Sentinel WMS 4.0

User Guide

TORO®

End User Agreement Terms

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ACCEPTANCE OF THE TERMS OF THIS SENTINEL WMS SOFTWARE END-USER

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Table of Contents

Welcome to Sentinel WMS Central System

The Challenge: Effective Water Management

Putting together an efficient irrigation system is no small task. Concerns such as watering precision, broken pipes and mainlines or dealing with electrical shorts and power outrages have been problematic for landscape managers for decades. These, along with increased competition for water supplies, scarcity of resources, and recent irrigation mandates, have left those in irrigation management roles searching for the most efficient, yet simple way of combating all of these issues.

The Solution: Sentinel WMS Central Control

Multiple Site Applications: Sentinel provides the ability to program, control and monitor multiple remote controllers from one location. Whether controlling one large, contiguous site like a sports complex or housing association, or multiple remote sites like a school district or parks & recreation department, a central control system provides easy, rapid access to the irrigation system from a computer.

System Control: Sentinel WMS allows all irrigation control actions to be carried out easily and efficiently from a central location. Control actions such as adjusting run times to changing weather conditions or stopping irrigation in the event of rain or high wind can be automatically accomplished without requiring a technician to visit individual controllers. However, if a technician is on-site and sees a need for programming changes, like shortening run times after a grow-in period, true two-way communications allow changes to the program at the field controller on-site and can also be uploaded to the central computer.

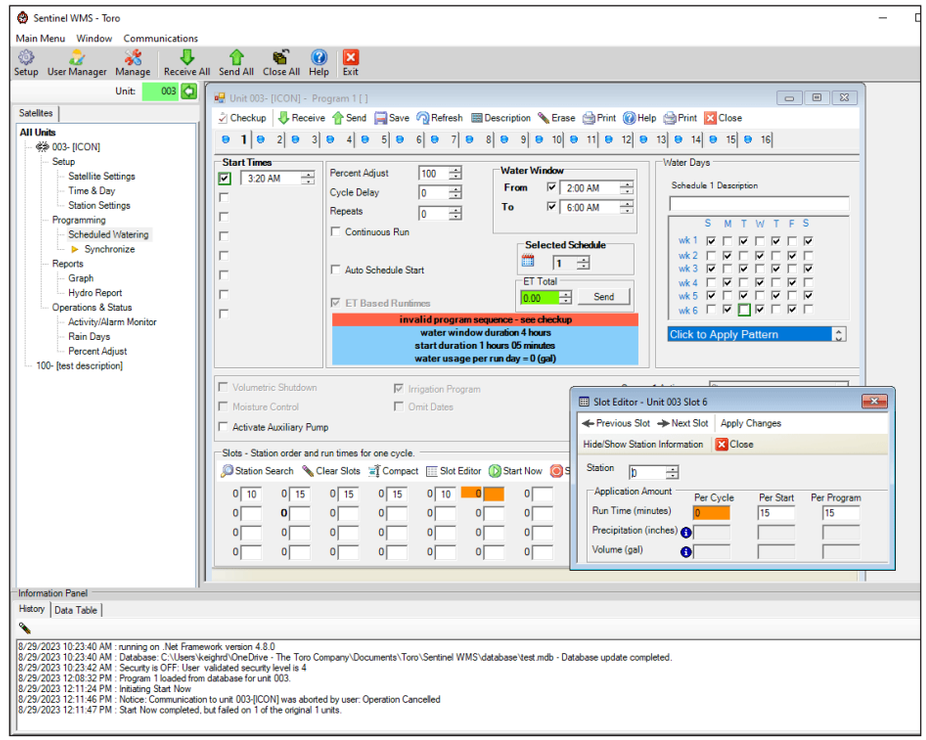
Sensor Integration: Sentinel can incorporate many different sensors, including flow sensors, tipping rain cans, wind sensors, freeze sensors, and full weather stations. These sensors and instruments monitor site and climate conditions and report to the central computer. Run time adjustments are automatically made based on these inputs and combined with information

on plant material and soil types. Sentinel Satellites can react automatically to readings outside of pre-defined limits set by the system operator, like isolating stations when excessive flow indicates a piping break.

Multiple Communication Options: A Sentinel WMS system consists of a central computer, irrigation controllers, sensors, weather stations, and a communication system that ties it all together. No matter whether the central computer is located on site or at a remote location, communication options like radio, telephone, and Ethernet can be mixed and matched to meet system communication needs.

Ease of Use: Sentinel WMS is fully-featured yet intuitively designed for ease of use, and it's one of the most powerful irrigation control systems ever offered. Information is graphically displayed—so it's easy to see and use. All similar functions are grouped together, making it simple to find, change and enter data quickly.

Program Interface: The friendly design of the Sentinel WMS program interface provides easy, point-and-click access to all programming functions—no extra keystrokes or sequences required and no extensive searching for functions.



Automatic Operations: Daily operations and scheduling are made quick and easy with automatic operations. All essential programming information is contained in one window so it's easy to understand and manage.

Customer-driven Features for Optimal Water Management:

- ET-based irrigation control features
- Operating setup parameters to the station output level
- Robust alarm and reporting capabilities
- Current and historical water-usage data review capabilities
- Dynamic map-based operational reference capabilities
- Extensive use of visual cues and intuitive tool sets. In this Chapter:

Chapter 1 - Getting Started

Part 1 – Hardware/Software Requirements
Part 2 – Software Installation

Sentinel Water Management System is comprised of the Sentinel WMS software running on a central computer and a system of Sentinel field satellite controllers. The central software and computer are used to program, monitor, and remotely operate the Sentinel field satellites.

Part 1 – Hardware/Software Requirements

The following computer hardware/software system components comprise the minimum requirements for operation of the Sentinel WMS 4.0 software the Sentinel WMS irrigation control system:

- Pentium IV, 1.5GHz CPU (or equivalent)
- 512 MB of RAM
- 256 Color display w/1280 x 1024 resolution (preferred). or 1024 x 768 resolution (min.)
- Dedicated USB or serial port
- Network adapter
- CD ROM drive

1. CPU
2. CPU Serial Cable Assembly
3. Phone Modem (56K or faster)
4. Modem Power Supply
5. Modem Serial Cable
6. Modem Phone Line Cable
7. Sentinel Central Interface Module
8. Interface Module Power Supply
9. Mast Antenna
10. Antenna Surge Arrestor
11. Antenna Cable

Software Requirements (minimum)

- Microsoft® Windows® Operating System*.
- Microsoft .NET Framework 4 (provided)
- Sentinel WMS 4.0 (provided)

*Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

Part 2 - Software Installation

⚠ **Important**: If a previous version of the Sentinel WMS program is installed, it is necessarey to remove the old program using the Add/Remove Programs control panel function. This process will leave the Sentinel folder intact with various support files including the configuration file, database(s) and data log(s). To perform a complete installation, delete the Sentinel folder after removing the program.

The Sentinel WMS software program is compatible with all recent versions of Microsoft Windows operating system. Microsoft® .Net Framework (version 4 or higher) client must be installed prior to installing the WMS software program. The required supplemental software is provided on the Microsoft folder on the WMS installation disk.

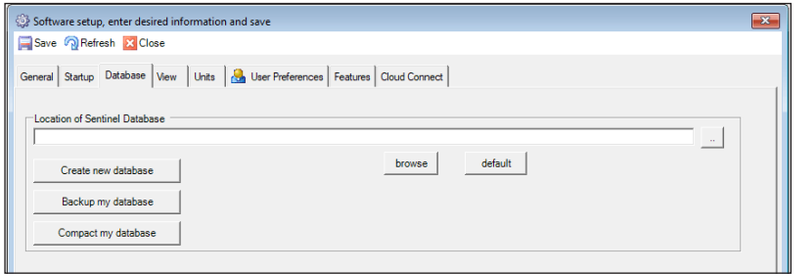
For technical assistance, contact the Toro National Support Network (NSN) at 1-800-275-8676.

1. To begin, insert the Sentinel WMS software installation disk into the computer drive. The Sentinel WMS Setup Wizard will open automatically to guide you through the software setup process.

   ***Note**: During initial Sentinel WMS software startup, a dialog box will ask to load the software configuration file. Simply choose **OK** to continue the software setup process.*
2. When the software installation is complete, the Sentinel WMS program startup icon will be installed on the desktop. Doulbe-click the icon to launch the Sentinel WMS program.
3. The Software Setup window will automatically open the first time Sentinel

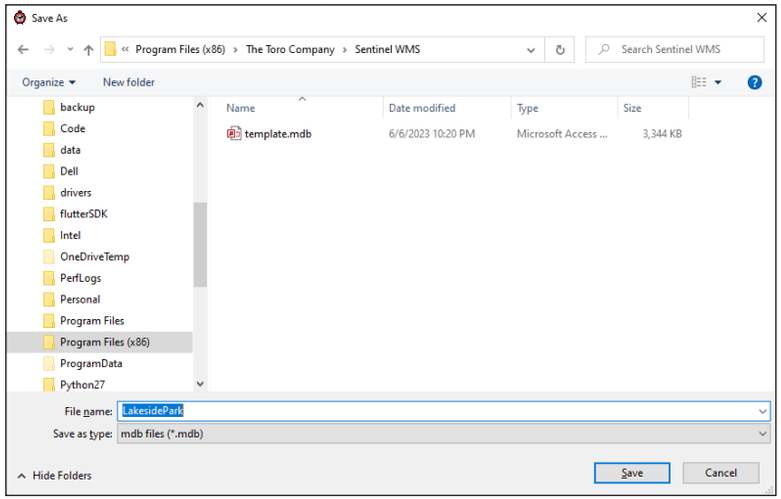
WMS software is launched to enable a Sentinel database to be located or created.

4. Choose the **Database** tab to display the database setup options.

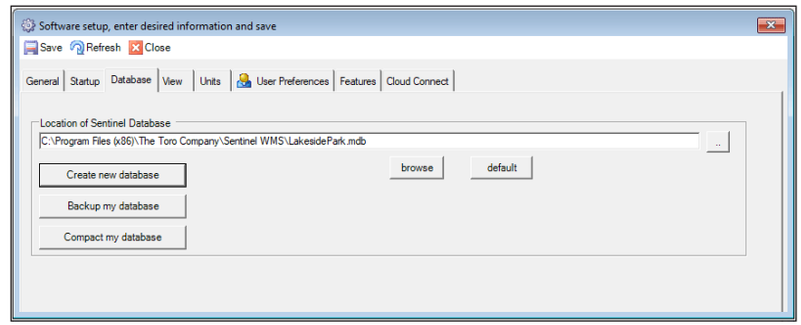


To load an *existing* database file (.mdb): Browse to the file location, then choose **Open**. The database file name will appear in the **Location of Sentinel Database** text field. Choose **Save and Close**.

5. To create a *new* database file: Choose the **Create New Database** button.
6. Browse to the Sentinel WMS folder (C:\Program Files\Sentinel WMS).
7. Enter a database file name; e.g., Lakeside Park, then choose **Save**.



8. The database file name will appear in the Location of Sentinel Database text field. Choose **Save** and then **Close**.



***Note**: When database setup has been completed, the Software Setup window will close. The Software Setup window can be selected in the Main Menu options or by choosing the **Setup** button*  *in the program window toolbar.*

Chapter 2 - Sentinel WMS System Setup

In this Chapter:

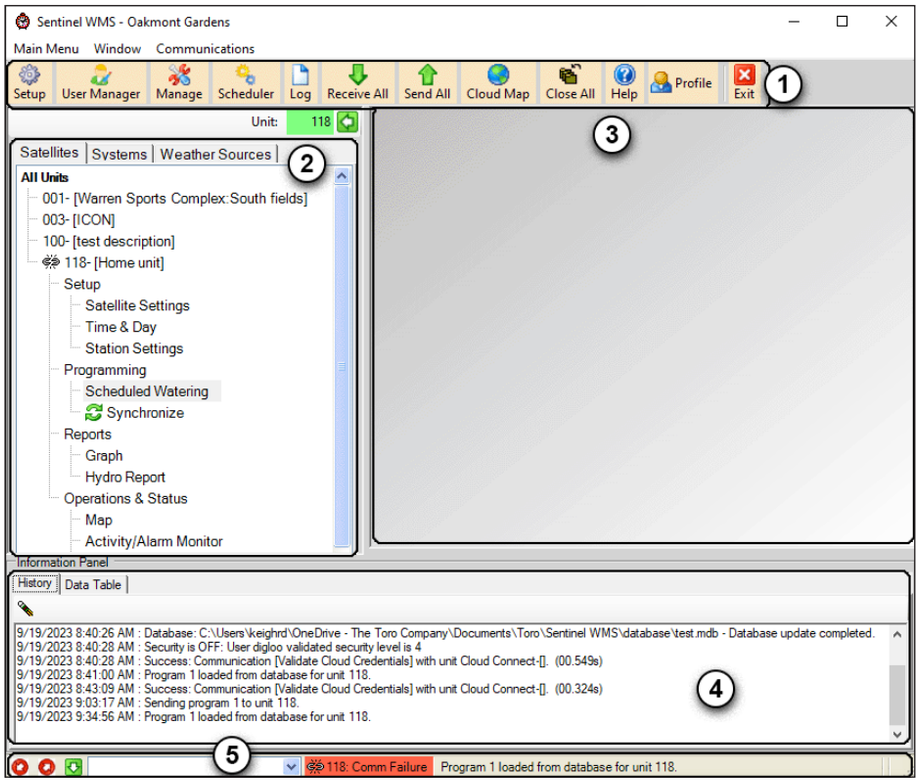
Part 1 – The Sentinel WMS Program Window

Part 2 – Sentinel WMS Program Setup

The first part of this chapter provides an introduction to the Sentinel WMS program interface features and walks you through the various setup and configuration steps required for basic operations. The second part provides the initial steps required to create satellite controllers in the Sentinel WMS satellite database.

Part 1 – The Sentinel WMS Program Window

The program window consists of five main components as follows:



1 – Main Menu Bar and Toolbar

The Main Menu bar and tool bar provide access to all software- and system level features and consists of the Main Menu options, Window configuration options, and Communication Send/Receive commands.

The toolbar buttons mirror the most commonly used functions of the Main Menu bar in a point-and-click selection format.

The **Setup** button selects the **Software Setup** window for Sentinel WMS program setup features and options.

The **Manage** button selects the **Manage Systems and Units** window used for creating satellites and satellite systems in the Sentinel WMS database.

The **Send All** and **Receive All** data transfer buttons apply to all open windows for system-wide communications.

The **Log** button selects to the Events Log file. Events are logged from any window with the Log Results option selected as well as all scheduled operations.

Choosing the Log button opens the file in a Word document format.

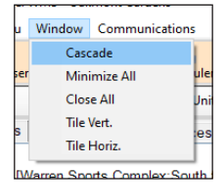
2 – The Selection Panel

The selection panel provides easy access to the irrigation operations database entries for Satellites, Systems, and Weather Sources. Access to the database is provided through an expanding-tree format enabling all levels of data entry to be easily defined and selected.

***Note**: The Selection panel Hide button toggles the panel open and closed. The drop-down menu on the left side of the Status bar provides options to open and close the Information panel, or close both panels simultaneously for maximum Workspace area.*

3 – The Workspace

The workspace is the area where all program windows are opened. Optional colors and graphics can be selected in the Setup window to personalize this area. An unlimited number of windows can be opened at the same time, including multiple copies of the same window.



Several commands are provided under the **Window** menu to help manage the multi-window workspace:

Cascade, Minimize All, Close All, Tile Vertically and Tile Horizontally.

4 – The Information Panel

All program actions are displayed in the **History** tab of the Information Panel.

The information posted on this panel is for reference only, and is not saved. The Data Table page lists all data sent and received when the Sentinel WMS is open. Use the **Erase** tool to clear the Information Panel.

5 – The Status Bar

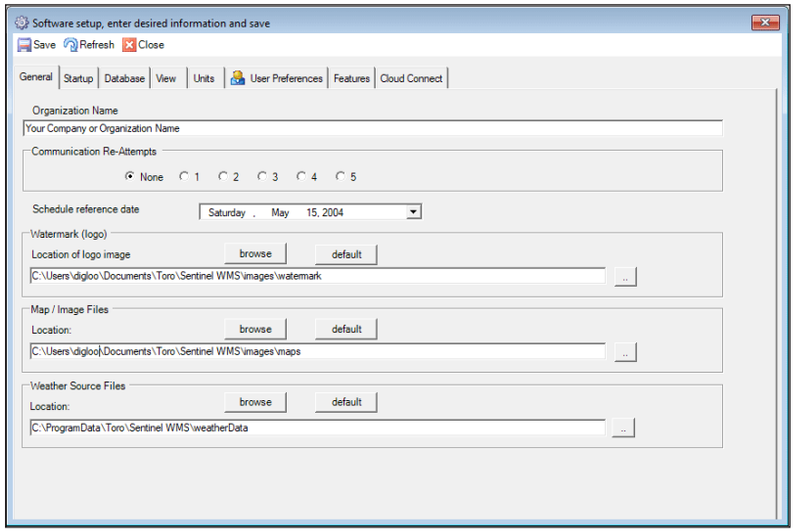
The Status Bar tracks and displays all actions, including alarms, that affect the database. Since the status bar is always visible, the information displayed is particularly useful when the information panel is hidden or messages are scrolled out of view.

Part 2 – Sentinel WMS Program Setup

The following procedures describe how to set up various Sentinel WMS program operating characteristics and user preferences.

1. To begin, choose the **Setup** button in the toolbar to open the **Software Setup** window. The Software Setup window will open at the **General** tab.

The General Tab

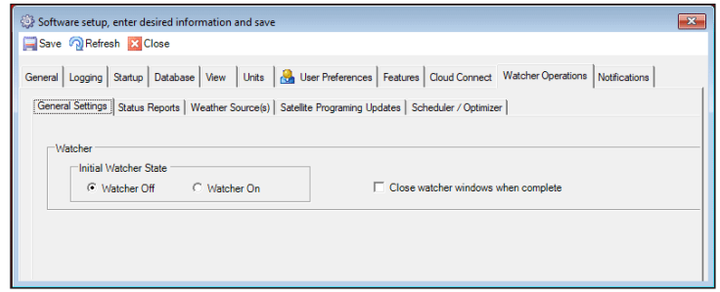


1. In the **Organization Name** text box, enter the name of your organization or any designation that you prefer to appear next to Sentinel WMS in the program window title bar.
2. To superimpose a Watermark (logo) graphic image (.jpg or .bmp) on the system Flow Graph image, browse to the file location and choose **Open**.

   ***Note**: The image file proportions should be relatively small to fit the flow graph image. The image file must be stored in the following location to be accessible by the Sentinel software: C:\Program Files\Sentinel.*
3. Select the preferred number of **Communication Re-attempts** ranging from **None** to **5**.
4. The **Schedule Reference Date** corresponds to week 1 of a 6-week rolling schedule. Sentinel WMS automatically calculates this reference date when synchronizing the current time and day. To select a specific date, choose the drop-down menu to use the scrolling calendar feature.

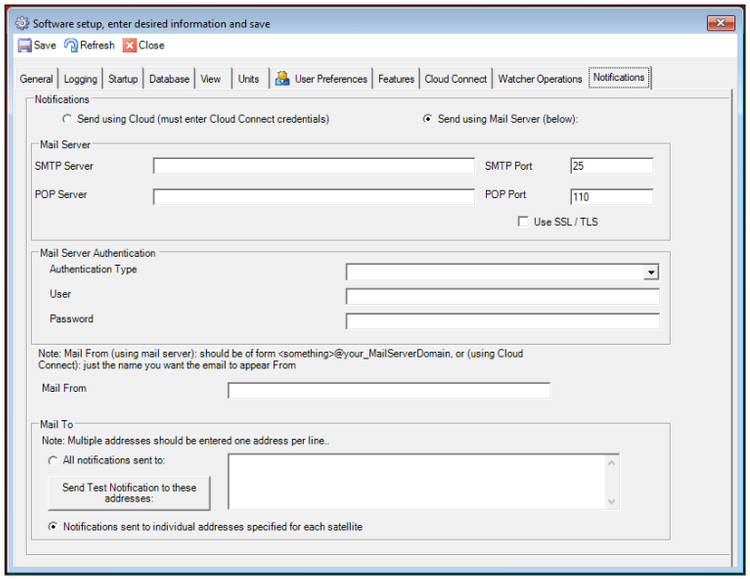
   ***Note**: Choose **Save** to record the settings as you work through each tabbed page of the **Software Setup** window.*

The Watcher Operations Tabs



***Note**: Bypass the Watcher Operations tab at this time. Prior to using this feature, refer to **Chapter 8 - Sentinel Watcher Operations** for detailed information.*

The Notifications Tab



1. Enter the **SMTP Server** Uniform Resource Locator (URL) address if you have access to a SMTP Server for email. Sentinel WMS can use the server to send emails for weather related operations including the results of nightly ET & Rain polling and rainfall monitoring activity.

   ***Note**: If the URL address is not known, refer your email client application settings for this information.*

2. Email notifications sent by Sentinel WMS will contain the **Mail From** address. Ideally, enter the email address of the person maintaining the list of email recipients. If a user wishes to be removed from the mailing list, they can simply reply to the notification.

   ***Note**: The **Mail From** address should be in the form of <something>@your_domain.*

3. Some SMTP servers require a user Authentication to send email. If your server does not have this requirement, select **None Required** from the **Authentication Type** drop down menu. If required, select either **SMTP** or **POP-before-SMTP**.

4. Both authentication options require a user name and password to be entered. Enter a User name and Password in the text boxes provided

5. Two **Mail To** options are provided. To direct all notifications to the email recipients entered in this window, select the **All notifications sent to:** option. To direct individual weather monitoring sources to specific email recipients, select **Notifications sent to individual addresses specified for each station**.

   ***Note**: When entering multiple email address, a semicolon (;) or comma(,) must be used between addresses. If you are not sure which separator to use, some trial and error may be required to send a successful test email.*

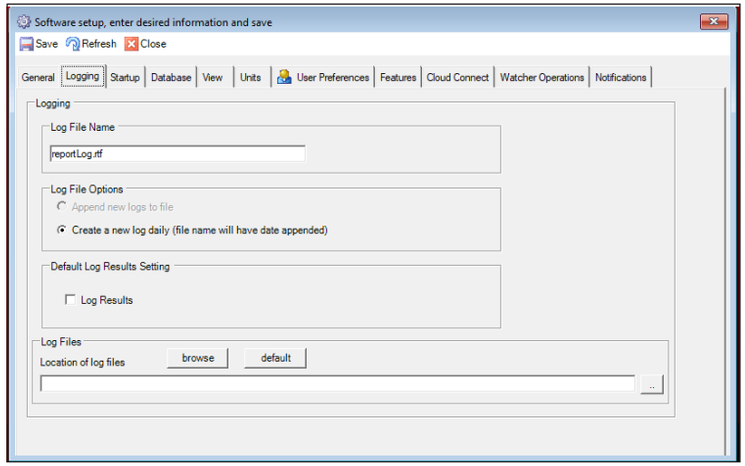
6. Once all of the notification information is entered, choose the **Send Test Notification to these addresses:** button to send to a test email to verify proper set up and functionality.

   ***Note**: Some trial and error may be required to send a successful test email.*

7. Choose the **Send as Text** or **Send as HTML** option.

   ***Note**: Send as HTML option is not currently supported.*

Logging Tab

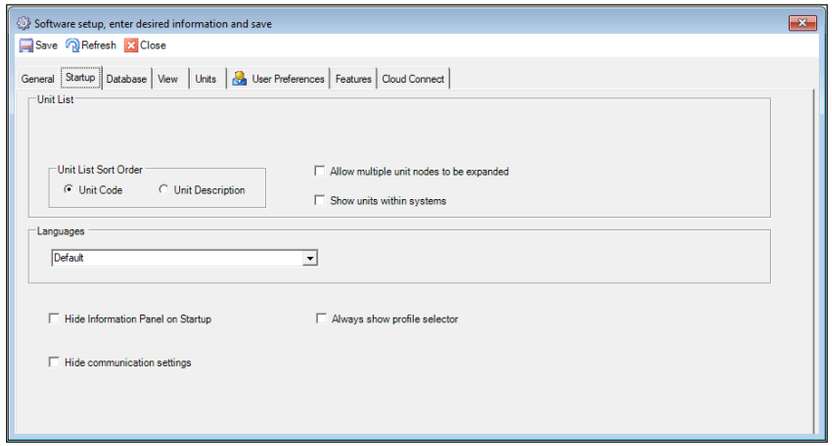


Choose a file name (including .rtf extension) to store the data logs.

Log File Options:
To create one all-inclusive file, choose **Append new logs to file**.
To create a new file each day, choose **Create a new log daily** option.

Default Log Results Setting:
Select **Log Results** option if you want the initial setting of log results on all screens to be checked, causing all operations to be written to the Log File.

The Startup Tab



The **Startup** tab setting are used during program startup and initialization.

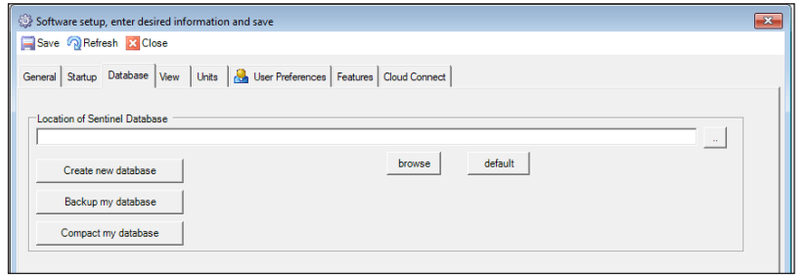
***Note**: All settings on this tab are stored in the local configuration file, allowing users on different machines (sharing a common database) to customize these settings independently.*

1. The settings in the **Unit List** determine the behavior of the Selection panel database tree.
2. Choose **Unit List Sort Order** by **Unit Description** or **Unit Code**.
3. Choose the **Allow multiple unit nodes to be expanded**: option to enable the database tree to be expanded and collapsed when selecting a satellite.
4. Leave the **Watcher Off** option selected at this time.

   ***Note**: "Chapter 9 - Sentinel Watcher Operations" reviews Watcher.*
5. English is the default program Language. Use the drop-down menu provided to select **French**, **Italian** or **Spanish**.

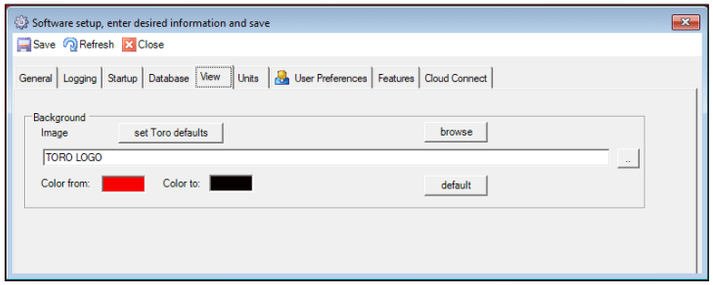
   ***Note**: Sentinel WMS software must be restarted to initiate a language format change.*
6. Selecting **Hide Information Panel on Startup** prompts the Information Panel to be hidden upon Sentinel WMS program startup.

The Database Tab



***Note**: Refer to **Chapter 1** for Database setup information.*

The View Tab



The options provided on the **View** tab enable you to customize your workspace by changing the color(s) and/or graphic image.

1. To change the workspace **Background Image** from the default Toro Logo, browse to the file (.jpg or .bmp) location and choose open.

   ***Note**: The image file must be stored in the following location to be accessible by the Sentinel software:* C:\Program Files\Sentinel.

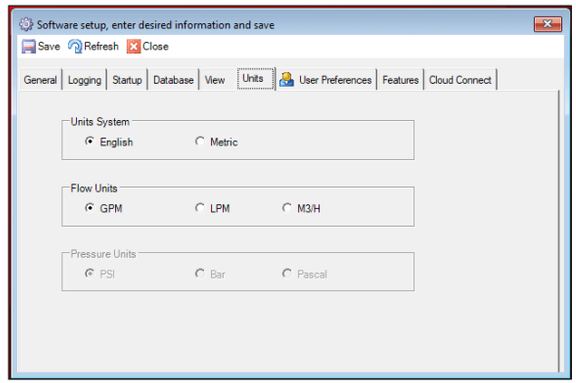
2. To change the background color(s), choose the **Color From** or Color To color box. The color-selection utility window will open automatically.

   Note: **Color From** and **Color To** indicates the color gradation from left to right.

3. Choose a color swatch or the **Define Custom Colors** button to display and select from the advanced color-selection options.

4. Choose **OK** to close the window. The selected color will be shown in the color box. Choose **Save** to display the changes.

The Units Tab

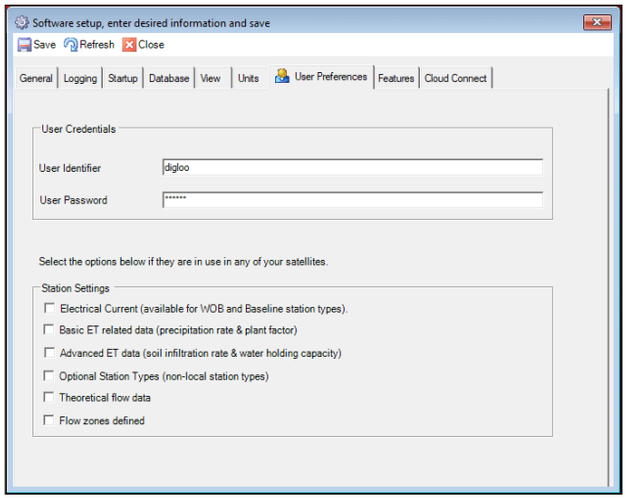


The options provided on the **Units** tab determine which measurement system the Sentinel WMS software will use as a basis to calculate and display measured or calculated data.

1. Choose the **English** or **Metric** Units System and Flow Units in **GPM**, **LPM** or **M3/H**.

   ***Note**: Ensure the preferred units options are selected before performing any satellite setup or programming procedures.*

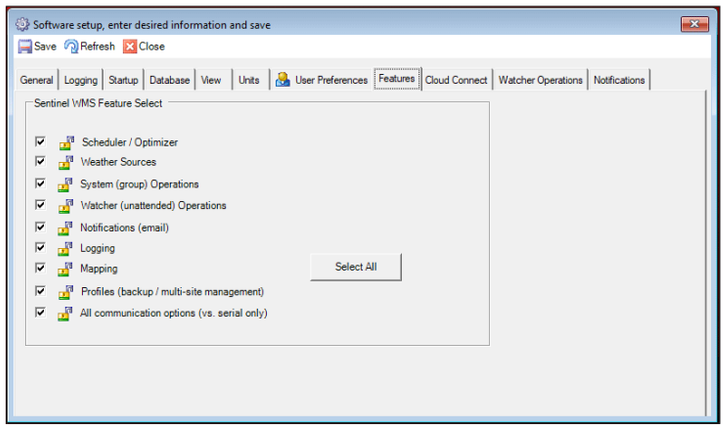
The User Preferences Tab



User Preferences tab provides several satellite Zone Data options that can be reflected in the Central software.

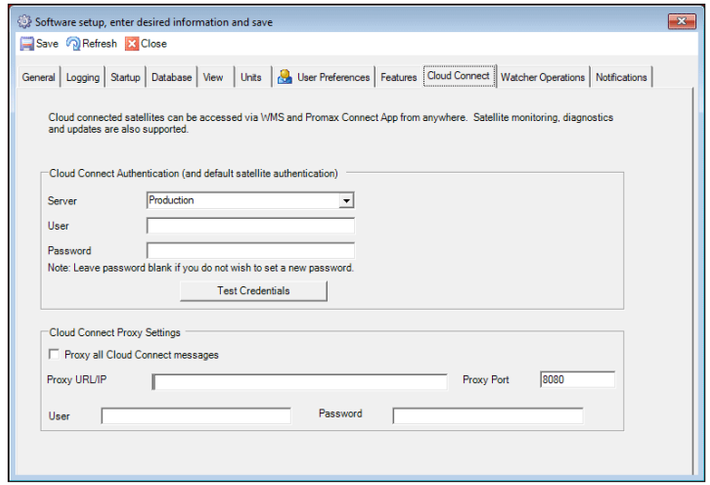
1. Choose the **Station Settings** options that apply.

The Features Tab



Various functionality features available for WMS 4.0 must be selected and activated in the **Features** Tab. Contact NSN at 1-800-275-8676 for activation key codes and additional information. Also refer to Sentinel application note: “AN00 - Feature Activation Keys” for detailed information.

The Cloud Connect Tab



The **Cloud Connect** tab allows the Central computer to communicate with cloud connected satellites. A Toro-supplied username and password will be necessary to unlock this feature. Contact NSN at 1-800-275-8676 for a username and password.

See **Appendix A: Connecting with Cloud Connect** for full details on how to connect to your satellites using Cloud Connect.

Chapter 3 - Satellite Setup

In this Chapter:

Part 1 – Creating Satellites

Part 2 – Satellite Special Data Setup

Part 3 – Synchronize Time and Day

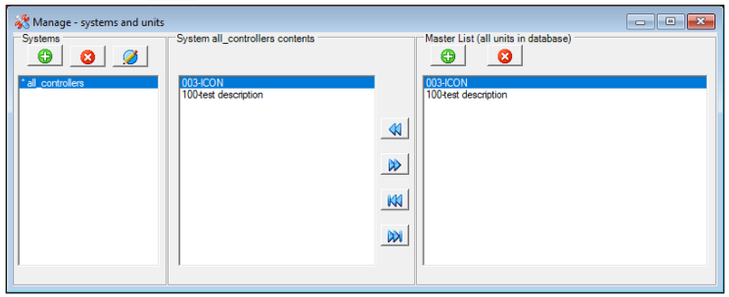
The satellite operations database is comprised of four primary functions:

Setup, Programming, Reports, and Operations & Status. Within this chapter, all of the required satellite Setup parameters will be completed in preparation for the irrigation programming procedures.

Part 1 – Creating Satellites

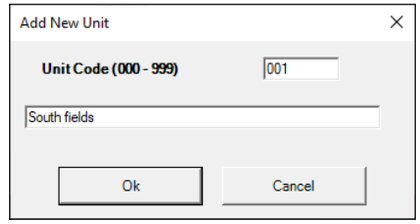
***Note**: The terms "Satellite", "Unit" and "Field Unit" are used synonymously within the Sentinel WMS program interface and User Guide.*

1. To begin, open the **Manage - Systems and Units** window by choosing the **Manage** button in the Program Toolbar.

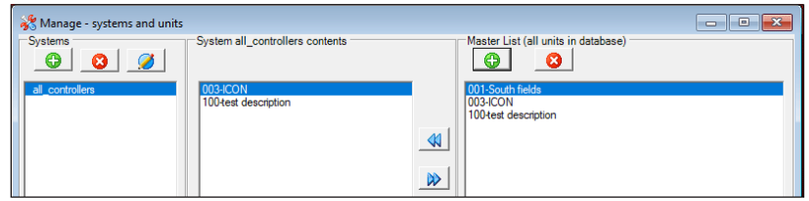


2. On the **Master List (all units in database)** side of the window, choose the **add** button to display the **Add New Unit** window as shown below.

   ***Note**: Each satellite must have a unique, 3-digit code to be created in the satellite database. If a description is also assigned, be sure to use a naming convention that will be consistent for all satellites, enabling a thorough database search by satellite code or description.*



3. Enter a 3-digit **Unit Code** ranging from **001** to **999**. It must match the unique 3-digit code of the satellite to be added.
4. Enter a name or brief description of the satellite in the text box provided, then choose **OK**.
5. As shown in the example below, the satellite is now created in the Master List of the satellite database file. Either minimize the window if additional satellites will be created later in this session, or choose **Close**.



***Note**: All data entry windows have standard-convention Windows control buttons in the top right corner. When minimized, the window will align to the lower edge of the workspace.*

About Window Toolbar Features

Most of the Windows you will be working within the Sentinel WMS program setup and operation have the following set of toolbar buttons for easy access to the most commonly used functions:

Receive Receive – Directs Sentinel WMS software to receive data from the selected satellite. The results of the data transfer are then displayed on window a **Results** tab or panel.

Send Send – Sends the contents of the window to the selected satellite.

Save Save – Saves the window content to the database.

Refresh Refresh – Reloads the last data saved from the window to the database (or default settings if user settings have not been saved).

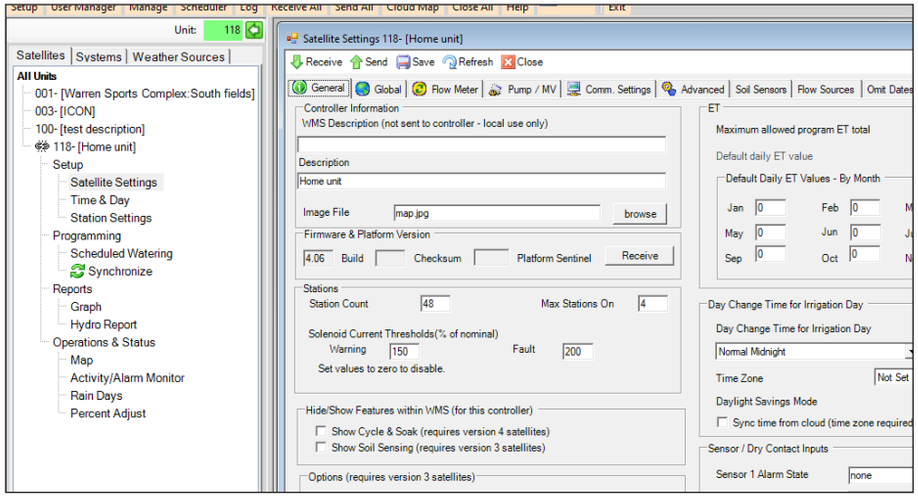
Part 2 – Satellite General Setup

As you can see by the Satellite database tree represented in the example below, the **General** window is one of three satellite setup windows within the main **Setup** directory. The majority of all required and optional satellite operating and communication settings are located on the tabbed pages of the **Satellite Settings** - **General** window.

1. Select a field unit by either entering its 3-digit address code in the green box next to **Unit:**, or choose the address code listed under **All Units**.

   ***Note**: The directory tree will expand/contract each time a directory is selected.*

2. Choose **Satellite Settings** from the **Setup** directory to open the Satellite Settings window. The **General** tab opens by default.

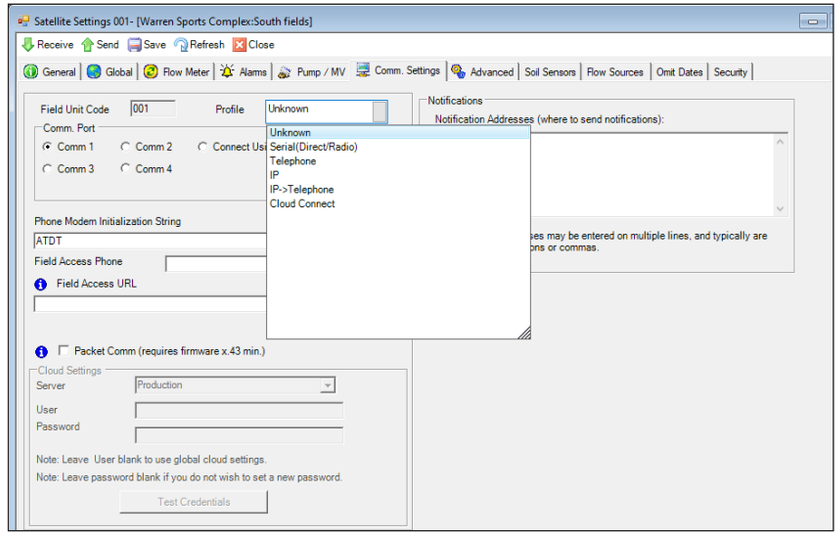


***Note**: Two-way communications between the Sentinel WMS software and the field control unit(s) must be established first to enable all remaining setup selections to be entered.*
Initial field unit setup procedures must be completed in the following order:

1. *Setup communication parameters*
2. *Transfer the field unit firmware version*
3. *Complete the required setup procedures.*

Setup Communication Parameters

1. Select the **Comm Settings** tab.

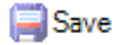


2. Select a Comm port setup profile from the drop-down menu.
3. If applicable, choose the communication (Comm) port of the phone modem, central interface, or satellite (if connected directly). If the Comm port number is higher than 4, select the **Connect Using** option and enter the Comm Port number; i.e., COM6.
4. If applicable, enter the **Phone Modem Initialization String**.
5. If applicable, enter to the **Field Access Phone** number of the satellite communicates via a phone modem.

   ***Note**: If this setting is not known, try entering AT&FE0DT or ATE0DT, or contact Toro NSN for assistance at 1-800-275-8676.*

6. If applicable, enter the **Field Access URL**.

   ***Note**: This is the IP and Port address of an Ethernet connection, for example, 10.0.0.4:10001. The address can also be entered in URL format; i.e., www.hostname.com:10001.*

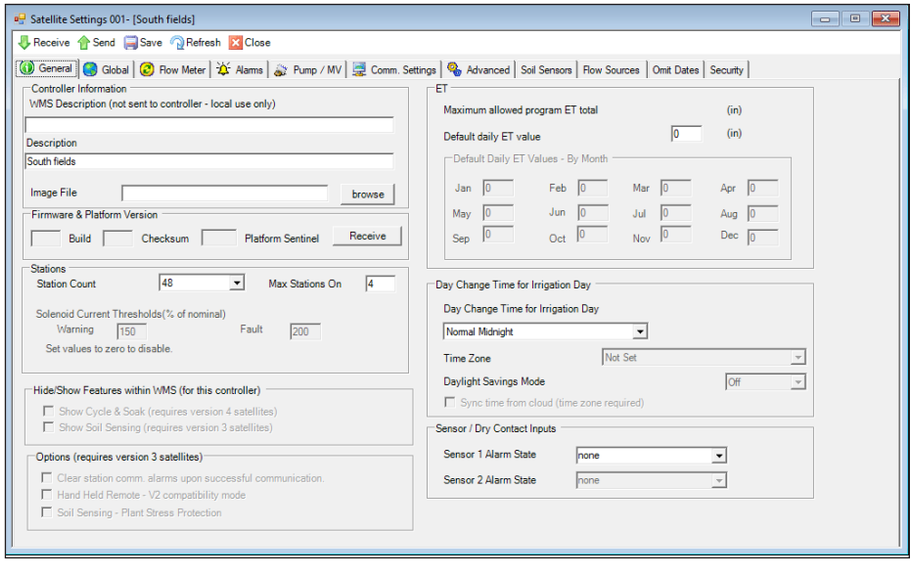
7. Select **Packet Comm** if applicable (firmware V1.43/2.43 and above).
8. If using **Cloud Connect**, please see **Appendix A: Connecting with Cloud Connect**.
9. Choose **Save**  to enter the selections.

Completing the Satellite Setup Procedures

To complete the satellite setup procedures, work through all tabbed pages of the **General** window.

***Note**: Following through the tabbed sequence within the **Satellite Settings** window is recommended to ensure that all data entry fields are completed as necessary.*

The General Tab



This procedure will establish two-way communications as well as ensure that the Sentinel WMS software will function properly with the current satellite firmware version.

1. Choose the **General** tab. The **Firmware Version** and **Checksum data** fields will be blank.
2. Choose the **Receive** button  to initiate the upload process from the satellite.
3. Upon receiving the firmware data from the satellite, choose **Save** to continue.

   ***Note**: The Receive and Send toolbar buttons will be grayed out (inactive) until a communications link has been established. When communications is confirmed, the arrow icons will become green (active). If the arrows remain inactive, either the firmware data has yet not been saved, or the firmware version is below the minimum requirements for communications.*

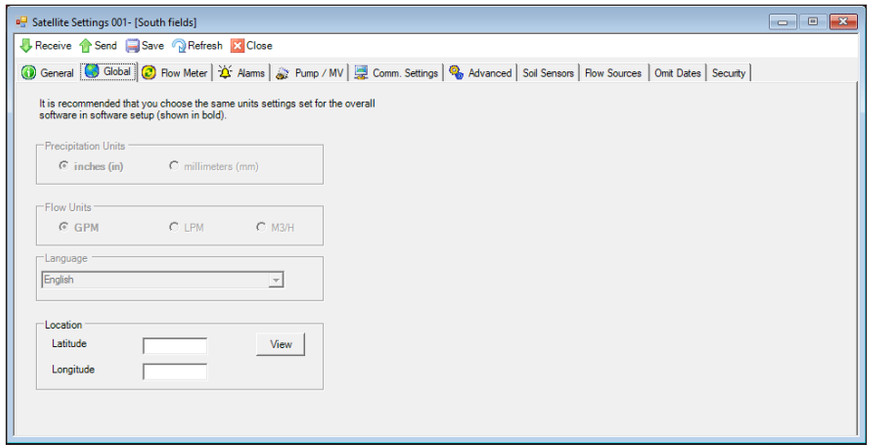
   Important: When updating satellite firmware, the new firmware data must be received by the Sentinel WMS software to ensure proper operation.
4. Select the **Max Stations On** number based on the number of satellite station outputs that can be operated simultaneously without exceeding the capacity of the satellite.

   ***Note**: Exceeding the satellite capacity can trigger an alarm condition.*
5. Choose the physical **Station Count** of the satellite.
6. Browse to the location of the map image file (.jpg or .bmp) to appear on the map window and choose **Open**.

   ***Note**: The image file must be stored in the following location to be accessible by the Sentinel software:* C:\Program Files\Sentinel.
7. Enter the **Day Change Time for Irrigation Day** option best suited for irrigation scheduling.

   ***Note**: This setting is critical when current Time and Day are synchronized with the irrigation watering schedule.*

The Global Tab



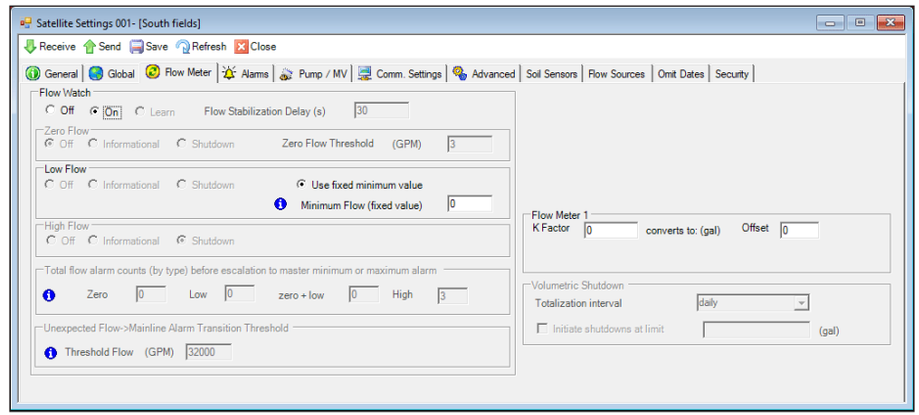
The settings in the Global page enable Precipitation Units, Flow Units and Language preferences to be selected.

When a satellite is initially created, it defaults to the settings in the Software Setup window. Those settings are shown as the choices under Precipitation Units, Flow Units and Language. To choose units and language specific to the satellite, select the options provided on this page.

***Note**: Selecting Units and Language options at the satellite level can be problematic and is not recommended. If the satellite does not enable global settings to be specified, the settings on this page will be grayed out.*

***Note**: It is recommended that you choose the same units settings selected within the **Software Setup>Units** tab.*

The Flow Meter Tab



1. Enter the K- Factor and Offset values per the flow meter specifications.
2. Select optional **Flow Watch** alarm parameters as applicable: **Zero Flow**, **Low Flow**, **High Flow**, and **Unexpected Flow>Mainline Alarm Transition Threshold**.

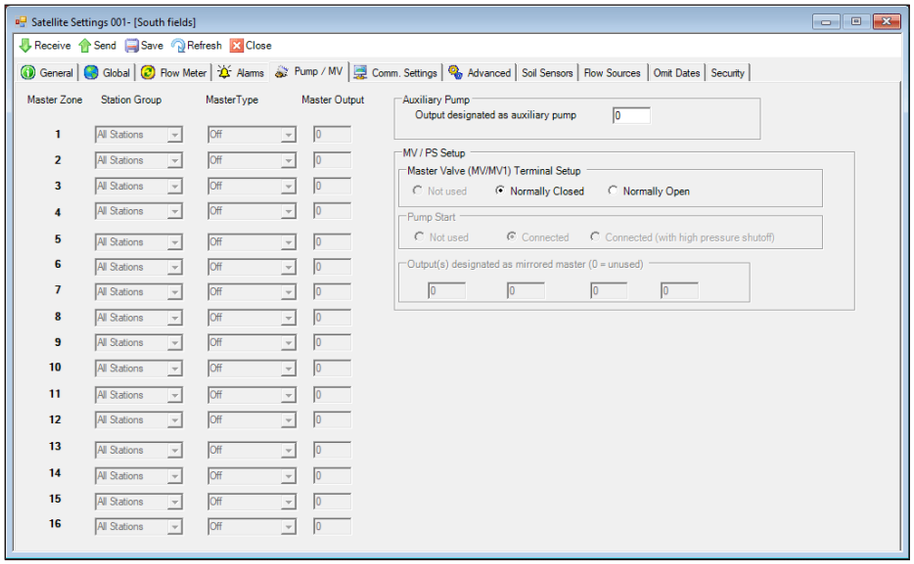
   ***Note**: **Zero-** and **High-Flow** options require firmware versions 1.43/2.43 and above. Unexpected Flow option requires version 1.41 and above.*

   ***Note**: The **Learn** option beneath Flow Watch requires each satellite station to have a minimum run time of 3 minutes.*
   *The **Flow Stabilization Delay**(s) option postpones flow meter data acquisition for a selected time period (30-minute default).*

   ***Note**: The **Minimum Flow** value under Low Flow is used in Fixed mode only. A flow rate **below** this value will set a **Master Minimum** flow alarm.*

   ***Note**: Flow rates **above** the **Unexpected Flow>Mainline Alarm Transition Threshold** value will be considered mainline failures, causing the **Master Maximum** alarm to be set and further irrigation to be suspended. Flows rates below this threshold will set the **Unexpected Flow** alarm (informational only), allowing irrigation to continue as scheduled.*

The Pump / MV Tab



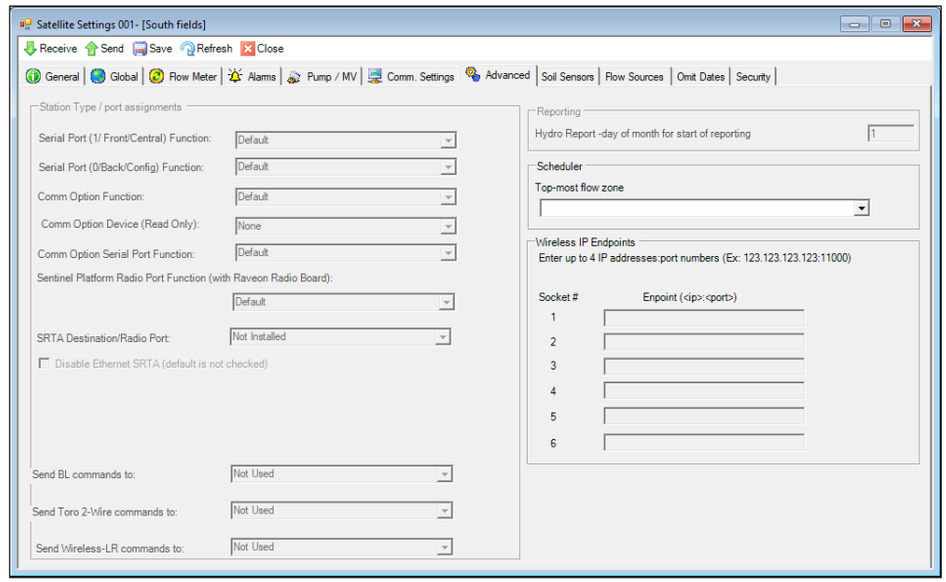
The settings on this tab enable you to designate a specific station output within a specific program (or programs) to activate auxiliary equipment, such as a pump start relay.

1. Enter the station number to be the **Output designated as auxiliary pump** in the text field.
2. Select the associated Program check box for the **Programs that activate auxiliary pump**.

The Comm Settings Tab

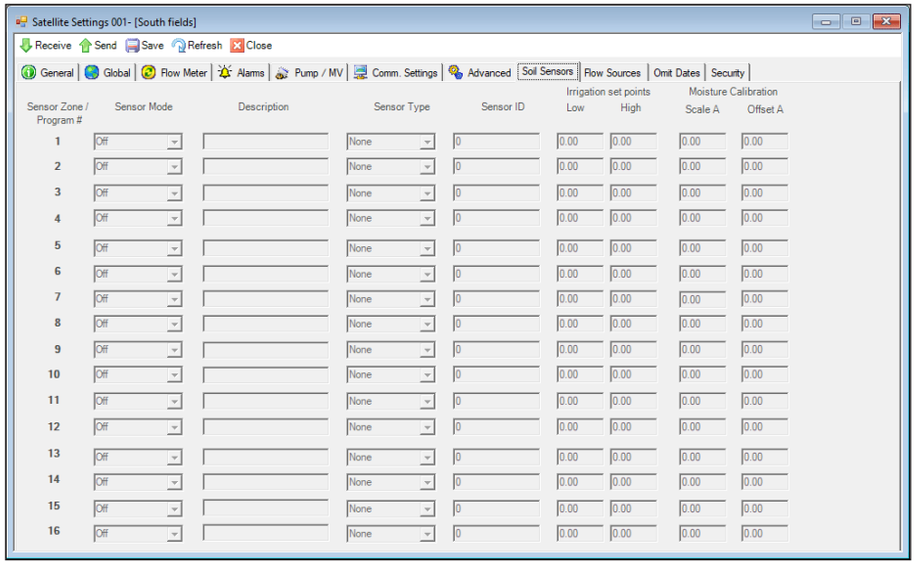
The **Comm Settings** tab is discussed on page 12.

The Advanced Tab



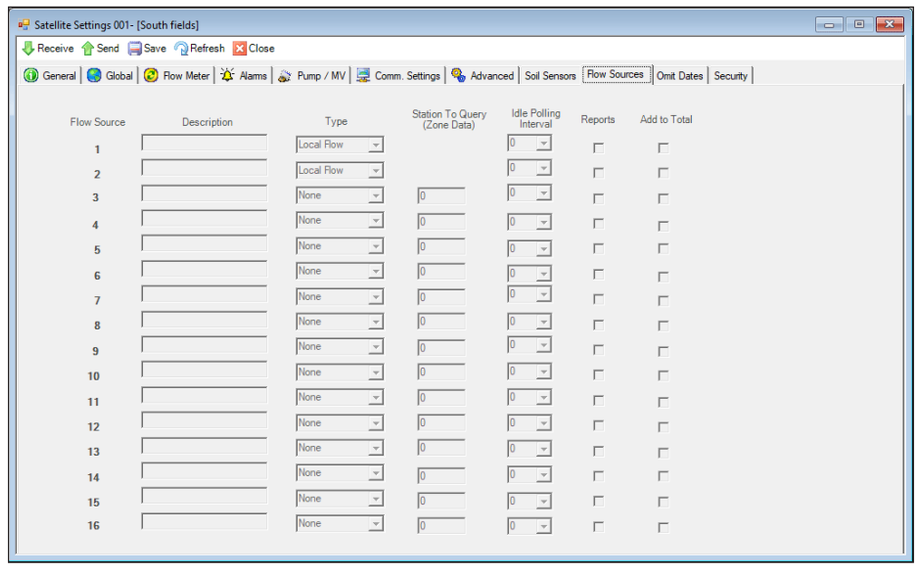
The Advanced tab allows the user to configure port assignment functions.

The Soil Sensors Tab



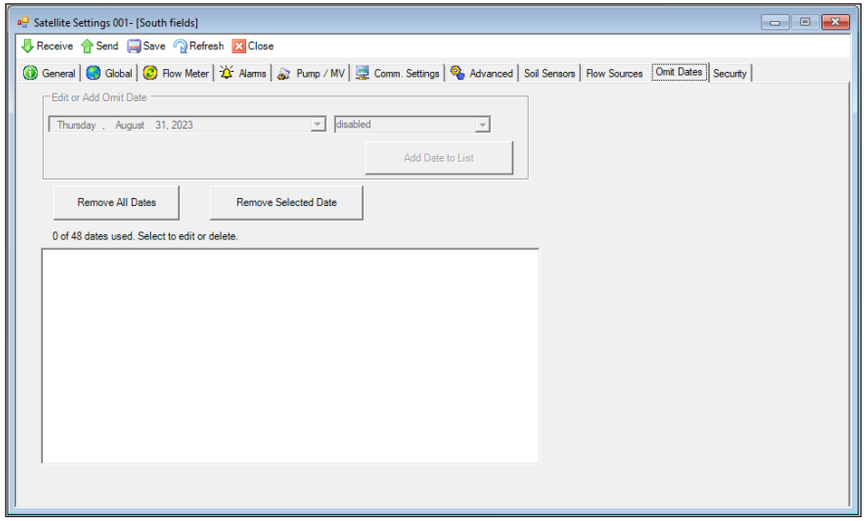
The Soil Sensors tab allows the user to configure soil sensors integrated into the irrigation system.

The Flow Sources Tab



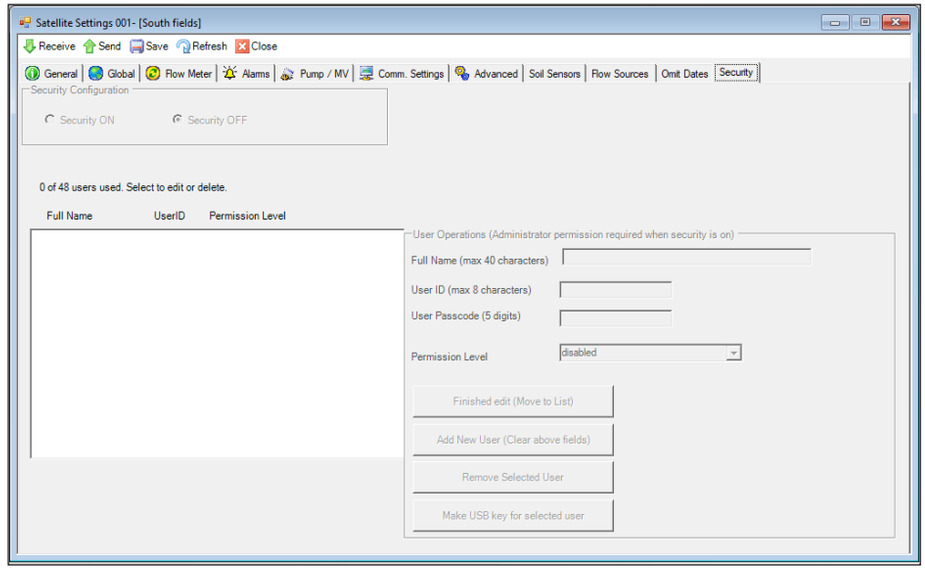
The Flow Sources tab allows the user to configure flow meters installed in the irrigation system.

The Omit Dates Tab



The Omit Dates tab allows the user to set irrigation activity for specific dates, such as disabled, occurring annually, or a one-time occurrence.

The Security Tab

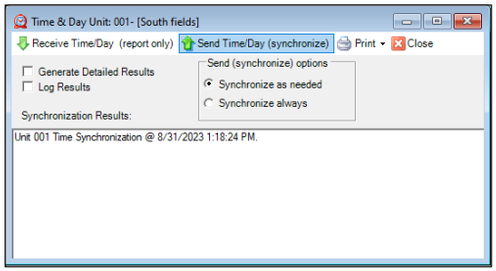


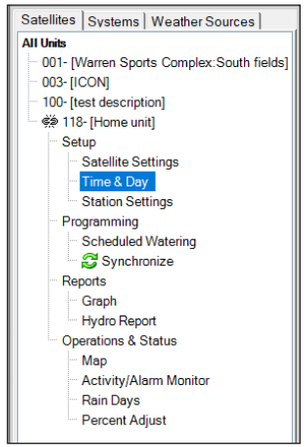
The Security tab allows the user to turn security on for the satellite or not, requiring individuals to have usernames and passwords to access the satellite.

Part 3 –Time and Day Setup

The Sentinel WMS central and satellite systems have time-keeping registers that must remain synchronized at all times to maintain scheduled operations.

The **Time & Day** window provides setup options for the time/day synchronization feature.





1. To begin, open the **Time & Day Unit:** window by choosing **Time & Day** under the Setup directory.
2. Basic results of the synchronization process will be displayed in the text window (above). Select the **Generate Detailed Results** checkbox to display the results in full detail.
3. Choose **Receive Time/Day** (report only) button to retrieve and display the current synchronization results.

   ***Note**: The Sentinel WMS receives and logs the current satellite time and day data prior to sending a synchronization command to prevent a possible satellite time-keeping malfunction from being masked.*
4. Choose **Send Time/Day** (synchronize) to synchronize the satellite with the Sentinel WMS software.
5. Select a **Send** (synchronize) option based on the following criteria:
   - Selecting the **Synchronize as Needed** option limits automatic synchronization to a time variation of three minutes or more.
   - Selecting the **Synchronize Always** option enables synchronization to occur regardless of time variation.
6. Select the **Log Results** checkbox to record all synchronization results.

Chapter 4 - Satellite Programming

In this Chapter:

Part 1 – Program Satellites for Automatic Operations

Part 2 – Checking Unsent Changes

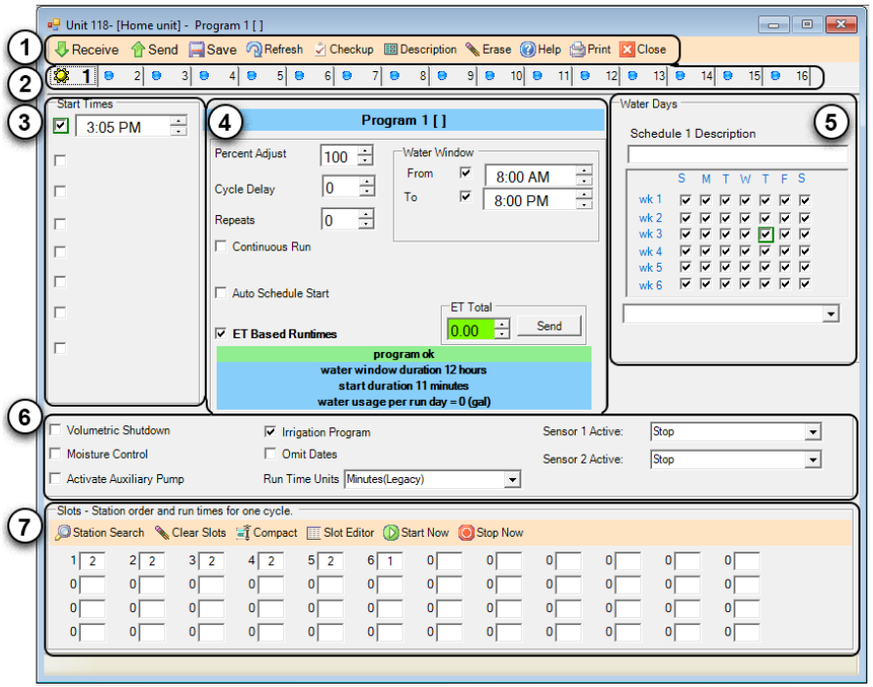
This chapter provides the various satellite programming procedures required to establish and configure automatic irrigation programs.

Part 1 – Programming for Automatic Operations

1. To begin, open the **Program** window by choosing the **Automatic Operations** under the **Programming** directory.

The satellite Program setup window is comprised of five main sections as illustrated below:

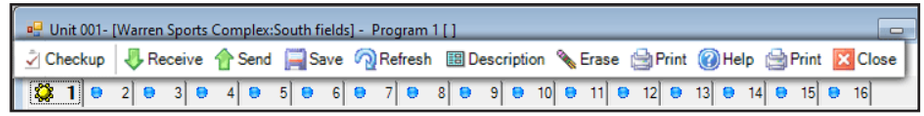
1 – Toolbar
2 – Program Tabs
3 – Start Times
4 – Parameters
5 – Schedule
6 – Station Slots



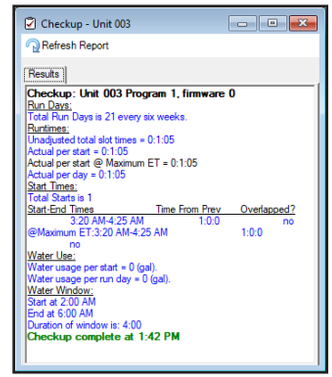
1 – Program Toolbar

Program Toolbar buttons provide easy access to the most commonly used menu functions.

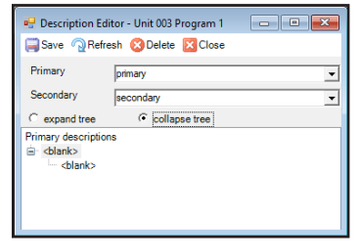
***Note**: The toolbar functions apply only to the program page currently being edited.*



Checkup - To view a detailed report of the current program status, choose the checkup button in the toolbar to open the Checkup window. The results provided in the Checkup window is color coded: Green indicates Ok, Blue and Black are informational and Red indicates a problem exists.



Description - To provide a program description, choose the Description toolbar button to open the Description Editor dialog box window. Type in the description(s) or, to select an existing description, use either the drop-down menus or description tree.

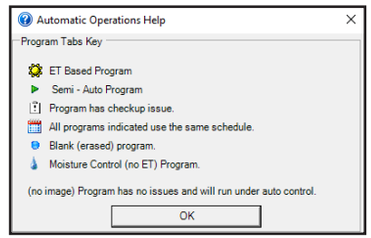


Note: In the example right, the program has been named "Primary Secondary."

After entering the description(s) choose **Save** and **Close** to exit the description editor.

On the Program setup window, choose **Refresh**. The program name will now be displayed on the Program window title bar.

Help - Displays a quick reference key for the various symbols used within the Automatic Operations setup window.



2 – Program Page Tabs

Each satellite is capable of having 16 individual irrigation programs.

The programs are organized in groups of four, called Clusters, with four programs assigned to each Cluster. Clusters are identified as A, B C, and D. Programs within the cluster are identified as 1, 2, 3 and 4. The Program window provides a separate tabbed page for each program.

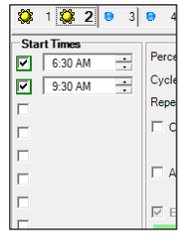
Since the program pages are stacked and viewed one at a time, a small icon will be placed on each tab to identify certain helpful program details:

- A sun identifies a program using ET data for runtimes.
- A blue dot identifies an available or unused program position.
- A check mark identifies programs that share the same watering day schedule assignment.
- A clipboard with an exclamation point indicates that the program may have an error or conflict in the programming setup and requires attention.

3 – Start Times

A Start Time initiates the automatic watering cycle.
Each program can be assigned to start up eight times within a 24-hour period.

***Note**: All start times must occur within the defined Water Window time frame. When multiple start times are used, they must be spaced far enough apart to enable the program irrigation cycle to be completed. The Sentinel WMS program will alert you to all scheduling conflicts, and provide the corrective measures required to resolve the problem.*

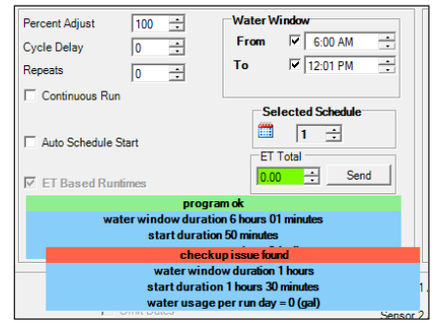


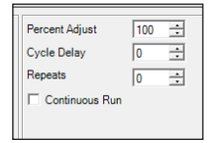
1. To begin, select a **Start Time** check box. The selection box with a default time will appear.
2. Highlight the portion of the time display to be adjusted.
3. Use the scroll bars or enter the preferred time.

   ***Note**: Green bars on the check box indicate the start time will occur today.*
4. When finished editing the Start Times, choose **Save**.

4 – Program Parameters

The various settings within this portion of the Program window enable each program to be modified as needed for optimum control. As settings are made, the program setup status information will be displayed in the colored panel. Green and Blue indicate the selected parameters are acceptable. When an error or conflict is found, the cause/resolution will be flagged in Red.

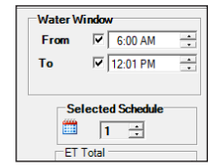




Percent Adjust - Adjusts the run time of all stations assigned to the program by percentage ranging from 0 to 255% (100% = no change).

Cycle Delay - Places a delay period, ranging from 0 to 255 minutes, between repeat watering cycles.

Repeats - Enables the watering cycle to be repeated from 1 to 250 times per start time.



Water Window - The Water Window is the period of time in a 24-hour day that automatic watering can occur. Selecting a **From** and **To** time defines the Water Window start time, duration and end time. A program that is running at the end of the Water Window is automatically terminated.

Selected Schedule - Up to 16 unique watering day schedules can be defined. For identification, each schedule has a number assignment ranging from 1–16.

To assign the program to one of the schedules, simply enter or scroll to the corresponding number in the box.

Continuous Run - Selecting **Continuous Run** checkbox will automatically repeat the program cycle continuously for the defined Water Window duration.

Activate Auxiliary Pump - Select this option to activate the auxiliary output (designated in the **General** window) at the beginning of the watering cycle.

ET-based Run Time - Select this option to enable station run times to be recalculated at the day change time based on the ET Total for the program.

***Note**: To utilize ET-based run time, a **Plant Factor** (other than 0) and an*

Application Rate *(entered in Zone Data or the Slot Editor) must be selected. When the ET-based run times option is selected, the ET Total selection box and Send button will be enabled.*

1. Choose the Program toolbar Receive button to receive the ET Total data from the satellite.
2. Send the ET Total to the satellite by choosing the Send toolbar button .
3. Control/click on the ET value box to recalculate and update station run time.

Takes starts and repeats into account and matches what the satellite unit would recalculate using the same ET value.

ET-based stations will appear green in the Slot Editor as shown in the example below.

Note*: Run times shown are based on the following formula:*

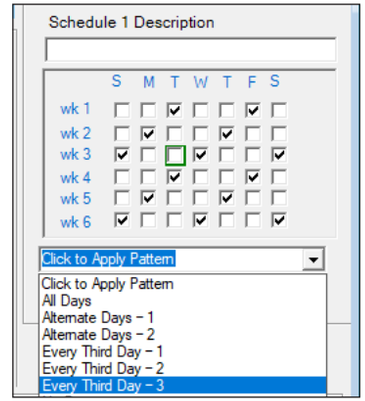
Run time = (ET Total/Precipitation Rate) x Plant Factor %.

5 – Watering Day Schedules

All watering day schedules are defined within this form. Active days can be scheduled by selecting individual check boxes or by selecting one of the pre-configured schedules provided in the selection menu.

In the following step-by-step example, a 6-week rolling schedule is set to water every third day (a three-day interval).

Note*: Multiple 2-day and 3-day Interval schedules are listed in the menu. For example, Every Third Day is listed three times to provide three initial start days of the interval period.*



1. Scroll to **Every Third Day - 3** schedule option on the rolling menu.
2. Click on the selection to highlight it in blue. Watering days are checked.

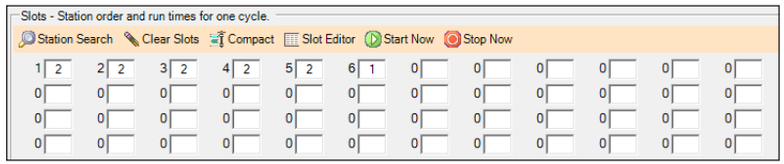
   Note*: The box highlighted by green bars indicates the current day of the week (based on a calender-date reference).*
3. Choose the **Calendar** tab to display the watering day schedule in a calendar-day format.
4. Choose the **Overlay 6 Week** button at the bottom of the calender window. The 6-week (every third day) schedule will be overlaid on the calendar, indicating the active days in bold.
5. To name the schedule, enter a brief description in the text box, then choose **Save**. As shown below, the watering day schedule with its schedule number and name are now associated to the number indicated in the Selected Schedule box.
6. To assign this schedule to another program (tab), simply select the number in the **Select Schedule** scroll menu during program setup.

   Note*: With 16 different watering schedules available, it is possible for each program to have a unique watering day schedule. However, when programs share the same schedule, changing the shared schedule on any program changes it in all programs sharing that schedule.*

6 - Station Slots

One of the most unique and powerful programming features of the Sentinel WMS software is the method used to organize and control satellite station outputs within each irrigation system. This method is referred to as "Program Slots."

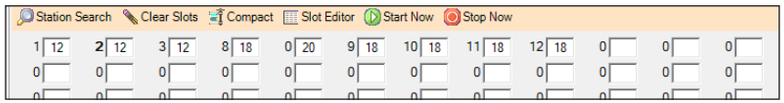
Program Slots are organized in a sequential matrix, defined by 4 rows of 12 Slots, for a total of 48 slot positions. The program cycle operating sequence begins at the first Slot in row 1, and ends at the last Slot in row 4.



The station number is assigned to a slot and assigned a run time duration ranging from 0 to 255 minutes. Station numbers range from 0 (inactive) to 96. Stations can be assigned to slots in any order and as many times as preferred. If more than 48 Slots are required; i.e., for a 96-station satellite, an additional program must be used to assign the remaining 48 stations.

When an irrigation program is running, any slot with 0 (or blank) run time is ignored. A slot with an assigned run time duration ≥1 minute, but without a station assignment, will create a pause in the watering cycle for the assigned duration.

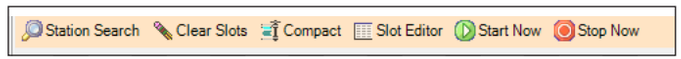
In the example below, the program cycle will run stations 1, 2 ,3 and 8 in sequence for their allotted run time. The cycle will pause for 20 minutes (at slot 5), then continue running stations 9–12 in sequence.



***Note**: A key to using the Slots programming method, is to remember that the number next to each slot is the assigned Station number, not the slot number.*

The Slots Toolbar

The Slots toolbar works exclusively with the program slots matrix by providing the tools commonly used during the slot editing procedure. In addition to editing support tools, manual irrigation can be controlled with the **Start Now** and **Stop Now** buttons.

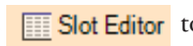


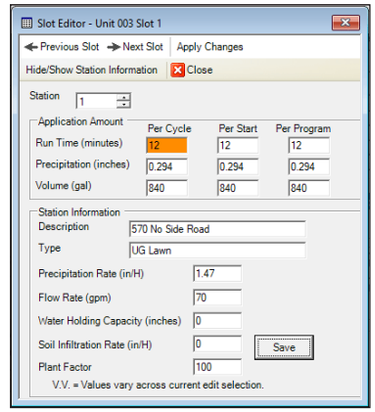
Editing Program Slots

Program Slot editing can be accomplished by simply highlighting a slot placeholder, assigning a station number and a run time duration, then applying and saving the data. However, in most cases the Slot Editor will also be utilized to perform various other editing tasks.

The Slot Editor links directly to the satellite database, enabling resident and new station setup parameters to be reviewed and updated. All changes applied in the Slot Editor will be reflected in the Zone Data window and all other database-linked windows. The Slot Editor also provides multiple-slot editing, similar the Multi-Station Editor tool provided in the Zone Data window.

Editing Single Slots

1. Select a slot by highlighting its placeholder (0) or the currently assigned station number.
2. Choose the **Slot Editor** button  to open the **Slot Editor** window.
3. Choose **Hide/Show Station Information** button to display all station data.
4. Assign a Station number to the slot being edited (highlighted in orange), using the text box scroll arrows or by keyboard entry.
5. All currently saved station data will be shown. Enter or edit data as preferred. (Edits made within the Slot Editor will overwrite the information in the Zone Data window.)



***Note**: All stations being edited require a precipitation and flow rate value. The slot editor allows run time to be entered per Cycle, Start or Program, mode and dynamically adjusts Precipitation and Flow rates accordingly.*

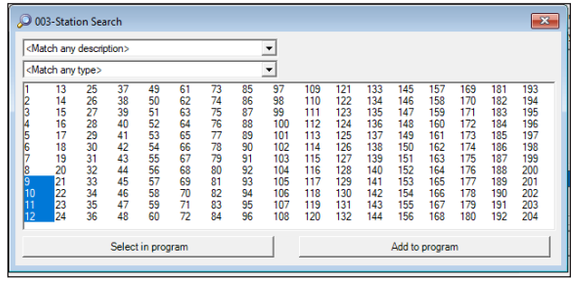
6. Choose **Apply Changes** and **Save.**

Editing Multiple Slots

When several slots will have station assignments that share common parameters and Run Time values, editing the slots simultaneously as a group can be a great time-saving tool to build programs rapidly.

Use the following procedure to select and edit multiple Slots.

1. To begin, all slots to be edited must have a **station number** assignment. Either assign station numbers individually, or choose the **Station Search** toolbar button to open the **Station Search** window.



2. Using the Station Search features, select stations to be entered on the Slots by either matching the station **Description** or **Type** to compile a list of stations, or select the station numbers from the number chart using standard multi-selection keyboard methods: <SHIFT>-click to select a consecutive number of stations or <CTRL>-click for random selections.
3. Once the desired group of stations is selected, choose the **Add to Program** button to transfer the selections to the Slots fields. The slots to be edited will be highlighted in orange and the **Slot Editor** window will open.

Editing Station Information

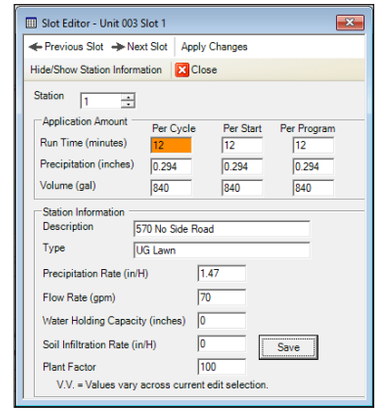
Station database information can be conveniently changed and entered directly within the **Slot Editor** and immediately reflected in the Zone Data window.

***Note**: When editing multiple stations simultaneously, changes made through the Slot Editor are applied to all stations within the edit group.*

1. To begin, select (highlight in orange) the Station number slot, or select multiple slots to be edited simultaneously using the standard shift-click and ctrl-click keyboard methods.
2. Choose **Add to Program** button to populate the Slots fields. The **Slot Editor** window will open automatically. Click on **Hide/Show Information** to expand the Slot Editor window.
3. Enter the station information in the appropriate text boxes within the Station Information area.

***Note: VV** (Varying Values) will be displayed if slots within the group do not have the same **Run Time**, **Precipitation Rate** or **Flow Rate** values. This is resolved by entering a Run Time and choosing **Apply Changes**.*

In the example right, station station run time entered is 10 minutes and Type description "N Park Strip" has been added to stations 4, 5, 15 and 16.



4. Choose **Apply Changes** and **Save**.

Clearing Slots

The **Clear Slots** tool Clear Slots removes Slots data incrementally as follows:

- Clears run time of all selected Slots (assigned station number in bold).
- Clears run time of all Slots with a 0 placeholder.
- Clears all Slots with blank run time.
- Clears all Slots data.

***Note**: Selecting the Refresh button returns all program data to the previously saved settings.*

The Compact Tool

The function of the Compact tool is to maximize the number of contiguous Slots by relocating all unused slots in each row to the back of the matrix field.

Choosing the **Compact** button Compact initiates the compaction process manually, and can be selected at any time.

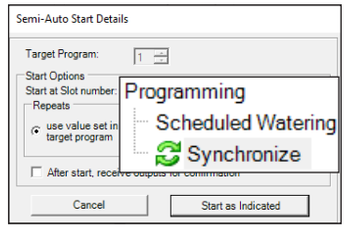
***Note**: Compaction will be initiated automatically when stations are added through the **Station Search** window.*

Manual Program Operations

The **Start Now** Start Now and **Stop Now** Stop Now buttons are provided to enable automatic irrigation programs to be manually controlled.

1. Choose the **Start Now** button to initiate the irrigation program at the first slot position.

   ***Note**: For advanced manual operations, right-click on the **Start Now** button to open the **Semi-Auto Start Details** window.*



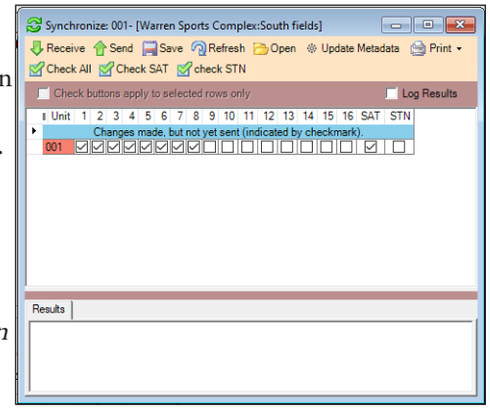
2. Select the options provided in the Semi-Auto Start Details window and choose the **Start as Indicated** button to initiate the program operation.
3. Choose the **Stop Now** button to terminate the auto program operation. This will cancel the current station running and all future stations in the program sequence.

Part 2 – Synchronize

As edits are made to primary programming screens that affect the satellite (Auto Program, Special Data (SD), Zone Data (ZD), the Sentinel WMS program flags the edits as they are made, then clears the flag when the changes are successfully sent to the satellite.

A quick and efficient way to verify the results of the data transmissions is by opening the **Synchronize** window.

1. Choose the **Synchronize** link from the **Programming** directory.
2. Unsent changes are indicated by a check mark in the box under the associated Program Tab.
   Select program(s) to update by choosing the associated program group button (**Check A** selected in example above) or by clicking on individual program check box(es).



3. Choose **Receive** to receive and save satellite data for all checked boxes.

   ***Note**: The exception is Special Data (SD). If the firmware version is blank, receiving Special Data will only receive and save the firmware version.*

4. Choose **Update Metadata** to sweep through all checked programs and re-save data. All calculations and/or flags will be brought up to date.

   ***Note**: Use the Update Metadata function when updating to a new version of WMS software to help identify changed or new metadata fields.*

5. Choose **Send** to update the satellite and generate a report in the **Results** pane.
6. To open and review Auto Program, Special Data, and/or Zone Data, select the associated check box, then choose **Open**.

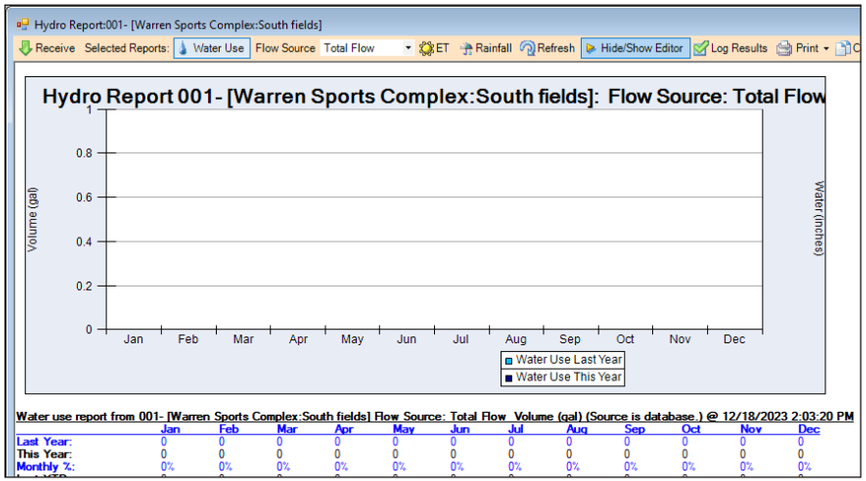
Chapter 5 - Satellite Reports

In this Chapter:

Part 1 – Hydro Report

Part 2 – Flow Graph Report

Part 1 – The Hydro Report



Hydro reports can be quickly generated from current and historic satellite data including: Water Use, ET and/or Rainfall, in a convenient graphic format. The reports can be viewed, printed and logged for future reference.

A data editor function enables the report data to be modified and sent back to the field satellite.

1. To begin, choose **Hydro Report** under the Reports directory.
2. Select (highlight) the type of data report you wish to receive: **Water Use**, **ET** and/or **Rainfall**.
3. Choose **Receive** Receive to upload current data from the satellite.

   A bar graph, such as the Water Use report shown in the example below, provides the usage totals, per month for the previous year, compared to the current year (for each data type when multiple data types are selected).

   The data is also represented in a spreadsheet format below the graph to provide comparison by percentage per month- and year-to-date totals.
4. To edit the data, choose the **Hide/Show Editor** to include the Editor fields.
5. Choose **Water Use**, **ET** or **Rainfall** data to edit from the drop down menu.
6. Edit the data fields as needed.
7. Choose **Send** Send to upload edited data to satellite.
8. Choose **Save** Save to save the selected report data to the database.

Part 2 – Flow Graph Report

1. To begin, choose **Graph** under the **Reports** directory.
2. Select the preferred Plot Element to Receive/Show options: **Today**, **Yesterday**, **Watermark** and/or **Theoretical**.

   Note: A Theoretical graph represents the calculated flow rate based on the programmed operating parameters. Including a theoretical graph will provide a visual baseline to compare actual flow rate for today and/or yesterday.

   Note: Programs that are blank, require checkup, or operate continuously, will not be represented in the flow graph or listing windows.
3. Choose **Receive** Receive or **Refresh** Refresh to plot the graph.

   ***Note**: Click-drag the pointer left to right and/or top to bottom to zoom in. Click on the graph to zoom back to the original scale.*

   ***Note**: To mark graph locations, right-click on the location.*

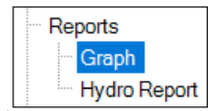
The Erase Tool

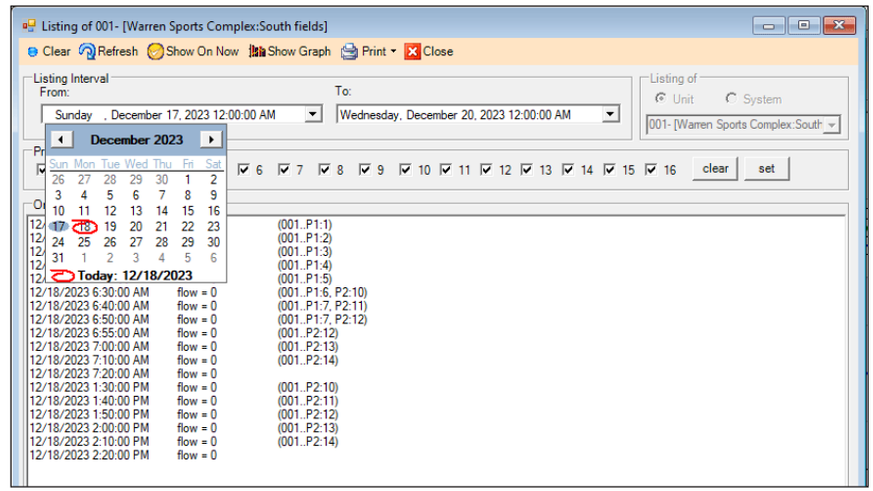
The Erase tool Erase works progressively to clear various elements of the graph.

1. Choose the Erase tool from the Flow Graph toolbar.
   - Click once to delete all maker lines,
   - Click twice to delete all marker labels,
   - Click three times to delete all graph data.

Listing Window

Selecting **Show Listing** from the menu bar opens the Listing window to display the Units, Programs, Stations and time interval that comprise the data depicted on the flow graph report. The Listing window can be printed by selecting the Print menu item.





1. Selecting the **Show On Now** menu item displays the current list of station operations represented in the flow graph.
   - The **Listing** window can be printed by selecting the **Print** menu item.
2. To generate a new flow report and listing, use the **To** and **From** date fields to define the satellite activity period to be reviewed.
3. Use the Program selection check boxes to include/exclude specific Program data from the report:
   - Use the **Clear** button to deselect all Programs.
   - Use the **Set** button to select all Programs.
4. Select **Refresh** to rebuild the program listing using the dates and programs to include parameters.
5. Select **Show Graph** Show Graph to view the graph corresponding tho the listing. If you have made changes to the listing parameters, you will need to select the refresh button on the graph to view those changes.

Chapter 6 - Satellite Operation and Status

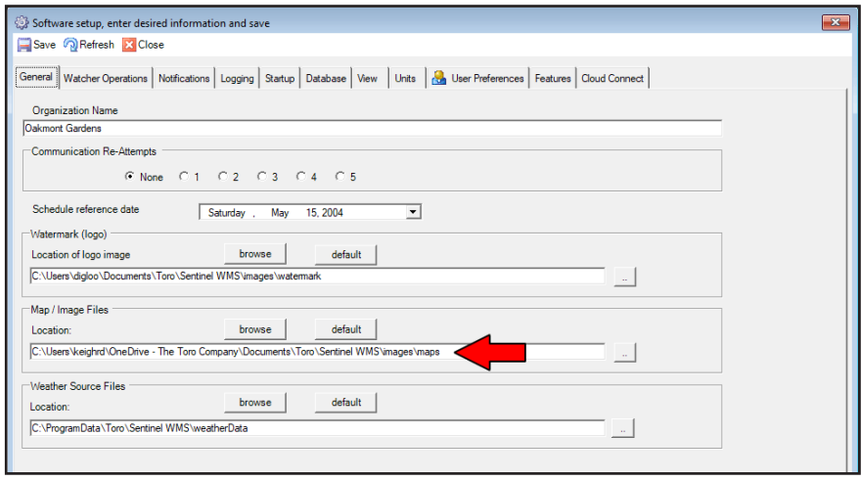
In this Chapter:

The Operations and Status windows provide various tools and functions to help you achieve optimum water system management and control.

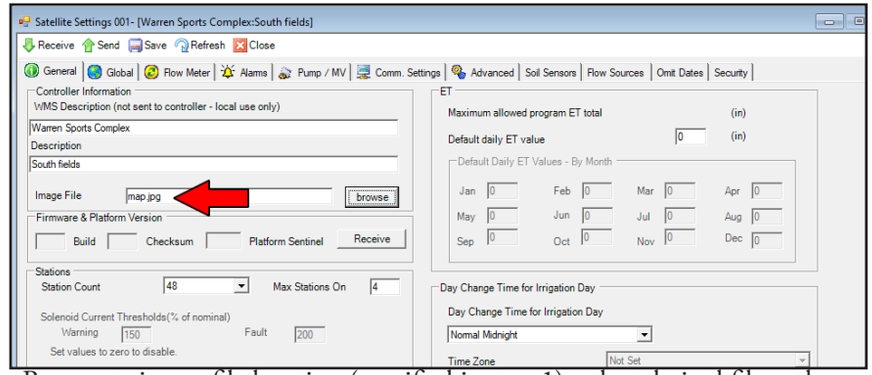
Part 1 – Map View Features

***Note**: To enable map view operations, the map file (.jpg or .bmp) must be stored in the file indicated on the software setup general tab, in the location of map/ image files text box. Sample map images are provided on the Sentinel WMS installation CD.*

1. First, press the **Setup** button and confirm the folder location for **Map / Image Files** (see red arrow below). This folder is where the desired map file must be stored.

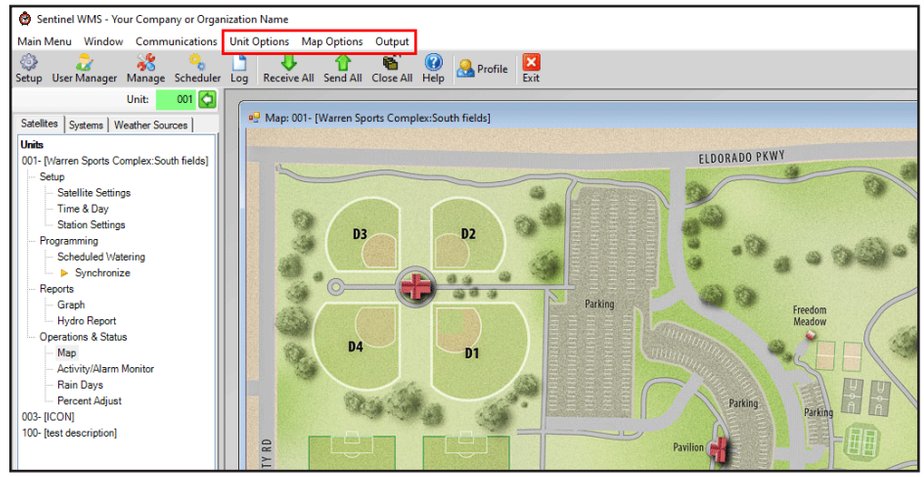


2. Next, select **Satellite Settings** for desired Unit and select the **General** tab. The map image file name will be entered into the **Image File** field.



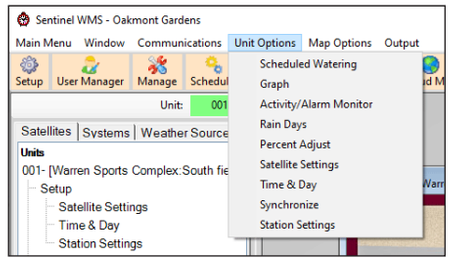
3. Browse to image file location (specified in step 1), select desired file and choose **Open**. The file name should now appear in the **Image File** text field.
4. Choose **Save** Save , then close the General window.
5. Choose **Map** under the Operations & Status directory to open the Map window.

   ***Note**: When the Map window opens, three additional menus appear in the Program Menu bar: **Unit Options**, **Map Options** and **Output**.*



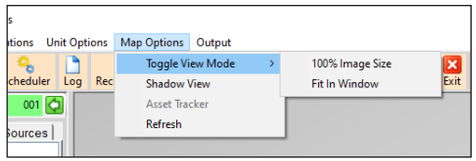
The Unit Options Menu

When working with map images, hiding the Selection and Information panels to increase the workspace area is often preferred. The satellite support features, accessible from the Selection panel database tree, are listed in the Unit Options drop-down menu to provide easy access to all support feature windows.



The Map Options Menu

Provided within the Map Options drop-down menu, are additional tools utilized for viewing, setup and functionality of the Map feature.

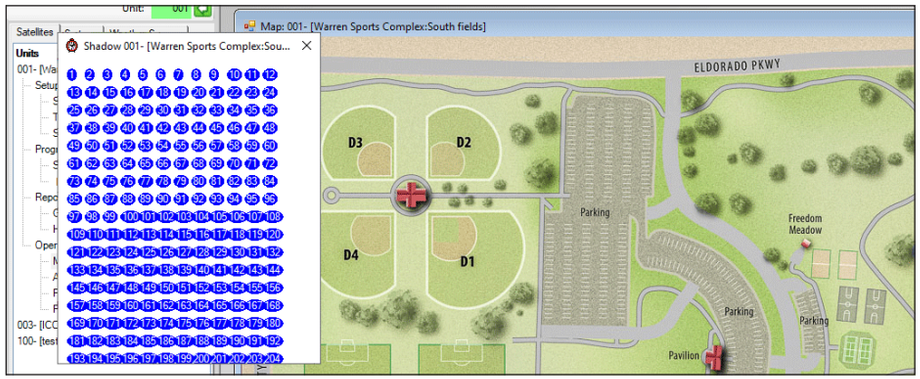


- **Toggle View Mode**

  These menu options enable the map image to be constrained to 100% or to scale proportionately to fit the window size.

- **Shadow View Mode**

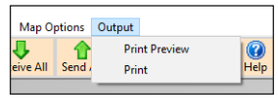
  Choosing this menu option opens a small window containing 96 individual drag-and-drop station markers used to identify and link satellite station data to the map image.



- Asset Tracker (Not currently enabled.)

Output Menu

Print and print preview options are provided in this drop-down menu item.



Placing Station Indicators on the Map

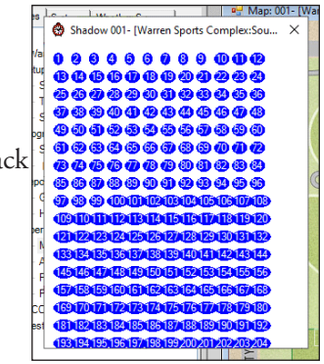
When station indicators are positioned on the map image, they are dynamically linked to the Sentinel WMS software to reflect current operating conditions. For example, during manual operations, the station indicator will change from blue (inactive) to yellow (manual operation). During automatic operation, active stations will be displayed in green. Station indicators are updated after selecting Receive on the Manual/Output Status screen.

1. Use either of the following methods to place station indicators on the map image:

   - By Numeric Sequence:

     Click and drag an indicator from the blue stack in the upper left corner of the map image, then drop the indicator at the corresponding map location.

   - Station indicators are extracted from the stack in numeric sequence, from 1 to 96.



   To **remove** an indicator from the map:

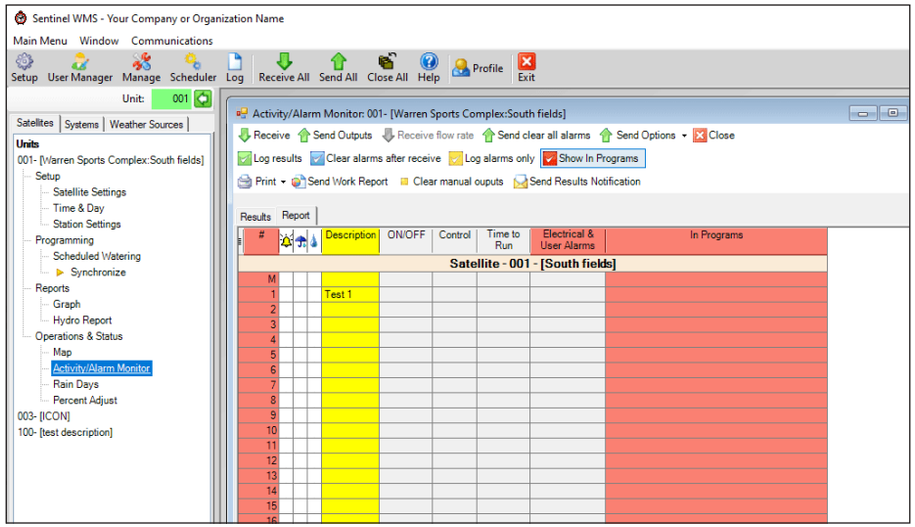
   - simply drag it back to the corner stack and then release
   - click on the corresponding number in the Shadow window

   By Random Sequence:

   Choose **Shadow View** from Map Options menu to open the Shadow window. Click and drag an indicator from the Shadow window, then drop the indicator at the corresponding map location.

   To **locate** a station number on the map that is currently hidden from view, right-click on the number in the Shadow window.

Part 2 – Activity/Alarm Monitor



The options provided in the Activity/Alarm Monitor window enable individual satellite stations to be started and stopped as needed, and all critical satellite operating parameters will be monitored. Any condition that meets the Alarm criteria is flagged and reported during routine polling and specified polling communications.

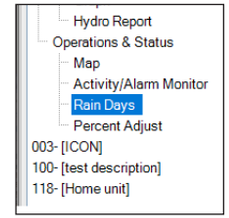
***Note**: Refer to Application Note AN04 - Activity/Alarm Monitor for detailed information.*

Part 3 - Rain Days

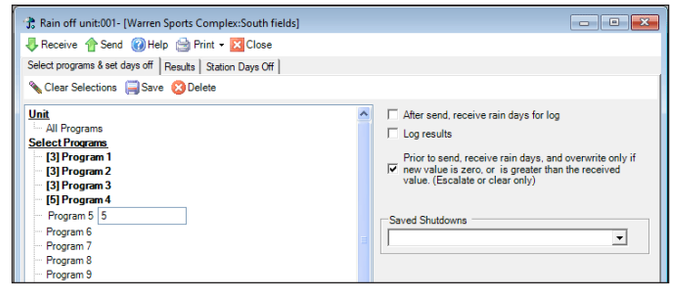
The Rain Days control feature enables program operation to be suspended for a defined period of time, ranging from 0 to 250 consecutive days, then automatically resume operation when the delay period elapses.

The Rain Days mode can be implemented by any one of three optional methods: Unit (all programs), Select Programs or program Description.

- Assigning Rain Days by Unit suspends automatic operation of all defined irrigation programs.
- Using the **Select Programs** option enables Rain Days to be assigned to any program Cluster(s) or individual program(s) within a Cluster.
- The **Description** option enables Rain Days to be assigned based on the program's Primary or Secondary description.



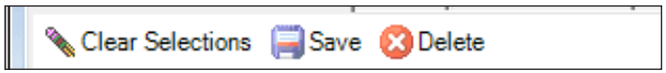
1. To begin, choose **Rain Days** under the **Operations & Status** directory to open the Rain off window. The window will open at the **Select programs & Set Days Off** tab and database tree expanded.
2. Choose **All Programs**, **Cluster** or a specific **Program**. A text field will appear next to the selection.
3. Enter the number of Rain Days (1 to 250) in the text field.



***Note**: In the example above, a 3-day Rain Days period is assigned to Programs 1, 2, and 3. A 5-day Rain Days period to Programs 4 and 5. When entered or by selecting another program to enter rain days, the assigned number of rain days will be shown in brackets and bold type (see inset).*

4. Press **Return** or click the mouse outside the text area to finish editing the rain days entry.

The Rain Days Toolbar

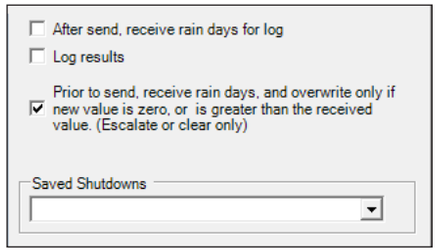


Clear Selections clears all current selections.

Save stores the current rain days selections as a saved shutdown with the name provided in the Saved Shutdown combo box. Saved shutdowns can be recalled for reuse.

Delete removes all current selections from the database.

Rain Days Configuration Options



- **After send, receive rain days for log** - Checking this option prompts the satellite to report back to the central after receiving a Rain Days upload. The current Rain Delay status is posted in the Results window.
- **Log Results** automatically saves current results data to the events Log.
- **Prior to send...** restricts updates to the current Rain Days status to only increase or cancel (zero) delay days .

Saved Shutdowns

The **Saved Shutdowns** feature enables the current Rain Day selections to be saved and reloaded.

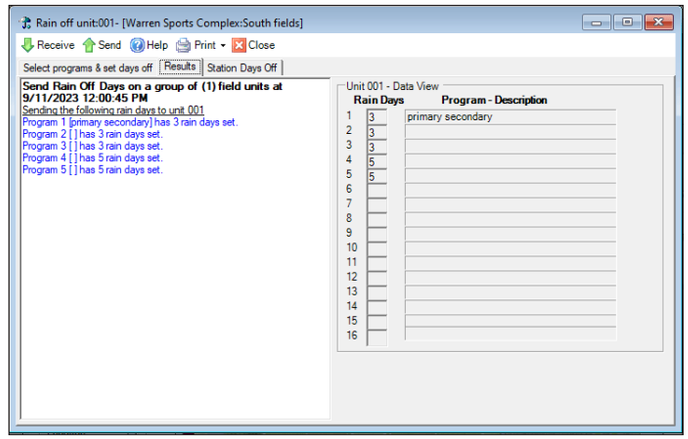
1. Once the Rain Day selections are made, enter a description text field, then choose the **Save** button.

   ***Note**: When a Shutdown description is saved, it becomes available to load into any satellite. Therefore, using a concise, specific description will help determine if the particular Rain Day selections are applicable. Only one Saved Shutdown entry (at a time) per satellite can be saved.*

2. To load a Saved Shutdown entry, select the description from the drop-down menu.
3. To delete a Saved Shutdown description and its associated selections, choose the toolbar **Delete** button.

The Results Tab

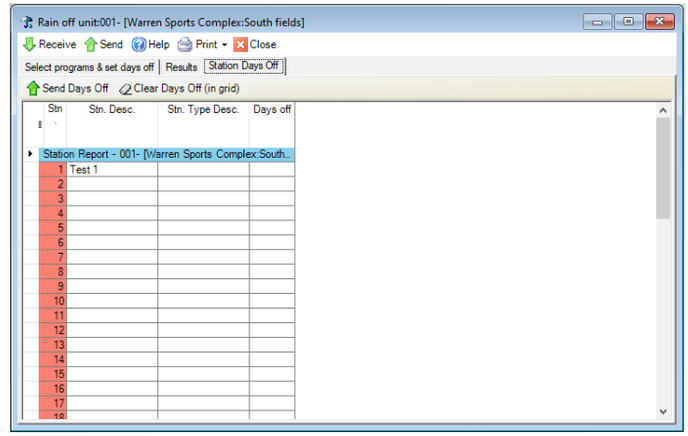
1. Choose the **Send and Receive** buttons to update the program status.



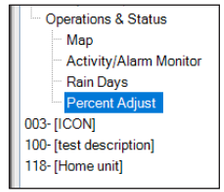
2. Choose the **Results** tab to view the results.

Station Days Off Tab

The Station Days Off tab displays a summary of Days Off per station in tabular format.

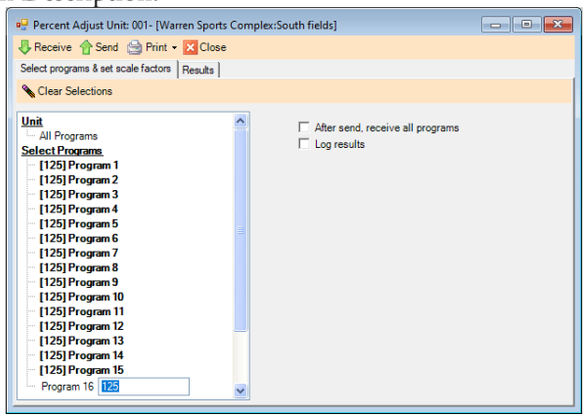


Part 4 - Percent Adjust



The control features of the **Percent Adjust** window are used to increase and decrease **Program Run Time** by percentage from 0 to 255%.

The Percent Scale adjustment can be implemented by any one of three optional methods: by Unit (all programs), by Select Programs or by program Description.

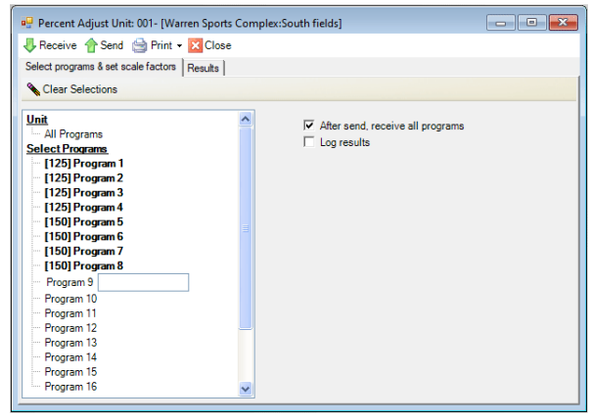


- Assigning Percent Adjust by Unit scales the run time of all defined irrigation programs.
- Using the **Select Programs** option enables a Percent Adjust to be assigned to program any cluster(s) or individual program(s) within a cluster.
- The **Description** option enables Percent Adjust to be assigned to programs based on the program's Primary or Secondary description.

***Note**: Percent Adjust entered in the **Percent Adjust** window will replace the Percent Adjust factor selected in the **Auto Operations** window.*

Percent Scaling Program Run Time

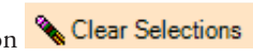
1. To begin, choose **Percent Adjust** window from the **Operations & Status** directory.
2. Choose **Unit**, **Select Programs** or **Description**. A text field will appear next to the selection.
3. Enter the Percent Adjust factor (0 to 255%) in the text field.



***Note**: The baseline or non-adjusted Program Run Time is 100%. In the example above, the run time of all satellite programs has been increased to 125% – a net 25% increase over the 100% baseline. When entered, the percent adjusted increase will be shown in parentheses and bold type (see inset).*

4. Press **Return** or choose **Save**.

The Percent Adjust Toolbar

Choosing the **Clear Selections** button 

clears all current Percent Adjust selections.

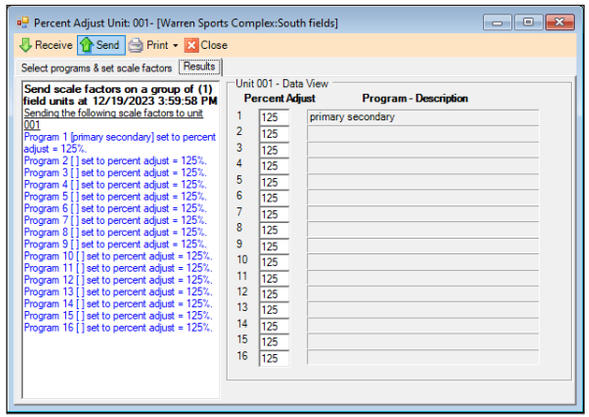
Percent Adjust Selection Options

Selecting the **After send, receive all programs** option prompts the satellite to respond with the current Percent Adjust information. The information is posted on the Results tab for review.

Selecting the **Log Results** option automatically saves the results information to the events Log file.

The Results Tab

1. Choose the **Send** or **Receive** buttons to upload or download the percent adjust settings – the results will be shown on the Results tab.



Chapter 7 - Satellite Systems

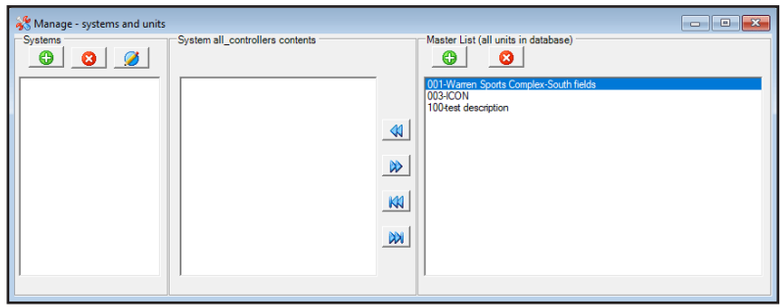
In this Chapter:

Organizing satellites with the same operating parameters into Satellite Systems enables edits and operational status checks to be performed on multiple satellites simultaneously. The procedure for creating Satellite Systems is basically the same procedure used to create individual satellites. When setting up systems, you may find it helpful to refer the additional details provided in Chapter 3, page 11.

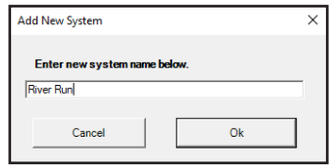
Part 1 – Creating Satellite Systems

1. To begin, choose the **Manage** button in the main window toolbar to open the Manage - Systems and Units window.

   ***Note**: For example purposes, the Master List in the following examples has been populated with four example satellites. The actual master list will include all satellites currently entered in the satellite database.*



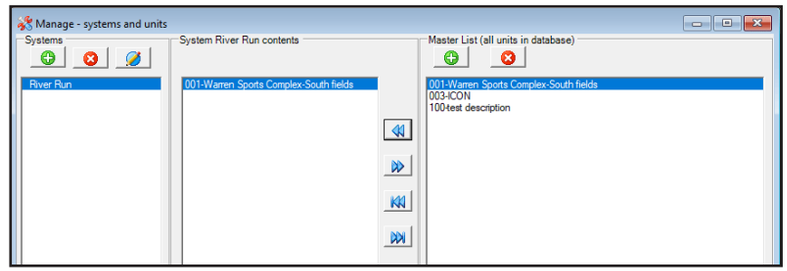
2. Choose the **Add Systems** button in the Systems field to open the **Add New System** Window.



3. Type in a System name, and choose **OK**.

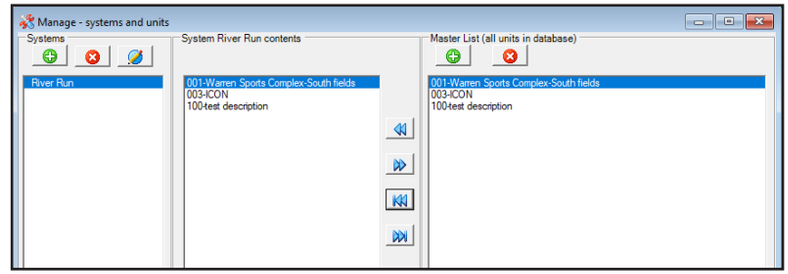
   ***Note**: The System name will be added to the System list as well as to the Systems tab of the Selection panel, as shown in the inset below.*

4. To add a satellite to the new System, choose the satellite from the Master List, then choose the Left Arrow button to copy the satellite to the System Contents list (center panel).
5. Repeat this process as needed to build the complete System Contents list.

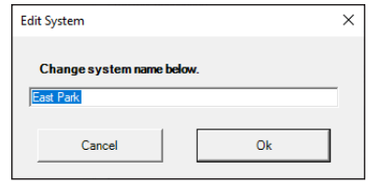


   ***Note**: The standard shift-click and ctrl-click multi-selection key combinations can be used to select the satellites from the master list.*

6. To transfer all listed satellites at the same time, choose the Double Left Arrow button.
7. To remove satellites from the System Contents list, use the same procedure as adding satellites, with the exception of using the Right arrow buttons.



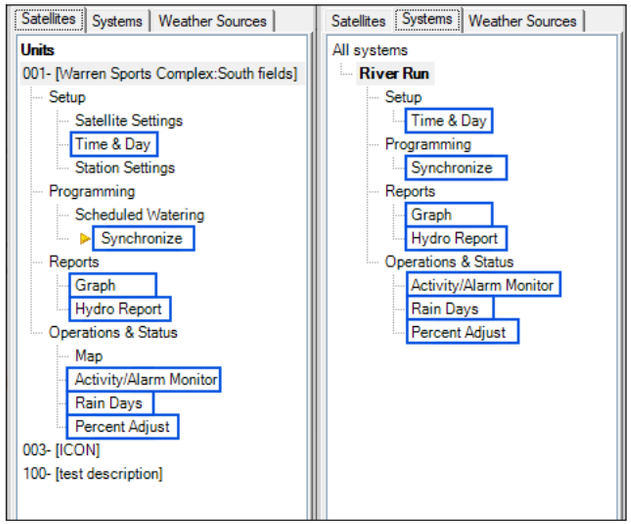
8. To change the System description, Choose the Edit Systems button to open the **Edit Window**.
9. Type in a new System description, and choose **OK**.



Part 2 – Working with Multiple Satellites

The database tree in the Selection panel should now list all Systems by name. The Systems Database Tree functions in the same manner as the Satellites Database Tree.

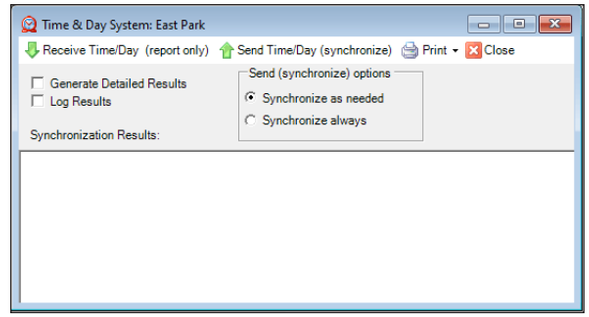
As indicated in a side-by-side comparison below, many equivalent operations can be done on systems of satellites that can be done on individual satellites. In all cases, the system operation performs the same task by applying the desired settings to each satellite in the system.



System Level Operations

1. Choose the **Systems** tab of the Selection panel.
2. Choose the **System name** to expand the database tree.

   ***Note**: In the following example, the **Time & Day** window is opened for a System named East Park.*
3. Choose the **Time & Day** window form the **Setup** directory to open the Time & Day window.
4. Choose the **Send Time/Day Synchronize** button. The Sentinel WMS will check and synchronize every satellite of the system to the computer's time and day. An action report will be generated and displayed in the **Synchronization Results** panel.



***Note**: The results information is color coded: Green indicates OK, Blue and Black are informational and Red indicates a problem was identified.*

Chapter 8 - Sentinel Watcher Operations

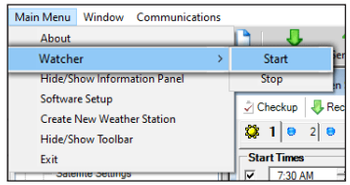
In this Chapter:

Many of the system level operations, as well as weather source related operations, can be scheduled to occur at a predefined time. In all cases, the results of the Watcher operations are written to the Log file and various windows Results areas. If the email feature is utilized, the results of some operations can be emailed immediately after they occur.

***Note**: To enable the Watcher operations to occur, the Sentinel WMS software must be running at the scheduled time of the event and the Sentinel Watcher mode switched on.*

Part 1 – Enabling the Sentinel Watcher

1. To begin, choose **Watcher** > **Start** from the Main Menu.



***Note**: When the Sentinel Watcher is started, the Sentinel Clock icon in the Windows Start Bar will change from Red to Green.*

Right-click on the Clock icon to open an options menu enabling Watcher Start/Stop and Hide/Show Sentinel WMS program shortcuts to be selected.

2. Choose **Setup** to open the Software Setup window.

3. To automatically launch Watcher at program start up, select **Watcher On** option located on the **Startup** tab of the **Setup** window. Refer to **Startup Tab** on page 6.

Part 2 – Configuring Watcher Operations

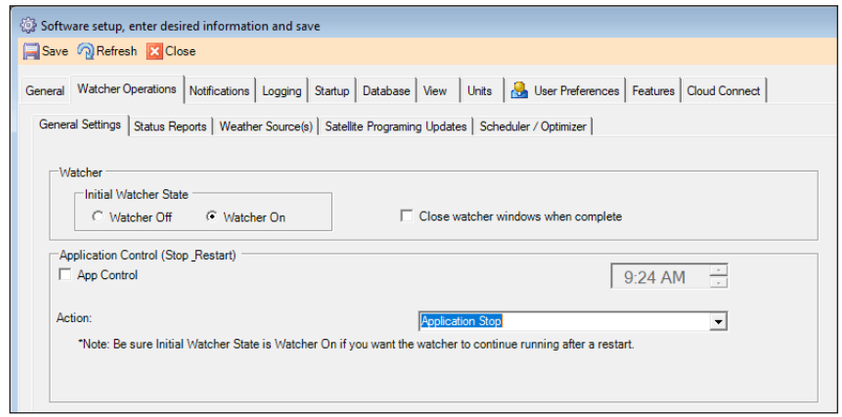
The **Watcher Operations** tab provides configuration options organized on five sub-category tabs: General Settings, Status Reports, Weather Sources, Satellite Programming Updates and Scheduler / Optimizer.

1. From the **Software Setup** window, choose the **Watcher Operations** tab.

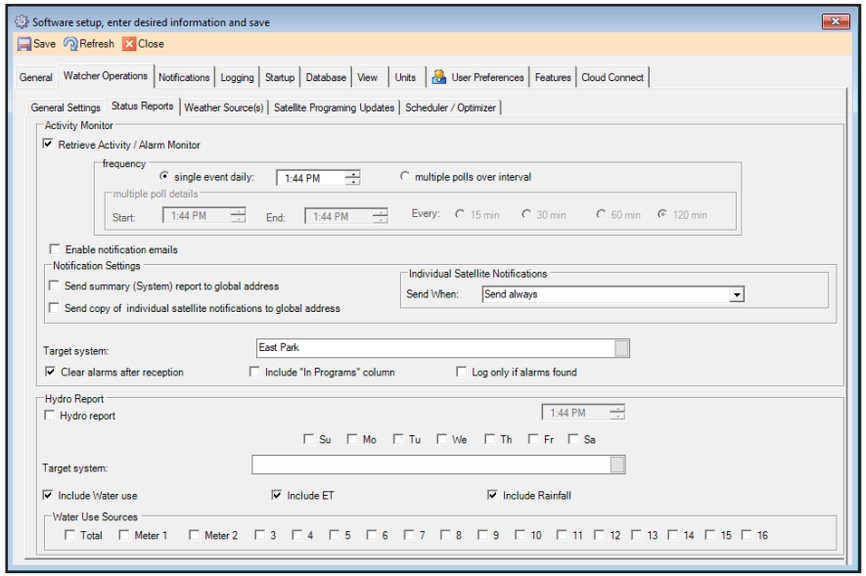
The **General Settings** tab is selected by default.

General Settings

This tab allows the user to turn on or off the Watcher state.

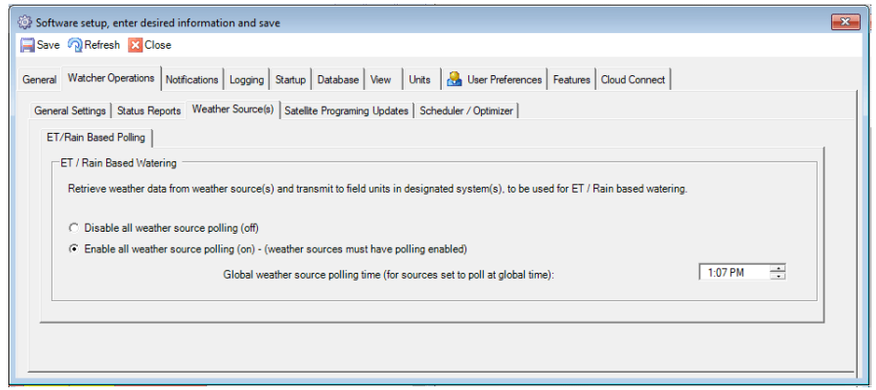


Status Reports



1. Select the **Retrieve Activity / Alarm Monitor** options as preferred:
   - To poll a specified Satellite System for alarm conditions, select **Retrieve Alarms**.
   - From the drop-down menu, select a **Target System** to poll.
   - Enter the preferred polling start time.
   - To automatically clear the alarm report after the Watcher has received the report, select **Clear Alarms After Reception**.
2. Select the **Hydro Report** options as preferred:
   - From the drop-down menu, select a **Target System** to poll.
   - Enter the preferred polling start time.
   - Select data to be included in the report: Water Use, ET and/or Rainfall.

Weather Source(s)

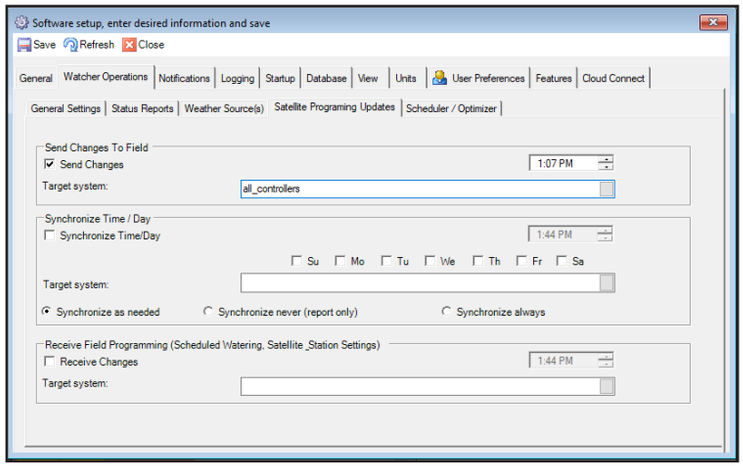


The options provided on the Weather Source(s) tab define and control weather data source polling required by ET- and Rain-based irrigation programs. Sending ET and Rain updates automatically recalculates run times in the database for all programs in the target system.

***Note**: The weather source must be configured for polling to enable this operation. (See "Configuring the Weather Station" on page 38.)*

1. Choose Enable or Disable polling option as preferred:
2. Enter the preferred polling start time.

Satellite Programming Updates

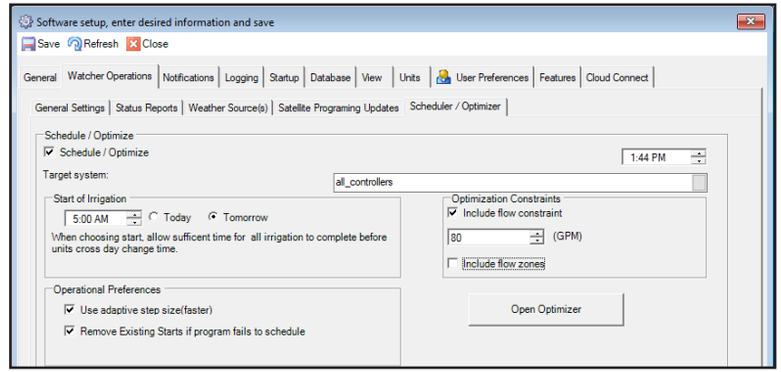


The options provided on this tab enable all changes made within the Special Data, Zone Data or Automatic Operations windows (not yet uploaded to the satellite system) to be uploaded at a specified time.

Time and day synchronization and reporting options are also provided, enabling the Watcher to compare current time/day registers between Sentinel WMS and the satellites.

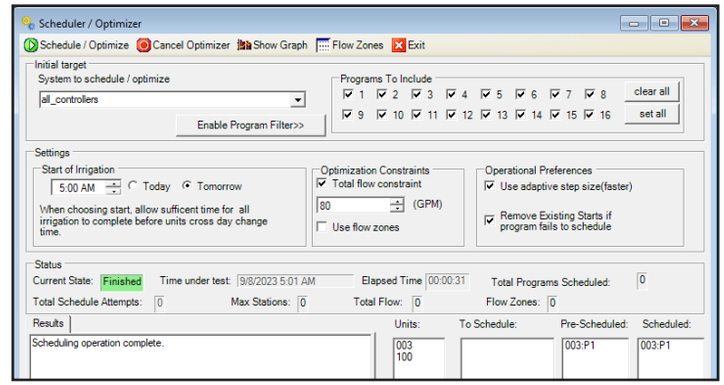
1. Select **Send Changes To Field** option as preferred.
   - Enter the data upload start time.
   - Select the **Target System** from the drop-down menu.
2. Select **Synchronize Time/Day** option as preferred.
   - Select the **Target System** (to poll) from the drop-down menu.
   - Enter the preferred upload start time.
3. Choose when to run synchronization:
   - Only as needed,
   - Never (report only), or
   - Always.

Scheduler/Optimizer



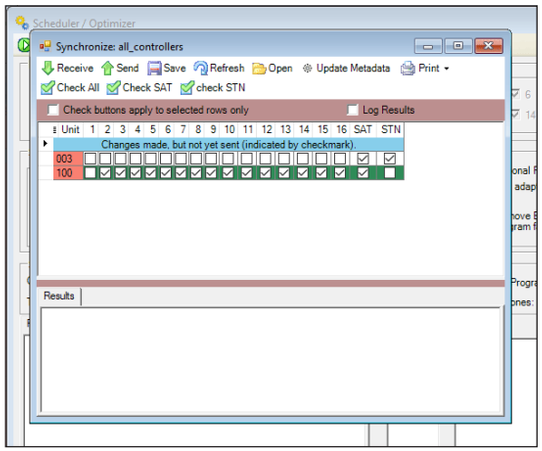
The Watcher Operations provided on this tab are used in conjunction with the Scheduler (Optimizer) window (main toolbar). The Scheduler/Optimizer is used to optimize programs based on demand and flow limit while leaving the station operating order within the program unchanged. Access to this feature from the Watcher simplifies scheduling; i.e., after an ET update.

1. Select Schedule/Optimize option.
   - Enter the **Optimization Start** time.
   - Select the **Target System** from the drop-down menu.
   - Enter the **Start of Irrigation** time for **Today** or **Tomorrow**.
   - Select the **Include flow constraint** option as preferred and enter a maximum flow rate value.
2. Select the **Use Adaptive Step Size** (faster) option as preferred.
3. Choose **Open Optimizer** to open the **Scheduler/Optimizer** window.



4. Select the System to optimize.
5. Choose **Enable Program Filter** to include/exclude Programs to optimize.
6. Click the Schedule / Optimize 

button.
The Optimizer runs.



7. View results log in the **Progress** and **Status** columns.

Chapter 9 - Working with Weather Sources

In this Chapter:

Weather Sources provide weather-related data to the Sentinel WMS software.

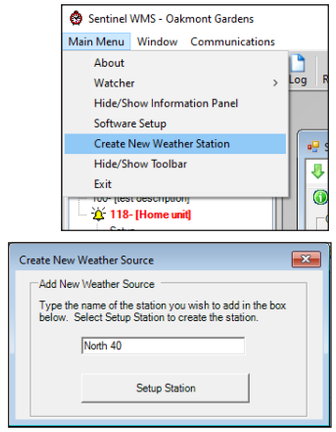
This information can be used by the satellites to automatically adjust run times based on ET demand and rainfall activity. Sentinel WMS can also monitor weather parameters and react at preset thresholds. For example, monitoring rainfall to automatically shut down a satellite System when measured rainfall reaches a predefined amount.

Once created in the Sentinel WMS database, the Weather Station will be shown in by description in the Weather Sources tab of the Selection panel.

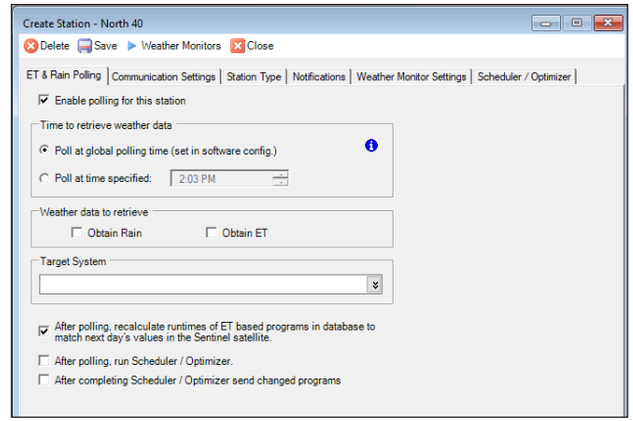
Choosing the Weather Station description will expand the database tree, providing access to the various setup, configuration monitor windows.

Part 1 – Creating a Weather Station

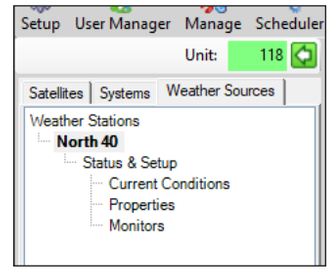
1. To begin, choose **Create New Weather Station** from the **Main Menu**.
2. The **Create New Weather Source** window will open automatically. Enter a description for the Weather Source and choose the **Setup Station** button.



3. When the **Create New Weather Source** window closes, the **Create Weather Station** window opens automatically. The new Weather Station name will be included in the **Create Station** window title bar, as shown in the example below.



4. Choose **Save** to create the new **Weather Station** in the Sentinel WMS database.
5. Choose **Close** to close the **Create Station** window.
6. Choose the **Weather Sources** tab of the **Selection** panel.
7. Choose the new Weather Station in the database tree to expand the directory branches.

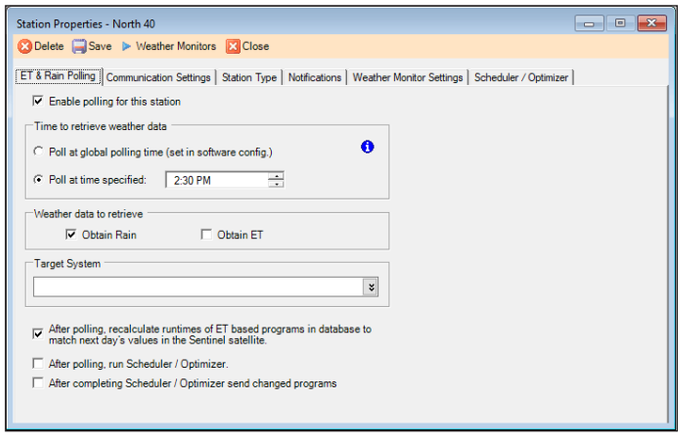


Part 2 – Configuring the Weather Station

When configuring new or existing Weather Station, all setup parameters will be accessed and defined on the tabbed pages of the **Station Properties** window.

1. To begin, choose **Properties** under the **Status & Setup** directory to open the Station Properties window.

The ET & Rain Polling Tab



1. The **ET & Rain Polling** tab will be selected by default. The options provided on this tab are used to designate if and when the Weather Station should be polled to retrieve ET and Rainfall data.
   - Select the **Enable polling for this station** option to enable the Weather Station to be polled by the **Sentinel Watcher**.
2. Select **Time to Retrieve Weather data** option:
   - Choose **Poll at global polling time** to enable polling at the time specified in the Watcher Sources preferences.

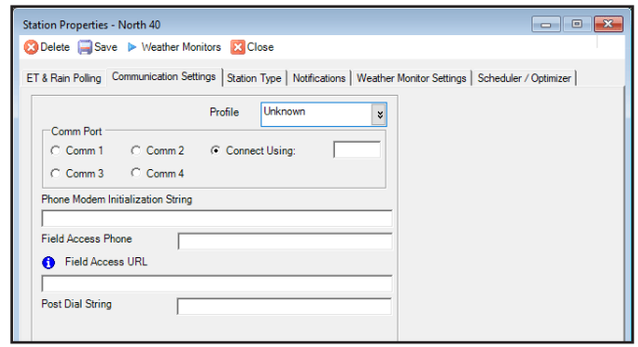
   (Refer to "ET/Rain Based Watering" on page 33 for detailed information).
   - Choose **Poll at specified time** to define a specific time to poll the Weather Station.
   - Enter the preferred polling start time.
3. Select the preferred **Weather Data to Retrieve** options:

   ***Note**: The Sentinel WMS program uses weather history data from the previous 24 hours to determine the 24-hour ET and rainfall values.*
   - Choose **Obtain Rain** for the measured rainfall value.
   - Choose **Obtain ET** for ET-based values.
4. To select **System to update with weather data** option, use the dropdown menu to select a specific satellite System name.

   ***Note**: The specified System should contain a list of all satellites that should receive the polled rainfall and/or ET values in the climate region of this Weather Station. ET and rainfall data is sent to each of these satellites immediately after obtaining the values from the Weather Station.*

The Communication Settings Tab

The Weather Station is connected to the Sentinel WMS system in the same manner as a satellite: by serial cable, phone modem, or Ethernet.

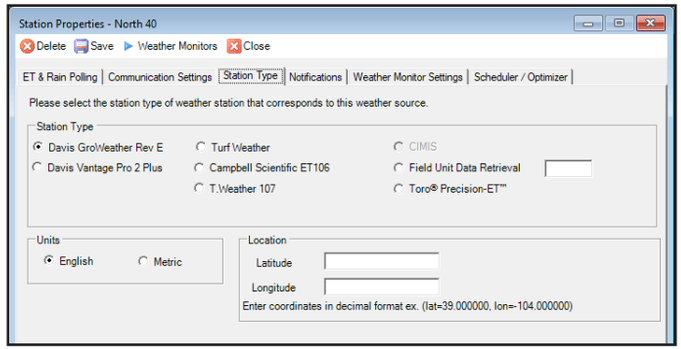


1. To begin, select the appropriate computer **Comm Port** number used for the Weather Station connection. If the Comm port number is higher than 4, select the **Connect Using** option and type in the comm port number for example, COM6.
2. Enter to the **Field Access Phone** number if the Weather Station is connected via a telephone modem.
3. Enter the **Phone Modem Initialization String**.

   ***Note**: If this setting is not known, try entering AT&FE0DT or ATE0DT, or contact Toro NSN for assistance at 1-800-275-8676.*
4. Enter the **Field access URL**.

   ***Note**: This is the IP and Port address of an Ethernet connection, for example, 10.0.0.4:14001. The address can also be entered in a URL format; i.e.,www.somewhere.com:14001.*
5. Choose **Save** to enter the selections.

The Station Type Tab



1. Select the manufacturer and model of Weather Station instrument.

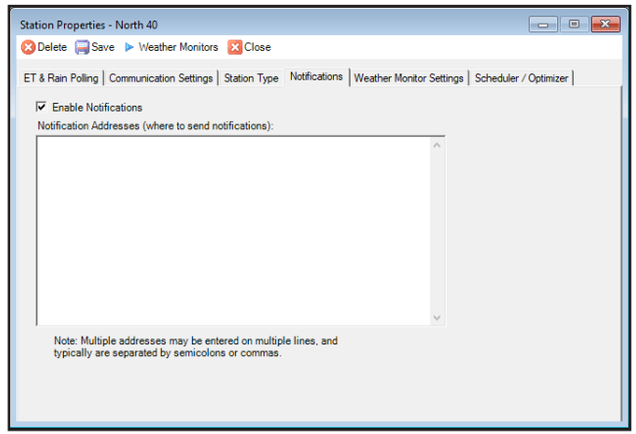
   ***Note**: If the of Weather Station instrument type or model is not listed, contact Toro NSN for assistance at 1-800-275-8676.*

2. Select **English** or **Metric** units.

   ***Note**: Units type must remain consistent throughout the Sentinel WMS program and satellite setup windows for proper operation.*

3. Choose **Save** to save the selections.

The Notifications Tab

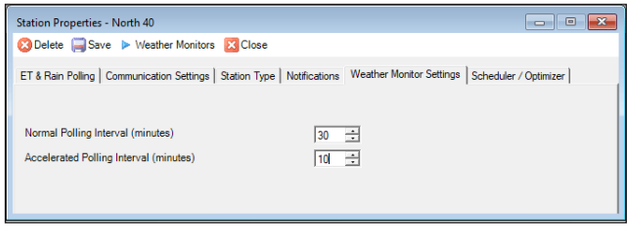


1. Select **Enable Notifications** option as preferred.
2. Enter the email address(es) to receive Weather Station reporting.

   ***Note**: All Information sent through notification email can be reviewed on the **History** tab. The information panel is cleared when the Sentinel WMS program is closed.*

   ***Note**: ET and Rain Polling data is also recorded to the Log file.*

The Weather Monitor Settings Tab

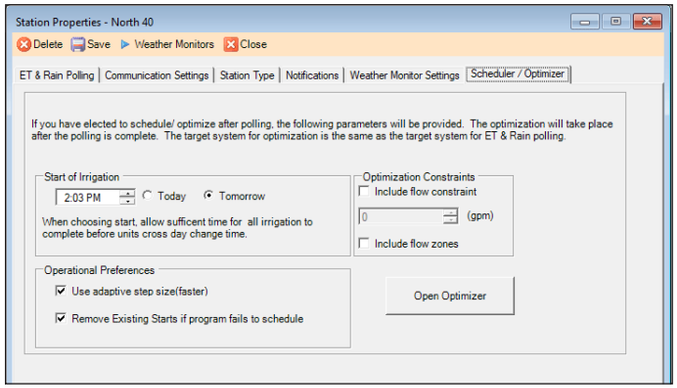


The settings on this tab are used to specify the normal and accelerated polling frequency rate of the Weather Station by the Sentinel WMS program. The Weather Station continuously monitors specific data points calibrated for various local weather and climate conditions. The Sentinel WMS polls the weather station at two specified frequency rates to retrieve data for normal, conditions and at a higher, more frequent rate, when monitored conditions begin fluctuating.

1. Enter a **Normal Polling Interval** from 0 to 100 minutes.

   ***Note**: Entering 0 will set a 1-minute interval rate.*
2. Enter an **Accelerated Polling Interval** from 0 to 100 minutes.
3. Choose **Save** to save the selections.

Scheduler / Optimizer Tab

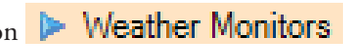


The settings on this tab...

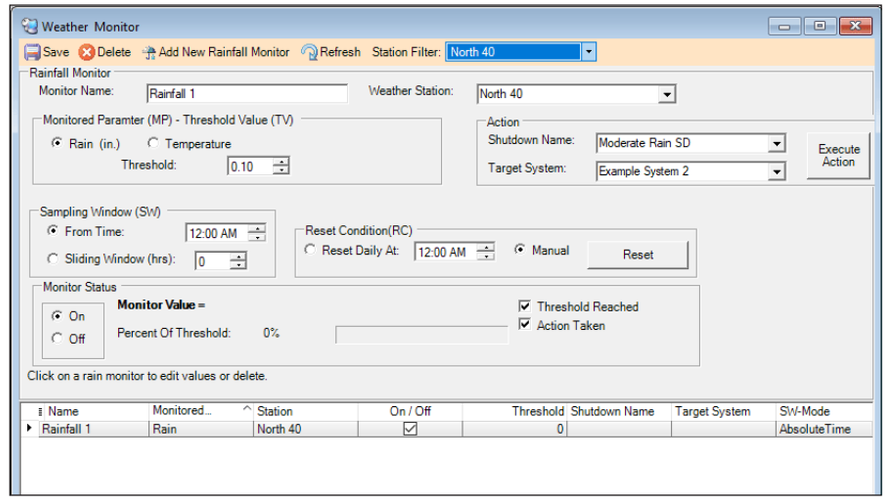
Part 3 – Creating a Weather Monitor

***Note**: Currently, only Rainfall monitors can be created.*

Sentinel WMS allows creation of as many weather stations as desired for each Weather source. The Weather Monitor window provides a convenient location to define a Weather Station by name, type, operating parameters, monitored activities and threshold limits.

1. Choose the **Weather Monitors** toolbar button 

on the **Station Properties** window to open the **Weather Monitor** window, or choose the Monitors option on the **Weather Sources** tab under the weather station desired.



***Note**: Enter a **Monitor Name** and choose **Save**. Once saved, the new monitor will be listed in the selection field at the bottom of the Weather Monitor window. Clicking on the monitor name will open the Weather Monitor window saved for the Weather Station.*

2. Choose the **Add New Rainfall Monitor** option, then enter a Monitor Name.
3. Select the associated **Weather Station** name from the drop-down menu.
4. Select a **Rain Threshold Value** from 0.00 to 100 inches (0.00 to 254 cm).

   ***Note**: The defined Rain **Threshold Value** will trigger the monitor **Action** when reached. The Threshold Value corresponds to the rainfall measured during the **Sampling Window** time frame. The monitor will remain active until the threshold is met, at which time it will become inactive until the*

***Reset Condition** is met. See Step 7 below.*

5. Choose a **Sampling Window** option:
   - Select **From Time** to set rainfall measurement start time. Rainfall is measured between the specified time and the last weather Station poll.
   - Select **Sliding Window** to define a fixed amount of time before the last reading taken from the weather station.
6. Select the **Action Name** and **Target System** from the drop-down menus.

   ***Note**: The **Action Name** menu is comprised of **Saved Shutdown** names entered on the Rain Days window under the Operations & Status directory.*
7. Select the preferred **Reset Condition** option.
   - Select **Reset Daily** to reset the monitor every day at a specified time.
   - Enter the preferred Reset time.
   - Select **Manual** to manually reset the monitor.

   ***Note**: The **Threshold Reached** and **Action Taken** boxes will be checked for confirmation and cleared when the monitor is reset.*
8. Select **Monitor Status: On** or **Off** as preferred.
9. Choose **Save**.

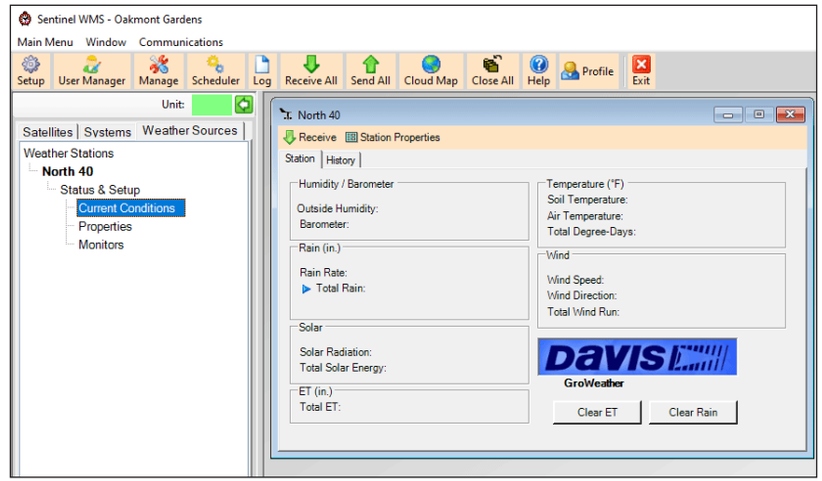
Part 4 – Checking the Weather Source

With the Weather Station and Weather Monitor parameters properly defined in the Sentinel WMS program software, weather monitoring and reporting should now be available.

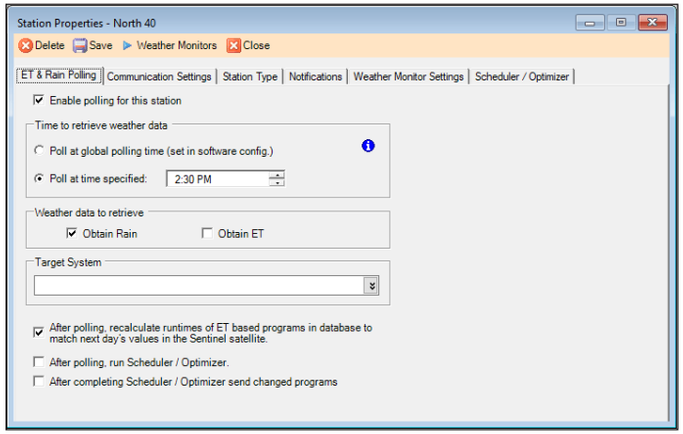
To test and evaluate operation of a Weather Station, the Current Conditions window should be opened to review all weather and climate-related data retrieved from the weather station.

1. Choose **Current Conditions** under the **Status & Setup** directory to open the **Current Conditions** window. The Weather Station name will be shown in the window title bar.

   ***Note**: The Current Conditions window configuration is defined by the type of weather station instrument selected on the **Station Type** tab of the **Station Properties** window. The window in the following example is configured specifically for the Davis GroWeather station.*



2. Choose the **Receive** button to download all available weather data from the Weather Station.
3. Choose the Blue arrowhead to open the **Weather Monitor** window.
4. To review the current Weather Station properties, choose the **Station Properties** toolbar button to open the **Station Properties** window.



The History Tab

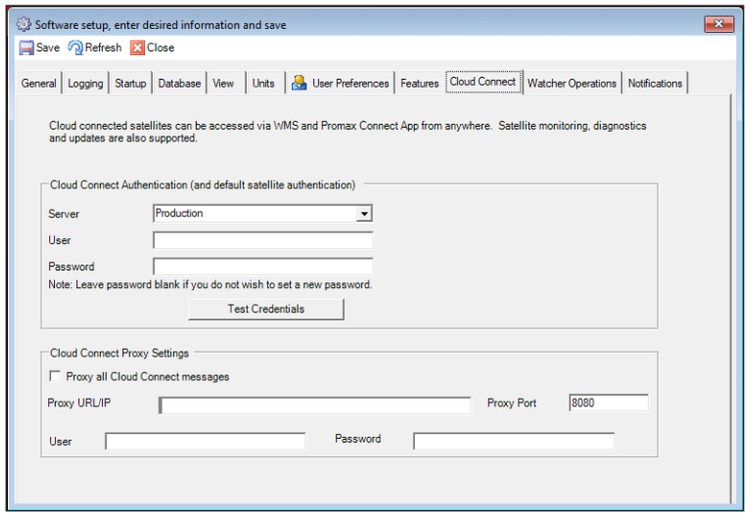
The current results of all Weather Station communications are posted for immediate review on the **History** tab. The history data provides the necessary information to calculate daily ET, rainfall and monitored weather conditions, and includes all automatic and manual communication results.

Appendix A: Connecting with Cloud Connect

Cloud Connect is Toro's solution to easily connect your WMS system to all field satellites.

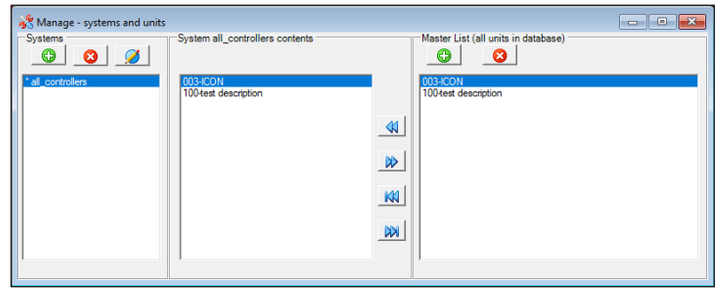
Cloud Connect requirements:

1. A Cloud Connect username and password supplied to you by Toro National Support Network (NSN). Call NSN at 1-800-275-8676 for a username and password.
   The username and password fields are found under the toolbar **Setup** button  under the **Cloud Connect** tab.

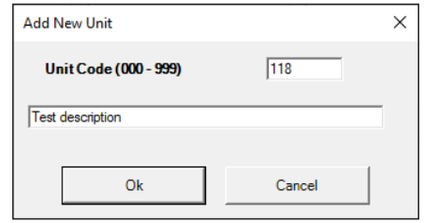


2. Click the **Test Credentials** button to verify communcation with the Toro Cloud Connect cloud. A "Cloud Ready! Credentials accepted" message will appear if communication was successful.
   Close the Setup window.

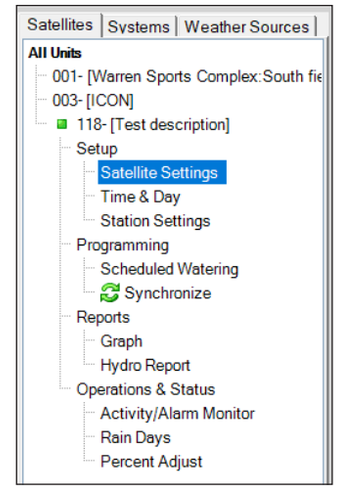
3. Next we must set a unique 3-digit code for the satellite at the satellite. See **Setup --> Communication** and use the Command Dial to set the code.
4. At the Central computer, click the toolbar **Manage** button  .



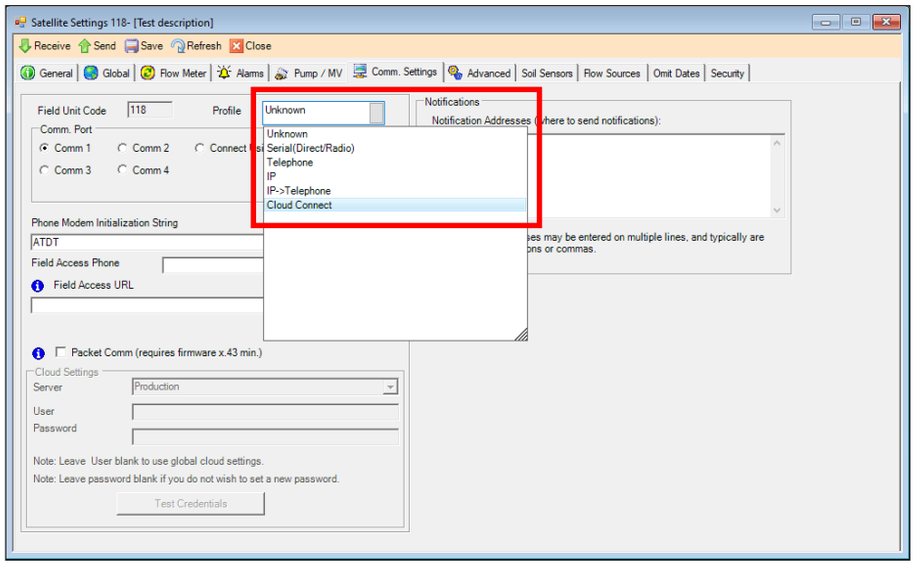
   Click the **add**  button to add the satellite. Enter the unique 3-digit code from step 3.
   Enter a description. Press **OK**.



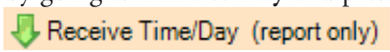
5. You will now see the new satellite in the list of satellites to the left. Click **Satellite Settings** for the new satellite.

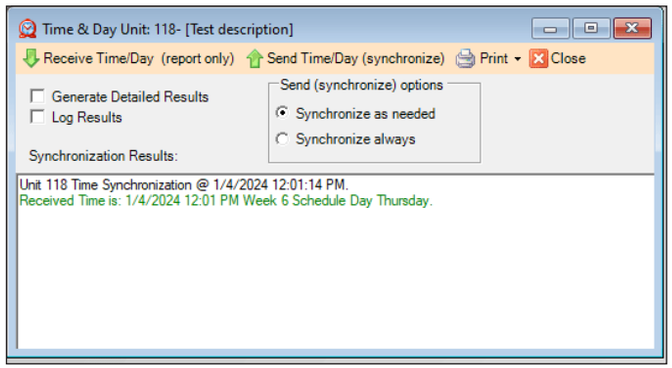


6. Click the **Comm. Settings** tab. Under **Profile**, select **Cloud Connect**.



Click the **Close** button.

7. Confirm communication by going to **Time & Day** and press the **Receive Time/Day (report only)**  button. You should see a message, in green, that the date and time from the satellite has been received.



8. To add more Cloud Connected satellites, repeat steps 3 through 7 for each satellite.

FCC Statement and Support

FCC / IC / EMC Statement

North America: This equipment has been tested and found to comply with the limits for a FCC Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to the radio communications. Operation in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

International: This is a CISPR 32 Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.Each station can activate up to two solenoids.

Products with transformer: Utilize a Class 2 transformer tested to UL1585 and satisfies the requirements of a Class 2 Power Source as defined in the NFPA 70 (NEC), Article 725.121(A)(3).

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For more information, please visit www.toro.com/CAProp65.

Patent: www.ttcopats.com