change name, e-mail address, or alerts sent) by selecting them in the distribution list and clicking Edit.

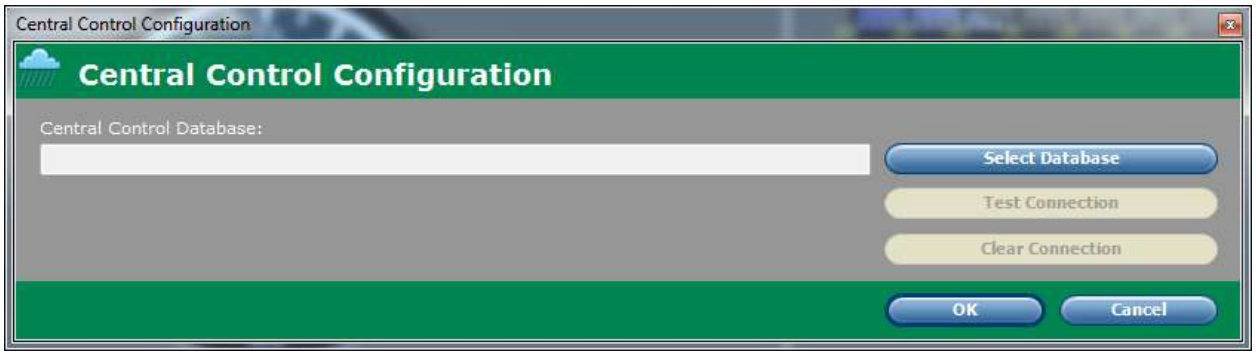
Members can be removed from the distribution list by selecting them and clicking Remove E-mail.

2.2.6. Central Control Configuration

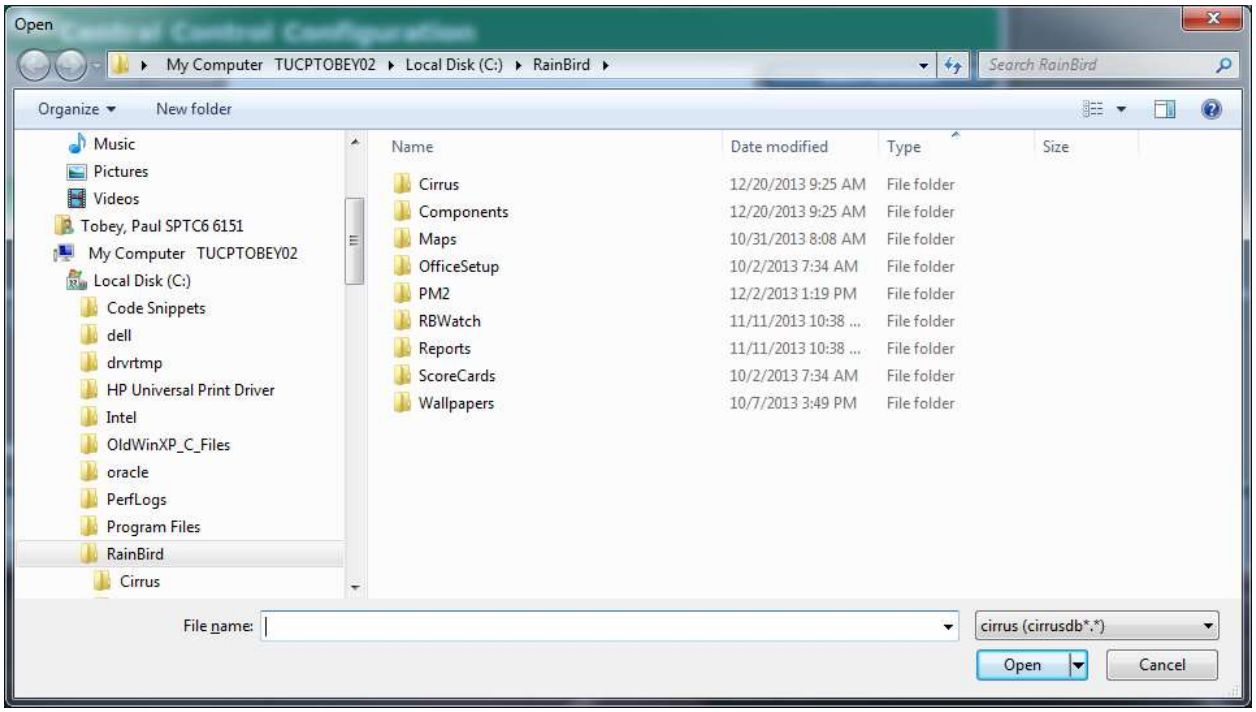


Central Control Configuration is only available if you have an Integrated Soil Manager license and have properly configured Soil Manager with the license key.

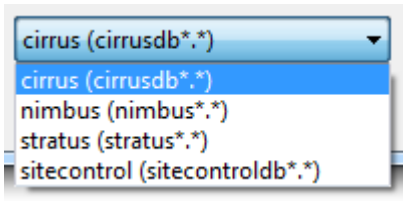
Central Control Configuration opens the Central Control Configuration dialog as shown below:



Soil Manager communicates with Rain Bird central control software through the central control software database file. To connect Soil Manager with your central control program you must identify that database. Click Select Database to open a file browsing dialog:



Use the file type pull-down menu to select the database type to find:



Soil Manager can work with Cirrus, Nimbus II, Stratus II, Stratus LT, and Site Control databases. After choosing the correct type, browse to the correct Rain Bird folder and select the correct database. Make certain that this is the active central control database in use by the Rain Bird central control application. Click Open to select the file and return to the Central Control Configuration dialog.

Click the Test Connection button to verify that Soil Manager can open and use the database file you've selected (an automatic Test Connection operation will also occur when you click OK). Most problems are caused by selecting the wrong central control database file.

If central control communication is to be stopped, click the Clear Connection button to clear the connection between Soil Manager and central control.

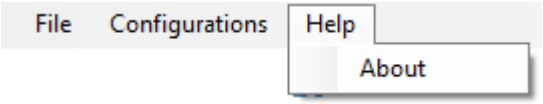
Click OK when satisfied.

When clicking OK or Test Connection, a status dialog will be displayed indicating either that the central control database was found or an error was encountered. If the database was

found, central control integration should function. Refer to Section 9 – Controlling Irrigation with Soil Moisture Data for information on linking irrigation programs to sensor data values.

2.3. Help Menu

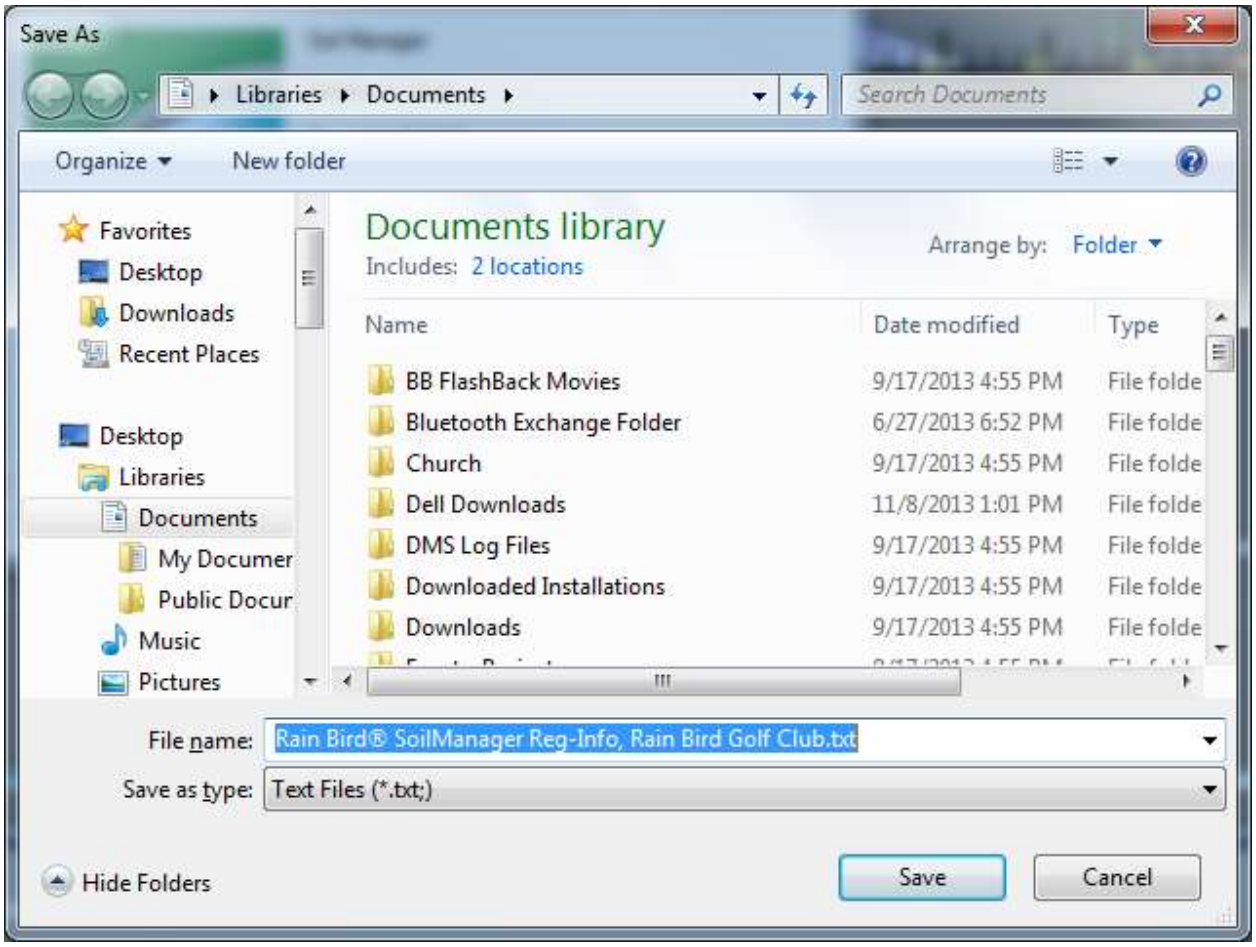
The Help menu contains 1 item:



About opens the Soil Manager About dialog as shown below (note that the values of some items may not exactly match depending on your Soil Manager version):

The title of the dialog will vary with the installed license type. The sample above shows a Rain Bird central control integrated license (allowing irrigation program control based on soil conditions). The Version string indicates the Soil Manager version and will vary. When requesting support for Soil Manager from your local Rain Bird office or Rain Bird GSP, **always** forward this information. The Golf Course Name can be changed to help identify the location of the PC.

Immediately below the Golf Course Name field is the PC machine ID (KVNF-DF30-YABD-AB3R, in the example), needed to complete the licensing process. This value must be transmitted to Rain Bird GSP along with Soil Manager purchase information retrieving a Rain Bird license. To save the ID value for transmission to GSP, click the Save ID button. This opens a dialog allowing a file name and location for the ID save to be selected, as shown below:



As shown above, the default file name includes the Golf Course Name entered. Click Save to save the indicated file to the indicated location. The file contents appear for the sample configuration above:

```
Information for Rain Bird® SoilManager License
==============================================

User Description:    Rain Bird Golf Club
Registration-ID:     KVNF-DF30-YABD-AB3R
```

When this data is sent to GSP with purchase confirmation, a 25-digit Activation Key will be returned. Enter this key in the Activation Key field and click OK to apply the key. If the key is valid, the Soil Manager main window will show the key type. See Section 2 – Soil Manager Window for details.

New Soil Manager installations can be run in Trial Mode for up to 30 days. Rather than entering an Activation Key, leave the key field blank and click OK. The Soil Manager main window will indicate remaining trial period. In Trial Mode, central control integrated operations are disabled but other Soil Manager operations match those in Stand-Alone License configuration.

Section 3 – Dashboard

When Soil Manager is started the Dashboard opens showing a snapshot of site data and status. The Dashboard can also be activated by clicking the “Dashboard” tab as shown below:

The Dashboard itself shows summary data for soil moisture, soil temperature and soil salinity. Values are categorized by “Area Location”. An area location might be a golf hole number (H1, H2…H18) or it might be a custom category appropriate for your application such as Nursery, Greenhouse 1, etc. Within an area location, various sublocations can be defined to help further categorize sensor values. For a golf installation sublocations might be Greens, Tee, Fairways, etc. For other installations sublocations might be Planters, Pots, Tree Wells, etc. New area locations and sublocations can be created through the Area Locations dialog. See 2.2.2 Area Locations for details.

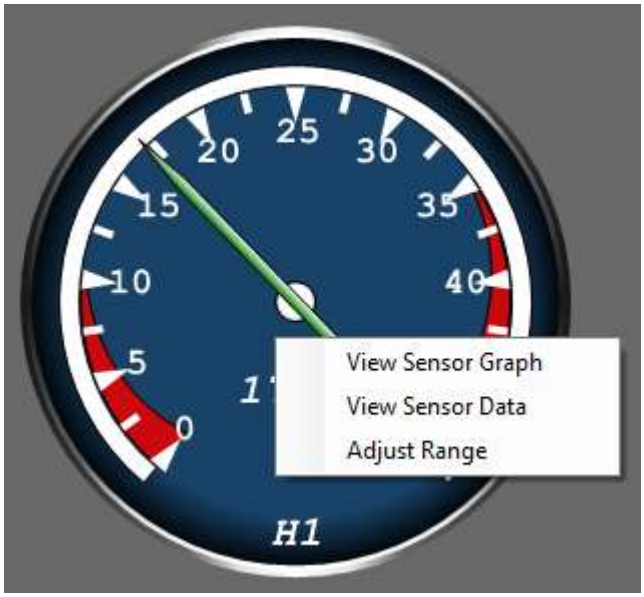
The sample dashboard below shows a partial golf course sensor network containing 2 holes with several sensors each.

As shown holes 3 and 4 contain sensors (note 2 gauges marked H3 and H4). The sublocation “Greens” is currently active and can be changed using the pull-down list:

3.1. Dashboard Moisture Display

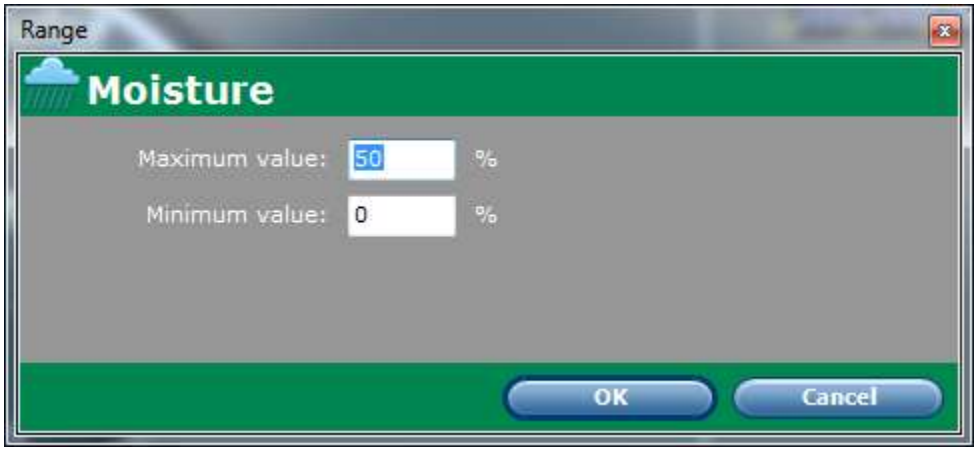
Dashboard moisture data is displayed in meter form. The graphic below shows moisture data for location H4 (Greens is the selected sublocation). The value displayed is the average of moisture data from all sensors assigned to this area location and the selected sublocation (Greens in this case). The colored ranges indicate established sensor threshold values (see 2.2.3 Sensor Thresholds). When the sensor is in red ranges it will be reported as out-of-range. Below, the sensor is just above the minimum moisture threshold of 10%.

Because several sensor values are combined into a single meter, you may wish to see further details by sensor. This can be accomplished easily by right-clicking the meter. This displays the pop-up menu as shown below:



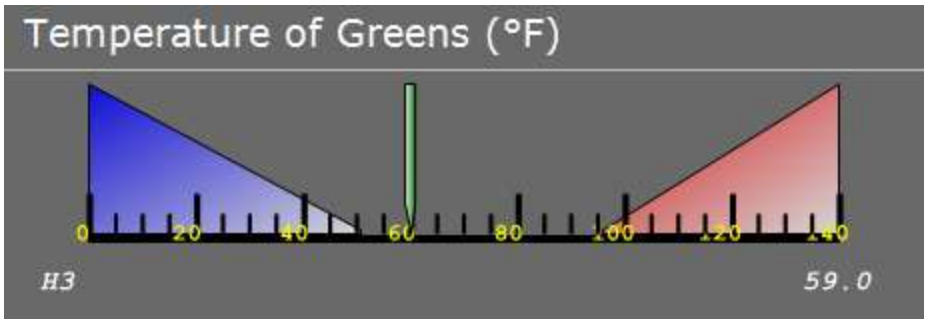
Select View Sensor Graph to open the Sensor Graph View tab and automatically graph today's data from all sensors represented by the meter (see Section 5 – Sensor Graph View). Select View Sensor Data to open the Sensor Data View tab and display a spreadsheet showing today's data from each sensor represented by the meter (see Section 6 – Sensor Data View).

You can also adjust the range of values for meters and graphs by selecting Adjust Range (or double-clicking the gauge). This displays the Range dialog shown below allowing adjustment of the minimum or maximum value for moisture gauges and moisture graphs:



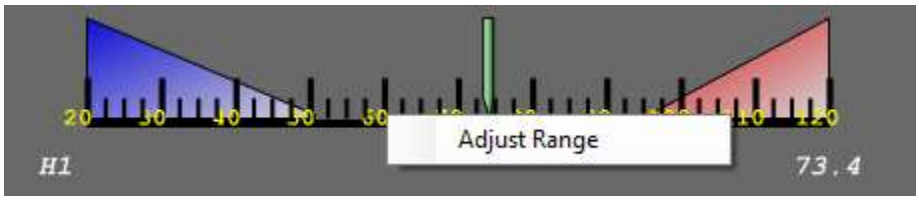
3.2. Dashboard Temperature Display

Dashboard temperature data is displayed in horizontal gauge form. The graphic below shows data for location H3. The value displayed is the average of temperature data from all sensors assigned to this area location and the selected sublocation (Greens in this case):

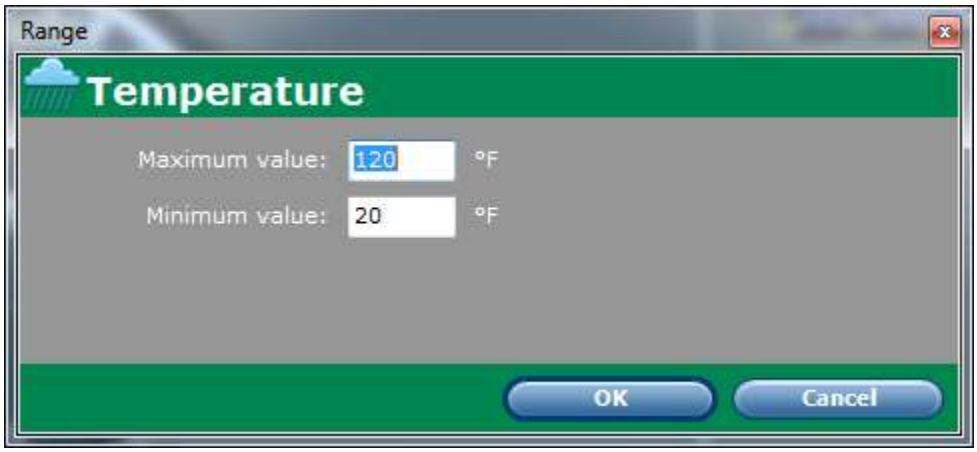


The H3 notation to the left of the graphic indicates the area location. The value to the right of the graphic indicates the average value. Note the temperature units in the title area, "°F". The units can be changed through the Unit Measurements dialog. See 2.2.1 Unit Measurements for details. The colored ranges represent the sensor thresholds set for temperature data alerts (see 2.2.3 Sensor Thresholds).

As with moisture gauges, additional temperature gauge options are accessible by right-clicking the gauge displaying a pop-up options menu as shown below:



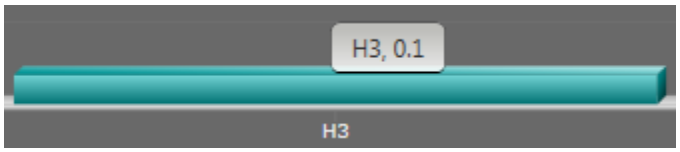
Choosing Adjust Range (or double-clicking the gauge) will open the Range dialog allowing adjustment of the minimum and maximum temperature values displayed:



3.3. Dashboard Salinity Display

Dashboard salinity data is displayed in bar graph format. The graphic below shows data for locations H3, H5 and H6. Each bar value is the average of salinity data from all sensors assigned to the area locations and selected sublocation (H5 Greens for example):

Data values represented by each bar can be found by “floating” the mouse over the bar. A tooltip will display showing the area location name and the average data value, as shown below:



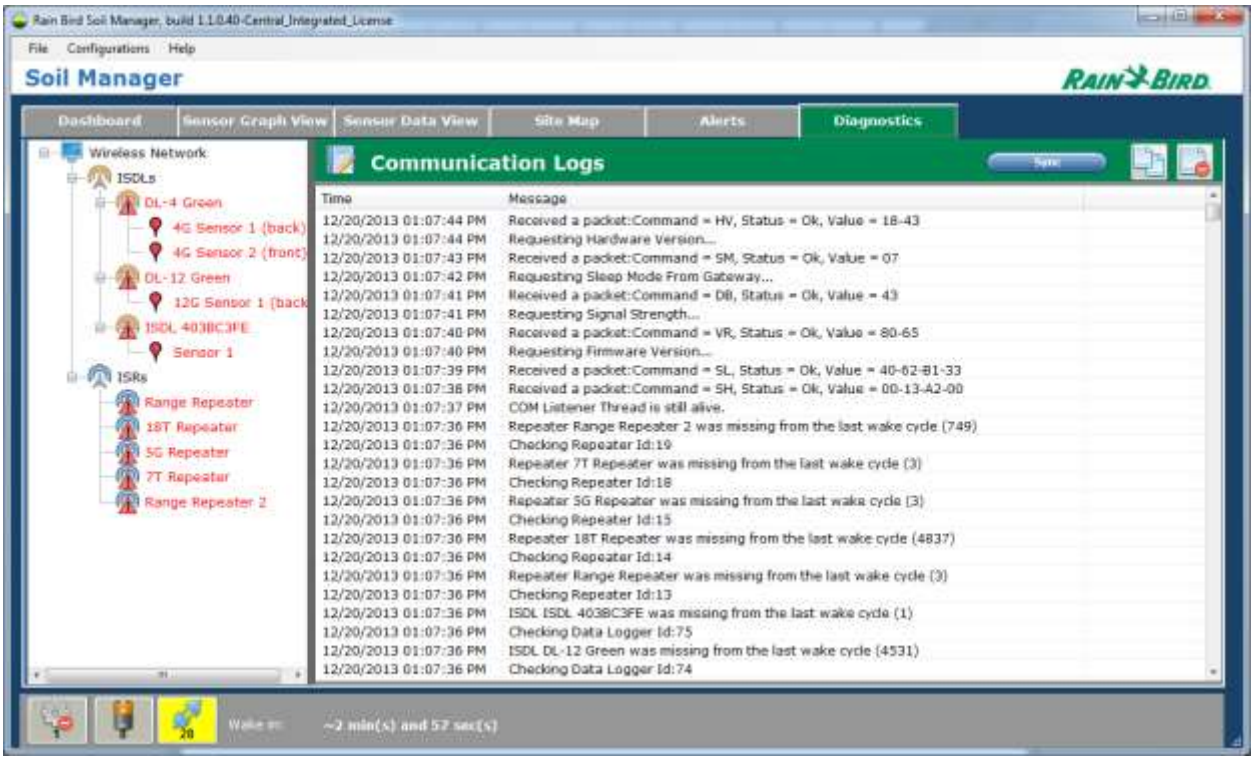
Dashboard also provides a manual refresh option. Although sensor data updates the dashboard automatically, you can click the button shown below to update all displays with latest sensor data.

Dashboard status data is displayed in a band across the window bottom. The graphic below indicates 0 sensor alerts (messages), 8 battery alerts, and 0 communication alerts. It also indicates that connection between Soil Manager and ISG-2400 gateway is off. When off no data is collected from the wireless network or any sensors.

When the connection is active a status display as shown below might be indicated, showing 0 sensor alerts, 8 battery alerts, 3 communication alerts, and an estimated time until next wake-up of 3 minutes and 53 seconds. The wake delay counts down until the network wakes up. The time between wake (communication) cycles on the wireless network is set through the Sampling Rate for Sensors dialog detailed in 2.2.4 Sampling Rate for Sensors.

Section 4 – Diagnostics

For initial configuration and wireless network status check, access the Soil Manager Diagnostics tab as shown below:



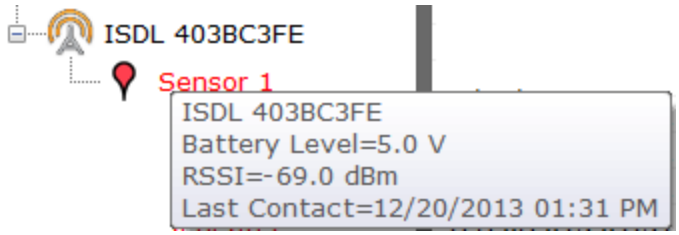
4.1. Wireless Network Tree

To the left of the Diagnostics tab is the Wireless Network tree, showing all known ISDL data loggers and ISR repeaters, as well as known sensors connected to each data logger. Different icons are used to indicate status information about each element of the tree as listed below:

	ISDL data logger in normal state. Battery is OK and ISDL responded to last network check.
	ISDL data logger in low-battery state. Battery should be replaced before unit drops off network.
	ISDL data logger showing communication error. The data logger may have a dead battery or there may be a radio signal issue (a tree blocking the signal, problem with antenna, etc.)
	ISR repeater in normal state. Battery is OK and ISR responded to last network check.
	ISR repeater in low-battery state. Battery should be replaced before unit drops off network.
	ISR repeater showing communication error. The repeater may have a dead battery or there may be a radio signal issue (a tree blocking the signal, problem with antenna,

	etc.)
	Sensor in normal state. Sensor data values are in-range.
	Sensor in alert state. Sensor data value(s) may be out of range or sensor may have been damaged (by aeration, for example), resulting in communication problems.

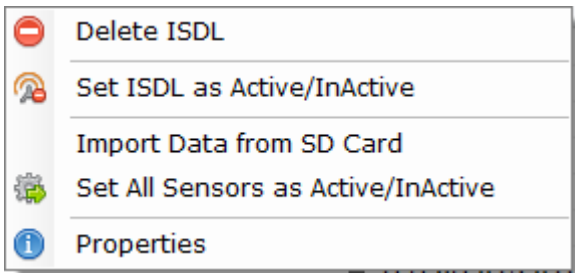
Further details for each tree item can be viewed by floating the mouse over the corresponding item as shown below for a data logger:



ISDL data loggers will indicate battery voltage level, radio signal strength (RSSI), and the last date/time at which they responded on the wireless network. ISR repeaters will indicate the same information.

Sensors list moisture percentage, temperature (in temperature units selected through Unit Measurements dialog), and salinity. The last sensor contact time can typically be derived by examining the associated ISDL data logger.

Right-clicking a data logger displays a menu of operations for that device:



Delete ISDL permanently removes the data logger from the database, from the tree view, from the site map and no longer notes missing communication from the device as an error. If the device still exists on the network it will likely be rediscovered during the next network operation but map location and notes will be lost. To actually remove the data logger permanently (preventing rediscovery), first turn the device OFF in the field, and then delete it from Soil Manager.

Set ISDL as Active/InActive allows a data logger and all of its sensors to be temporarily removed from service. Missing communication will not be treated as an error and sensor data will not be collected while the data logger is inactive. This option might be used during maintenance that will block radio contact with the device.

Import Data from SD Card allows sensor data stored by the data logger on its internal storage card to be imported to the Soil Manager database. This can be useful when a radio issue prevents contact with a data logger for some period. If the data logger remains operational locally the data can be imported and analyzed or exported from Soil Manager

after using this option. See Section 15 – Importing Data Logger Data Into Soil Manager for more details.

Set All Sensors as Active/InActive allows the sensors connected to a data logger, but not the data logger itself, to be treated as inactive (no sensor errors will be generated and data will not be collected). To reenable select the menu item a second time.

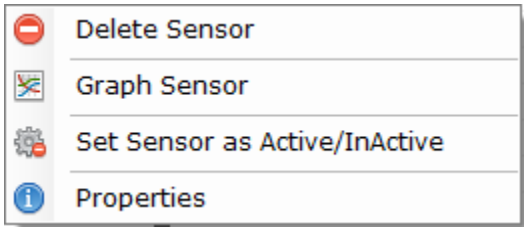
Properties allows the name and other data logger information such as map location, area location or sublocation, or device notes to be edited. Refer to Section 11 – Setting ISDL Data Logger Properties for further details.

Right-clicking a repeater displays a menu of repeater operations:

Delete ISR permanently removes the repeater from the database, from the tree view, from the site map and no longer notes missing communication from the device as an error. If the device still exists on the network it will likely be rediscovered during the next network operation but map location and notes will be lost. To actually remove the repeater permanently, first turn the device OFF in the field, and then delete it from Soil Manager.

Properties allows the name and other repeater information such as notes and map location to be edited. Refer to Section 12 – Setting ISR Data Repeater Properties for further details.

Right-clicking a sensor displays a menu of operations:



Delete Sensor permanently removes the sensor from the database, tree view and site map and no longer range-checks the sensor data to detect errors. If the sensor remains connected to the data logger and if the data logger is active on the network the sensor will likely be rediscovered during the next network cycle but the map location and notes will be lost. To actually remove the sensor permanently, first remove it from the data logger's sensor list using data logger controls in the field (refer to ISDL documentation), and then delete it from Soil Manager.

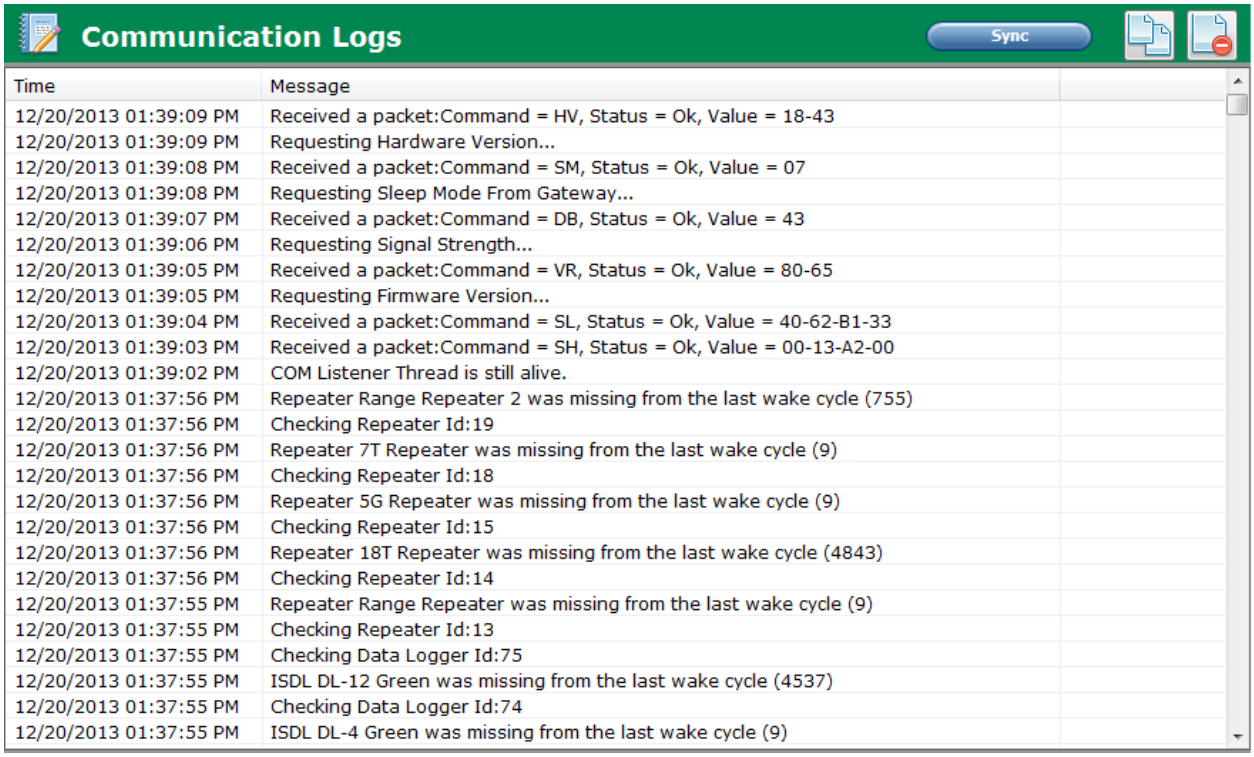
Graph Sensor displays the sensor's data graphically on the Sensor Graph View tab.

Set Sensor as Active/InActive allows the sensor to be disabled temporarily. To reenable select the menu item a second time.

Properties allows the name and other sensor information such as map location, area location or sublocation, or device notes to be edited. Refer to Section 13 – Setting Sensor Properties for further details.

4.2. Communication Logs

Also in the Diagnostics is a list of communication events recorded for debugging purposes. You generally do not need to interact with this display but it can be useful when a gateway will not connect or during initial startup.



Time	Message
12/20/2013 01:39:09 PM	Received a packet:Command = HV, Status = Ok, Value = 18-43
12/20/2013 01:39:09 PM	Requesting Hardware Version...
12/20/2013 01:39:08 PM	Received a packet:Command = SM, Status = Ok, Value = 07
12/20/2013 01:39:08 PM	Requesting Sleep Mode From Gateway...
12/20/2013 01:39:07 PM	Received a packet:Command = DB, Status = Ok, Value = 43
12/20/2013 01:39:06 PM	Requesting Signal Strength...
12/20/2013 01:39:05 PM	Received a packet:Command = VR, Status = Ok, Value = 80-65
12/20/2013 01:39:05 PM	Requesting Firmware Version...
12/20/2013 01:39:04 PM	Received a packet:Command = SL, Status = Ok, Value = 40-62-B1-33
12/20/2013 01:39:03 PM	Received a packet:Command = SH, Status = Ok, Value = 00-13-A2-00
12/20/2013 01:39:02 PM	COM Listener Thread is still alive.
12/20/2013 01:37:56 PM	Repeater Range Repeater 2 was missing from the last wake cycle (755)
12/20/2013 01:37:56 PM	Checking Repeater Id:19
12/20/2013 01:37:56 PM	Repeater 7T Repeater was missing from the last wake cycle (9)
12/20/2013 01:37:56 PM	Checking Repeater Id:18
12/20/2013 01:37:56 PM	Repeater 5G Repeater was missing from the last wake cycle (9)
12/20/2013 01:37:56 PM	Checking Repeater Id:15
12/20/2013 01:37:56 PM	Repeater 18T Repeater was missing from the last wake cycle (4843)
12/20/2013 01:37:56 PM	Checking Repeater Id:14
12/20/2013 01:37:55 PM	Repeater Range Repeater was missing from the last wake cycle (9)
12/20/2013 01:37:55 PM	Checking Repeater Id:13
12/20/2013 01:37:55 PM	Checking Data Logger Id:75
12/20/2013 01:37:55 PM	ISDL DL-12 Green was missing from the last wake cycle (4537)
12/20/2013 01:37:55 PM	Checking Data Logger Id:74
12/20/2013 01:37:55 PM	ISDL DL-4 Green was missing from the last wake cycle (9)

Two operations can be performed on the communication log data and are controlled by icons near the top-right edge of the log area:

	Copy all contents of the Communication Logs to the clipboard. For support purposes, Rain Bird GSP may ask for this data.
	Clear Communication Logs contents.

Also available in Diagnostics is the button shown below:

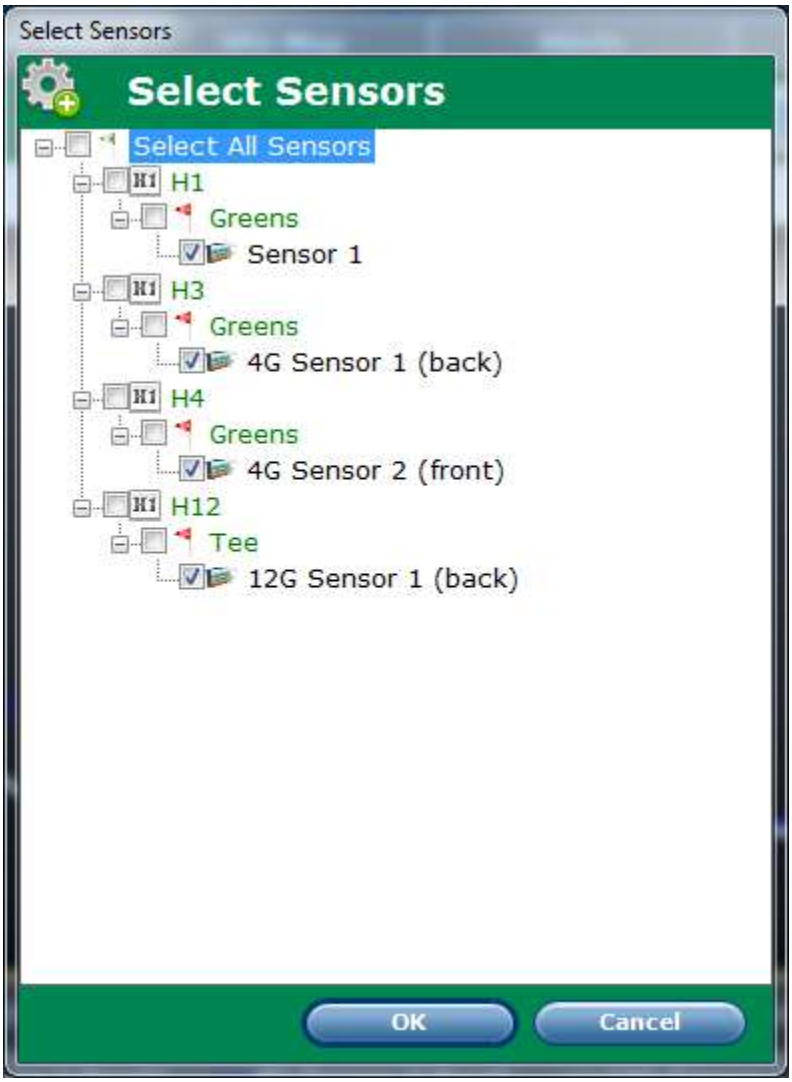
Select this button to perform a sync operation the next time the wireless network wakes up. The sync operation sets the date/time of each device based on the date/time of the PC and updates the wake-up interval set in the Sampling Rate for Sensors dialog (see 2.2.4 Sampling Rate for Sensors). After adding new ISDL data loggers or ISR repeaters to the wireless network, push the Sync button to assure that the device(s) will be discovered and properly integrated into the wireless network on the next wake cycle.

Section 5 – Sensor Graph View

For graphical data view and sensor/central control program calibration prior to integrated irrigation management Soil Manager uses the Sensor Graph View:

The graph view can display up to 14 sensors at a time. Additional options will be shown if 1 sensor only is selected. Those options will be discussed in Section 9 – Controlling Irrigation with Soil Moisture Data. The list of displayed sensors is set by clicking the Select Sensors button:

A simple dialog showing all known sensors will be displayed. Set the checkbox beside each sensor to be charted, as shown below:



Once display sensors have been selected, the days of data display are set through the 2 calendar controls:

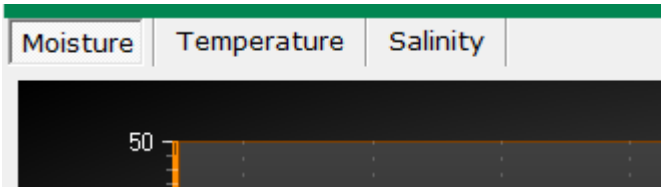
The left calendar control sets the start date. The start time associated with the date will automatically be set to 00:00:00, midnight. The right calendar control sets the end date. The end time associated with the end date is automatically set to 23:59:59.

To update the displayed chart after changing start or end dates, click the refresh button, as shown below:

The first time a new date range is entered the data retrieval time may be long but subsequent queries will be faster.

To move both start and end dates forward or backward by 1 day, click the left and right arrow buttons. You might do this keeping 1 week of data displayed while moving through time.

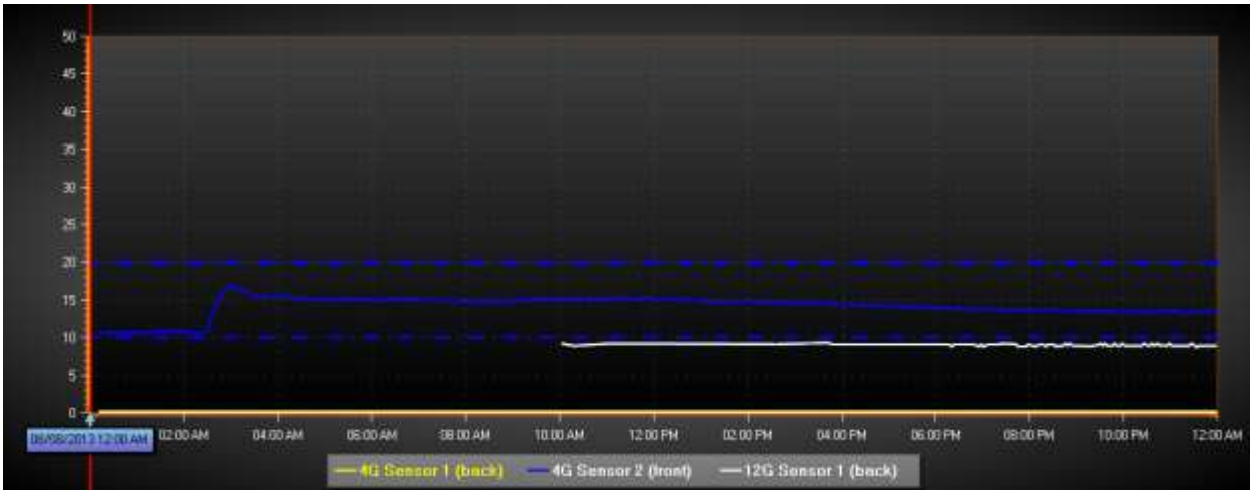
Moisture, temperature and salinity data can be charted for the selected sensors. Choose the view using the chart tabs as shown below:



To automatically update the chart with new sensor data upon arrival, select the Auto Refresh checkbox, as shown below:

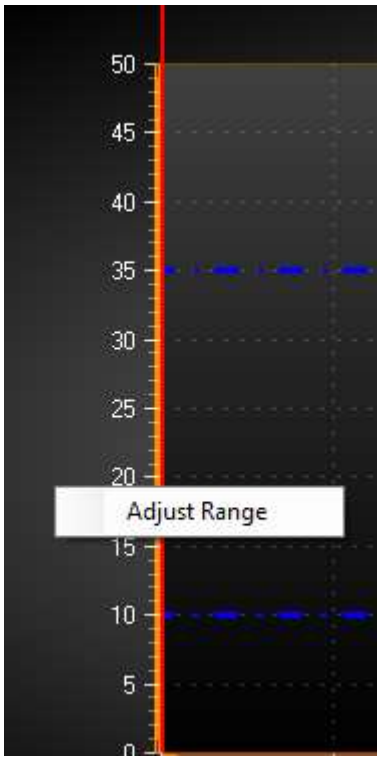
When Auto Refresh is selected, the end date is automatically set to the current time and new sensor data is automatically added to the end of the chart. When Auto Refresh is selected, neither start nor end date can be changed manually. To manually change start date, deselect Auto Refresh, change the start date and reselect Auto Refresh.

The data chart itself has several features to help analyze and understand data. Refer to the figure below for an overview. Each feature will be discussed below.



5.1. Adjusting Y-Axis

The Y-axis value range can be adjusted. To adjust, right-click in the area left of the axis to display a popup menu and select the Adjust Range item (see below):



You may also double-click the Y-axis area to open the Chart Range dialog for the data type being displayed, moisture, temperature or salinity:

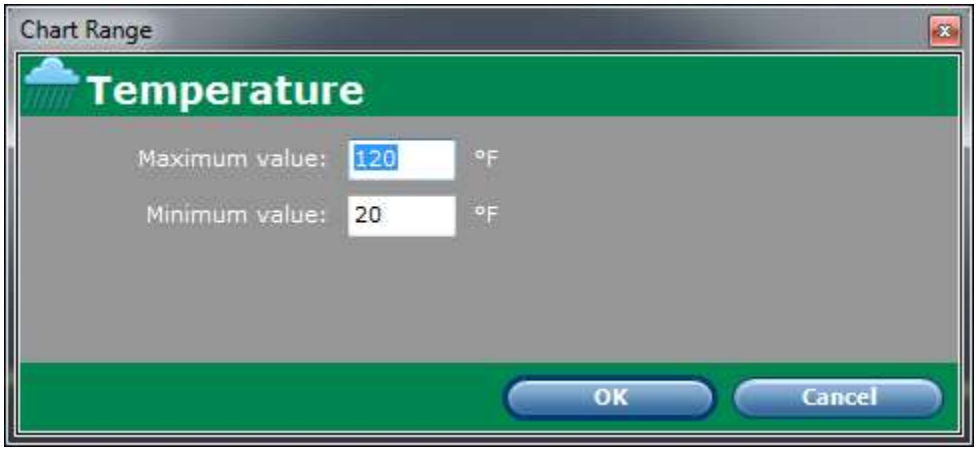


Chart Range
Temperature
Maximum value:
120
°F
Minimum value:
20
°F
OK
Cancel

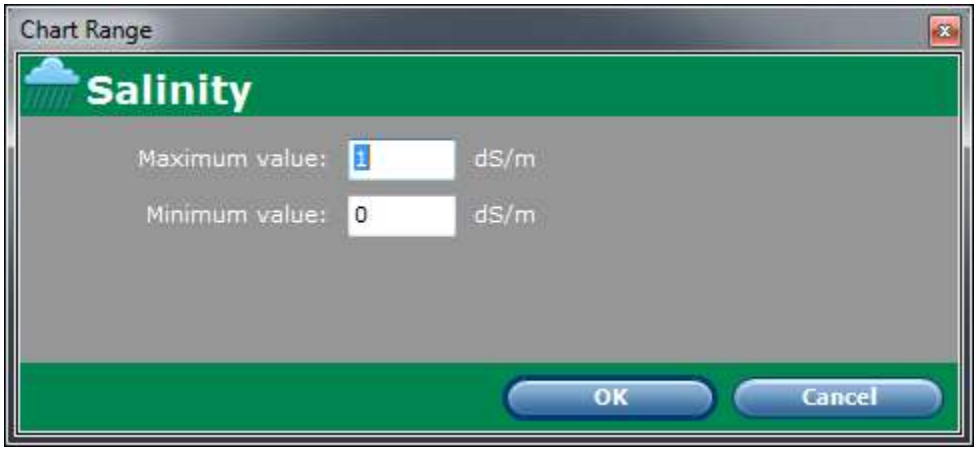
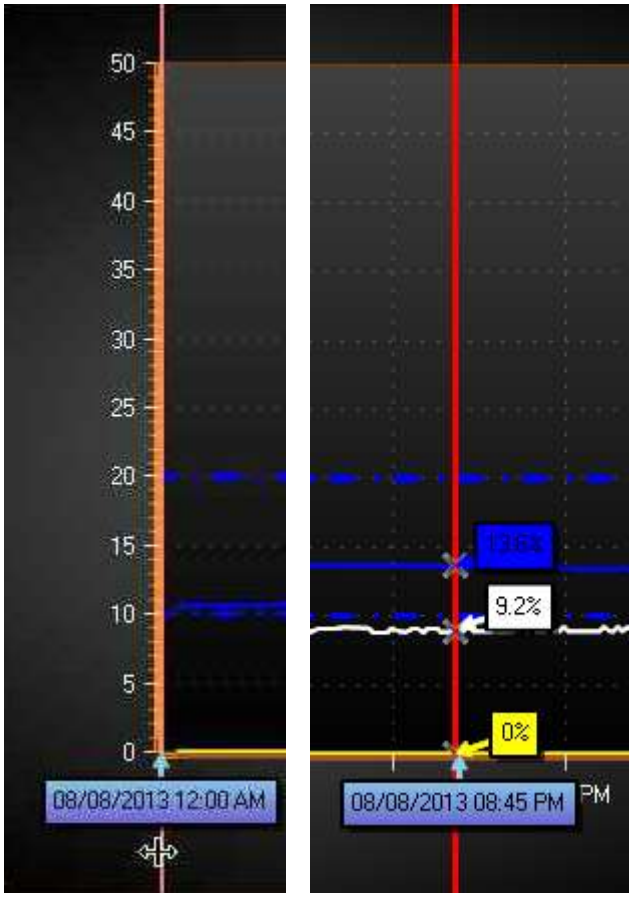


Chart Range
Salinity
Maximum value:
1
dS/m
Minimum value:
0
dS/m
OK
Cancel

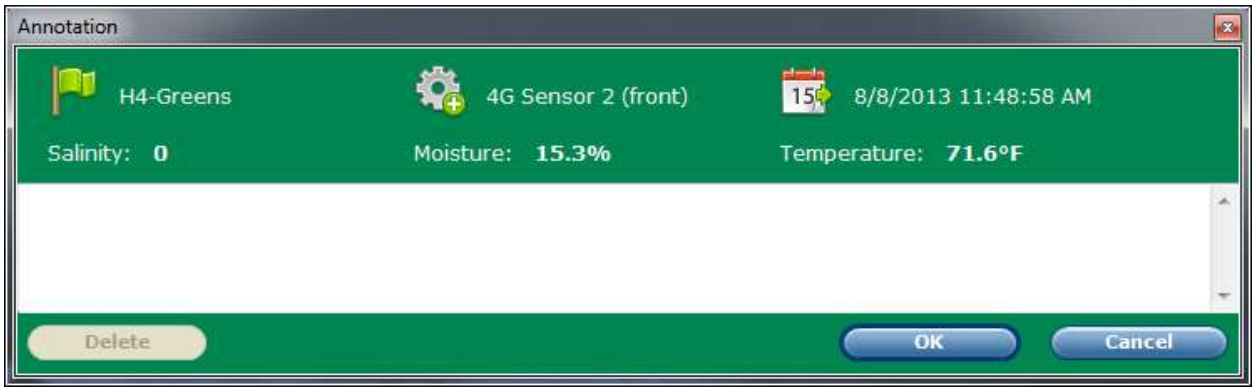
5.2. Cursor

In the chart area, a cursor is provided allowing identification of each sensor's value at a given date/time. The cursor is moved by floating the mouse above it (the mouse cursor will change to indicate), clicking and draging to move the cursor. Where the cursor intersects sensor data, pop-up notes will indicate the data value for each.

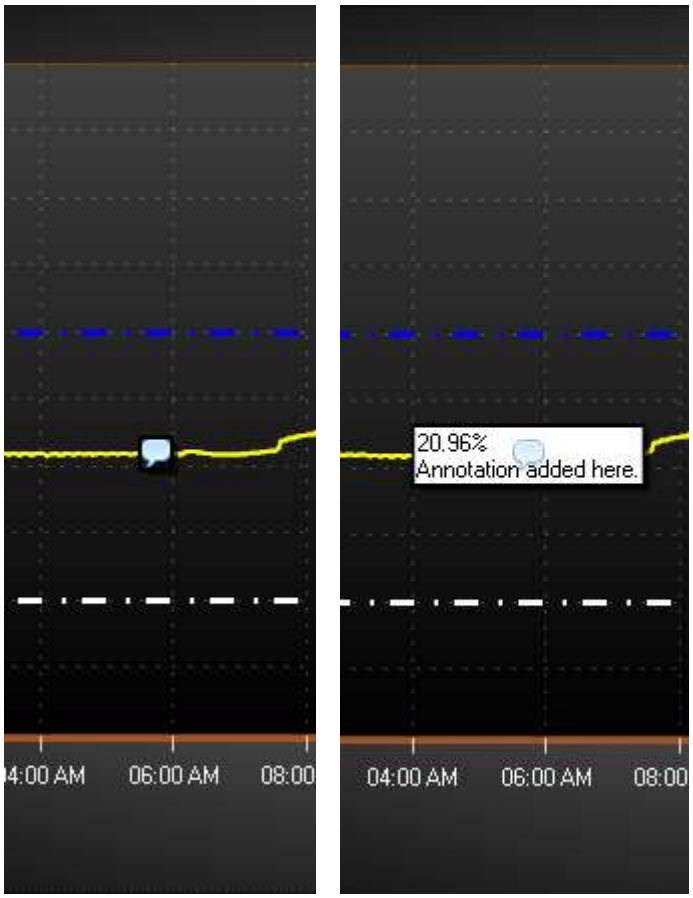


5.3. Annotations

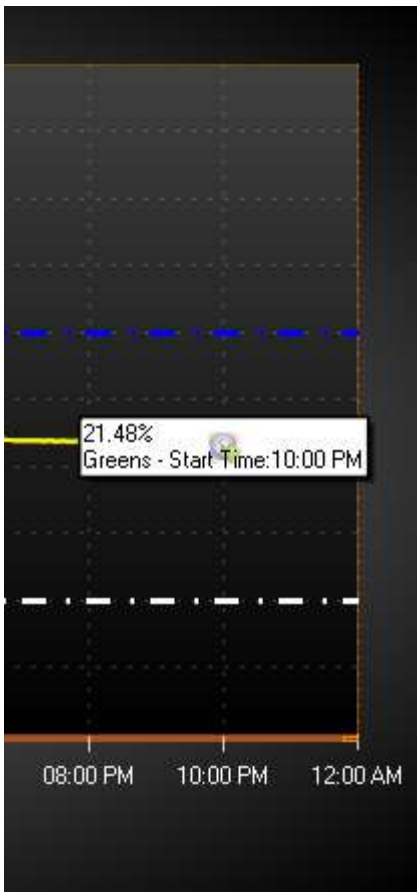
To add a data annotation at a given point in the chart, right-click. The Annotation dialog will appear allowing you edit edit an existing annotation or add a new one:



Once an annotation is created it is displayed on the chart as a bubble. Float the mouse over the bubble to see the annotation text with the sensor data value.

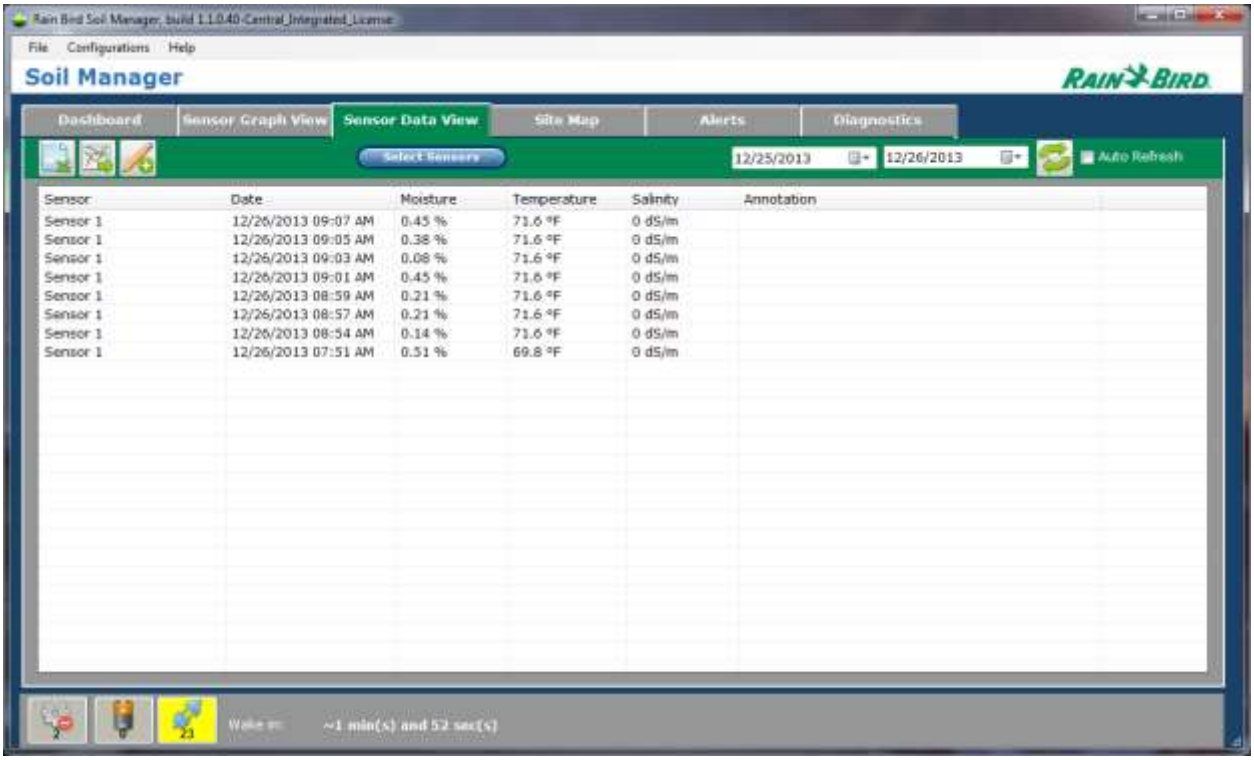


When using Rain Bird central control integration, central control irrigation program start times associated with sensors are indicated with clock icons on the data traces as shown below. Floating the mouse over the clock icon shows the sensor data point and program name and information:



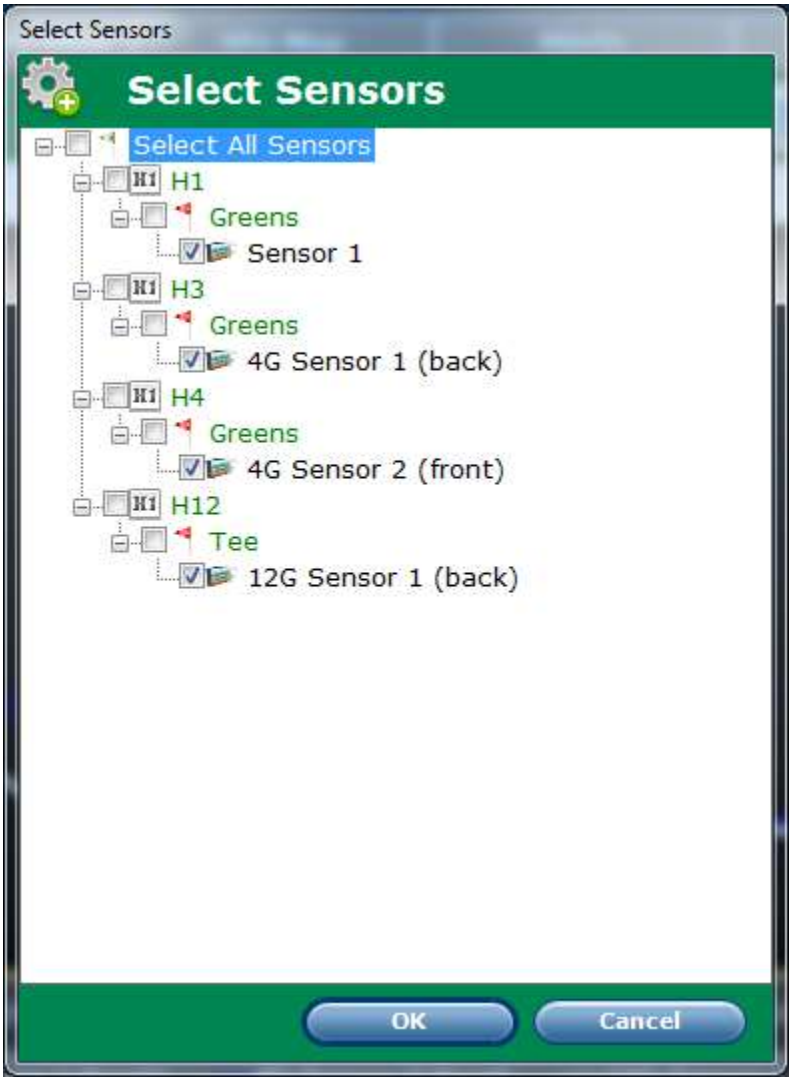
Section 6 – Sensor Data View

For tabular data view Soil Manager uses the Sensor Data View:



The Sensor Data View can be configured to display up to 14 sensors and many days' data. The list of displayed sensors is selected by clicking Select Sensors button shown below:

A simple dialog showing all known sensors will be displayed. Set the checkbox beside each sensor to be displayed, as shown below:



Once display sensors have been selected, the days of data display are set through the 2 calendar controls:

The left calendar control sets the start date. The start time associated with the date will automatically be set to 00:00:00, midnight. The right calendar control sets the end date. The end time associated with the end date is automatically set to 23:59:59. To update the displayed data table after changing start or end dates, click the refresh button, as shown below:

Data is displayed for each sensor value recorded between the start and end dates, generally as shown below:

Sensor	Date	Moisture	Temperature	Salinity	Annotation
Sensor 1	12/26/2013 09:07 AM	0.45 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 09:05 AM	0.38 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 09:03 AM	0.08 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 09:01 AM	0.45 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 08:59 AM	0.21 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 08:57 AM	0.21 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 08:54 AM	0.14 %	71.6 °F	0 dS/m	
Sensor 1	12/26/2013 07:51 AM	0.51 %	69.8 °F	0 dS/m	

The Sensor colum gives the sensor name (set through sensor Properties in the Diagnostics tab; see Section 13 – Setting Sensor Properties). The Date is the date and time the sensor data was received by Soil Manager. Tabular data is always sorted by Date. Moisture, Temperature and Salinity are the sensor data values for each parameter. Annotation is a text field that you can edit allowing irrigation information, notes, or comments to be added to the sensor data. See below for Annotation editing instructions.

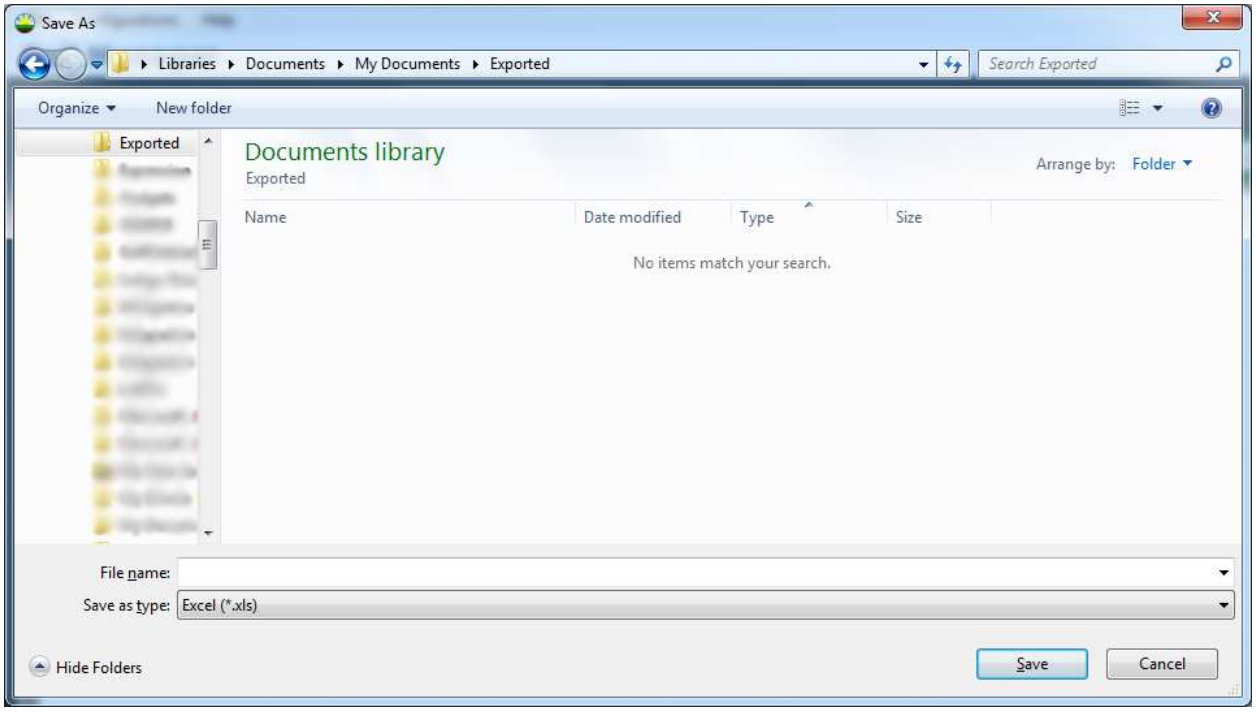
To automatically update the table with new sensor data upon arrival, select the Auto Refresh checkbox, as shown below:

When Auto Refresh is selected, the end date is automatically set to the current time and new sensor data is automatically added to the end of the chart. When Auto Refresh is selected, neither start nor end date can be changed manually. To manually change start date, deselect Auto Refresh, change the start date and reselect Auto Refresh.

6.1. Export to Excel

The Copy to Excel button allows the current table entries to be exported for use in Microsoft Excel or another analysis package. To export data click the button as shown below:

A Save As dialog will be presented allowing selection of the exported file name and location:



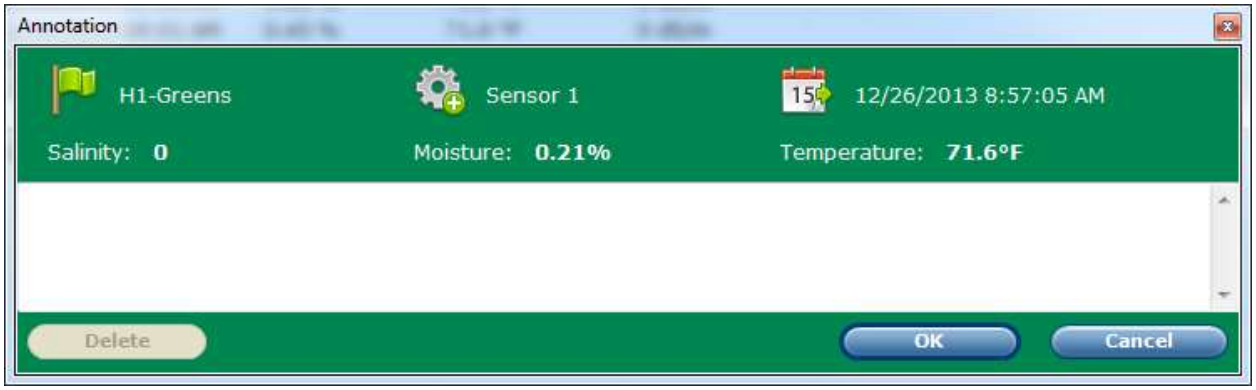
Select the target folder and file name and click Save to complete the export process. Click Cancel to abort the export process. Data is exported in Excel XML format. When opening in Excel you may be notified that the extension does not match the data format (depending on Excel version used). Allow the open to continue and the data will be properly read. See Section 16.1 – Error indicators for further information.

The Graph Values button shown below uses the same date range and sensor list creating a new graph in the Sensor Graph View tab.

6.2. Annotations

The Add an Annotation button pictured below allows you to add a note or comment to a single sensor reading. To add an annotation (or edit an exiting annotation), select 1 row in the sensor table by clicking anywhere in the row. This will highlight the row allowing an Add an Annotation click:

Clicking the Add an Annotation button opens a simple dialog for annotation entry:

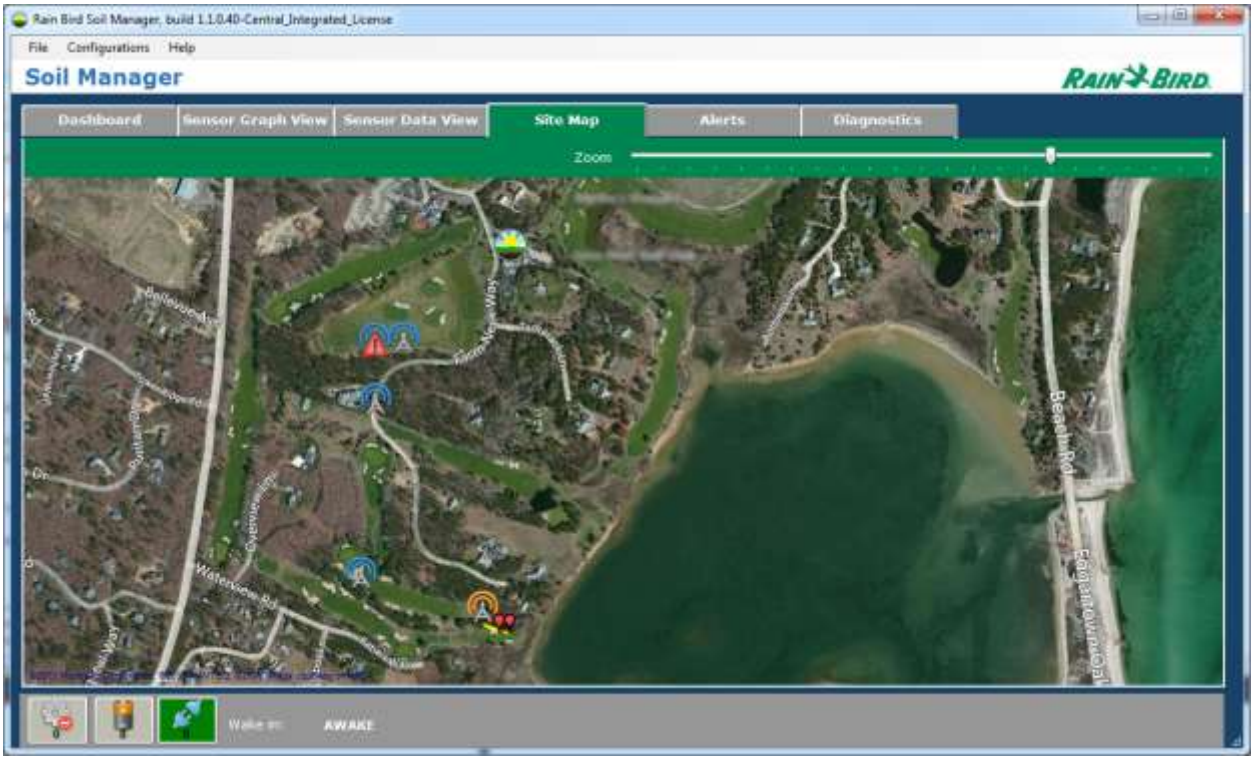


The dialog shows the selected row's sensor data values and the sensor's location and sublocation. Click in the text field and type your annotation. Click OK to accept the annotation or Cancel to abort annotating the row.

If the data row already contains an annotation when Add an Annotation is clicked, the Delete button is enabled. Clicking this button deletes the existing annotation, after requesting confirmation.

Section 7 – Site Map

Soil Manager can display the wireless network components of the system using satellite maps from Bing. In order to locate the network gateway, data loggers, repeaters, and sensors, their GIS (geographic information system) location values must be entered through the Diagnostics tab and each device properties dialog (as described in 4.1 Wireless Network Tree, Section 10 – Setting Wireless Network Properties, Section 11 – Setting ISDL Data Logger Properties, Section 12 – Setting ISR Data Repeater Properties, and Section 13 – Setting Sensor Properties). Once 1 or more devices have such location data, clicking the Site Map tab will display a map of the area, marking device locations with the same icons used in the Diagnostics tab:



Icons used for each device type are:

	ISDL data logger in normal state. Battery is OK and ISDL responded to last network check.
	ISDL data logger in low-battery state. Battery should be replaced before unit drops off network.
	ISDL data logger showing communication error. The data logger may have a dead battery or there may be a radio signal issue (a tree blocking the signal, problem with antenna, etc.)
	ISR repeater in normal state. Battery is OK and ISR responded to last network check.
	ISR repeater in low-battery state. Battery should be replaced before unit drops off network.
	ISR repeater showing communication error. The repeater may have a dead battery or there may be a radio signal issue (a tree blocking the signal, problem with antenna,

	etc.)
	Sensor in normal state. Sensor data values are in-range.
	Sensor in alert state. Sensor data value(s) may be out of range or sensor may have been damaged (by aeration, for example), resulting in communication problems.

7.1. Panning and Zooming

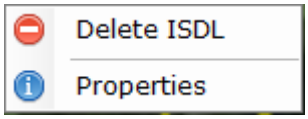
The map can be panned (moved from side-to-side or up-and-down) by clicking in the map area and dragging the mouse. The map can be zoomed in 1 of 2 ways: using the mouse wheel found on certain mice while the mouse cursor is over the map, and using the Zoom control, as shown below:

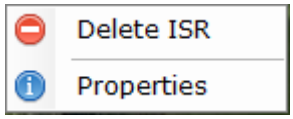
When zooming, the map remains centered on the same location during zoom. Click and drag the Zoom control marker left or right to zoom out (left) or in (right). Clicking in the Zoom control to the left or right of the marker also decreases or increases zoom by 1 step.

Floating the mouse over a device icon displays information about the device state similar to that shown in the Diagnostics tab. For example below a repeater's state is found by floating over the icon:

In the example above, the repeater has not been contacted recently, possibly due to bad batteries or radio issues. However, the last battery voltage received from the repeater was relatively good, 5.2V. This suggests that antenna problems, new tree or shrub growth, or other line-of-sight issues have caused the problem.

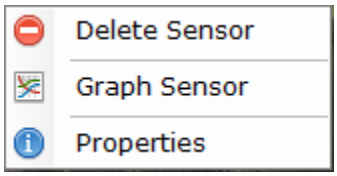
Right-clicking an icon in Site Map will display a short menu. For data loggers, the menu allows deletion or property editing (see Section 11 – Setting ISDL Data Logger Properties). For repeaters, the same 2 menu items are provided (see Section 12 – Setting ISR Data Repeater Properties).





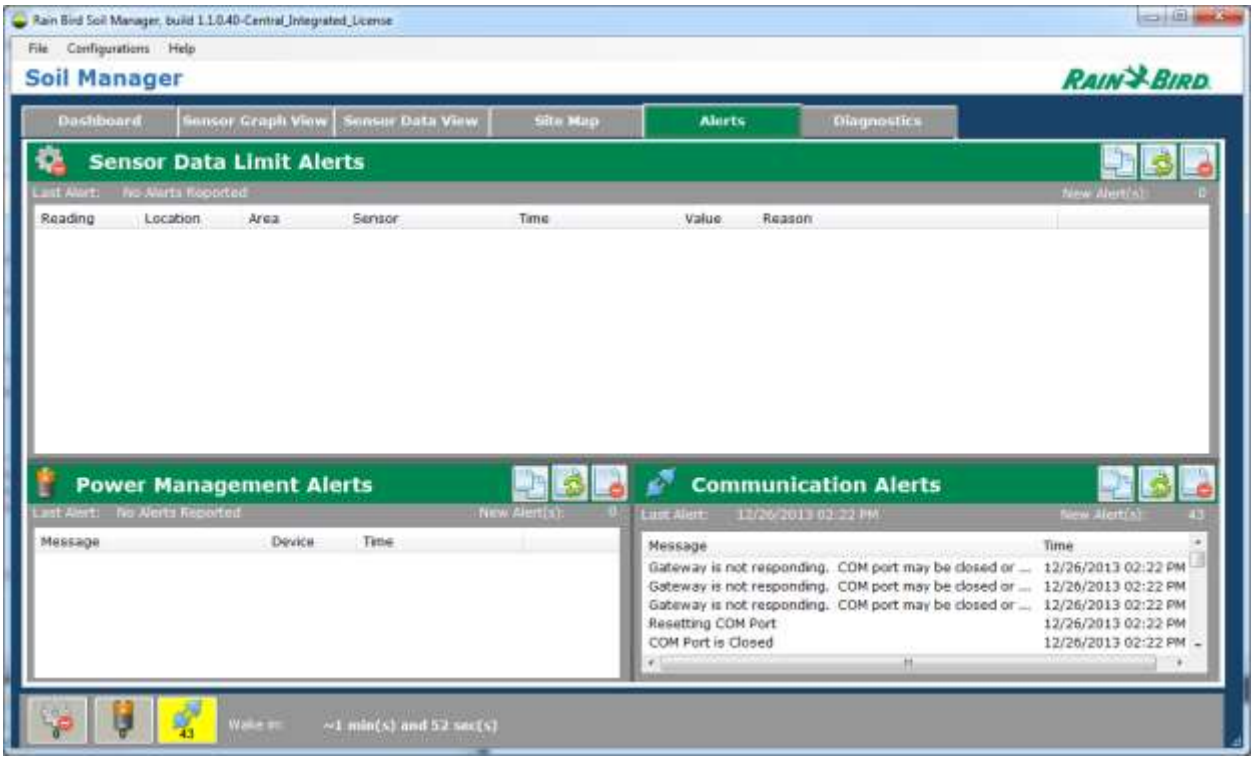
The Delete ISDL and Delete ISR items will permanently remove the devices from the database. If the devices are still active on the network they will likely be rediscovered during the next network cycle but map location and notes will be lost.

For sensors, the device can be deleted, have properties edited (see Section 13 – Setting Sensor Properties), or the data can be graphed on the Sensor Graph View tab.



Section 8 – Alerts

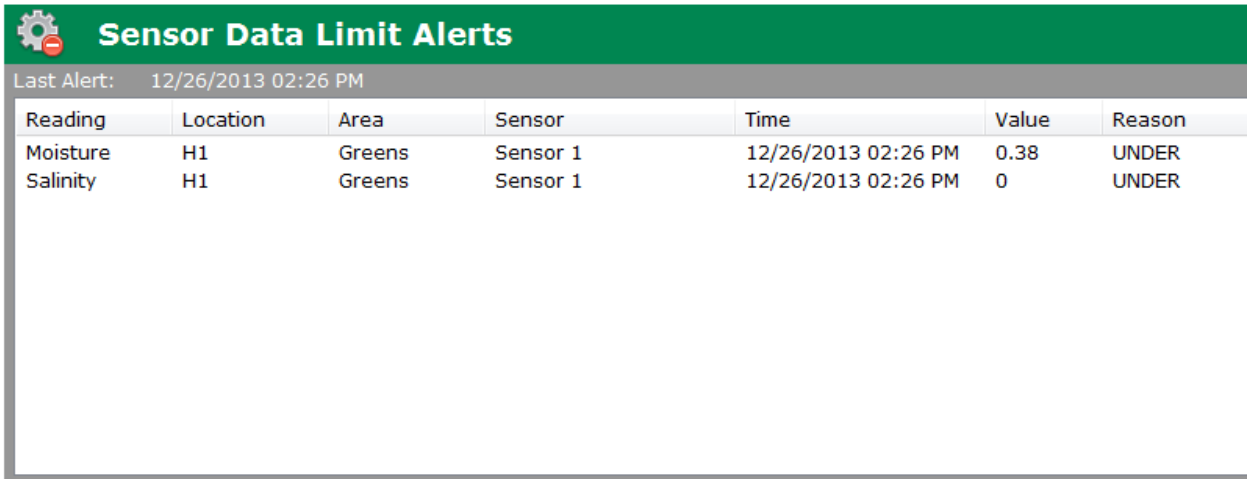
Soil Manager records several types of exceptional conditions and can react to these “alerts” in various ways. The Alerts tab provides access to the alert logs:



Alerts are divided by Soil Manager into 3 classes: Sensor alerts, Power alerts, and Communication alerts.

8.1. Sensor Data Limit Alerts

Sensor Data Limit Alerts contains sensor warnings and errors. For example in the picture below a sensor's moisture and salinity values are out-of-range:



Reading	Location	Area	Sensor	Time	Value	Reason
Moisture	H1	Greens	Sensor 1	12/26/2013 02:26 PM	0.38	UNDER
Salinity	H1	Greens	Sensor 1	12/26/2013 02:26 PM	0	UNDER

The Reading column indicates which sensor value is out of range. The Location and Area columns display the faulted sensor's Location and Area values. The Sensor column displays the user-assigned sensor name. The Time column displays the date and time at which the sensor fault was detected. The Value column displays the sensor value associated with the Reading parameter at the time the fault was detected. The Reason column further indicates why the sensor value was categorized as faulted. The first example row shows that Sensor 1, located at H1/Greens is reading a moisture value of 0.38% which is below the established range for this parameter. In this case, the very low moisture value might indicate a sensor not yet installed in the soil or faulty sensor hardware or sensor-to-data logger communication.

Sensor data limits are actually set through the Sensor Thresholds dialog. Pull down the Configurations menu and select Sensor Thresholds. Refer to 2.2.3 Sensor Thresholds for further information.

The Sensor Data Limit Alerts provide 3 alert operations:

	Copies the contents of Sensor Data Limit Alerts to the Windows clipboard. From the clipboard the data could be pasted into email or almost any Windows document.
	Refreshes the contents of Sensor Data Limit Alerts with the latest sensor data. This normally happens automatically.
	Acknowledges (and hides) sensor alerts. If 1 or more alert rows are selected in Sensor Data Limit Alerts, those alerts will be acknowledged and removed from the list. If no alerts are selected, Soil Manager will ask if all sensor alerts should be cleared. If approved this will clear the contents of Sensor Data Limit Alerts entirely.

Sensor alerts trigger Soil Manager notification of new alerts, but if a sensor continues out of range alerts are not repeated for each new sensor read. Even if the sensor value moves back into range and then leaves again, the alert will not be repeated until the sensor alert is acknowledged (this prevents the same alert from being generated repeatedly, during maintenance for example). If the sensor reports an alert for an UNDER condition and then later moves to an OVER condition, a new alert will be created for the OVER condition. Until

both the OVER and UNDER alerts are acknowledged, no further alert notifications will be generated for the sensor.

8.2. Power Management Alerts

Power Management Alerts contains low-battery warnings generated by ISDL data loggers and ISR repeaters on the wireless network. Battery level alerts are signaled when device internal voltage is less than 4.4V. If not addressed promptly devices in the low battery state will shut down and stop recording/reporting sensor data. Power Management Alerts should be addressed quickly because of this.

As with Sensor Data Limit Alerts, several commands can act on Power Management Alerts:

	Copies the contents of Power Management Alerts to the Windows clipboard. From the clipboard the data could be pasted into email, work order, or almost any Windows document.
	Refreshes the contents of Power Management Alerts with the latest data logger and repeater data. This normally happens automatically.
	Acknowledges (and hides) power alerts. If 1 or more alert rows are selected in Power Management Alerts, those alerts will be acknowledged and removed from the list. If no alerts are selected, Soil Manager will ask if all power alerts should be cleared. If approved this will clear the contents of Power Management Alerts entirely.

8.3. Communication Alerts

Communication Alerts contains all remaining alert types generated by Soil Manager. This includes such non-error activities as start-up and shut-down of Soil Manager. Soil Manager will not notify you of such benign alerts.

Other alerts can include notifications of SD card issues in an ISDL data logger (card is missing or damaged), radio network disruptions (missing devices during the last wake cycle), data loggers with the rotary switch in the wrong position for best battery performance, problems integrating with Rain Bird central control software to control irrigation, and mismatched serial port (COM) settings causing the radio gateway device to be missed.

As with other alert types, several commands are available for Communication Alerts:

	Copies the contents of Communication Alerts to the Windows clipboard. From the clipboard the data could be pasted into email, work order, or almost any Windows document.
	Refreshes the contents of Communication Alerts with the latest data logger and repeater data. This normally happens automatically.
	Acknowledges (and hides) alerts. If 1 or more alert rows are selected in Communication Alerts, those alerts will be acknowledged and removed from the list. If no alerts are selected, Soil Manager will ask if all communication alerts should be cleared. If approved this will clear the contents of Communication Alerts entirely.

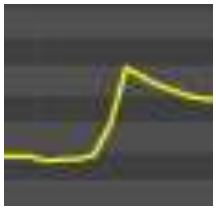
Section 9 – Controlling Irrigation with Soil Moisture Data

9.1. Theory of Operation

Soil Manager and Rain Bird central control allow irrigation to be controlled by soil moisture data. Using the integrated Soil Manager license this control can be fully automated with irrigation program run-time adjusted each time a sensor data value is received. However, even the stand-alone version of Soil Manager can be used to control irrigation through water budget calculation.

The basis of Soil Manager's irrigation control is a "calibration" cycle. The calibration cycle is a single irrigation program run of the program to be controlled. For this run, the program must not use ET, but a fixed run-time. Cycle and soak should not be used so the moisture effect of the full run can be observed. Soil Manager also assumes the program water budget is 100% during the run. Further, the program should not cause the soil to reach field capacity.

During the calibration run, the Soil Manager sensor sampling rate is set to a small value giving more data. Once the run is complete Soil Manager can be set back to a slower sampling rate. The data acquired during the calibration run will appear something like the example shown below:



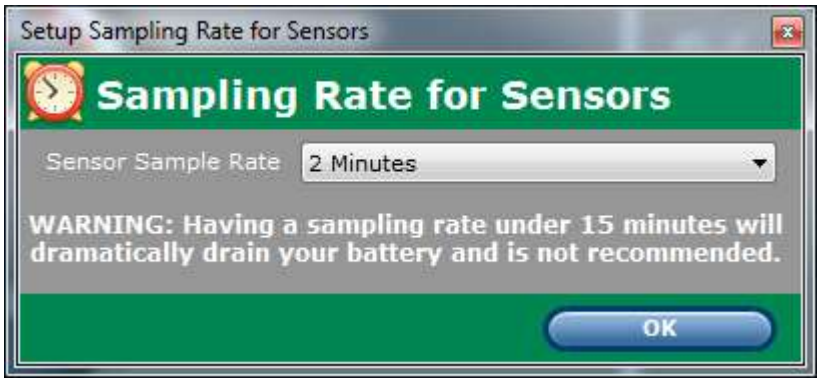
During the irrigation event the soil moisture rises relatively sharply. At the end of the irrigation run it begins dropping from the peak value. Using the initial soil moisture value (the low spot on the curve before the irrigation event begins), and the difference between the starting value and the peak value, Soil Manager can calculate the change in soil moisture for a 100% water budget program irrigation event. From this information the slope of the moisture curve is calculated. Rain Bird has tested many soil types and found that this slope is consistent across the moisture levels normally encountered in turf growing applications.

Once the slope is identified Soil Manager can predict the water budget needed to reach any target soil moisture level. Based on a user-entered target soil moisture value Soil Manager will display the water budget needed to reach the moisture level given the current soil moisture. When integrated with Rain Bird central control, the program water budget will be automatically updated with each new soil sensor result.

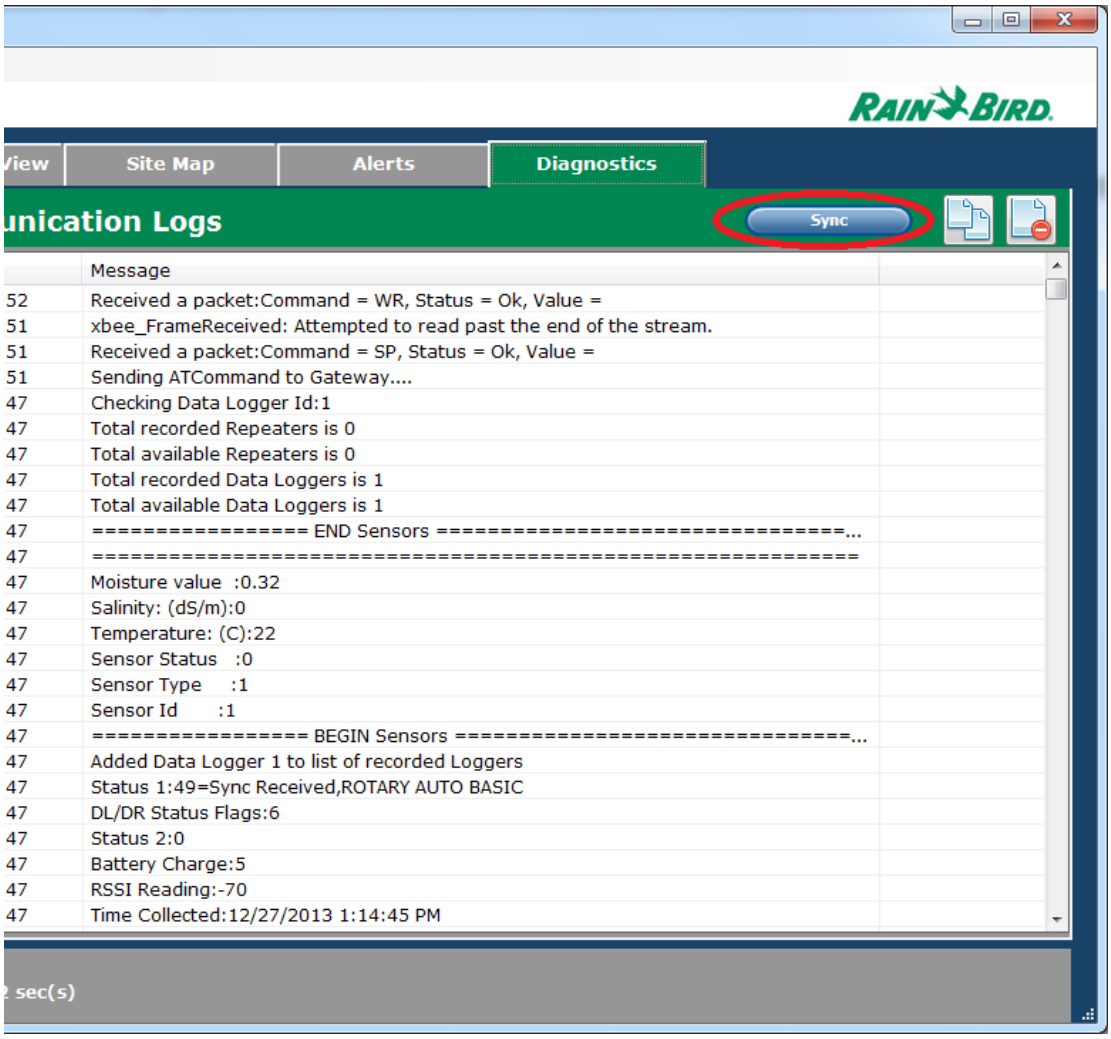
9.2. Performing the Calibration Cycle

To perform a calibration cycle first adjust the sensor sampling rate. The 2-minute sample rate is ideal for this operation, maximizing the resolution of measurements during the

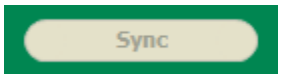
irrigation cycle. From the Configurations menu select Sampling Rate for Sensors. In the Setup Sampling Rate for Sensors dialog, select 2 minutes:



Click OK. To assure that all network devices are set for the new sampling rate, click the Sync button on the Diagnostics tab as shown below:



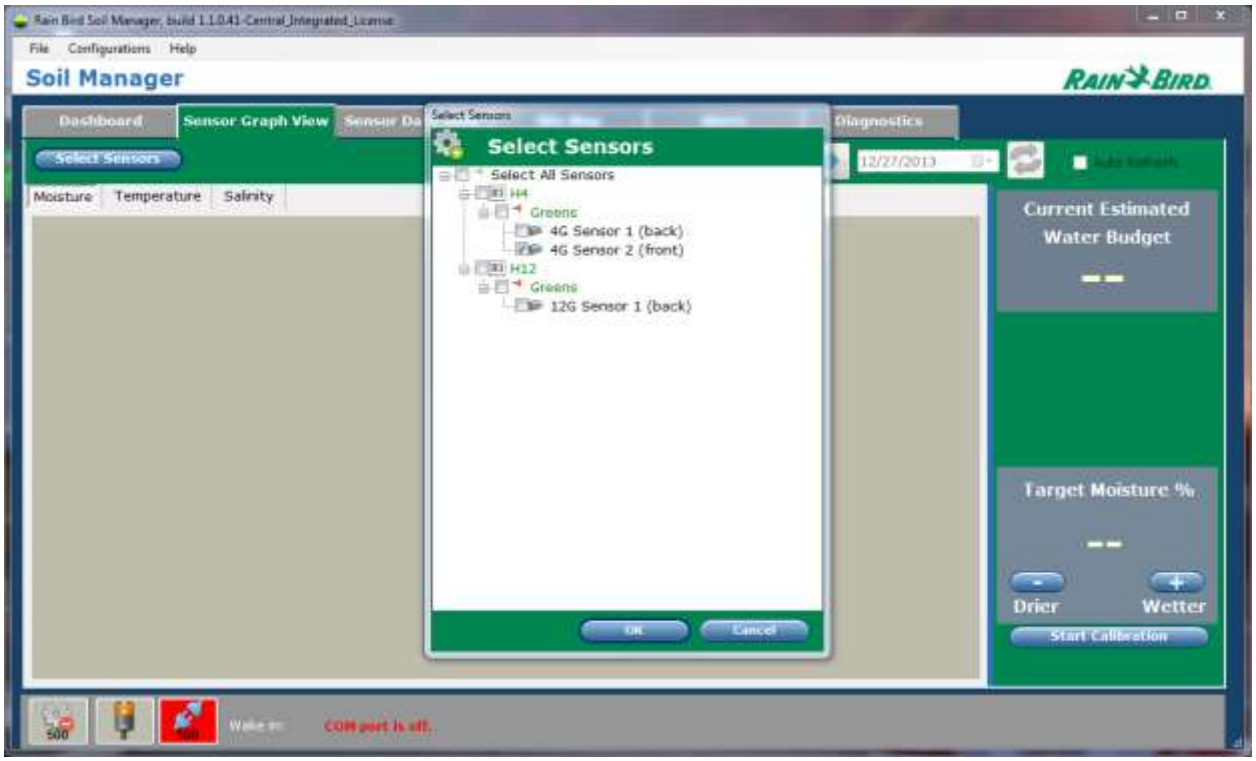
The Sync button will turn gray:

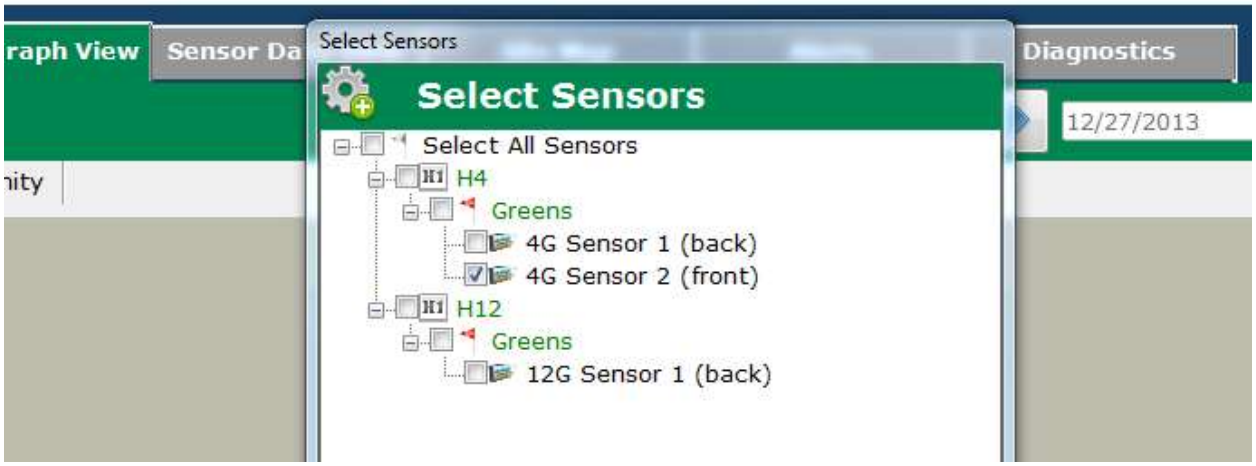


Wait for the next wake cycle. If the previous setting was 15 minutes, you may need to wait up to 15 minutes for the network devices to be updated. When the update is complete the Sync button will be reenabled:

Once the Sync button is reenabled, Soil Manager is ready for the irrigation event. Trigger the irrigation event/program. Remember that ET should not be used for calibration events and that programs should be set for 100% water budget for calibration. Allow the irrigation event/program to run to completion.

Open the Sensor Graph View tab. Use the Select Sensors button to select the single sensor which will control the irrigation program. Note that you should not select more than 1 sensor. A sample is shown below:

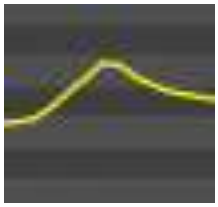




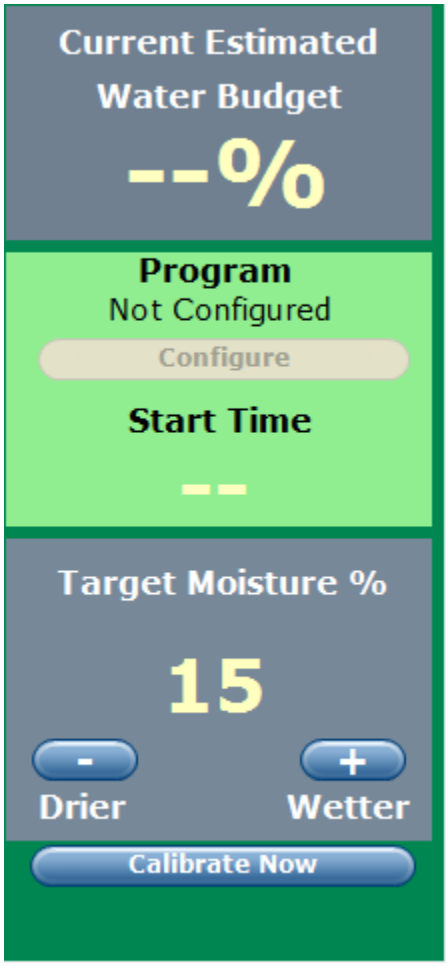
After selecting the sensor for calibration click OK and the Sensor Graph View should display the data, including the calibration run. A sample is shown below:

Various curve shapes may be seen. As mentioned above, a sharp peak indicates that field capacity was not reached during the event:

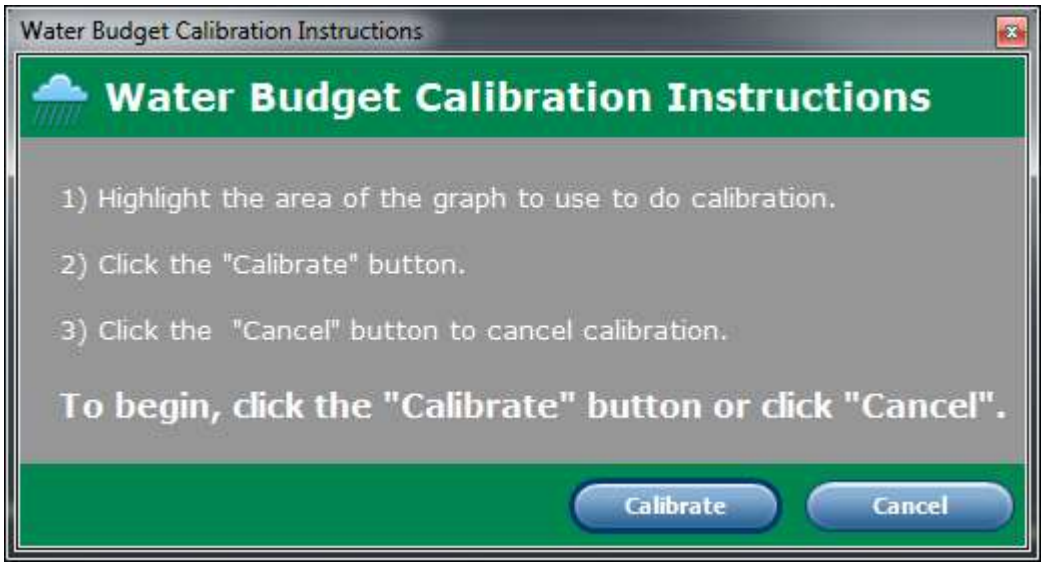
A smooth peak or plateau usually indicates that field capacity was reached. Such events are not suitable for calibration (and they indicate that too much water is being applied, an opportunity for savings when soil moisture controls the program). The curve below indicates that field capacity was reached:



Next note the additional controls in the Sensor Graph View when 1 sensor is selected. Both integrated and stand-alone Soil Manager licenses show the Current Estimated Water Budget and Target Moisture % controls. Only the central control integrated version shows the Program controls:



The next step in calibration is to click the Calibrate Now button. The Water Budget Calibration Instructions dialog will be displayed as shown below:



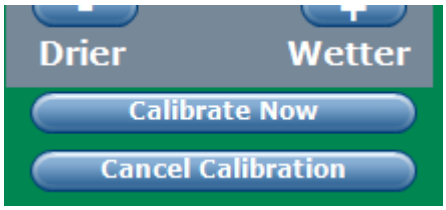
If you are ready to continue the calibration process, click Calibrate. To abort calibration for the selected sensor, click Cancel. Once you click Calibrate, several new capabilities are added to the Sensor Graph View:

The chart display can now be zoomed to isolate the irrigation event data. To zoom, click in the graph display away from the cursor and drag to select the section of the graph including the flat area before irrigation and the peak when irrigation was completed:

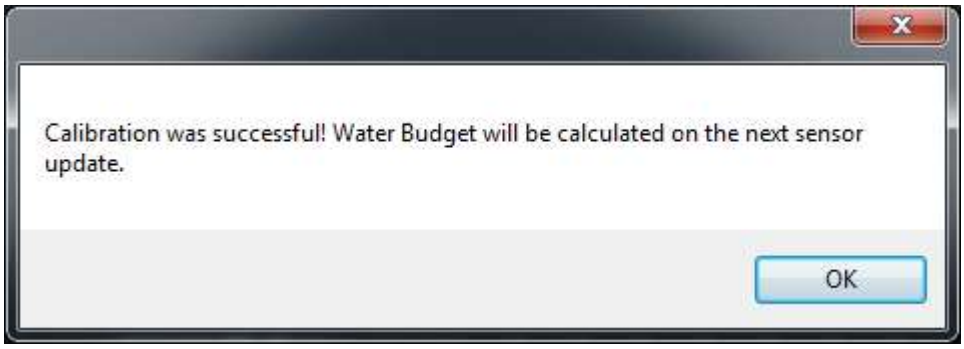
When you release the mouse, the graph will be zoomed to the selected area as shown below:

To zoom back to normal graph scale, click the Show All button:

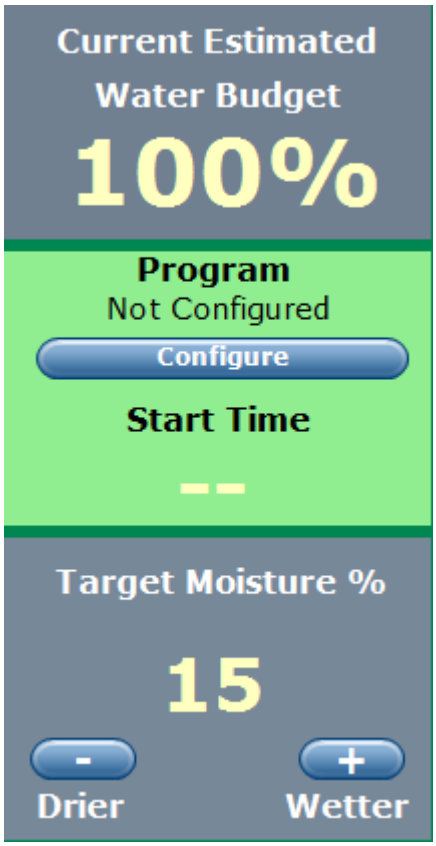
To scroll through the zoomed data use the scroll bar above the chart area. After the calibration data has been selected the calibration controls appear as follows:



To complete the calibration using the selected data range, click Calibrate Now. To cancel the calibration operation and return the graph to normal zoom state, click Cancel Calibration. After clicking Calibrate Now the calculations will be performed. If calibration is successful a dialog will be displayed:



If there is a problem with the data (field capacity was reached, there is not enough data in the irrigation event possibly because sensor sampling rate is too slow, data after the end of irrigation was not selected, etc.), an error dialog will be displayed indicating the problem. Repeat the process to select more data, better data, etc. and complete the calibration. After successful calibration, Soil Manager will display the water budget needed for the calibrated irrigation program to reach the selected soil moisture value:



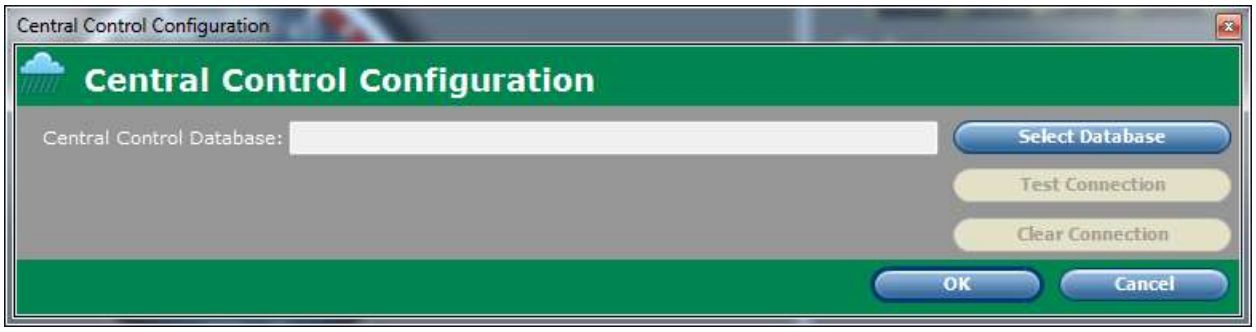
Use the Drier and Wetter buttons to adjust the Target Moisture % to achieve the most desirable conditions for the plant material. The target moisture value will be marked on the graph display with a white dashed line. Note that the Current Estimated Water Budget will not update immediately but only when the next sensor sample is received. If the soil moisture is higher than the target moisture, the water budget will be 0%. The maximum water budget Soil Manager will recommend is 300% (or 3 times the standard program run-time). Note that the water budget value can be used even with stand-alone Soil Manager to adjust a program for optimal soil moisture.

Once calibration is complete select Sampling Rate for Sensors fom the Configurations menu and restore the normal sensor monitoring frequency.

9.3. Linking a Rain Bird Central Control Program for Automatic Irrigation

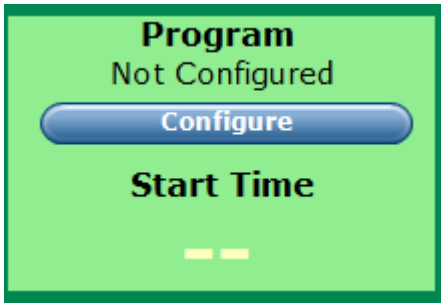
For completely automated sensor-based irrigation Soil Manager must be linked to the Rain Bird central control program calibrated above. It will then not simply display the water budget required to reach target moisture but will automatically adjust the program water budget each time sensor data is received.

Select Central Control Configuration from the Soil Manager Configurations menu to open the Central Control Configuration dialog:

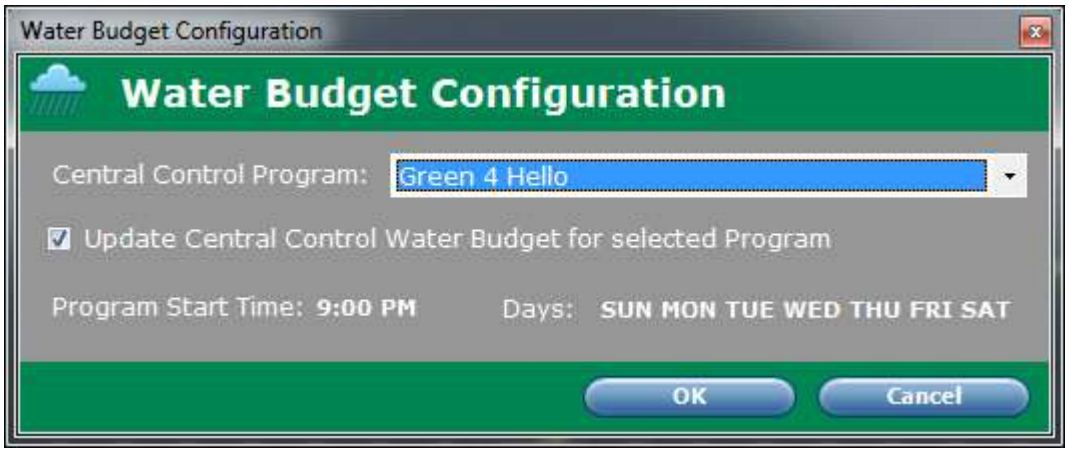


Click Select Database and select the active Cirrus, Nimbus II, Stratus II or Stratus central control database from your hard disk. Click OK.

In Sensor Graph View select Configure as shown below:

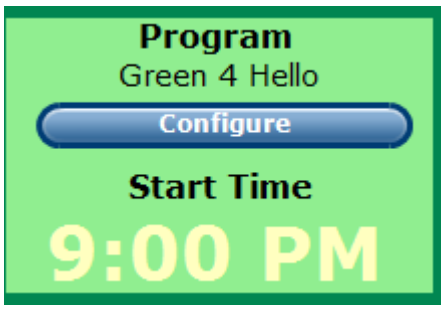


The Water Budget Configuration dialog opens for Rain Bird central control program selection. Use the Central Control Program drop-down list to choose the irrigation program used for calibration above. Note that you must use the program generating calibration data or water budget calculations will be incorrect:

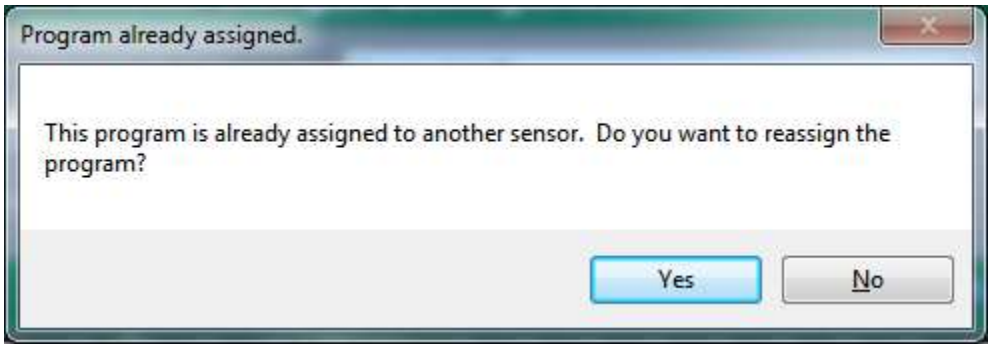


Above, the central control program called Green 4 Hello has been chosen as the calibrated program. To automatically update the central control database water budget for this program, set the checkbox Update Central Control Water Budget for selected Program. If this checkbox is unset, water budget will be calculated and displayed on the Sensor Graph View

but the central control database will not be updated. The first program start time and the watering days for the program are displayed in the dialog. After completing selections click OK to accept. When selected the program's use of ET will be disabled automatically by Soil Manager. The Sensor Graph View is updated with the program name and the next start time.

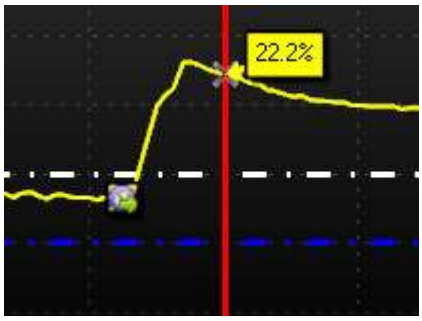


A single sensor can be linked to only 1 central control program and each central control program can only be linked to a single sensor. If you choose a central control program already associated with another sensor the following dialog will be presented:



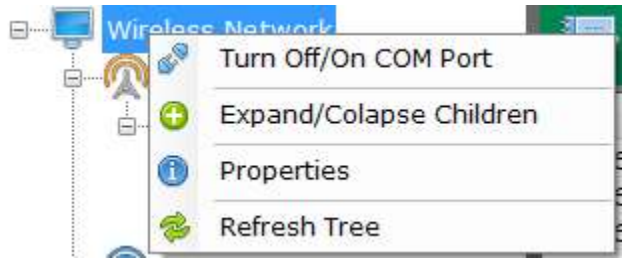
Selecting Yes will cause the program to be unlinked from the existing sensor association and linked with the current sensor. Clicking No will not assign the current sensor; you may choose a different program and try again.

Once a program is associated with the sensor the data graph itself will also be annotated with clock icons indicating the program start time each day. Note that the annotation does not indicate that irrigation actually ran at those times but acts as a reference showing when the program may have executed:



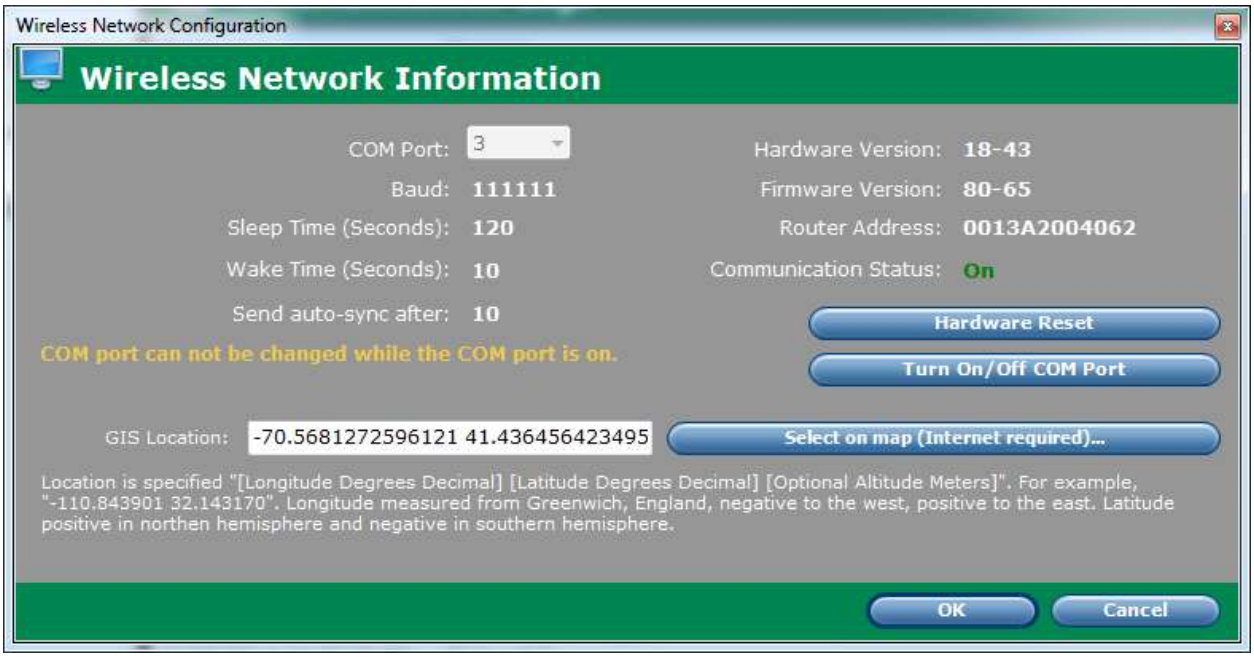
Section 10 – Setting Wireless Network Properties

The ISS gateway device and the wireless network have several properties which can be viewed and set through the properties dialog. To access the dialog, right click the Wireless Network node in the Diagnostics tab tree view and choose Properties as shown below:



Or right-click the gateway device on the Site Map tab and choose Properties.

This opens the Wireless Network Configuration dialog shown below:



COM Port controls the serial port number through which the PC communicates with the wireless network gateway device. The value can be changed using the pull-down list, but only when the COM port is in the OFF state.

The Baud rate, Wake Time, Send auto-sync after, Hardware Version, Firmware Version, and Router Address are fixed by the hardware and software configuration.

The Sleep Time is the time between network wake events during which all network communication occurs. This value can be changed through the Sampling Rate for Sensors dialog as described in 2.2.4 Sampling Rate for Sensors.

Communication Status indicates the state of the COM port (and whether or not the port number can be changed). To switch the COM port from ON to OFF or vice versa, select the Turn On/Off COM Port button. If the COM port is ON, you will be prompted to confirm that the COM port should switch OFF. While OFF, no network/sensor data is acquired by Soil Manager.

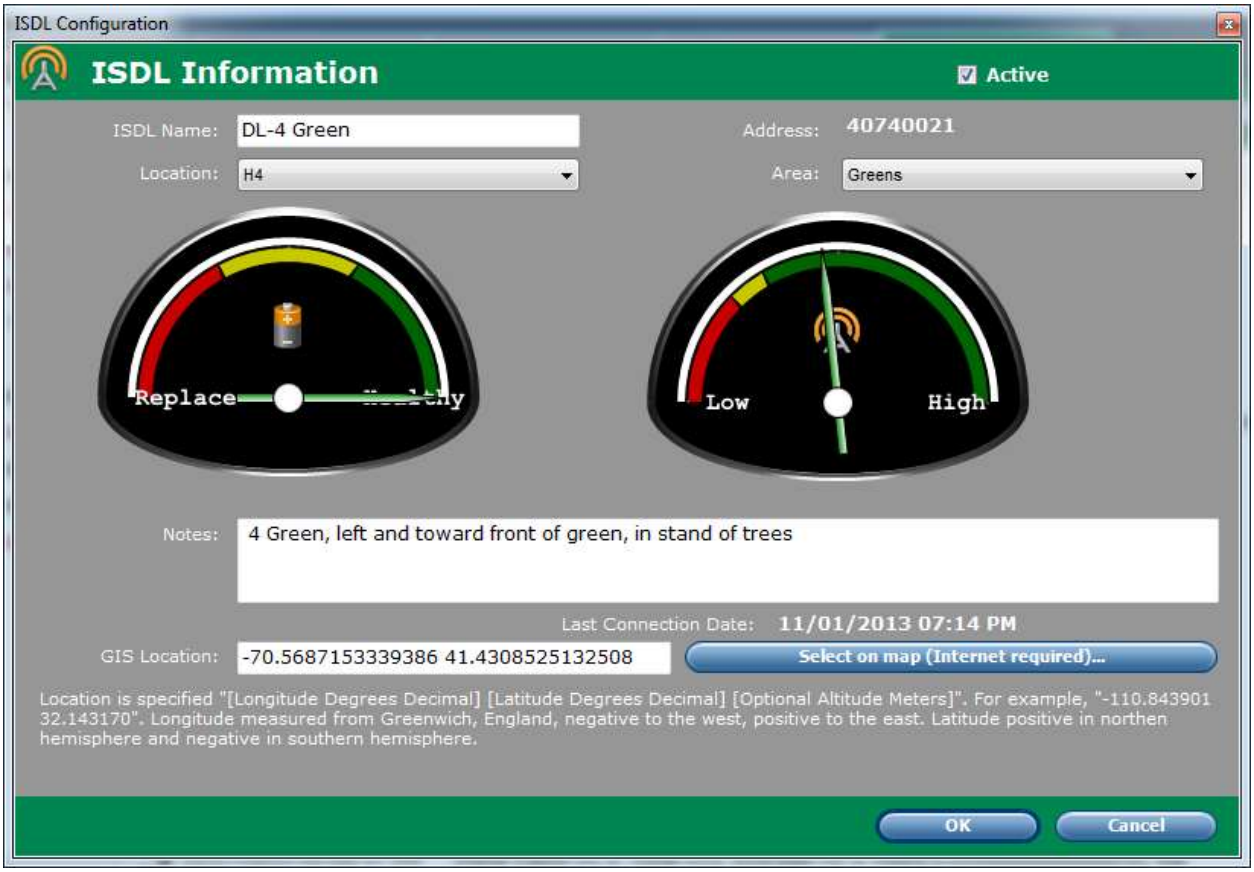
Hardware Reset performs a reset operation to the wireless network gateway and should be used only when instructed by Rain Bird support.

GIS Location is user-entered longitude and latitude data describing the geographical location of the gateway/central PC. These values can be entered directly from a GPS source that gives decimal values or the Select on map (Internet required) button can be used to find the location using overhead maps. For direct entry, longitude is measured from Greenwich, England (0 degrees), with negative degrees to the west and positive to the east. Latitude is similarly entered with the equator being 0 degrees and positive values in the northern and negative values in the southern hemisphere.

Select on map (Internet required) uses Bing maps to display an overhead view from which the gateway location can be selected. Clicking produces the Map Location dialog. Until at least 1 ISDL, ISR, sensor or the gateway has GIS Location set, the map will default to a location in Tucson, AZ, USA. Refer to Section 14 – Map Location Dialog for details on the Map Location Dialog.

Section 11 – Setting ISDL Data Logger Properties

Each ISDL Data Logger has a number of properties, some user-entered and some fixed. When the Properties menu item in the Diagnostics tab Wireless Network Tree (see 4.1 Wireless Network Tree), or the Site Map is selected, the ISDL Configuration dialog opens:



The ISDL Name is user-entered. Above a name of DL-4 Green has been entered to identify the data logger. The Address field contains the factory-assigned data logger address. When a new ISDL Data Logger is found on the wireless network a default Name value will be created based on the Address.

The Location and Area where the data logger is located can also be user-entered. Use the drop-down Location list to choose a location and the Area list to choose a list. To add new locations or areas or to edit existing location and area names see 2.2.2 Area Locations.

The Battery gauge indicates the relative health of the device battery (green = healthy, yellow = marginal, red = low battery). If the battery level shows in the red range unit batteries should be replaced promptly to avoid loss of network connectivity.

The Signal Strength gauge indicates the strength of the radio connection between the device and its neighbors. In the green region, either the up-stream or down-stream devices have good signal strength. In the yellow or red ranges, steps should be taken to strengthen the signal to prevent intermittent operation or loss of connectivity.

The Notes information is free-form user-entered information. It can be any useful text describing the data logger.

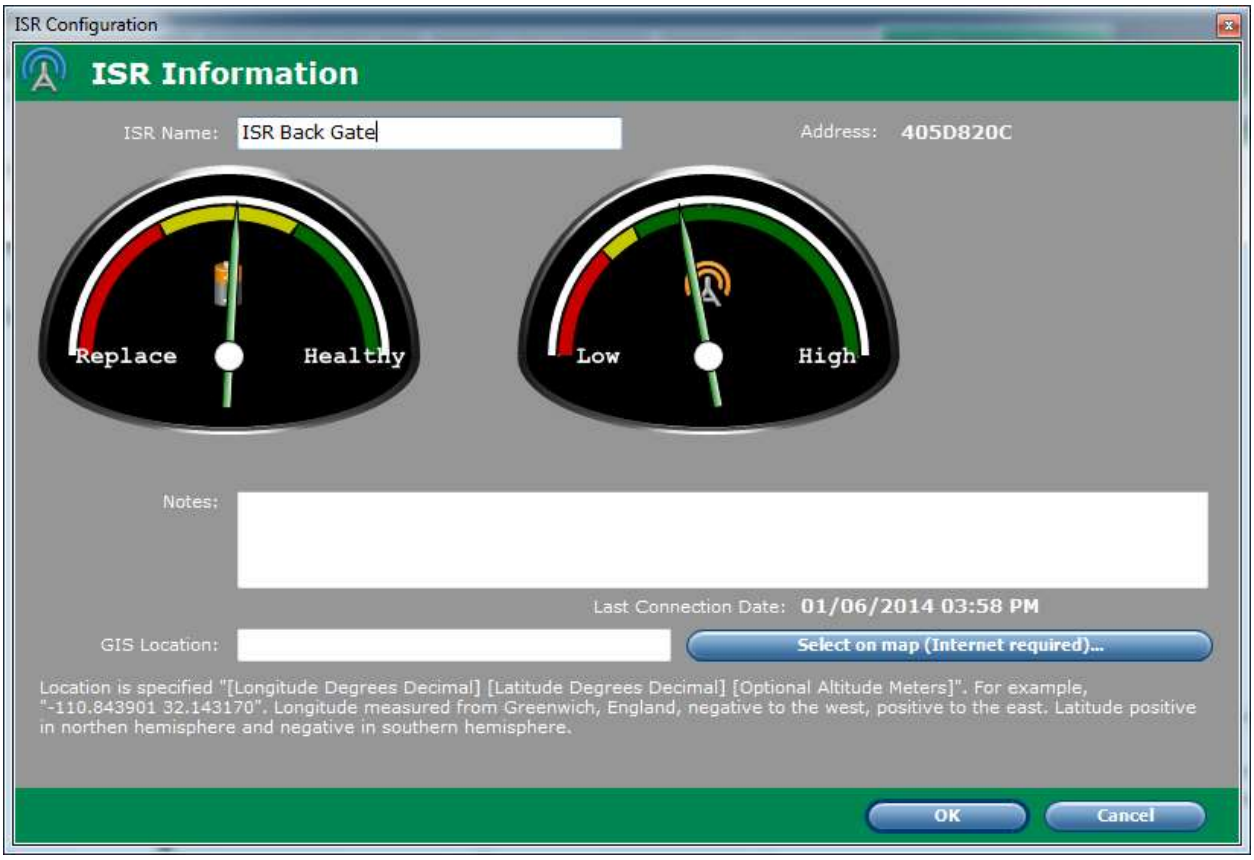
Last Connection Date lists the last time network data was received from the data logger. This can be used for diagnostic purposes.

GIS Location is user-entered longitude and latitude data describing the geographical location of the data logger. These values can be entered directly from a GPS source that gives decimal values or the Select on map (Internet required) button can be used to find the location using overhead maps. For direct entry, longitude is measured from Greenwich, England (0 degrees), with negative degrees to the west and positive to the east. Latitude is similarly entered with the equator being 0 degrees and positive values in the northern and negative values in the southern hemisphere.

Select on map (Internet required) uses Bing maps to display an overhead view from which the ISDL location can be selected. Clicking produces the Map Location dialog. Until at least 1 ISDL, ISR, sensor or the gateway has GIS Location set, the map will default to a location in Tucson, AZ, USA. Refer to Section 14 – Map Location Dialog for details on the Map Location Dialog.

Section 12 – Setting ISR Data Repeater Properties

Each ISR Repeater has a number of properties, some user-entered and some fixed. When the Properties menu item in the Diagnostics tab Wireless Network Tree (see 4.1 Wireless Network Tree), or the Site Map is selected, the ISR Configuration dialog opens:



The ISR Name is user-entered identifying the location or function of the data repeater. Above, a descriptive value “ISR Back Gate” has been used. The Address field contains the factory-assigned repeater address. When a new ISR Data Repeater is found on the wireless network a default Name value will be created based on the Address.

The Battery gauge indicates the relative health of the device battery (green = healthy, yellow = marginal, red = low battery). If the battery level shows in the red range unit batteries should be replaced promptly to avoid loss of network connectivity.

The Signal Strength gauge indicates the strength of the radio connection between the device and its neighbors. In the green region, either the up-stream or down-stream devices have good signal strength. In the yellow or red ranges, steps should be taken to strengthen the signal to prevent intermittent operation or loss of connectivity.

The Notes information is free-form user-entered information. It can be any useful text describing the repeater.

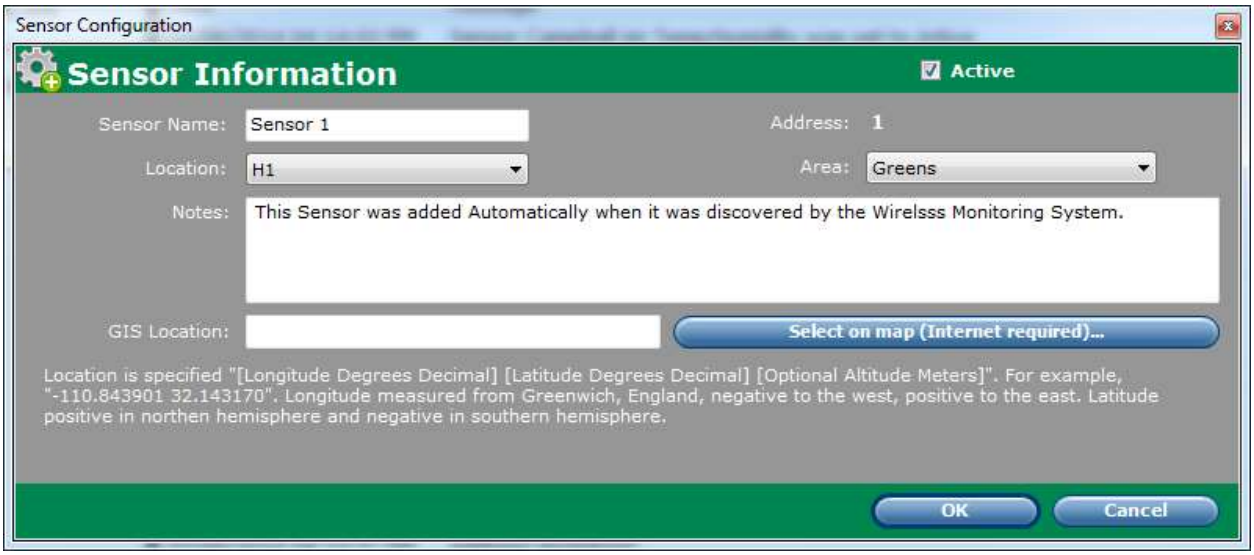
Last Connection Date lists the last time network data was received from the repeater. This can be used for diagnostic purposes.

GIS Location is user-entered longitude and latitude data describing the geographical location of the repeater. These values can be entered directly from a GPS source that gives decimal values or the Select on map (Internet required) button can be used to find the location using overhead maps. For direct entry, longitude is measured from Greenwich, England (0 degrees), with negative degrees to the west and positive to the east. Latitude is similarly entered with the equator being 0 degrees and positive values in the northern and negative values in the southern hemisphere.

Select on map (Internet required) uses Bing maps to display an overhead view from which the ISR location can be selected. Clicking produces the Map Location dialog. Until at least 1 ISDL, ISR, sensor or the gateway has GIS Location set, the map will default to a location in Tucson, AZ, USA. Refer to Section 14 – Map Location Dialog for details on the Map Location Dialog.

Section 13 – Setting Sensor Properties

Each Sensor has a number of properties, some user-entered and some fixed. The Sensor properties can be accessed by right-clicking a sensor in the Diagnostics tab tree or by right-clicking a sensor in the Site Map tab, and selecting the Properties popup menu item. This opens the Sensor Configuration dialog as shown below:



Sensors do not have unique identities. That is, a sensor is identified by Soil Manager using the combination of its data logger's unique ID and the sensor address. If you replace a sensor with another configured for the same address, it will take on the identity of the old sensor. Conversely, if a sensor address changes (moving it from one wire path to the other, for example), sensor data will no longer be attached to that sensor. New data from the new address will be treated as a new sensor (with a default name) and missing-sensor warnings will be generated for the old sensor address/name.

The Sensor Name is user-entered and be descriptive of the sensor location, type, etc. Above, a name of Sensor 1 has been created automatically when the data logger was found. The Address field contains sensor address configured during sensor hardware installation on the data logger.

The Location and Area where the sensor is located can also be user-entered. Use the drop-down Location list to choose a location and the Area list to choose a list. To add new locations or areas or to edit existing location and area names see 2.2.2 Area Locations.

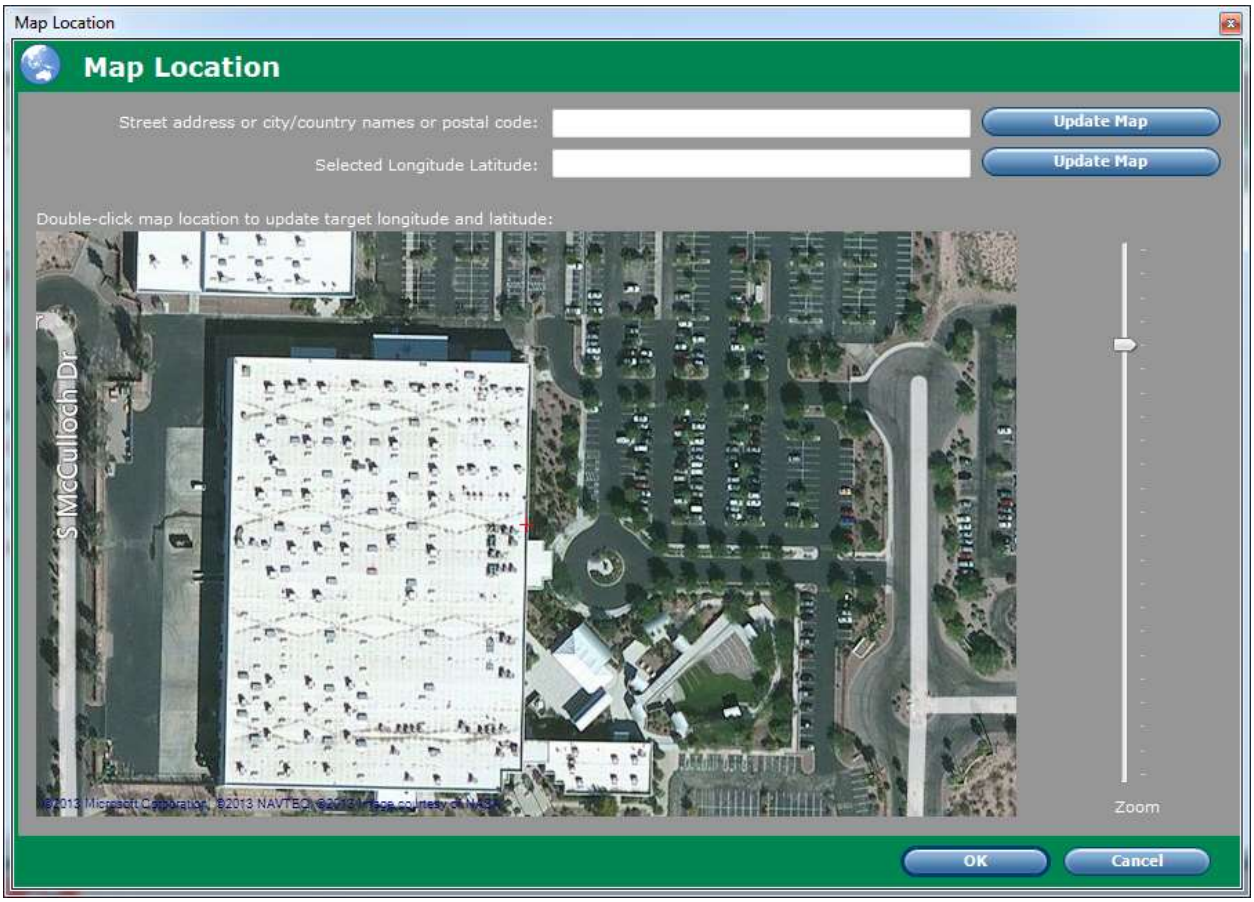
The Notes information is free-form user-entered information. It can be any useful text describing the sensor. The text above is created by default when a new sensor is found on a data logger.

GIS Location is user-entered longitude and latitude data describing the geographical location of the sensor. These values can be entered directly from a GPS source that gives decimal values or the Select on map (Internet required) button can be used to find the location using overhead maps. For direct entry, longitude is measured from Greenwich, England (0 degrees), with negative degrees to the west and positive to the east. Latitude is similarly entered with the equator being 0 degrees and positive values in the northern and negative values in the southern hemisphere.

Select on map (Internet required) uses Bing maps to display an overhead view from which the sensor location can be selected. Clicking produces the Map Location dialog. Until at least 1 ISDL, ISR, sensor or the gateway has GIS Location set, the map will default to a location in Tucson, AZ, USA. Refer to Section 14 – Map Location Dialog for details on the Map Location Dialog.

Section 14 – Map Location Dialog

The Map Location Dialog is displayed when setting GIS Location for the wireless network gateway, ISDL data loggers, ISR repeaters, and sensors. Before any GIS data is entered for any device, the default Map Location is in Tucson, Arizona, USA, as shown below:



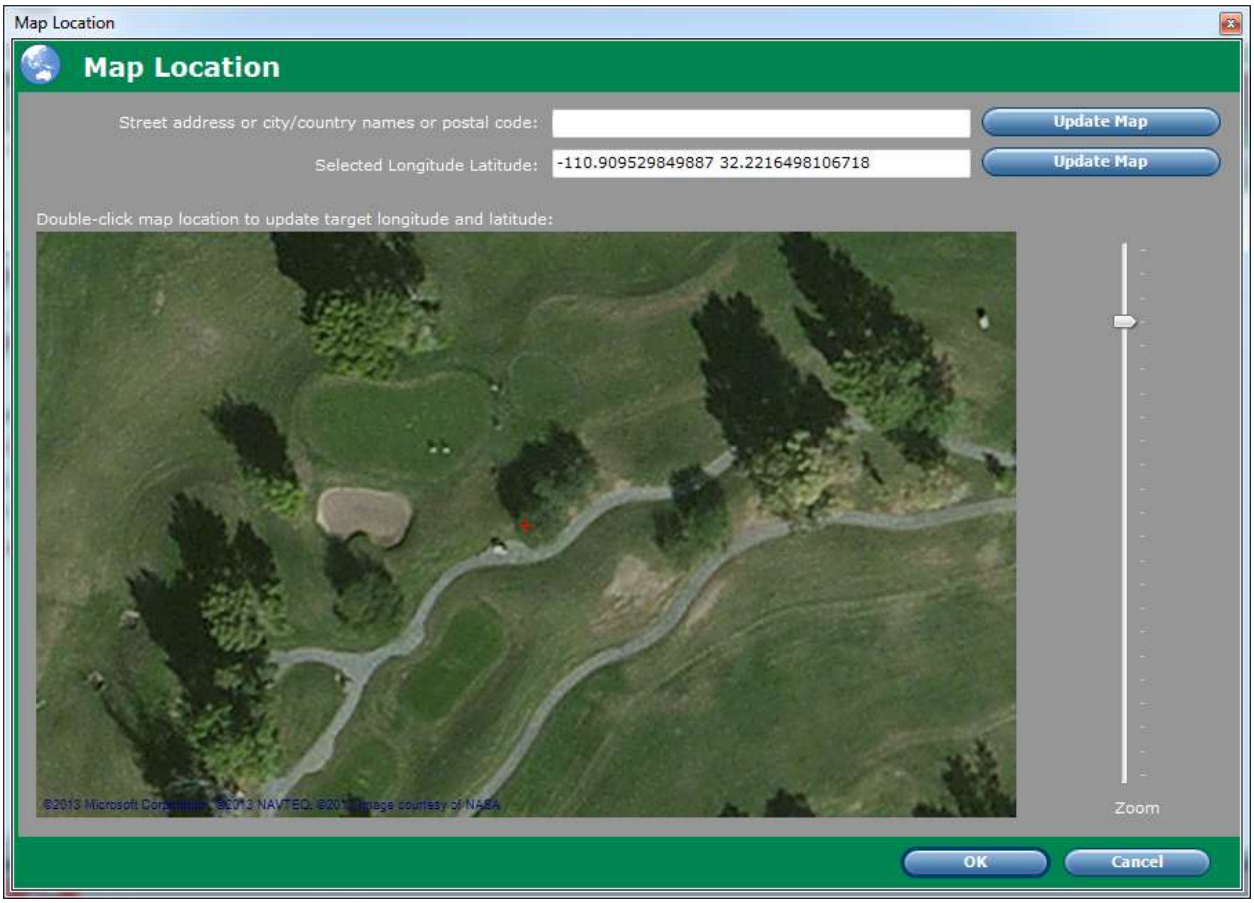
To locate your device on the map several controls are provided:

Street address can receive a street address, city name, or postal code. After entering the value, click the Update Map button to the right of the field or press the Enter key on the keyboard. Map Location will use Bing to locate the map corresponding with the address and will center the map view at that location. A beep indicates that the address was unknown to Bing.

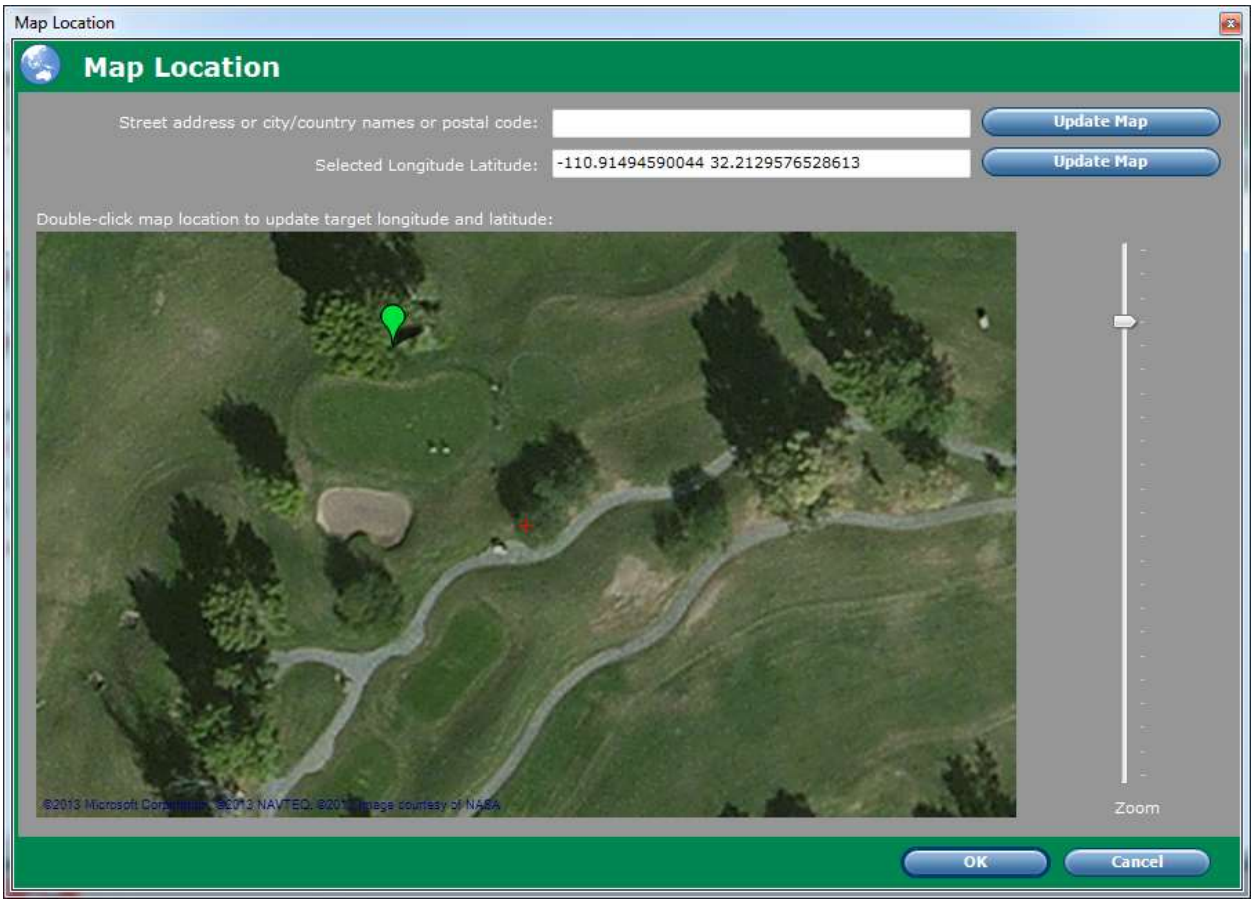
Selected Longitude Latitude can receive decimal longitude and latitude values on which to center the map. After entering the values, possibly from your GPS device, click the Update Map button to the right of the field or press the Enter key. The map view will be updated.

The Zoom control can be used to zoom in or our to assist in locating the target coordinates. Drag the marker down to zoom out (less detail), or up to zoom in (more detail). Clicking in the Zoom control above or below the marker moves it 1 step.

After locating the target area using 1 or more of the above means the Map Location may appear as follows:



To place the final GIS location, double-click the location in the map view. This will place a green push-pin and update the Selected Longitude Latitude field with the location:

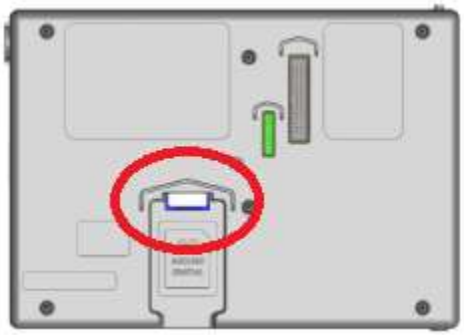


Section 15 – Importing Data Logger Data Into Soil Manager

It is possible to retrieve sensor data stored in the data logger's SD card and update the sensor history in Soil Manager. You may do this if communication between Soil Manager and the ISDL was interrupted.

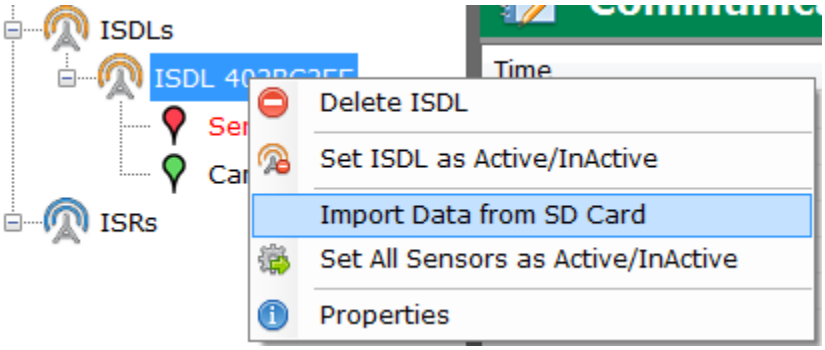
An SD Card Reader accessory is required for transfer from SD card to the PC.

1. Retrieve the SD card from the data logger and bring it to the PC. Mark the card clearly with the data logger's name or location so it can be returned to the correct location. The SD card location on the back of the data logger display panel is shown below:

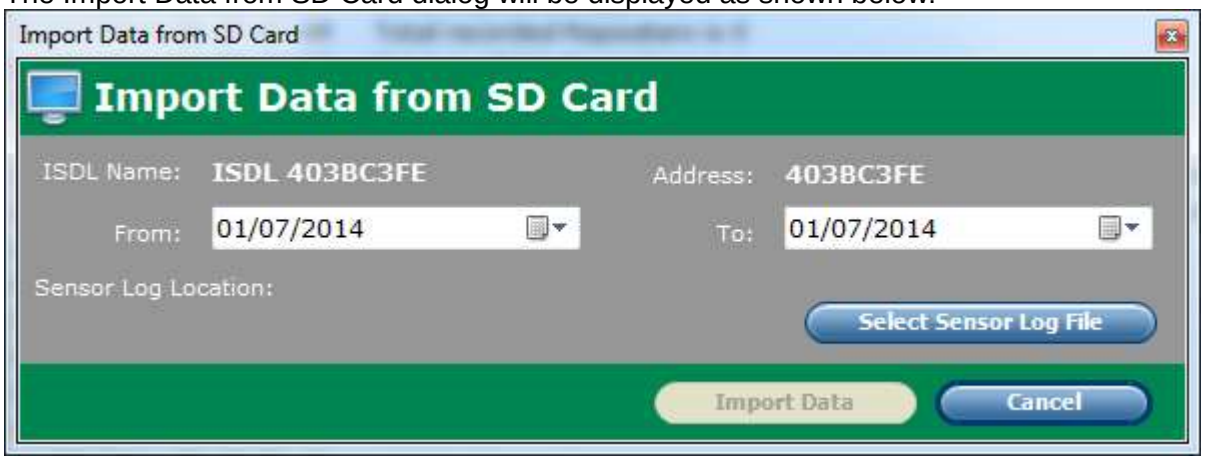


   To eject the card, push the card upward a short distance until it stops and release.
2. Insert the SD card in the PC's SD card reader. The PC should prompt for action. Choose Open folder to view files to show the contents of the SD card.

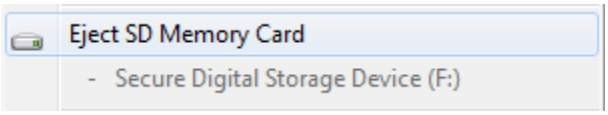
3. In Soil Manager, open the Diagnostics tab, and in the Wireless Network Tree, right-click the data logger for the SD card. Select Import Data from SD Card from the popup menu as shown below:



4. The Import Data from SD Card dialog will be displayed as shown below:



5. Select the From calendar drop down and choose a starting date for the import. Repeat with the To calendar drop down. All data between midnight at the beginning of From date through midnight at the end of To date will be imported, replacing any radio-retrieved sensor data from the unit. No data will be lost provided the correct SD card is used and the correct data logger is chosen.
6. Click on Select Sensor Log File to show the Open dialog. Find the SD card and choose the Sensor.Log file. Click Open.
7. In Import Data from SD Card, click Import Data to initiate transfer. Progress information will be shown in the Communication Logs list as the data is imported.
8. When the data transfer is complete, safely eject the SD card by choosing Safely Remove Hardware and Eject Media from the system tray, . From the popup menu choose the SD card:



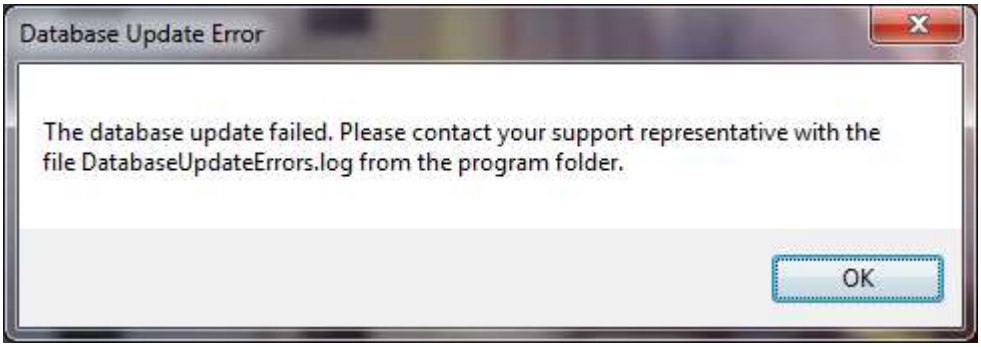
9. Verify that the data was correctly imported in Soil Manager using Sensor Graph View (see Section 5 – Sensor Graph View), or Sensor Data View (see Section 6 – Sensor Data View).
10. Return the SD card to the appropriate data logger. Install the card by sliding it into the slot until it stops and releasing.

Section 16 – Troubleshooting

16.1. Error indicators

- Soil Manager starts slowly or shows the system tray icon for several minutes without showing the main window on startup. This may be followed by the error below. This is a database error. See 16.2 Database errors.

- Soil Manager displays the following error dialog and fails to start:



  This is caused by a database error. See 16.2 Database errors and save the file DatabaseUpdateErrors.log from c:\Program Files\Rain Bird\Soil Manager.

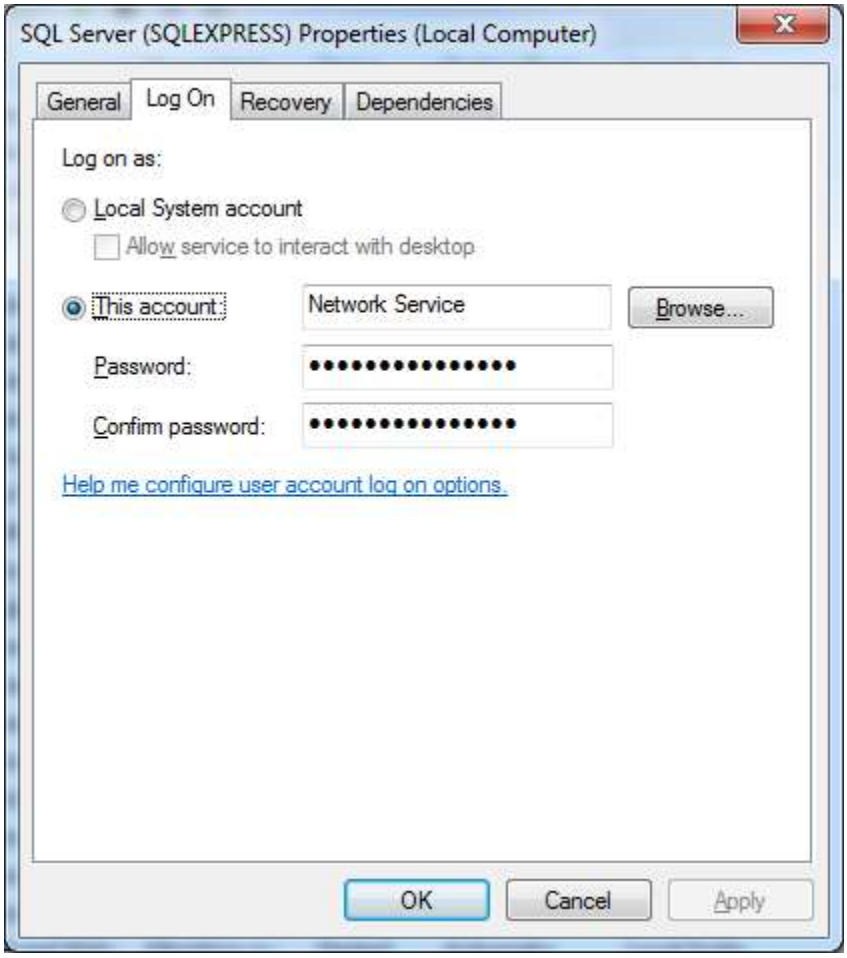
- Soil Manager repeatedly generates Communication Alerts like the following:

  - Resetting COM Port [Date/Time]
  - Gateway is not responding. COM port may be closed or set incorrectly. [Date/Time]
  - COM Port is Closed [Date/Time]

  This is usually caused by an incorrect serial (COM) port selection for the gateway device. See 16.2.1 SQL Server Will Not Start

If SQL Server will not start but does appear in the Services list of services, the error is often caused by one of two problems: incorrect or incomplete installation or security settings. Before contacting Rain Bird support, please try the modification below and notify the support engineer of the result:

1. Right-click on SQL Server (SQLEXPRESS) in the Services applet and select Properties (as described previous when checking startup option).
2. Click the Log On tab to examine the system “account” used for SQL Server operations.



3. If “This account: Network Service” is selected, change the selection to “Local System account” and enable “Allow service to interact with desktop”. Click OK.
4. Attempt to start the SQL Server (SQLEXPRESS) service again.

Communication Errors.

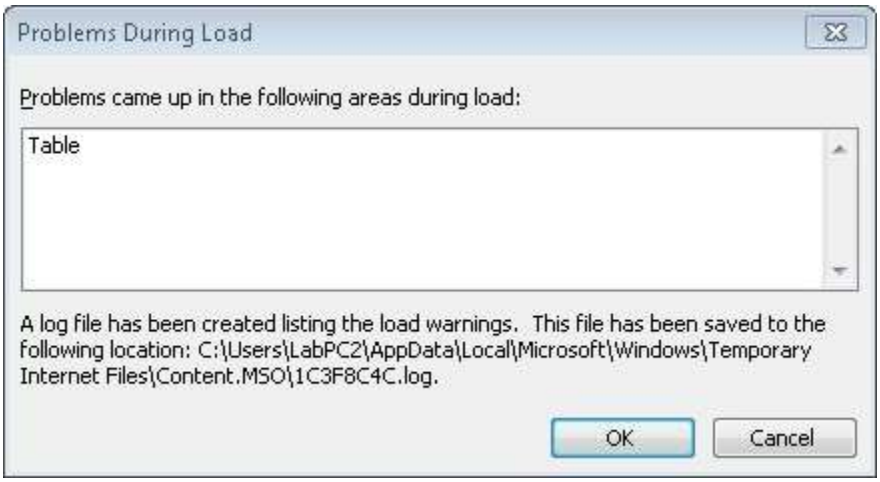
- Soil Manager repeatedly generates Battery Alerts. The batteries should be replaced promptly when such alerts are generated. The alert indicates which device has low batteries. 4 new D-cell batteries should be installed. If a device quickly discharges its batteries after installation, check the Sampling Rate for Sensors (see 2.2.4 Sampling Rate for Sensors). It should normally be set to 15 minutes. Settings below 15 minutes will cause quicker battery discharge. If discharge is extremely fast, contact Rain Bird support for further troubleshooting steps.

- Soil Manager does not display AM/PM in my date/time values (tooltips, charts) correctly. It displays the time as a 12-hour time but without the AM/PM indicator. This occurs in languages where AM/PM is not normally used: German (Germany), French (France), Italian (Italy), Portuguese (Portugal), and Swedish (Sweden).

- Microsoft Excel displays the message below when opening a Soil Manager data export XLS file:

The message is generated because Soil Manager exports data in XML format not "native" XLS format (Excel 2003 XML format). Selecting Yes from the dialog will open the file correctly and, if desired, the spreadsheet can be saved in an alternate format for further processing.

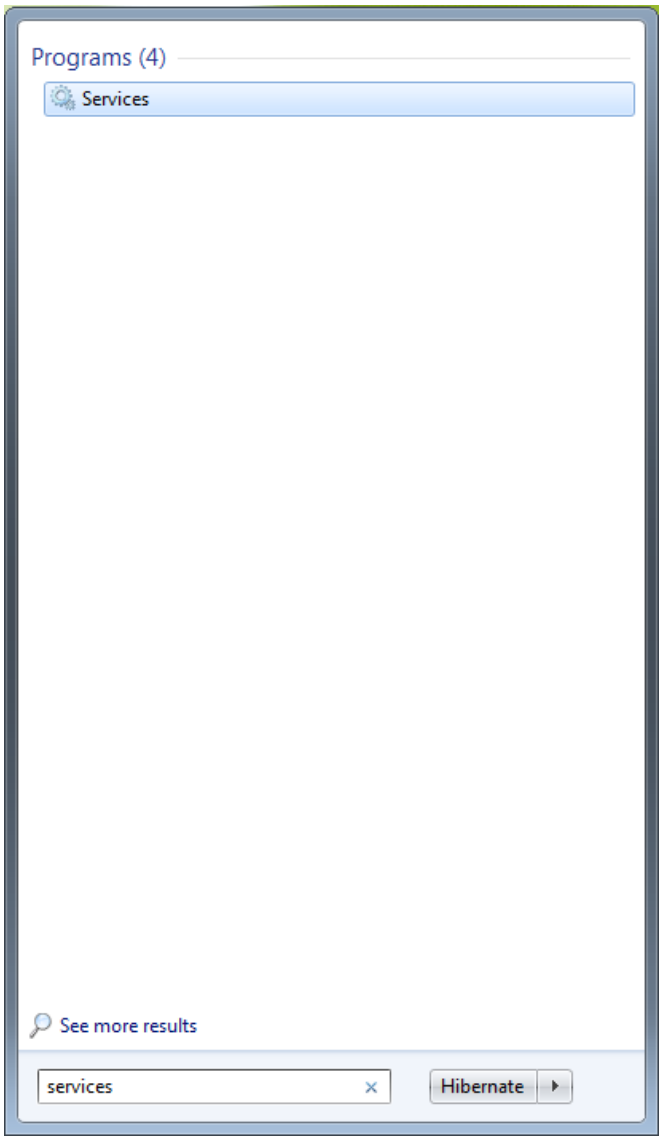
- Microsoft Excel 2003 limits imported data sets to 65535 rows. If you export sensor data containing more than this number of rows, an error message similar to below will be displayed:



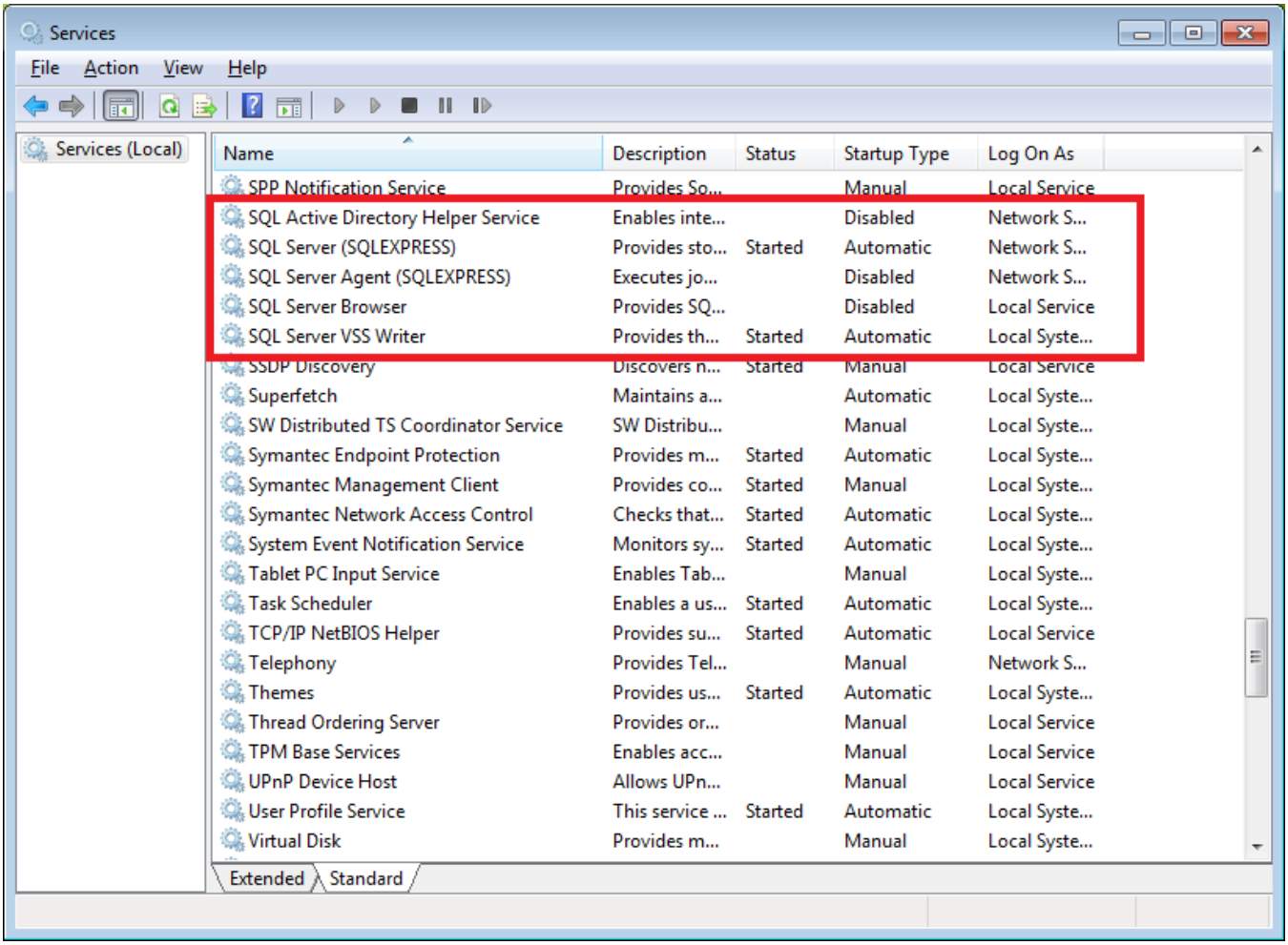
Later versions of Excel can handle larger data sets. Alternatively you could export a smaller date range or a smaller number of sensors.

16.2. Database errors

Database errors are often caused when SQL Server Express is not running. Soil Manager uses this database service to store sensor data. SQL Server might have been disabled by IT personnel trying to reduce processor overhead. To verify that SQL Server is properly configured on the PC, open “services.msc”:

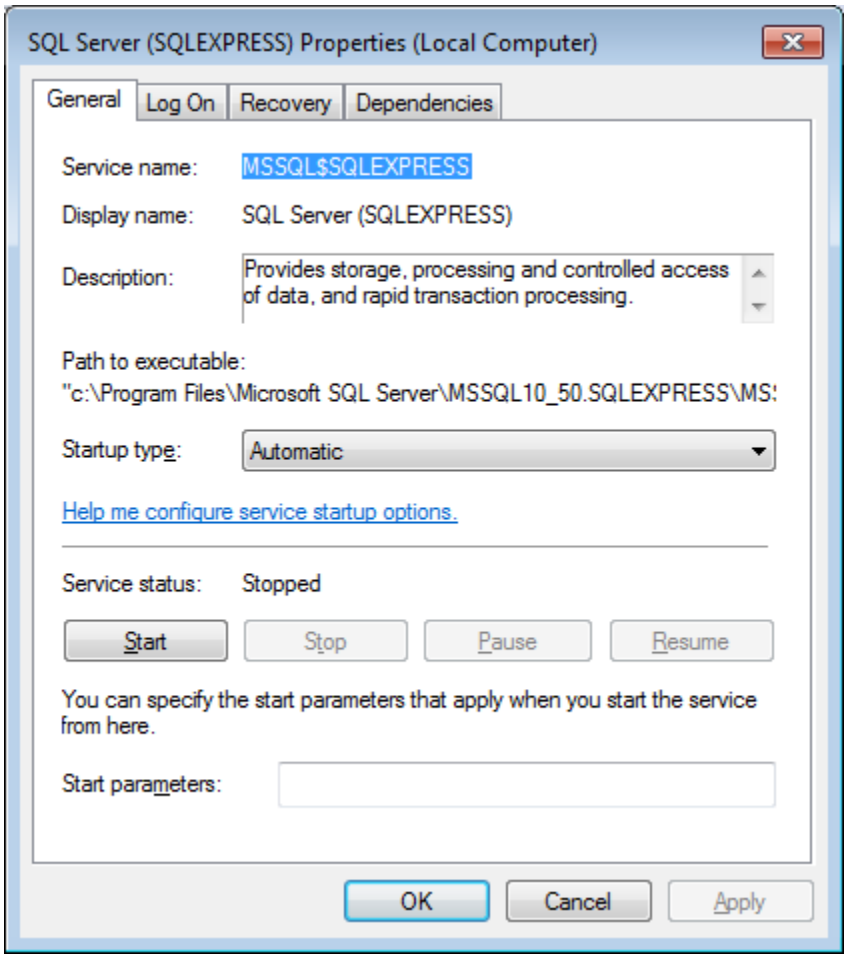


The Services applet will appear. Scroll to the entries associated with SQL Server Express:



The SQL Server (SQLEXPRESS) item should have a status of “Started”. If not, select the item and click the start button in the toolbar: .

If the service successfully starts, assure that the Startup Type is “Automatic”. If it is not or if the service Startup Type is “Disabled”, right-click the item, choose Properties from the menu, and adjust the Startup type to “Automatic”:

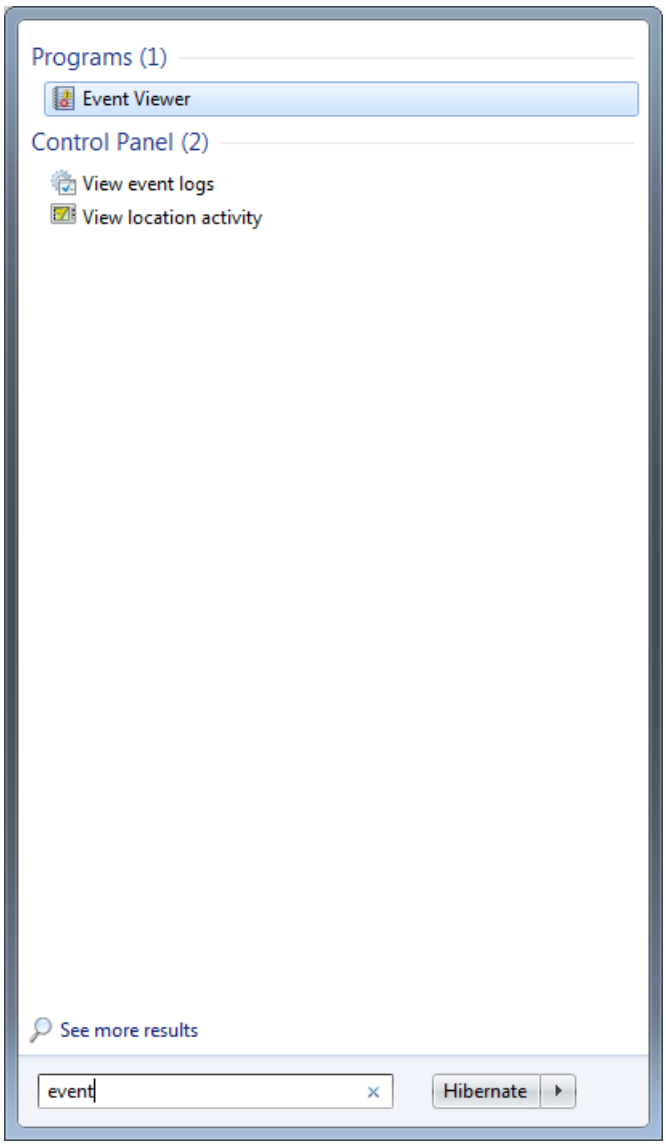


Perform the same steps for the “SQL Server VSS Writer” service.

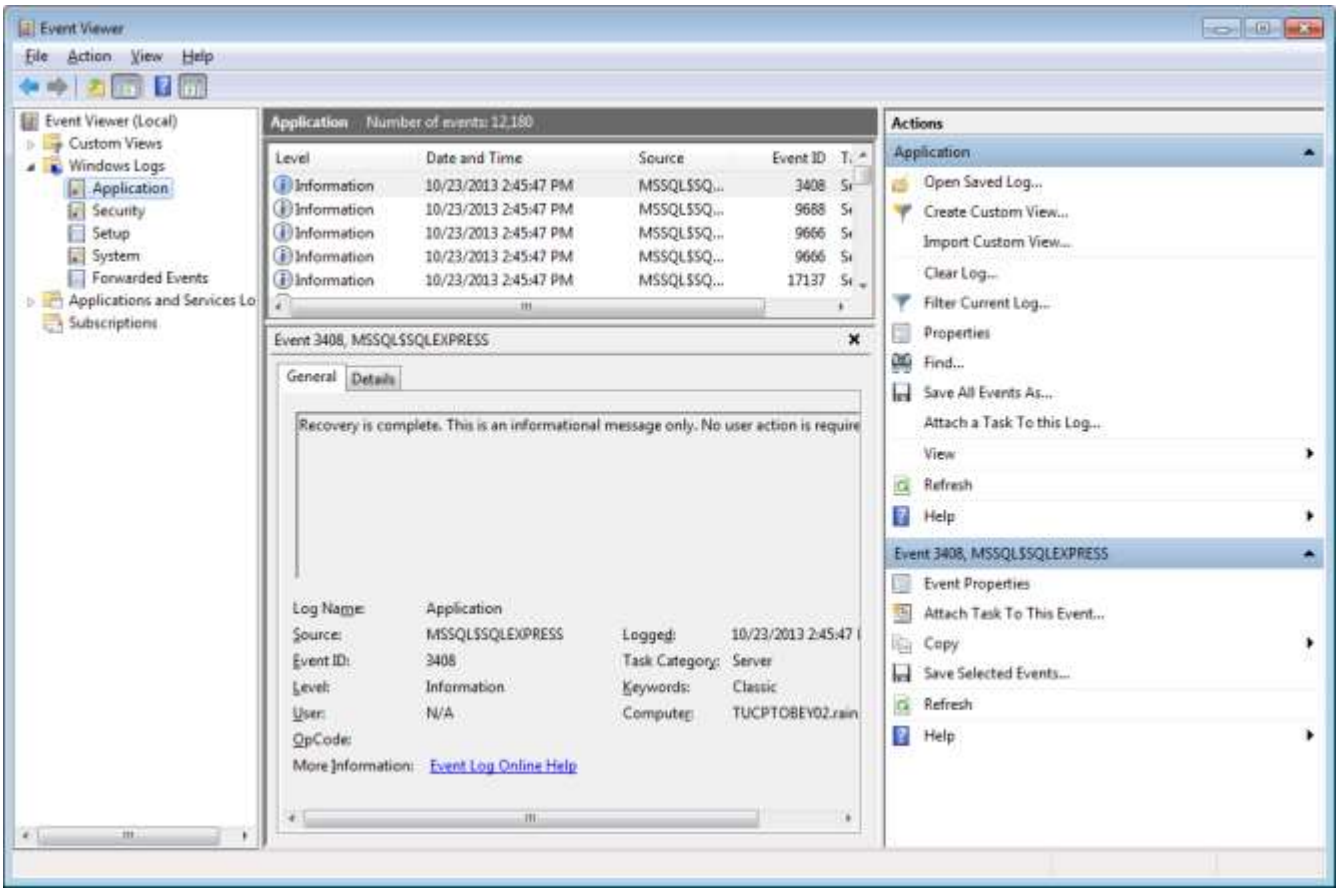
If either service still fails to start see section 16.2.1 below.

If service changes were made and the services both started successfully, return to Soil Manager and check the database status.

If the database error continues to persist for several minutes, run the system Event Viewer:



The event viewer window will appear. In the left tree view, double-click “Windows Logs” and select “Application”:



The Application event list in the center area will contain error and general information items. Scroll downward to find any error items where Source is “SoilManager”. This information will be helpful to Rain Bird support personnel.

If one specific error item is present, you may be able to correct the error yourself:

> *Failed to generate a user instance of SQL Server due to a failure in starting the process for the user instance. The connection will be closed.*

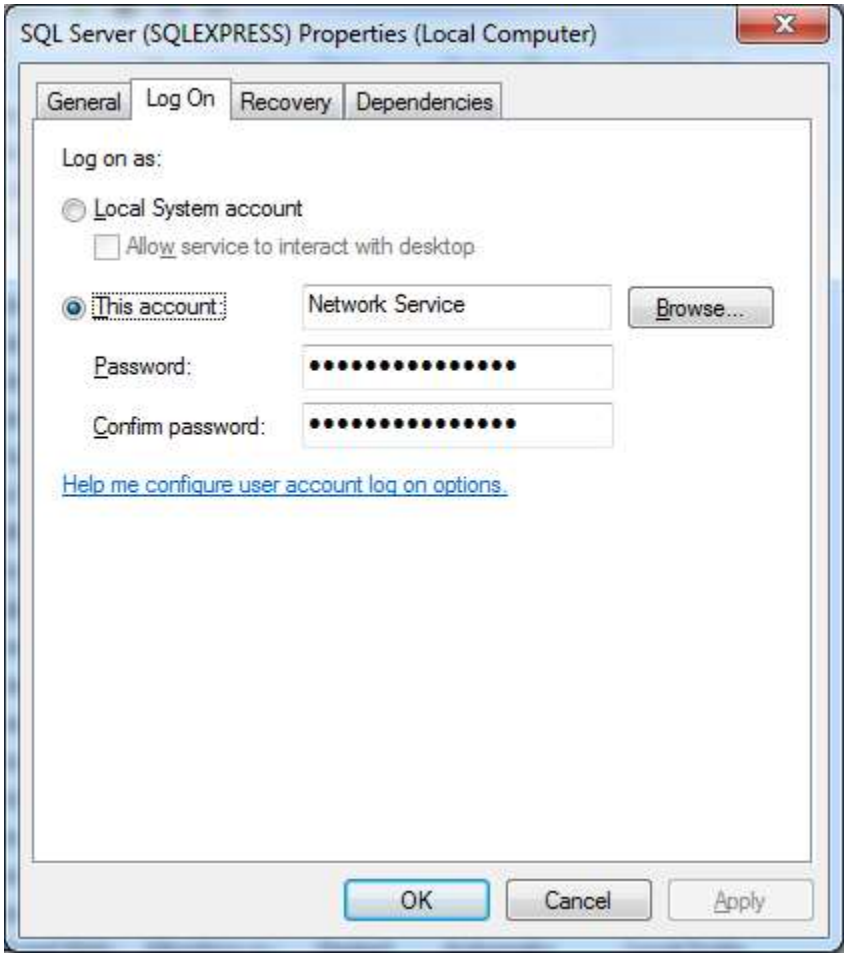
If you encounter this error, SQL Server Express is running correctly but has some invalid stored data. It can be cleared following these steps:

1. Exit Soil Manager.
2. In Services, stop both “SQL Server VSS Writer” and “SQL Server (SQLEXPRESS)” services.
3. Delete the following folder (replacing “YOUR_USERNAME” with your PC user name, often “PreferredCustomer”):
   C:\Documents and Settings\YOUR_USERNAME\Local Settings\Application Data\Microsoft\Microsoft SQL Server Data\SQLEXPRESS
4. In Services, start “SQL Server VSS Writer” and “SQL Server (SQLEXPRESS)” services. Restart Soil Manager and check proper startup. If the problem is still not corrected, contact Rain Bird support.

16.2.1. SQL Server Will Not Start

If SQL Server will not start but does appear in the Services list of services, the error is often caused by one of two problems: incorrect or incomplete installation or security settings. Before contacting Rain Bird support, please try the modification below and notify the support engineer of the result:

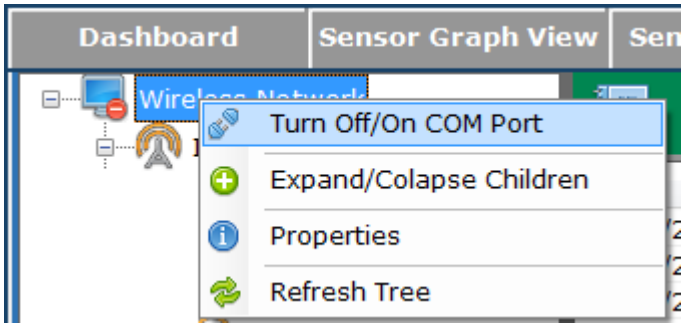
1. Right-click on SQL Server (SQLEXPRESS) in the Services applet and select Properties (as described previous when checking startup option).
2. Click the Log On tab to examine the system “account” used for SQL Server operations.



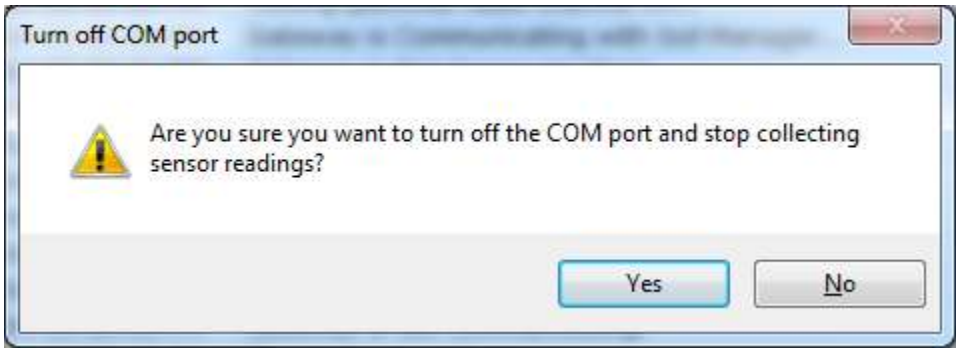
3. If “This account: Network Service” is selected, change the selection to “Local System account” and enable “Allow service to interact with desktop”. Click OK.
4. Attempt to start the SQL Server (SQLEXPRESS) service again.

16.3. Communication Errors

Communication errors are often caused by incorrect serial (COM) port assignment to the radio gateway device. This can happen if the gateway is disconnected from its USB port on the PC and connected to a different port. To stop the communication alerts, open the Diagnostics tab and right click Wireless Network in the tree view:



Select Turn Off/On COM Port from the popup menu. The dialog below will be presented:



Select Yes to disable communications with the gateway. This will stop the alerts from generating while you review the Gateway and Soil Manager Installation Procedure document to determine the correct serial (COM) port (and install drivers, if necessary). After the serial port has been determined, right click Wireless Network again and select Properties. Refer to Section 10 – Setting Wireless Network Properties to select the correct serial port and restart networking.