Sentinel WMS - The Toro Company

Main Menu   Window   Communications

Setup   Manage   Scheduler   Log   Receive All   Send All   Locate All   Close All   Cascade   Tile Vert.   Tile Horiz.   Help   Profile   Exit

Unit:

Satellites | Systems | Weather Sources

All Units
- 001 - [Sat 1]
  - Setup
    - Special Data
    - Time & Day
    - Zone Data
  - Programming
    - Automatic Operations
    - Unsent Changes
  - Reports
    - Flow Graph
    - Hydro Report
  - Operations & Status
    - Activity/Alarm Monitor
    - Rain Days
    - Percent Scale

<< Hide

Special data loaded from database for unit 001.

Sentinel® WMS
Water Management System

TORO®

Version 3.2
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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.
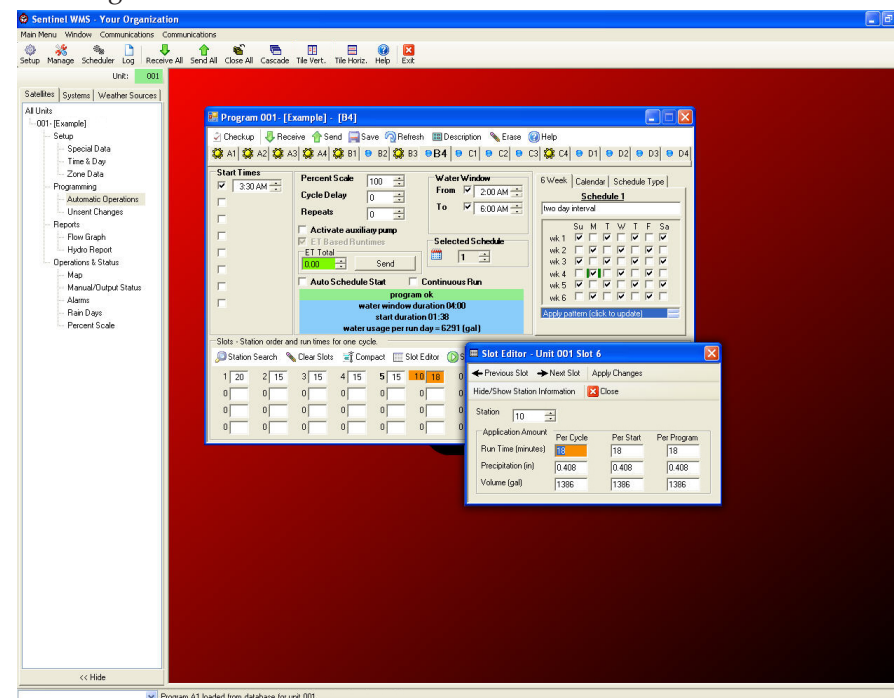
Automatic Operations: Daily operations and scheduling are made quick and easy with automatic operations. All essential programming information is contained in one window so it's easy to understand and manage.

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.

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In this Chapter:
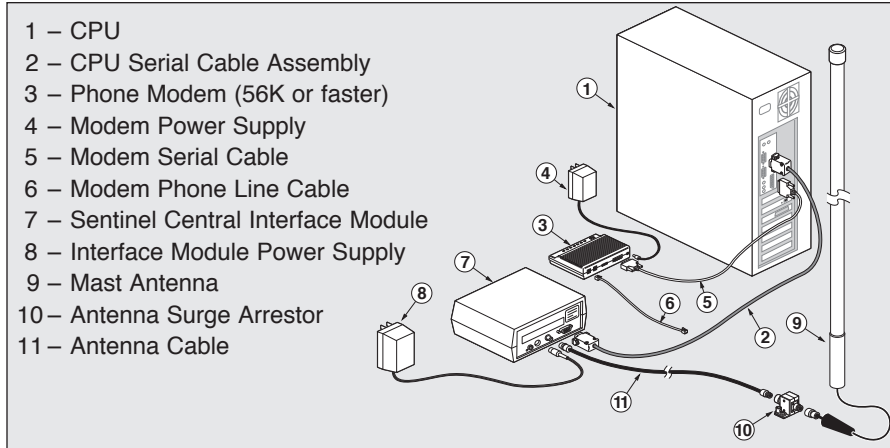
Part 1 – Hardware/Software Requirements

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 3.2 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® XP Service Pack 3 or higher, Vista SP 1 or higher, or Windows 7 Operating System*.
• Microsoft .NET Framework 4 (provided)
• Sentinel WMS 3.2 (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, remove the 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 Microsoft operating systems: Windows® XP (SP 3 or higher), Vista (SP 1) and Windows 7.

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.
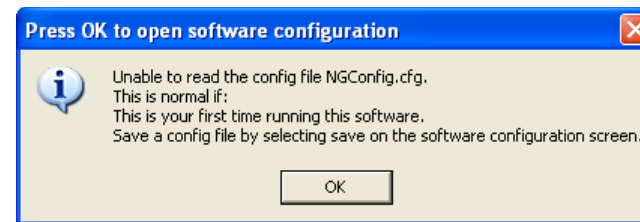
2. When the software installation is complete, the Sentinel WMS program startup icon will be installed on the desktop. Click on the icon to launch the Sentinel WMS program.

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**, then continue on **page 4**.

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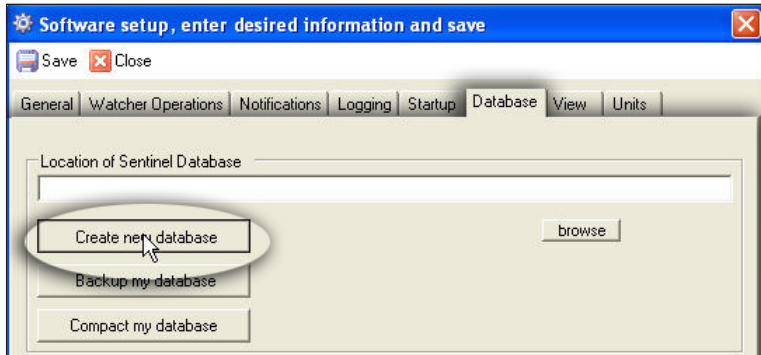
6. Browse to the Sentinel WMS folder (C:\Program Files\Sentinel WMS).
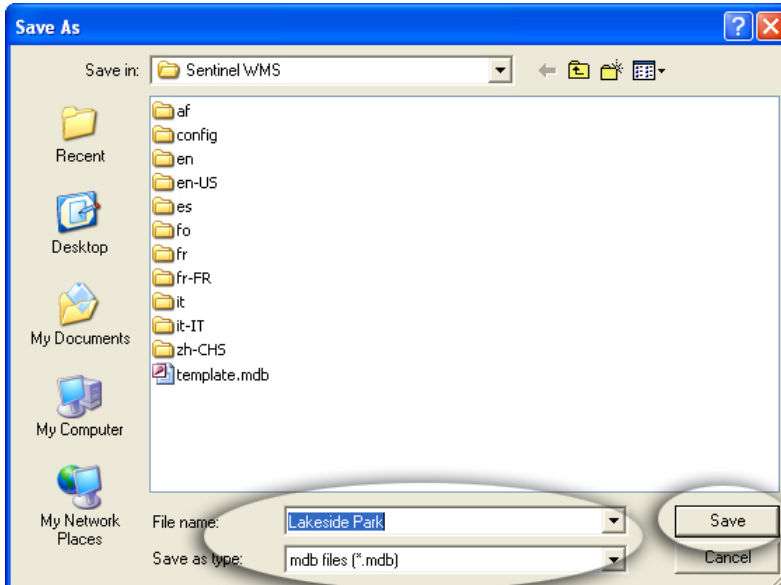
7. Enter a database file name; e.g., Lakeside Park, then choose **Save**.

8. The database file name will appear in the **Location of Sentinel Database** text field. Choose **Save** and **Close.**
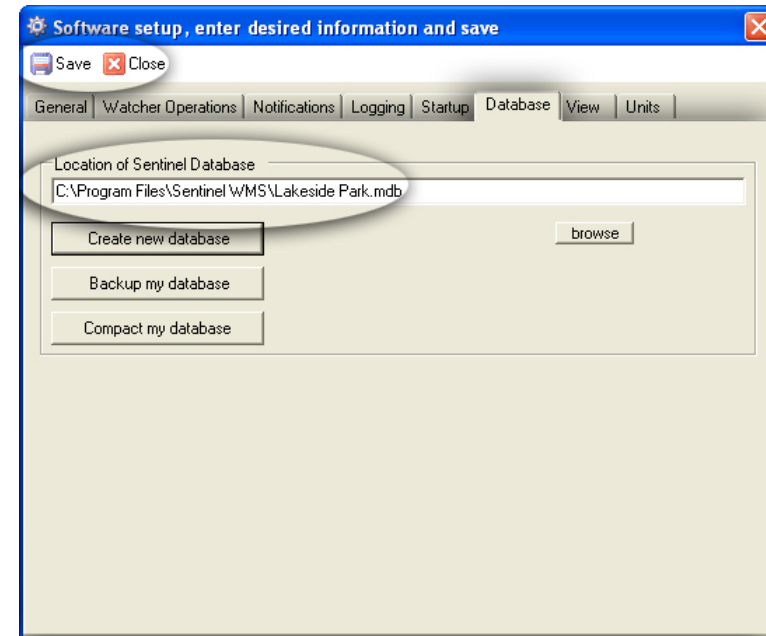
Note: *When database setup has been completed, the Software Setup window will close. The Software Setup window can be selected in the* **Main Menu** *options or by choosing the* **Setup** ⚙ *button in the program window toolbar.*

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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.

> *Note: The **Locate All** feature is not currently enabled.*

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 tools are provided to help manage the multi-window workspace: Close All , Cascade , 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.
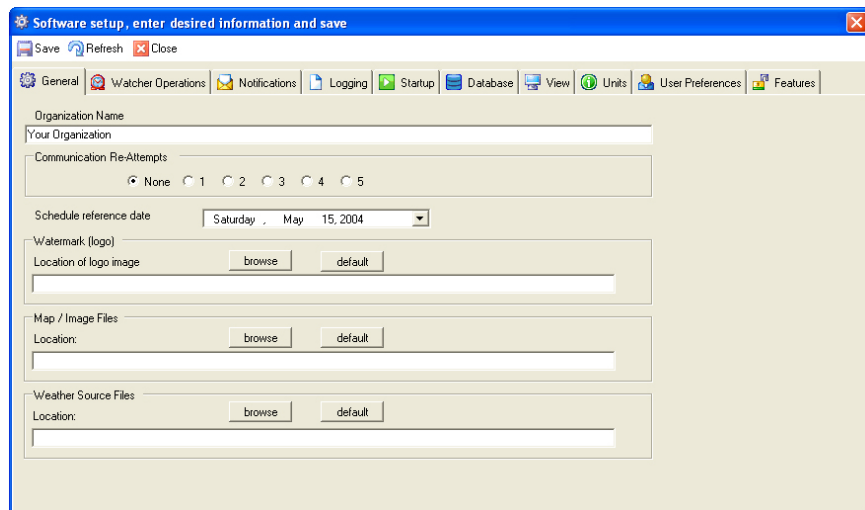
The General Tab

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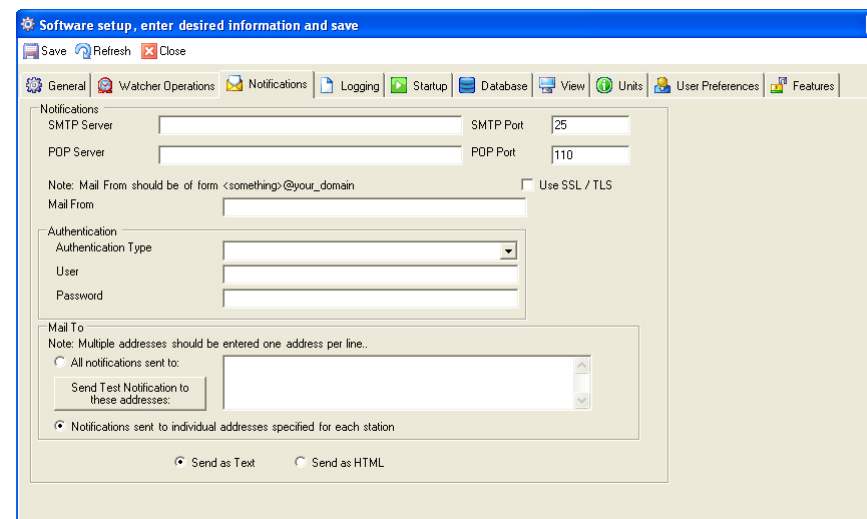
2. Email notifications sent by Sentinel WMS will contain the **Mail From** address. Ideally, enter the email address of the person maintaining the list of email recipients. If a user wishes to be removed from the mailing list, they can simply reply to the notification.

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

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3. Some SMTP servers require a user **Authentication** to send email. If your server does not have this requirement, select **None Required** from the drop down menu. If required, select either **SMTP** or **POP-before-SMTP**.
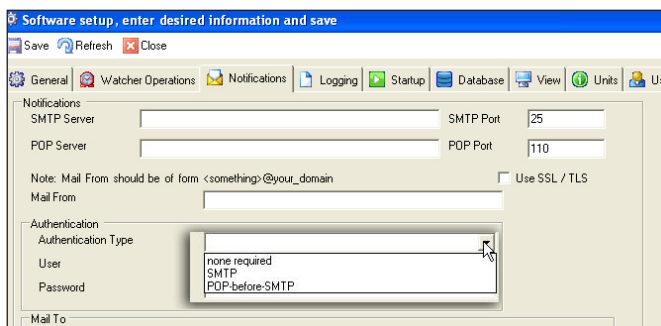
4. Both authentication options require a user name and password to be entered. Enter a **User** name and **Password** in the text boxes provided

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.*
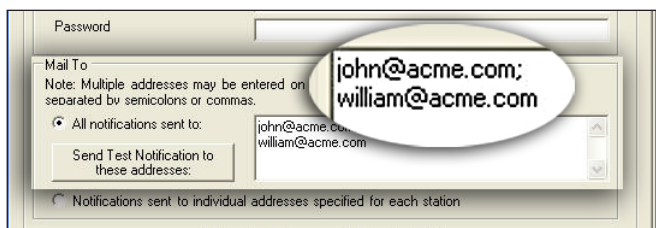
6. Once all of the notification information is entered, choose the **Send Test Notification to these addresses:** button to send to a test email to verify proper set up and functionality.
   Note: *Some trial and error may be required to send a successful test email.*

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.*
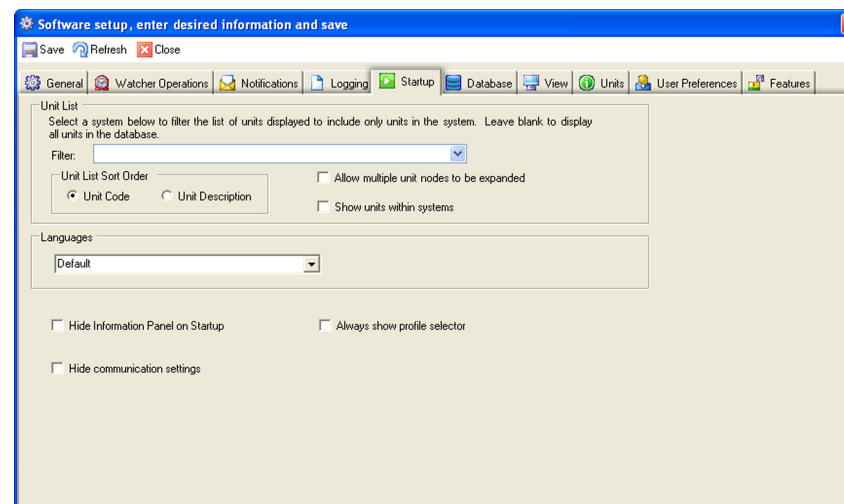
1. The settings in the **Unit List** determine the behavior of the Selection panel database tree. Leave the **Filter** box blank to show all satellites in the database, or to limit the database tree to only satellites within a certain System, choose the system description from the drop-down menu.
2. Choose **Unit List Sort Order** by 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: *Bypass the Watcher settings at this time. Prior to using this feature, refer to* **"Chapter 9 - Sentinel Watcher Operations**" *for details.*

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.*
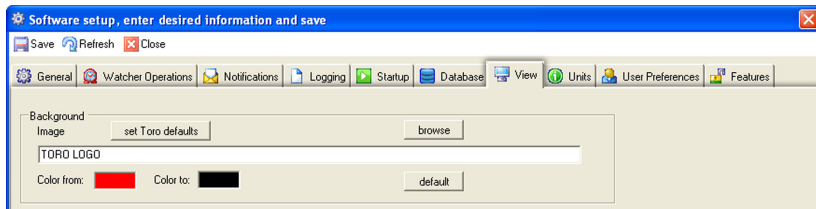
6. Selecting **Hide Information Panel on Startup:** prompts the Information Panel to be hidden upon Sentinel WMS program startup.

The Database Tab

Note: *Refer to page 3 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.*
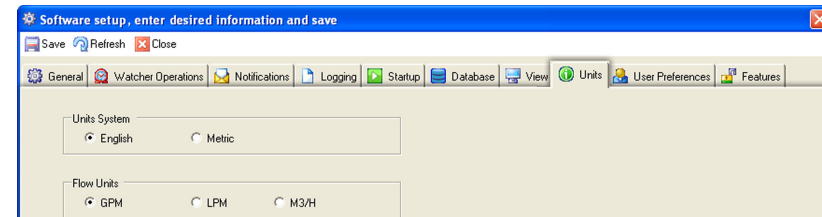
The User Preferences Tab

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

1. Choose the **Zone Data** and **Special Data** options that apply.
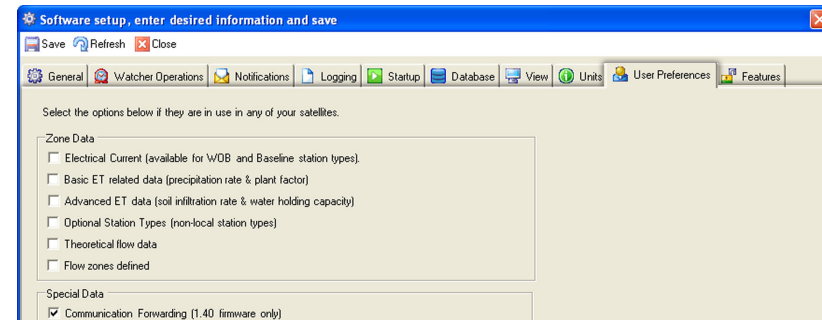
The Features Tab

Various functionality features available for WMS 3.2 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.

7
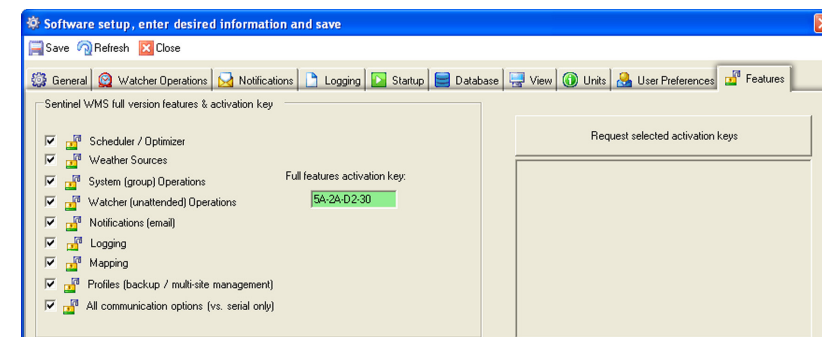
In this Chapter:

Part 1 – Creating Satellites
Part 2 – Satellite Special Data Setup
Part 3 – Synchronize Time and Day
Part 4 – Zone Data Editor

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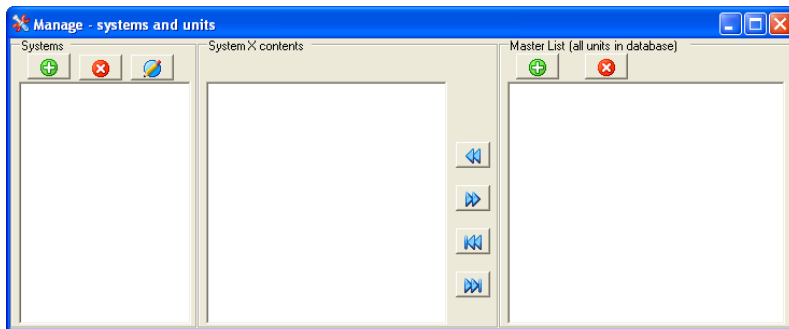
2. On the **Master List (all units in database)** side of the window, choose the **add** button to display the Add New Unit window as shown below.

   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.*
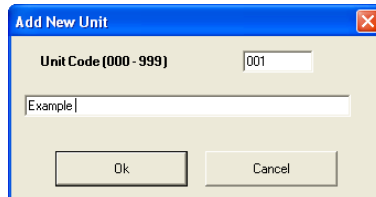
3. Enter a 3-digit **Unit Code** ranging from **001** to **999**.

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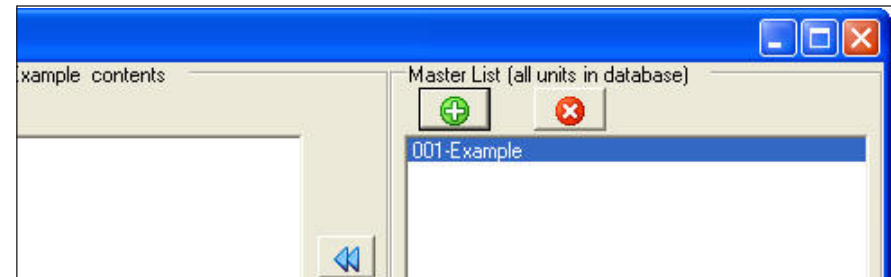
Note: *All data entry windows have standard-convention Windows control buttons in the top right corner. When minimized, the window will align to the lower edge of the workspace.*

About Window Toolbar Features

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

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

Save – Saves the window content to the database.

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 Special Data Setup

As you can see by the Satellite database tree represented in the example below, the Special Data 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 **Special Data** 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 directory is selected.
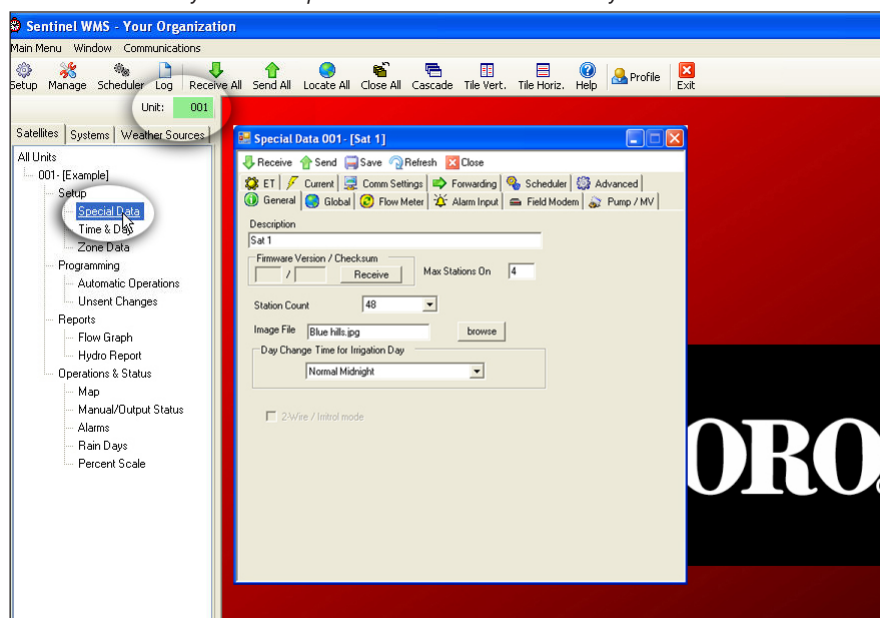
2. Choose **Special Data** from the **Setup** directory to open the Special Data window.

3. For 2-Wire TDC system (only), select **2-Wire/Irritrol mode** check box as shown above.

   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:

   • *Setup communication parameters*
   • *Transfer the field unit firmware version*
   • *Complete the required setup procedures.*

Setup Communication Parameters

1. Choose the **Comm Settings** tab.

2. 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.
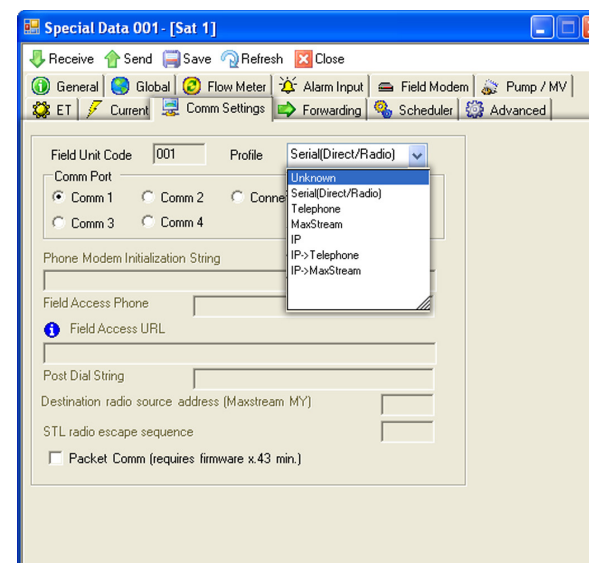
3. If applicable, select a Comm port setup profile from the drop-down menu.

4. Enter the **Phone Modem Initialization String**.

5. 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. 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. Enter a Post Dial (initiation) String if applicable.

8. For MaxStream™ radio setup, enter the **Destination radio source address** and the **STL radio escape sequence**.

9. Select **Packet Comm** if applicable (firmware V1.43/2.43 and above).

10. Choose **Save** to enter the selections.

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## Completing the Satellite Setup Procedures

To complete the satellite setup procedures, work through all tabbed pages of the Special Data window.

Note: *Following through the tabbed sequence within the Special Data 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.
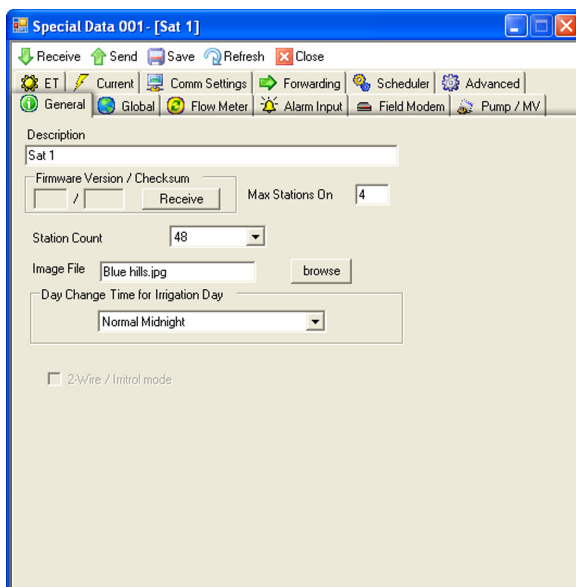
3. Upon receiving the firmware data from the satellite, choose **Save** to continue.

   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.

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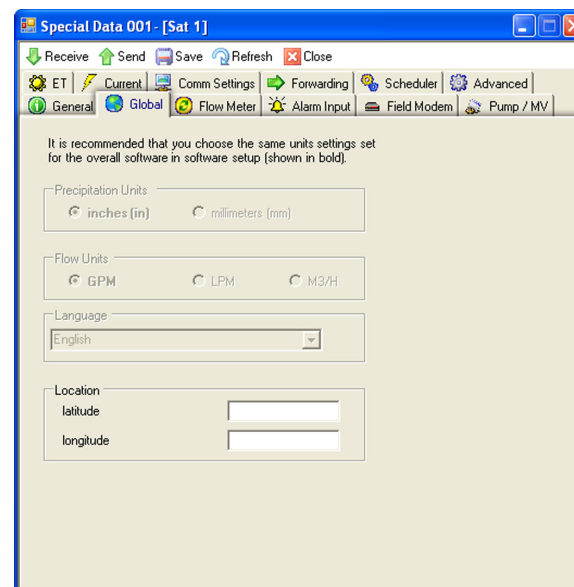
The Flow Meter Tab

1. Enter the K- Factor and Offset values per the flowmeter 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 (Flow Watch) option 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 (Low Flow) value 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 Alarm Input Tab

1. The **Assert alarm on input change to** options enable the alarm input to be triggered when the sensor contacts **open** (normally-closed) or **close** (normally-open). Select **neither** to ignore or external alarm input.

2. Choose to **Start** or **Stop** automatic programs as preferred.

   Note: Alarm input options are based on program Clusters A, B, C and D, not by individual program; i.e., Cluster A controls programs A1, A2, A3 and A4.

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The Field Modem Tab

The settings on this tab are provided for satellite communication using a telephone modem connected via the serial interface.
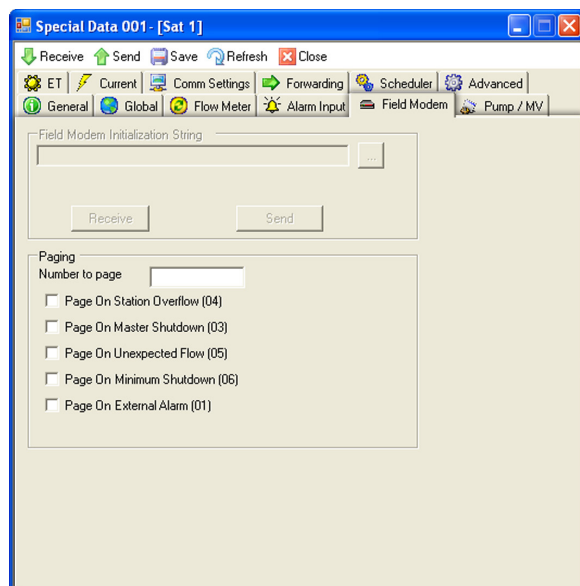
1. The **Field Modem Initialization String** is sent to the modem upon power reset of the satellite. Enter the modem initialization string or choose the (**...**) button to select an option from the drop-down menu.

2. The paging functions require a satellite phone modem hardware connection and active pager number. Enter the **Number to page** in the text field.

3. Check the box of each **Page On** alarm code to be automatically forwarded to the pager.

The Auxiliary Pump 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.
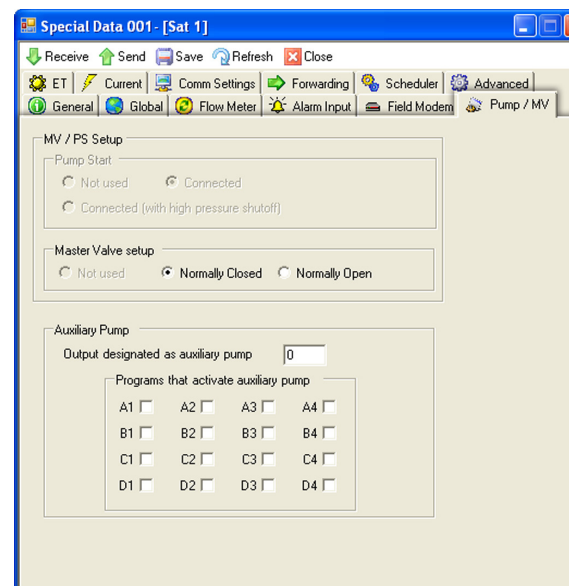
1. Enter the station number to be the **Output designated as auxiliary pump** in the text field.

2. Select the associated Program check box for the **Programs that activate auxiliary pump**.

The ET Tab

The settings on ET (evapotranspiration) tab are provided for programs that utilize ET data to determine run time.
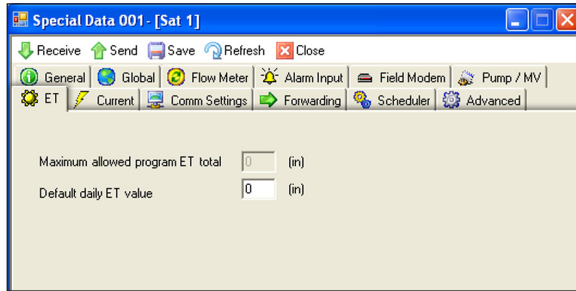
1. Enter the **Maximum allowed program ET total** value and the **Default daily ET value** in the text fields provided.

The Global Tab

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.
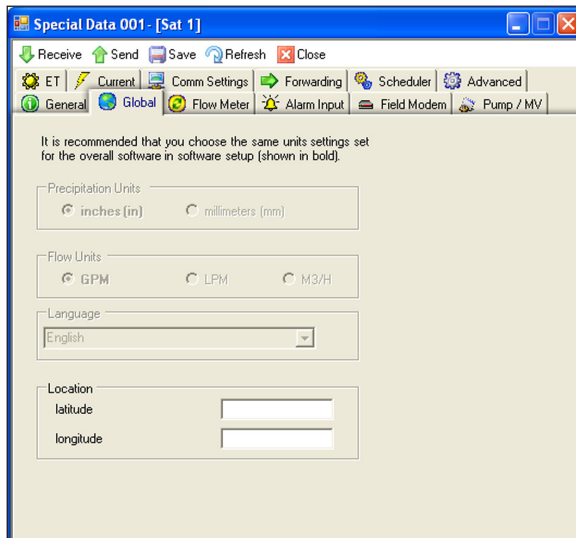
The Forwarding Tab

The Forwarding tab options enable the satellite to transfer stored data via radio communication to other satellites in the network. (Refer to page 9 for Target Device Comm Parameter setup procedures.)

Note: To enable satellite-to-satellite communications, the satellites must be properly equipped; i.e., with 450 MHz radios and firmware version 1.41 (or higher).

1. To populate the **List Units To Forward To** data fields, choose the **Receive Forwarding List** button to choose from a list of available satellites.

   Note: The satellite can forward data to a maximum of 10 satellites. If less than 10 satellites are listed, the designation "FFF" must be entered in all remaining open text fields.

2. Choose the **Send Forwarding List** button to upload the list.

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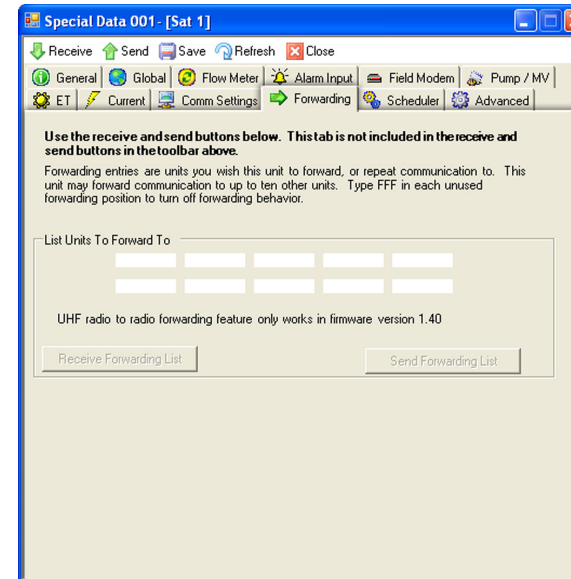
Part 3 –Time and Day Setup

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.
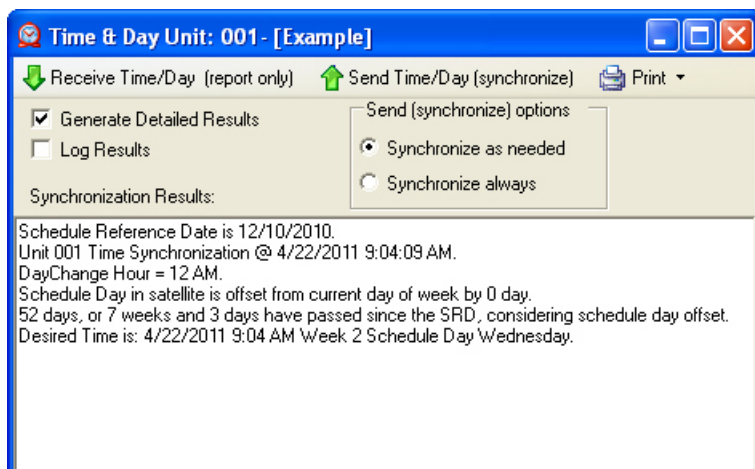
2. Basic results of the synchronization process will be displayed in the text window. Select the **Generate Detailed Results check box** to display the results in full detail.

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** option to record all synchronization results.

Part 4 – Zone Data Setup

The Zone Data window provides all zone setup parameters, conveniently organized in spreadsheet format. The seven column-groups, color-coded by function, can be viewed, hidden, edited, uploaded, saved, and printed from one convenient location.

1. To start, choose **Zone Data** from the **Setup** directory to open the Zone Data window.

    Note: *The number of station data rows listed on the Zone Data spreadsheet is defined by the station count selected on the* **General** *tab of the* **Special Data** *window.*

    Note: *To view the Zone Data window at the largest scale, choose* **Min/Max Workspace** *from the drop-down menu of the Status Bar (shown at left).*
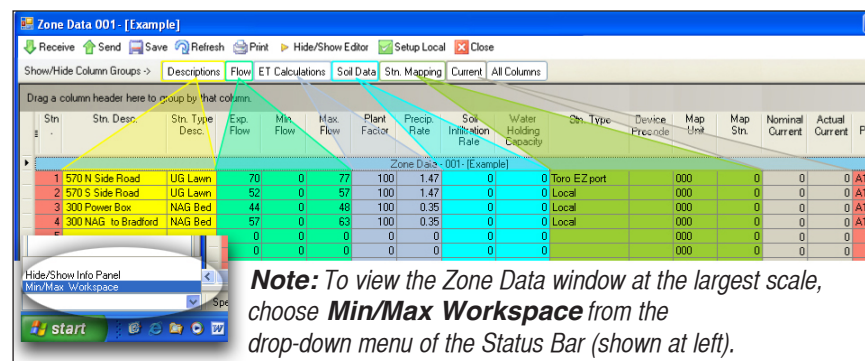
2. All column-groups are shown in the example above. To hide/show columns as desired, click on the column group button(s), then click the All Columns button to reconfigure the spreadsheet. To reinstate all columns, click the All Columns button.

    Note-TDC decoder system only: *Ensure the Device Precode, Map Unit and Map Station data matches the actual five-decoder unit address (etched on the side of each decoder) and its corresponding field connections. The Device Precode should be 0 + the first two digits, and Map Unit should be the last three digits of the decoder address.*

    Station type must be selected from the drop-down menu. The example at right illustrates station setup for a Toro 2-wire decoder #66259 with four station outputs.
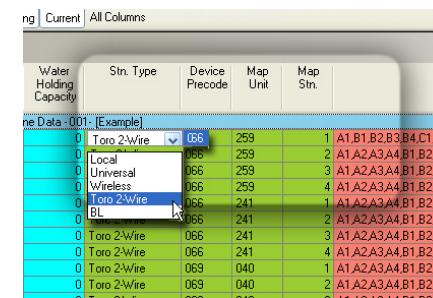
3. The example below shows Soil Data Station and Station Mapping columns hidden from view.

Note‑EICON special-build wireless system only: *The Setup Wireless, and Learn Current buttons in addition to the Nominal and Actual Current data column are applicable to EICON wireless communication system setup only. (Requires satellite firmware version 2.43 or higher.)*

Using the Multi-Station Editor

The Zone Data column headings are organized within the Multi-Station Editor panel. Station setup information is entered in the Editor text fields, then transferred to a selected station or selected group of stations.

1. Choose **Hide/Show Editor** button on the **Zone Data** toolbar to display the **Multi-station** Editor panel.

2. Enter a brief **Station (Stn) Description** and/or **Type Description** enabling the station to be easily identified using the Station Search feature.

3. Choose the **Station Type** from the list-menu options. (Requires satellite firmware version 1.41 or higher.)

4. Enter the **Expected Flow** rate of the station.

5. Enter the **Maximum Flow** rate allowed for the station (alarm threshold).

6. Enter the **Plant Factor** value from 0–255% (where 100% represents the ET total value). (Required for ET-based run time calculations.)

7. Enter the **Precipitation Rate** value from 0–99.9 Inches/Hour. (Required for ET-based run time calculations.)

8. Enter the **Soil Infiltration Rate** value from 0–99.9 Inches/Hour. (Required for ET-based run time calculations.)

9. Enter the **Water Holding Capacity** value from 0–2.55 Inches.

10. Enter the **MapTo** data Unit and Station numbers as applicable.

11. Using standard **shift-click** or **ctrl-click** keyboard commands, select all station numbers to be edited simultaneously.

12. Edits can also be made for a specific column heading by dragging the column heading box into the gray edit field as shown in the example below.

Note: *To revert to the default view, click and drag the column header out of the gray field. Release the mouse button when the pointer changes to an* **X**.

13. Identify the Editor column data to be transferred by selecting its check box. The selected field color will change to yellow as shown the example above.

14. Choose **Apply Checked Columns** button to transfer the data.

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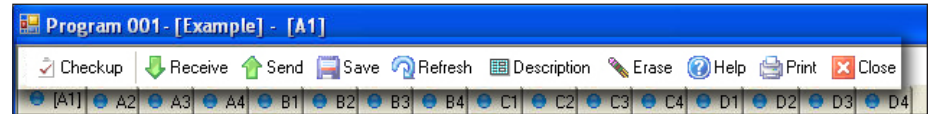
The satellite Program setup window is comprised of five main sections as illustrated below:

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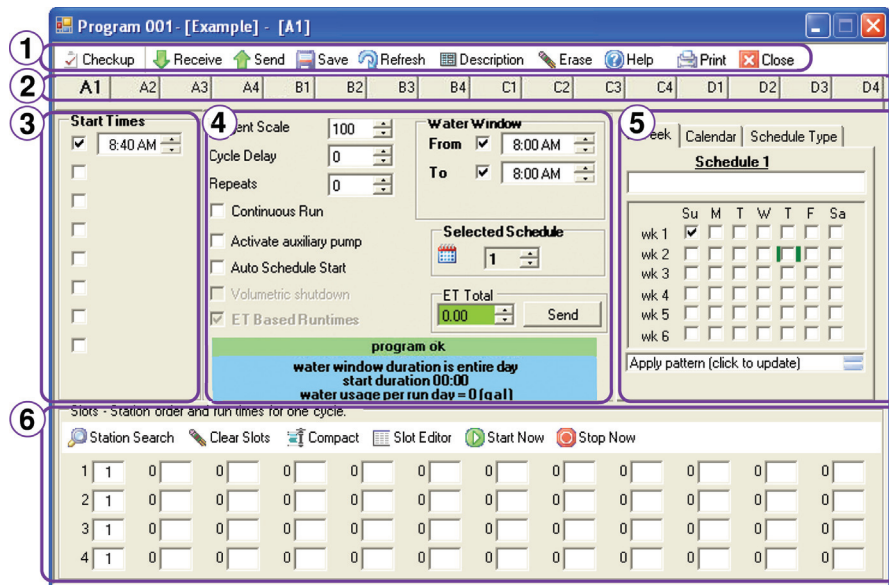
1 – Program Toolbar

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.
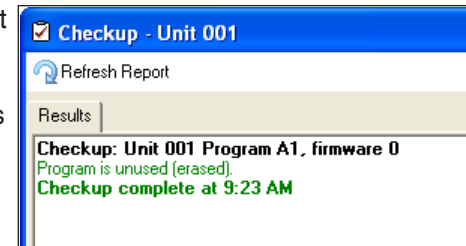
▦ **Description -** To provide a program description, choose the Description toolbar button to open the Description Editor dialog box window. Type in the description(s) or, to select an existing description, use either the drop-down menus or description tree.
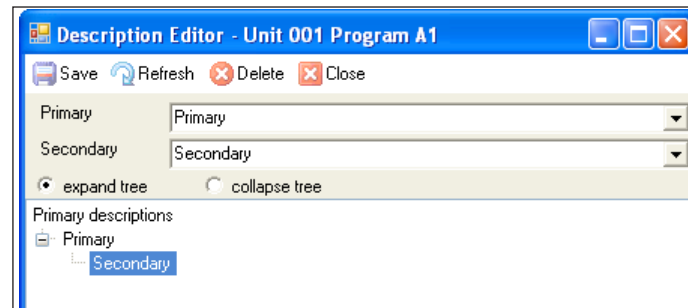
*Note: In the example above, the program has been named "Primary Secondary." After entering the description(s) choose **Save** and **Close** to exit the description editor.*

On the Program setup window, choose **Refresh**. The program name will now be displayed on the Program window title bar.
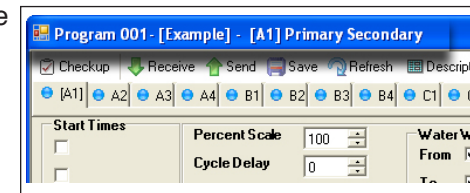
Help - Displays a quick reference key for the various symbols used within the Automatic Operations setup window.
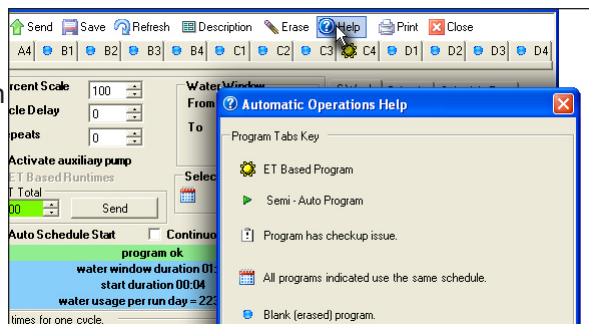
2 – Program Page Tabs

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 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 check mark 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**.
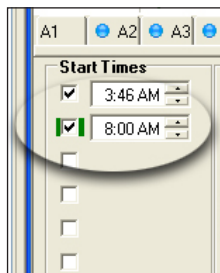
4 – Program Parameters

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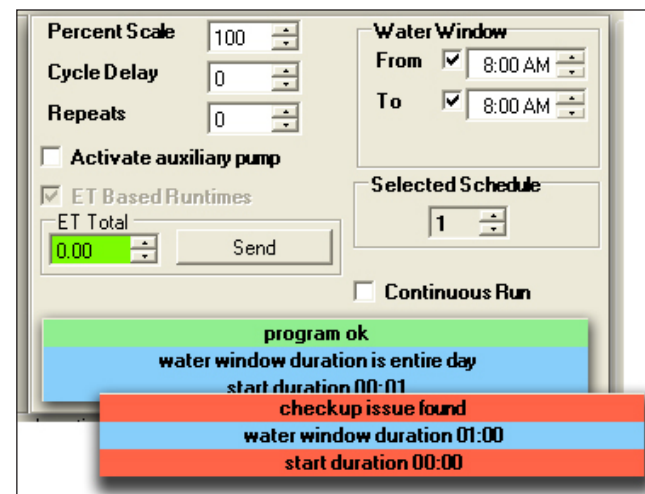
Percent Scale - Adjusts the run time of all stations assigned to the program by percentage ranging from 0 to 255% (100% = no change).

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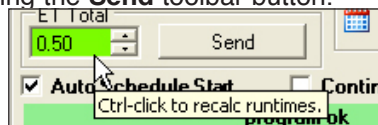
Continuous Run - Selecting Continuous Run will automatically repeat the program cycle continuously for the defined Water Window duration.

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

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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.
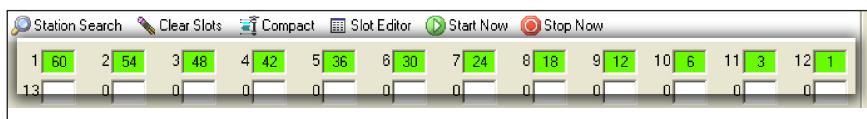
Note: *Run times shown are based on the following formula:*
Run time = (ET Total/Precipitation Rate) x Plant Factor %.

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).*
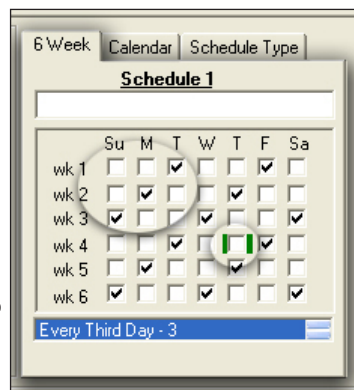
3. Choose the **Calendar** tab to display the watering day schedule in a calendar-day format.
4. Choose the **Overlay 6 Week** button at the bottom of the calender window. The 6-week (every third day) schedule will be overlaid on the calendar, indicating the active days in bold.
5. To name the schedule, 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.
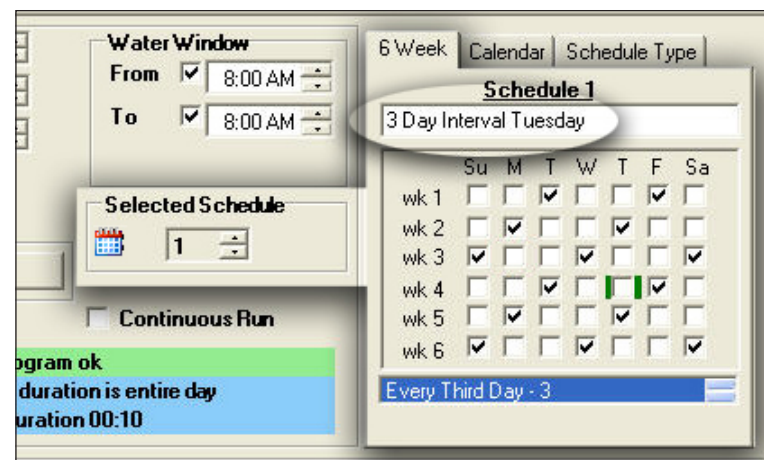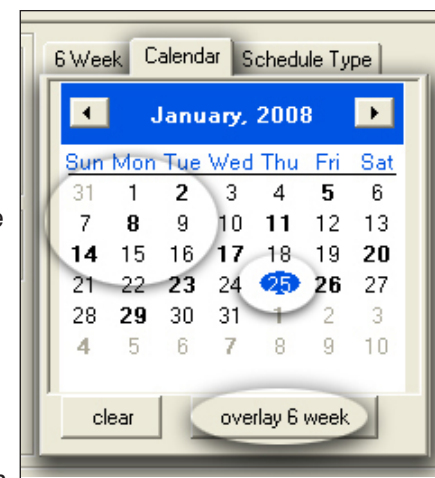
6. To assign this schedule to another program (tab), simply select the number in the **Select Schedule** scroll menu during program setup.

   Note: *Programs assigned to the same watering day schedule are easily identified by the Calendar icon next to the program identifier.*
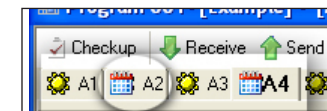

   Note: *With 16 different watering schedules available, it is possible for each program to have a unique watering day schedule. However, when programs share the same schedule, changing the shared schedule on any program changes it in all programs sharing that schedule.*

6 – Program 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 program. 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.
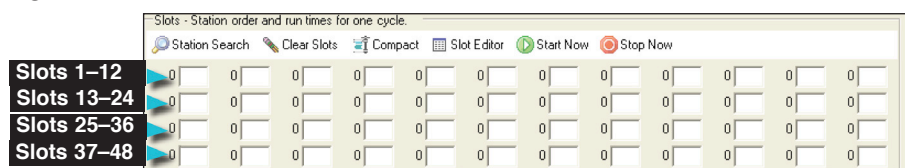
The station number is assigned to a slot and assigned a run time duration ranging from 0 to 255 minutes. Station numbers range from 0 (inactive) to 96. Stations can be assigned to slots in any order and as many times as preferred. If more than 48 Slots are required; i.e., for a 96-station satellite, 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.
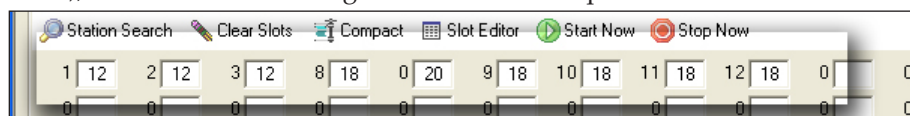
Note: *A key to using the Slots programming method, is to remember that the number next to each slot is the assigned* **Station** *number,* **not the slot** *number.*

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.
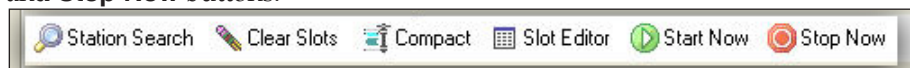
Editing Program Slots

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 Edito**r button [Slot Editor] to open the Slot Editor window.
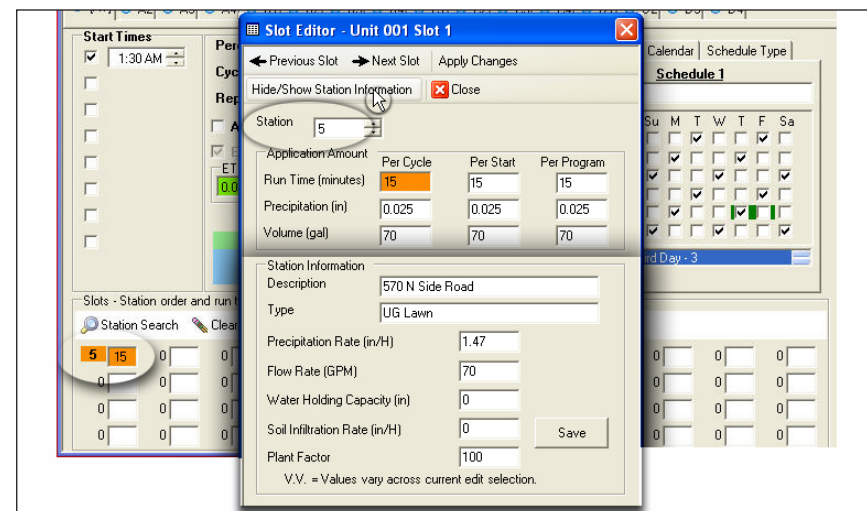
3. Choose **Hide/Show Station Information** button to display all station data.
4. Assign a **Station** number to the slot being edited (highlighted in orange), using the text box scroll arrows or by keyboard entry.
5. All currently saved station data will be shown. Enter or edit data as preferred. (Edits 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**.

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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.
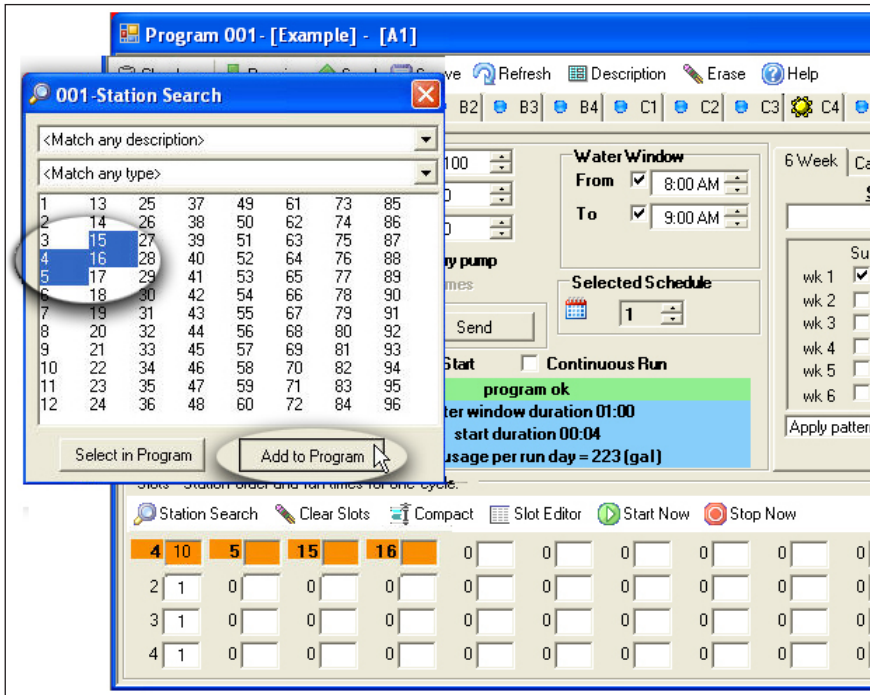
2. Using the Station Search features, select stations to be entered on the Slots by either matching the station **Description** or **Type** to compile a list of stations, or select the station numbers from the number chart using standard multi-selection keyboard methods: **shift-click** to select a consecutive 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.

2. 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 note 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 below station station run time entered is 10 minutes and Type description "N Park Strip" has been added to stations 4, 5, 15 and 16.
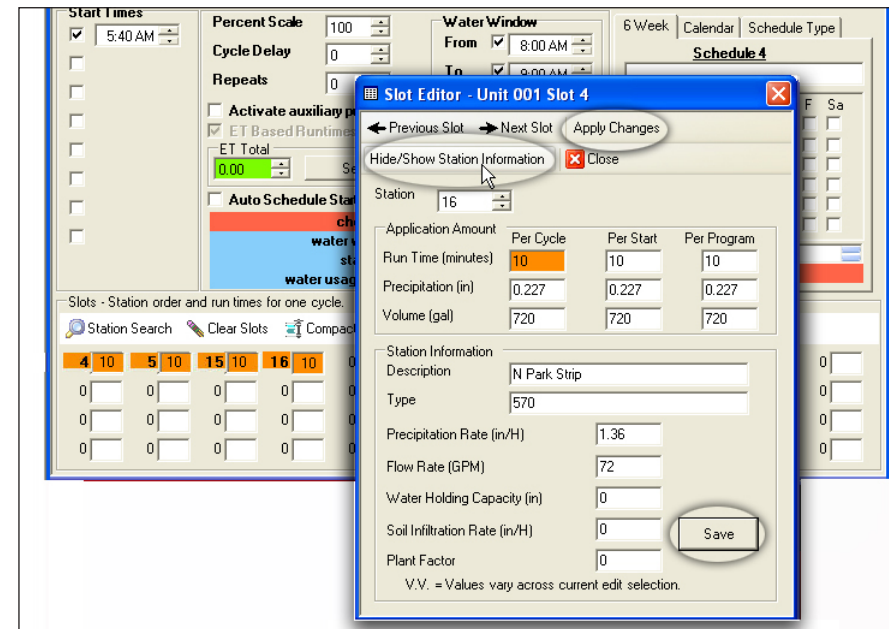
3. Choose **Apply Changes** and **Save**.

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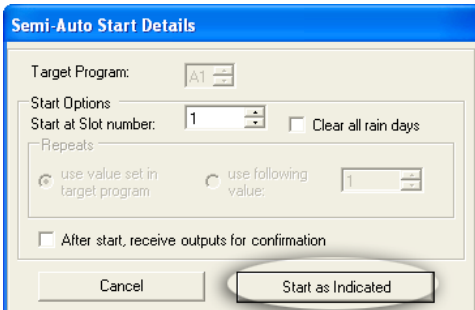
Note: *Compaction will be initiated automatically when stations are added through the* ***Station Search*** *window.*

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 – Checking Unsent Changes

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 **Unsent Changes** window.

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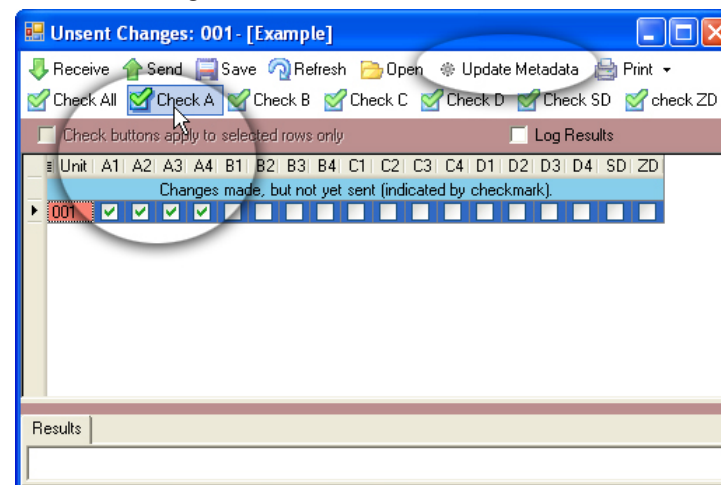
2. Select program(s) to update by choosing the associated program group button (**Check A** selected in example above) or by clicking on individual program check box(es).

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**.

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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.
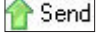
1. To begin, choose **Hydro Report** under the **Reports** directory.

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.
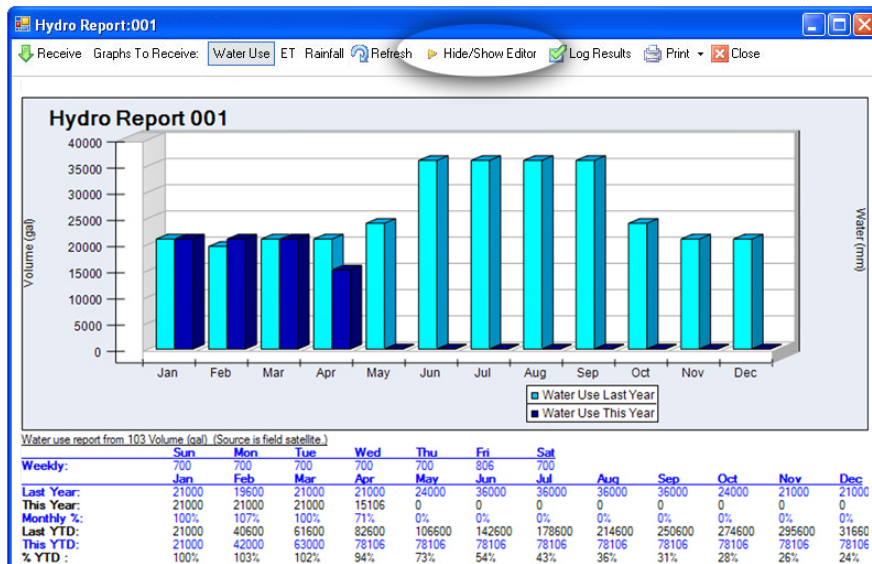
4. To edit the data, choose the Hide/Show Editor to include the Editor fields.
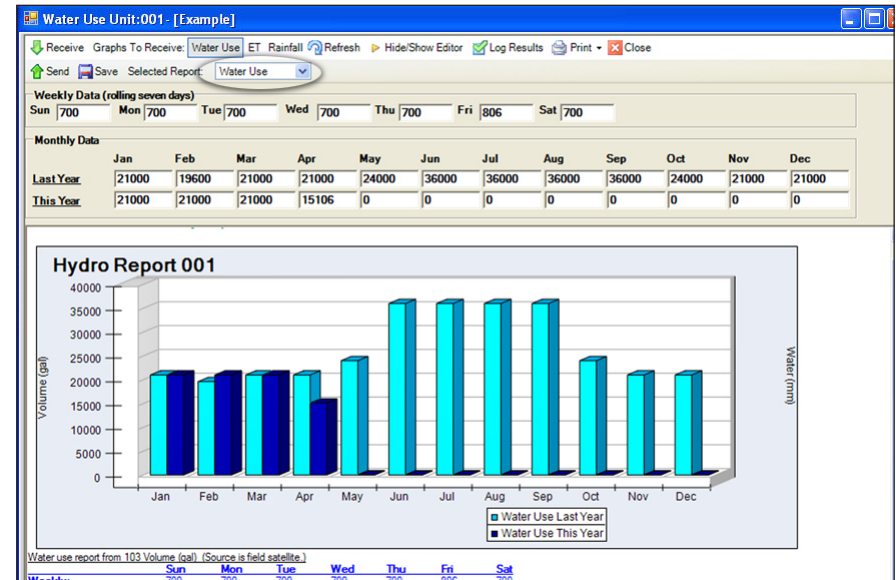
5. Choose Water Use, ET or Rainfall data to edit from the drop down menu.

6. Edit the data fields as needed.

7. Choose **Send** ⬆ Send to upload edited data to satellite.

8. Choose Save to save the selected report data to the database.

Part 2 – Flow Graph Report

1. To begin, choose **Flow 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.*
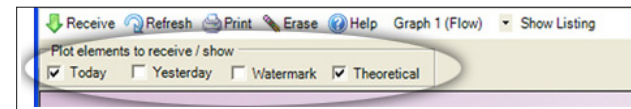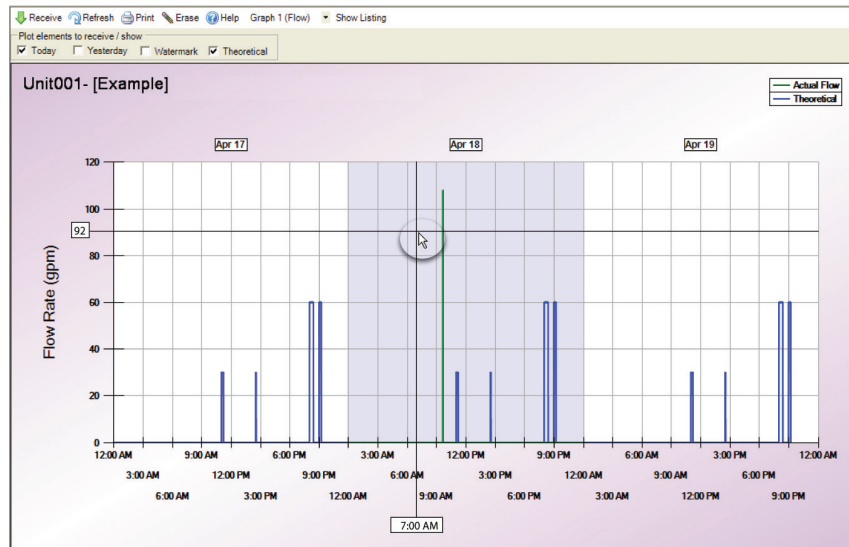

   Note: *Programs that are blank, require checkup, or operate continuously, will not be represented in the flow graph or listing windows.*

3. Choose **Receive** ![Receive] or **Refresh** ![Refresh] to plot the graph.
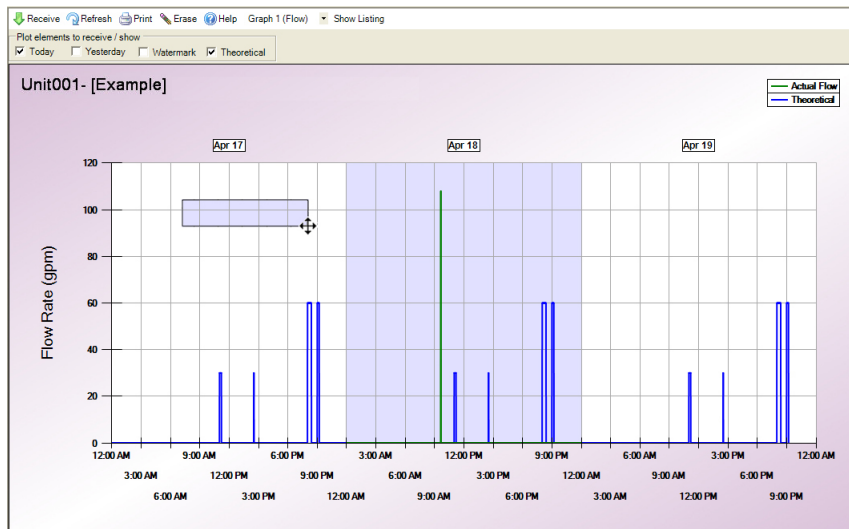
Note: *Click-drag the pointer left to right and/or top to bottom to zoom in. Click on the graph to zoom back to the original scale.*

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** 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.
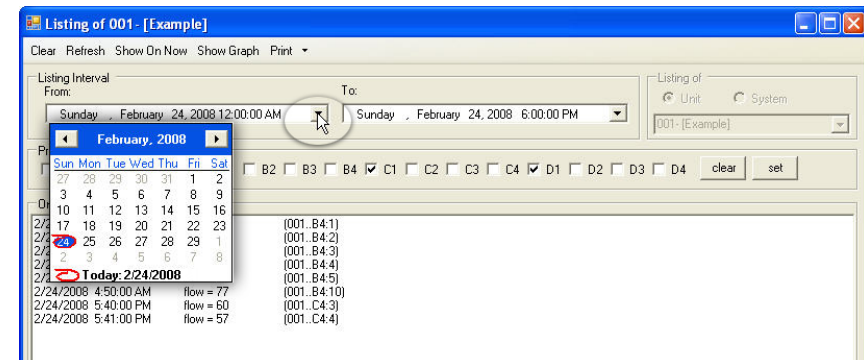
In this Chapter:

Part 1 – Map View Features

**Part 2 – Activity/Alarm Monitor**

Part 3 – Rain Days

Part 4 – Percent Scale

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. To begin, choose **Special Data** under the **Setup** directory to open the **Special Data** window. The map image file name will be entered in **Image File** field.

2. Browse to image file location, select it and choose **Open**. The file name should now appear in the **Image File** text field.
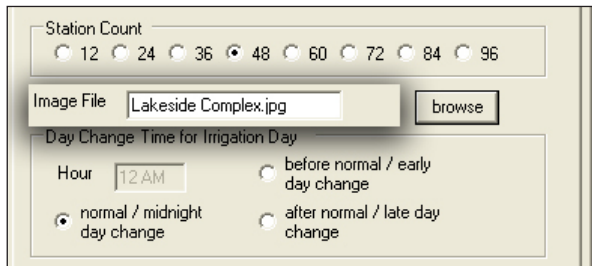
3. Choose **Save**, then close the Special Data window.

4. 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.***
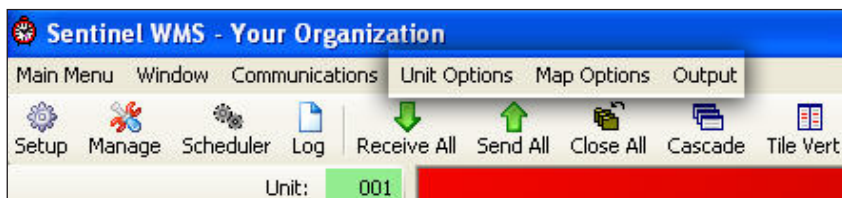
The Unit Options Menu

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.
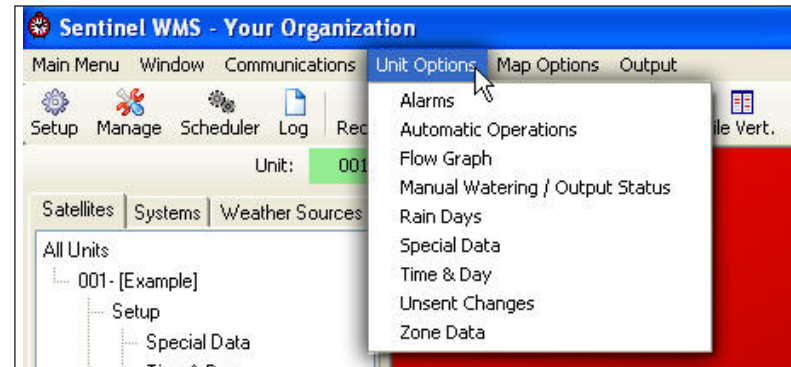
The Map Options Menu

Provided within the **Map Options** drop-down menu, are additional tools utilized for viewing, setup and functionality of the **Map** feature.
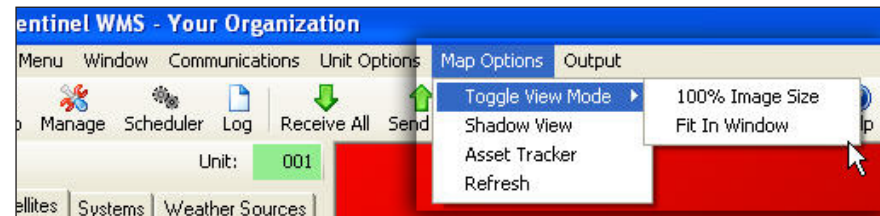
- **Toggle View Mode**
  These menu options enable the map image to be constrained to 100% or to scale proportionately to fit the window size.

- **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, then release.

   • **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 remove a station number for the map image, click on the corresponding number in the Shadow window.

   • To automatically locate a station number on the map that is currently hidden from view, **right-click** on the number in the Shadow window.
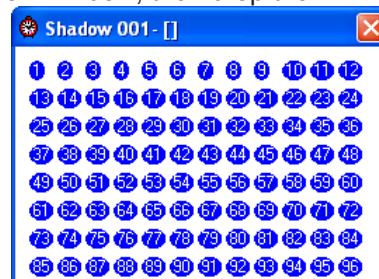
Part 2 – Activity/Alarm Monitor

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.*


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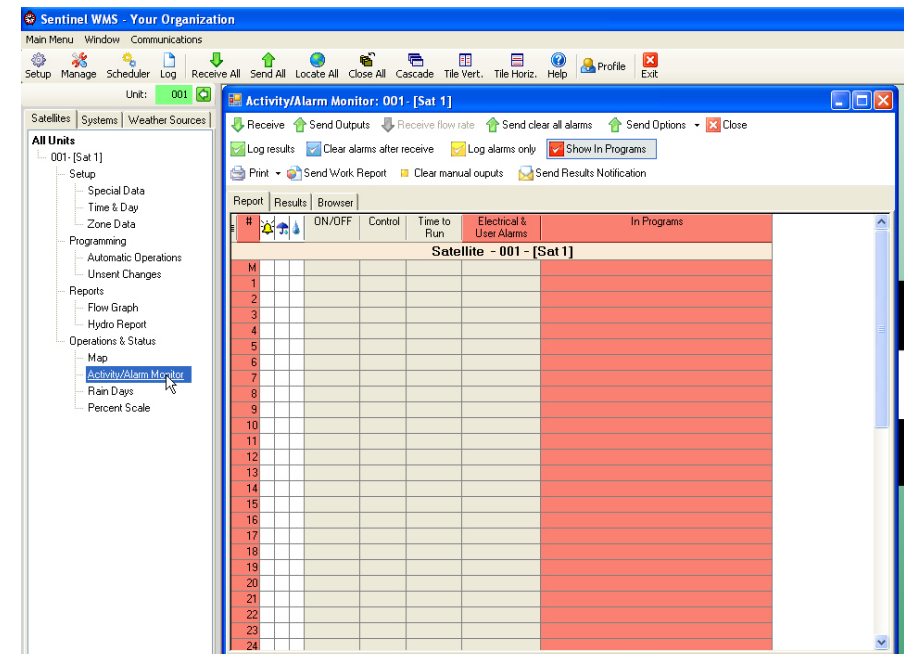
Results Tab

1. To begin, choose **Alarms** window from the **Operations & Status** directory. By default, the **Results** tab is displayed when the **Alarms** window is opened. All current **Alarm Reports** are posted on this page.

2. Choose the **Receive** button to upload all current alarm status information. The data received from the satellite will include specific details to identify the **Alarm** source, cause and time of occurrence.
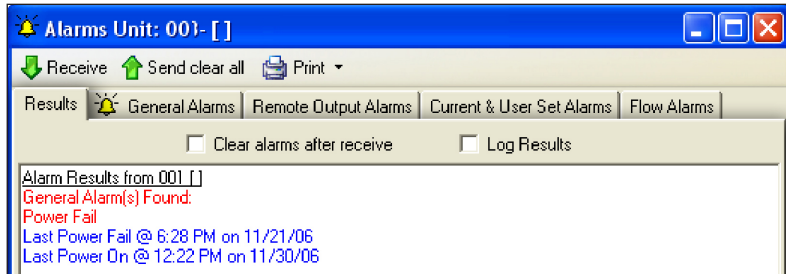
3. Choose the **Send clear all** button to clear and rearm the **Alarm** system at the satellite.

4. Select the options check boxes as preferred:
   - **Clear alarms after receive** automatically clears and rearms the alarm system after it has been received.
   - **Log Results** automatically logs the alarm results in a Word file format.

The General Alarms Tab

General Alarms include satellite-specific alarms such as power failure, or an alarm condition on the external alarm input.
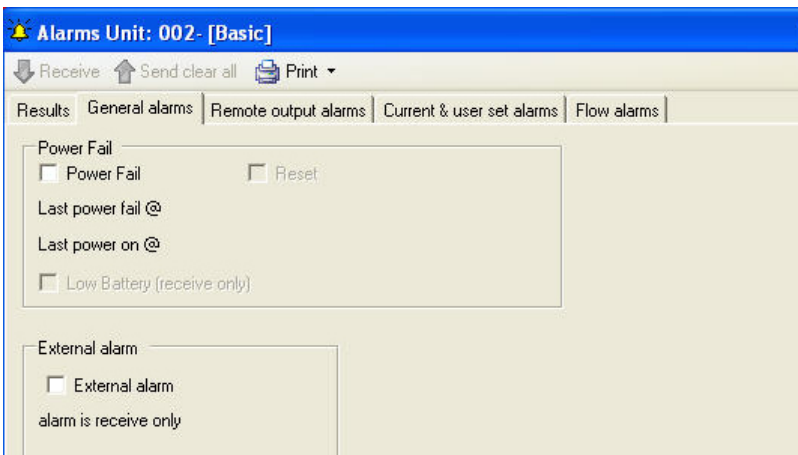
The Remote Output Alarms Tab

The Alarm information on this tab concerns communications failures between the Sentinel controller and remote outputs such as Map to Universal controls, 2-wire systems or wireless output boards.
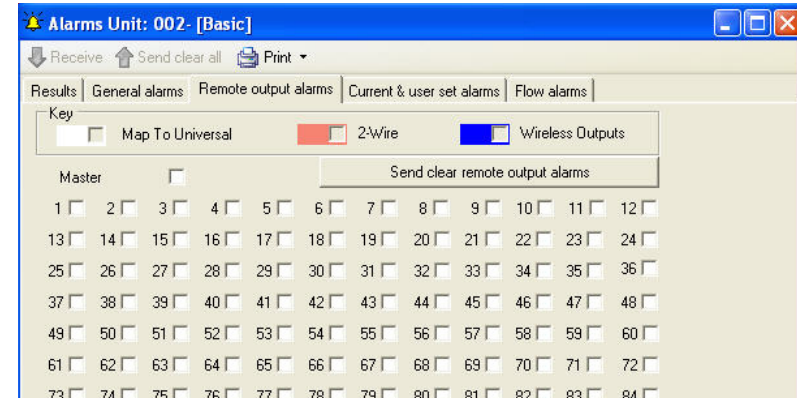
1. Choose the **Send clear remote output alarms** button to clear all alarm conditions on this tab.

The Current & User Set Alarms Tab

The alarm and warning information corresponds to the measured current draw on each station output. All alarms will prevent the output from running under automatic control, warnings are informational and do not affect operation.
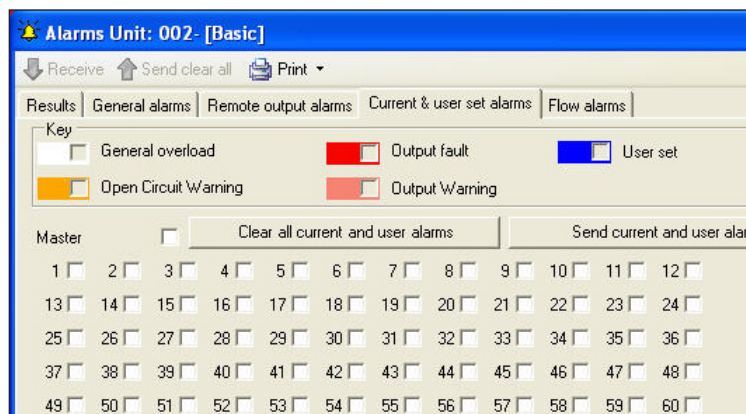

1. Choose the **Clear all current & user alarms** button to clear all checked boxes.
2. Select an alarm to set/reset the user set alarm on that station.
3. Choose the **Send current & user alarms** button to update the satellite.

The Flow Alarms Tab

The alarm information on this tab concerns flow related alarms and warnings. All alarms will prevent the output from running under automatic control, warnings are informational and do not affect operation.
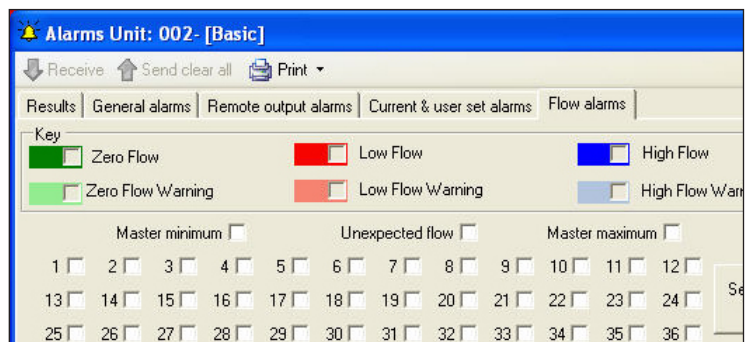
1. Choose the **Send clear flow alarms** button to clear all alarms and warnings on this tab and send to the satellite.

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.
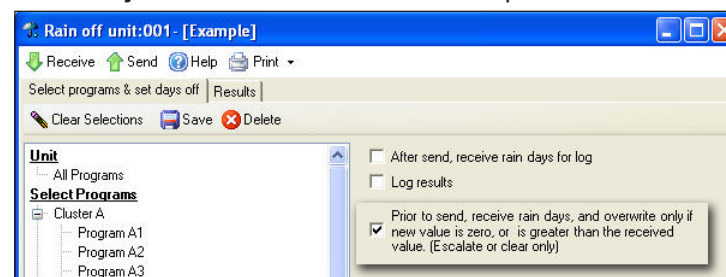
2. Choose **All Programs**, **Cluster** or a specific **Program.** A text field will appear next to the selection.
3. Enter the number of Rain Days (1 to 250) in the text field.
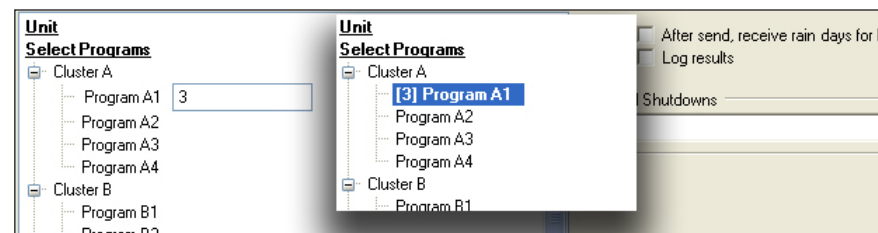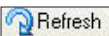

Note: *In the example above, a 3-day Rain Days period is assigned to Program A1. When entered or by selecting another program to enter rain days, the assigned number of rain days will be shown in parentheses and bold type (see inset).*

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

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The Rain Days Toolbar

Clear Selections [Clear Selections] clears all current selections.

Save [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.

Refresh [Refresh] reloads the last saved database entry.

Delete [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 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.
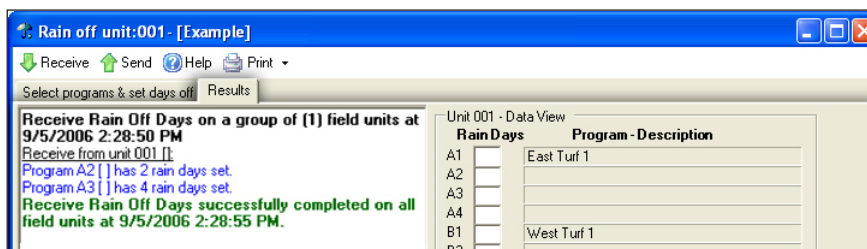
Part 4 - Percent Scale

The control features of the **Percent Scale** 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 Scale adjustment by **Unit** scales the run time of all defined irrigation programs.

· Using the **Select Programs** option enables a Percent Scale adjustment to be assigned to program any cluster(s) or individual program(s) within a cluster.

· The **Description** option enables Percent Scale to be assigned to programs based on the program's Primary or Secondary description.

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

Percent Scaling Program Run Time

1. To begin, choose **Percent Scale** 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 Scale factor (0 to 255%) in the text field.
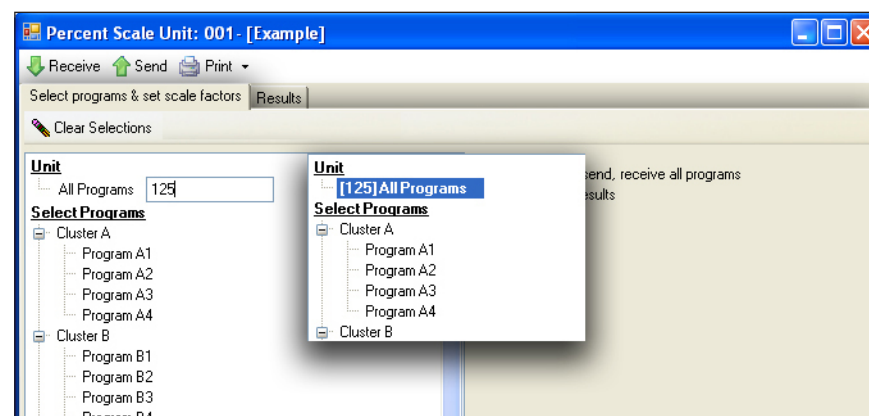
Note: *The baseline or non-adjusted Program Run Time is 100%. In the example above, the run time of all satellite programs has been increased to 125% – a net 25% increase over the 100% baseline. When entered, the percent scaled increase will be shown in parentheses and bold type (see inset).*

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

The Percent Scale Toolbar

Choosing the **Clear Selections** [Clear Selections] button clears all current Percent Scale selections.
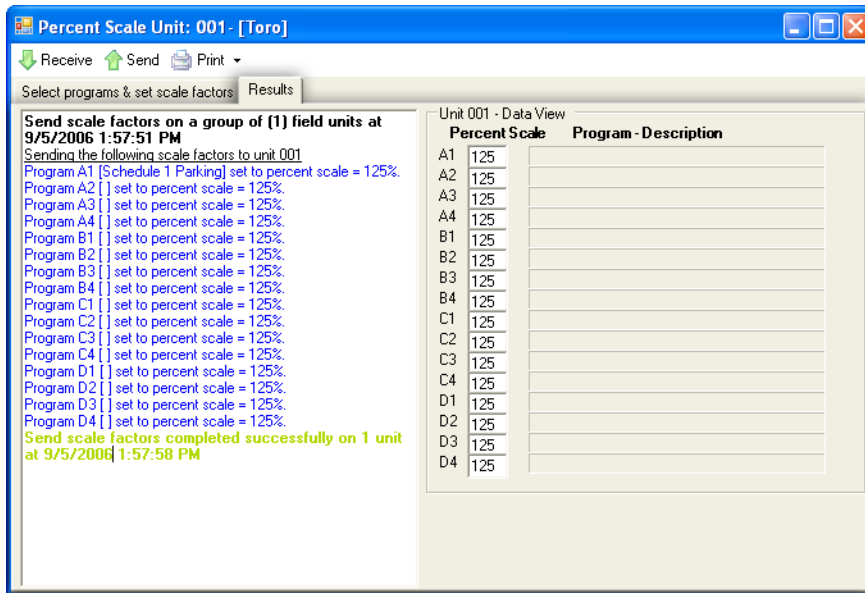
Percent Scale Selection Options

Selecting the **After send, receive all programs** option prompts the satellite to respond with the current Percent Scale 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 scale settings – the results will be shown on the Results tab.

In this Chapter:

Part 1 – Creating Satellite Systems

Part 2 – Working with Multiple Satellites

A Satellite System is simply a collection or group of satellites that are given the same name. Organizing satellites with the same operating parameters into 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 8**.

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.
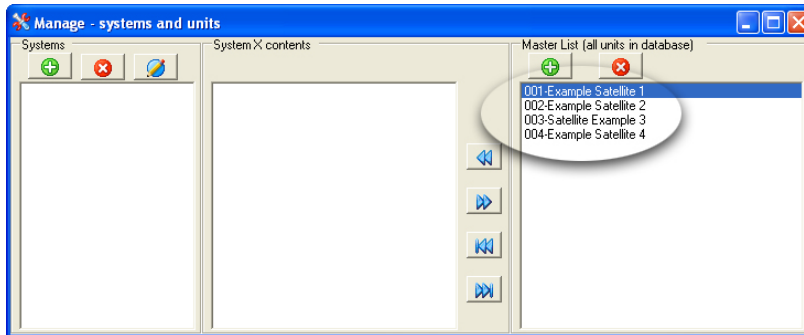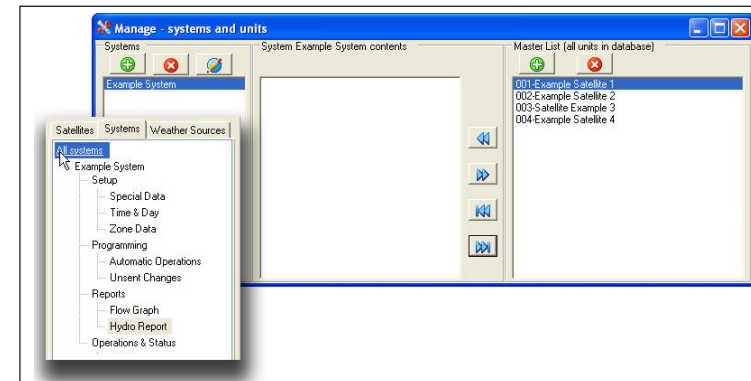

2. Choose the Add Systems button in the Systems field to open the **Add New System** Window.
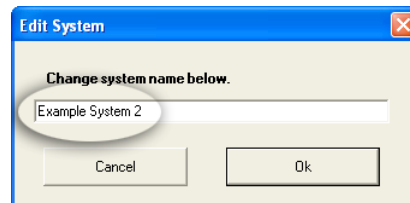
3. Type in a System name, and choose **OK**.

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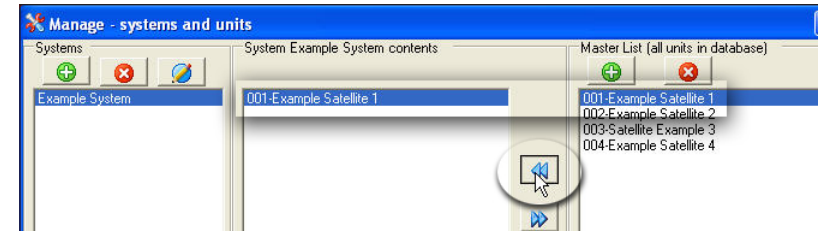
*Note: The standard **shift-click** and **ctrl-click** multi-selection key combinations can be used to select the satellites from the master list.*

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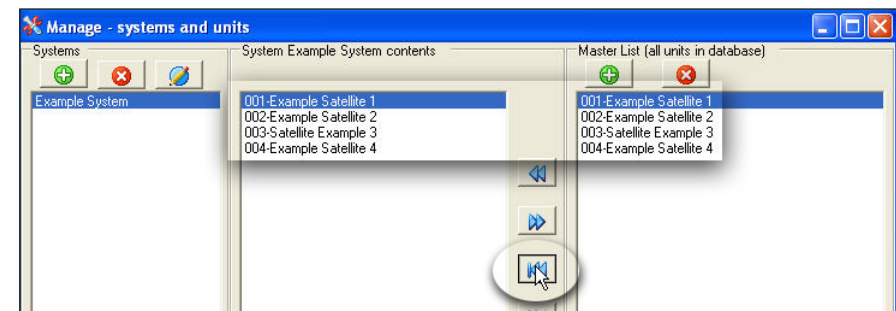
7. To remove satellites from the System Contents list, use the same procedure as adding satellites, with the exception of using the Right arrow ⏩ buttons.

8. To change the System description, Choose the Edit Systems 📝 button open the **Edit** Window.

9. Type in a new System description, and choose **OK**.
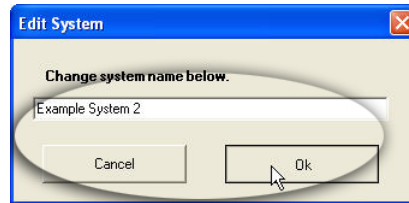
Part 2 – Working with Multiple Satellites

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.
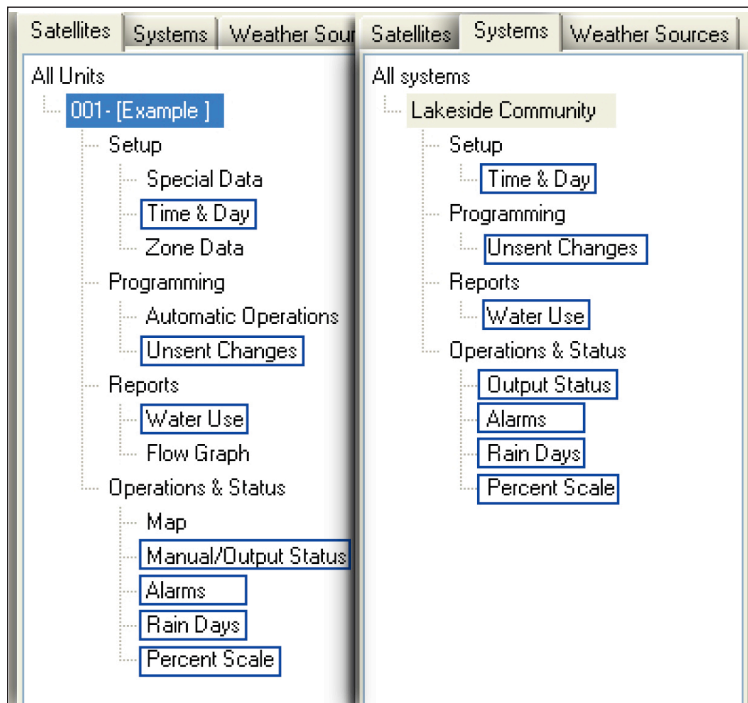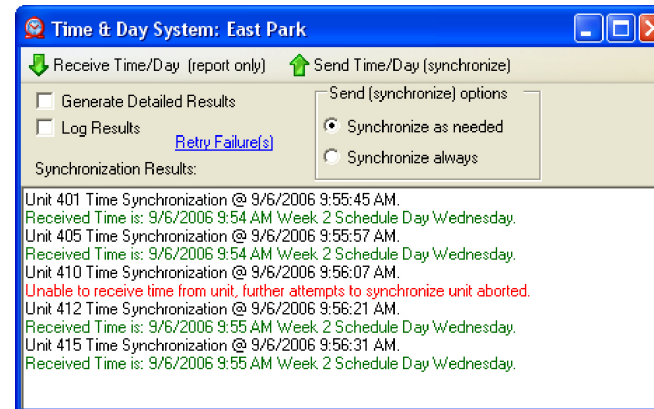
System Level Operations

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 East Park 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.*

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In this Chapter:

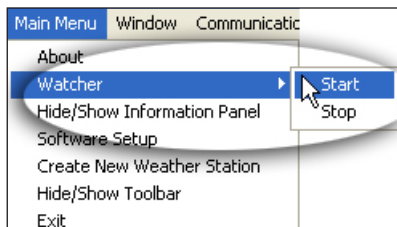**Part 1 – Enabling the Sentinel Watcher**

Part 2 – Configuring Watcher Operations

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 four sub-category tabs: Status Reports, Weather Sources, Satellite Programming Updates and Scheduler / Optimizer.

1. From the **Software Setup** window, choose the **Watcher Operations** tab. The **Status Reports** tab will be selected by default.
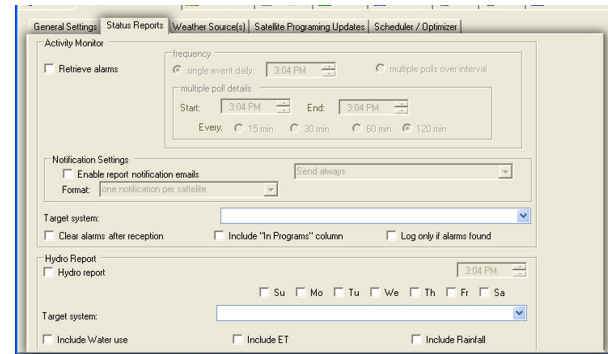

Status Reports

1. Select the **Retrieve Alarms** 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 35.)*
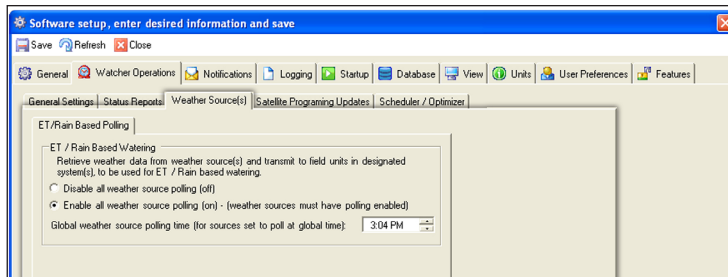
1. Choose Enable or Disable polling option as preferred:

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.
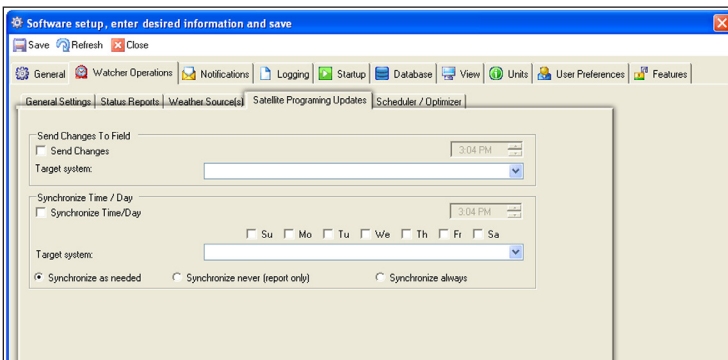

1. Select **Send Changes To Field** option as preferred.
   - Enter the data upload start time.
   - Select the **Target System** from the drop-down menu.
2. Select **Synchronize Time/Day** option as preferred.
   - Select the **Target System** (to poll) from the drop-down menu.
   - Enter the preferred 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.
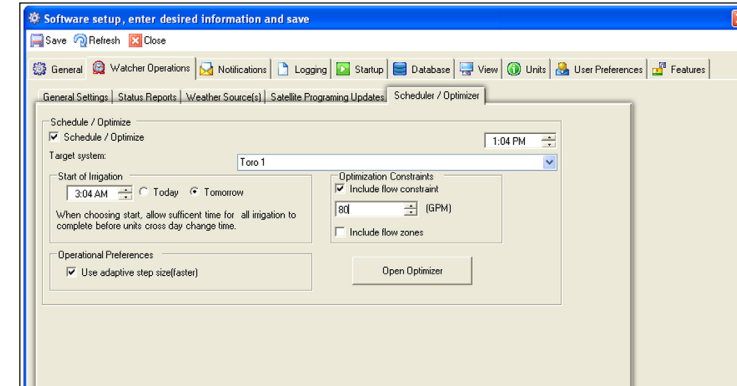
1. Select Schedule/Optimize option.
   - Enter the **Optimization Start** time.
   - Select the **Target System** from the drop-down menu.
   - Enter the **Start of Irrigation** time for **Today** or **Tomorrow**.
   - Select the **Flow Constraint** option as preferred and enter a maximum flow rate value.
2. Select the **Use Adaptive Step Size** (faster) option as preferred.
3. Choose **Open Optimizer** to open the Scheduler/Optimizer window.
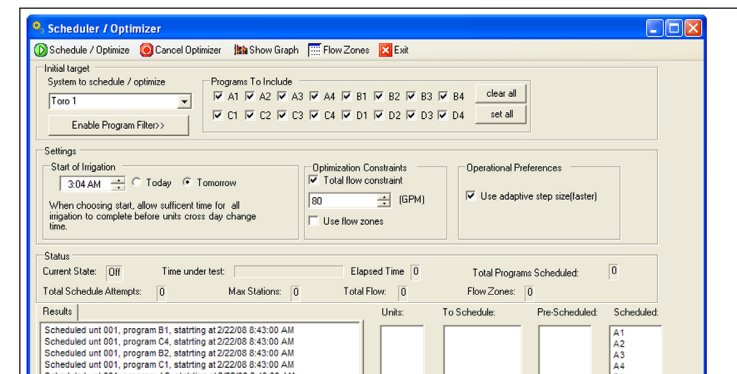
4. Choose **Enable Program Filter** to include/exclude Programs to optimize.
5. View results log in the Progress and Status columns.

In this Chapter:

Part 1 – Creating a Weather Station

Part 2 – Configuring a Weather Station

**Part 3 – Creating a Weather Monitor**

Part 4 – Checking the Weather Source

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.**
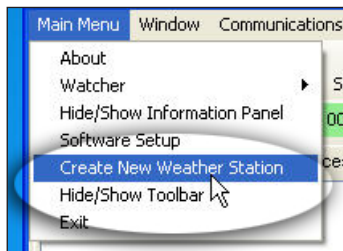
2. The **Create New Weather Source** window will open automatically. Enter a description for the Weather Source and choose the **Setup Station** button.

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.
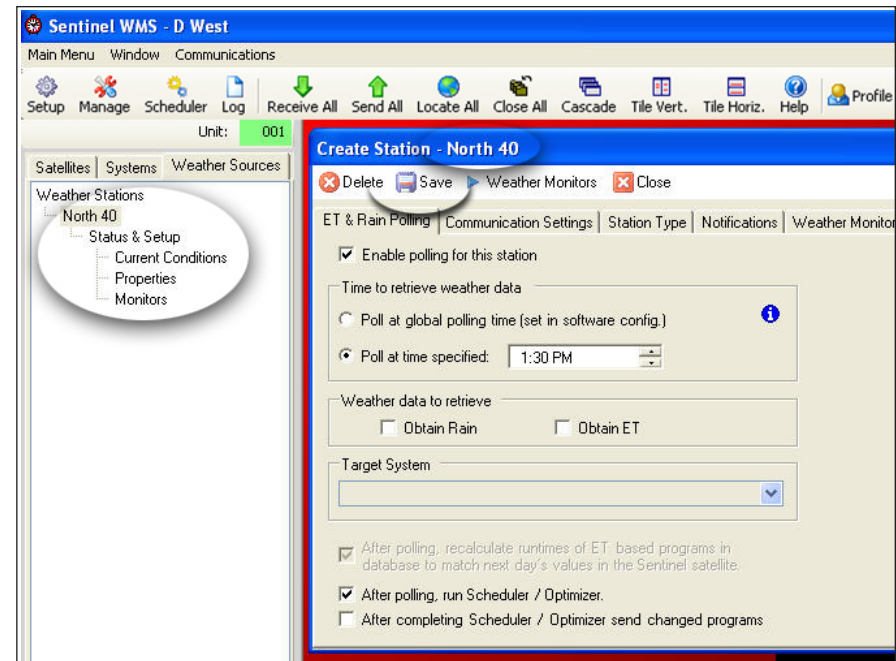
6. Choose the **Weather Sources** tab of the **Selection** panel.

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.
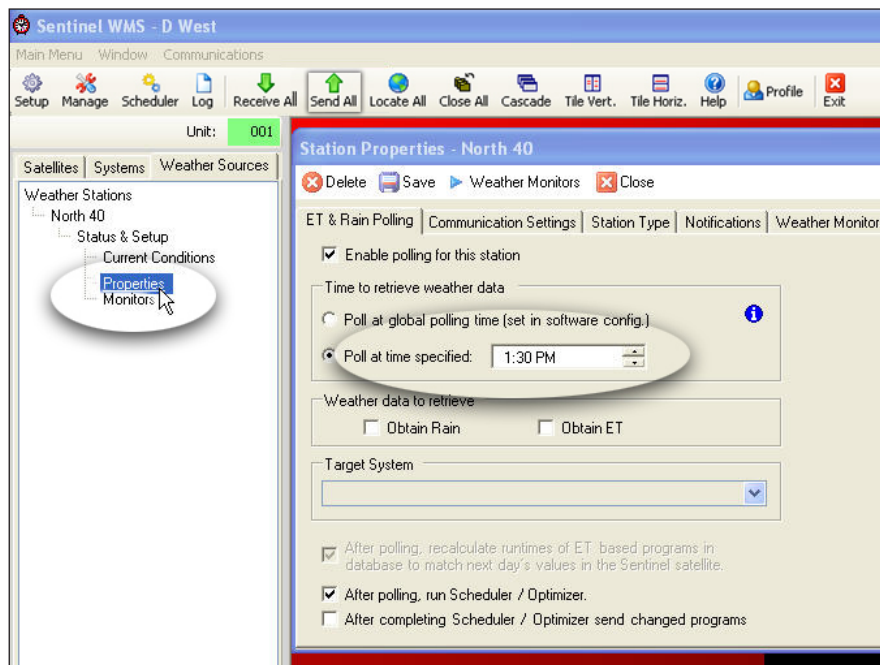
The ET & Rain Polling Tab

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 drop-down 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.
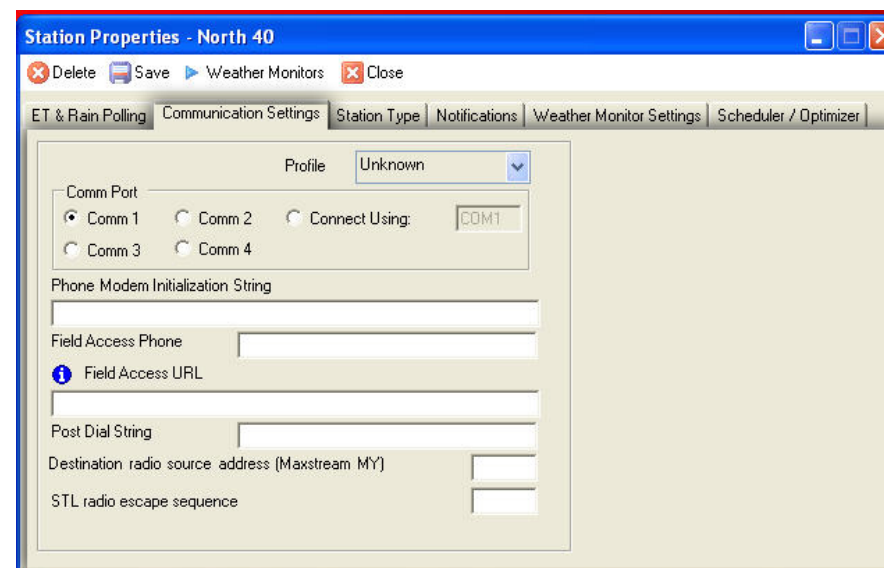
1. To begin, select the appropriate computer **Comm Port** number used for the Weather Station connection. If the Comm port number is higher than 4, select the **Connect Using** option and type in the comm port number for example, COM6.

   (continued)

The Communication Settings Tab (continued)

3. Enter to the **Field Access Phone** number if the Weather Station is connected via a telephone modem.

4. 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.*

5. 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.*

6. 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.
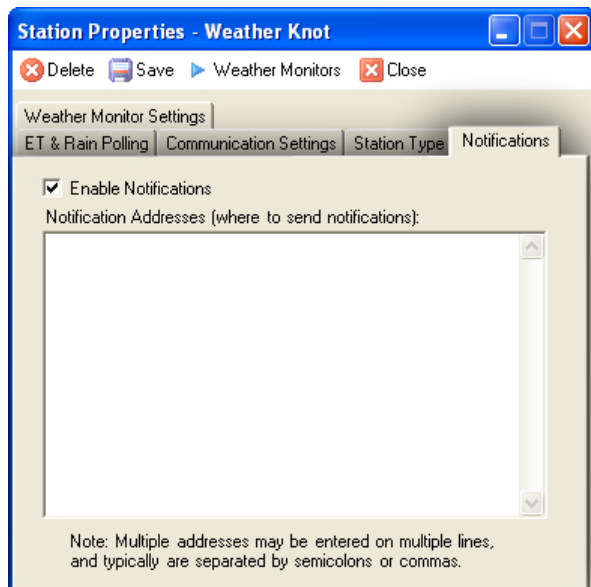
2. If applicable, enter the email address(es) to receive Weather Station reporting.

   Note: The option **Notifications sent to individual addresses specified for each station,** provided on the **Notifications** tab of the **Setup** window, must be selected as shown below.
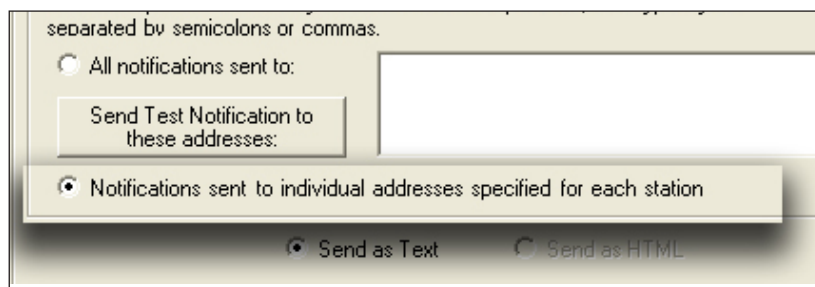

   Note: All Information sent through notification email can be reviewed on the **History** tab of the **Information** panel. The information panel is cleared when the Sentinel WMS program is closed.

   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.
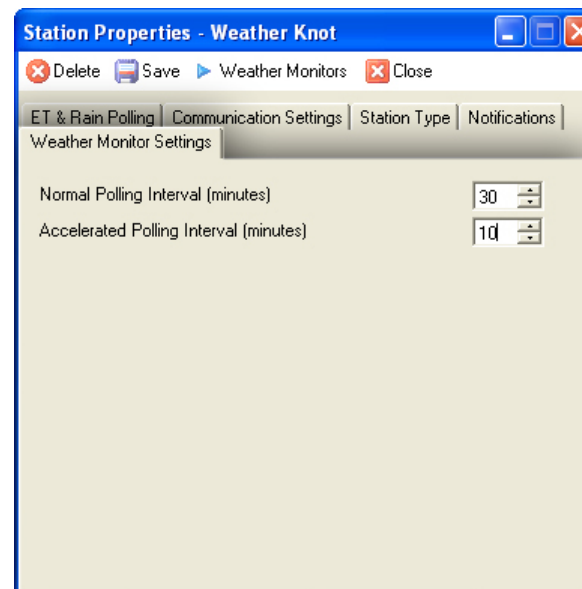

1. Enter a **Normal Polling Interval** from 0 to 100 minutes.

   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.

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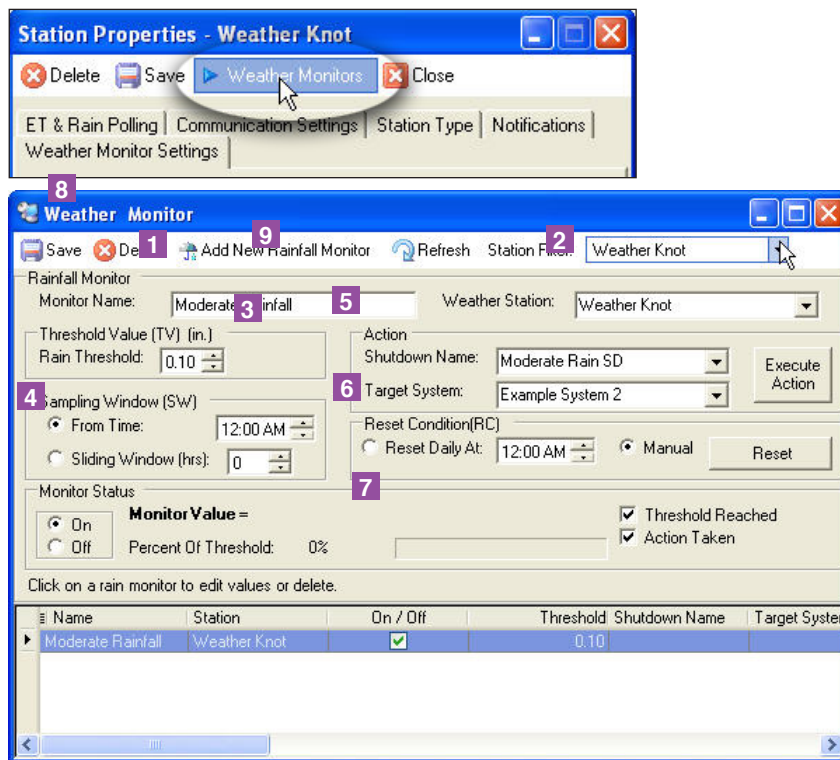
Note: *At a minimum, enter a **Monitor Name** and choose **Save**. Once saved, the new monitor will be listed in the selection field at the bottom of the Weather Monitor window. Clicking on the monitor name will open the Weather Monitor window saved for the Weather Station.*

1. To create a new Rainfall Monitor, choose the [Add New Rainfall Monitor] toolbar button.
2. 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 specify a time to begin measuring rainfall. The rainfall measurement is taken between the specified time and the last poll sent by the Weather Station.
   - 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 t**o 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 VantagePro weather station.
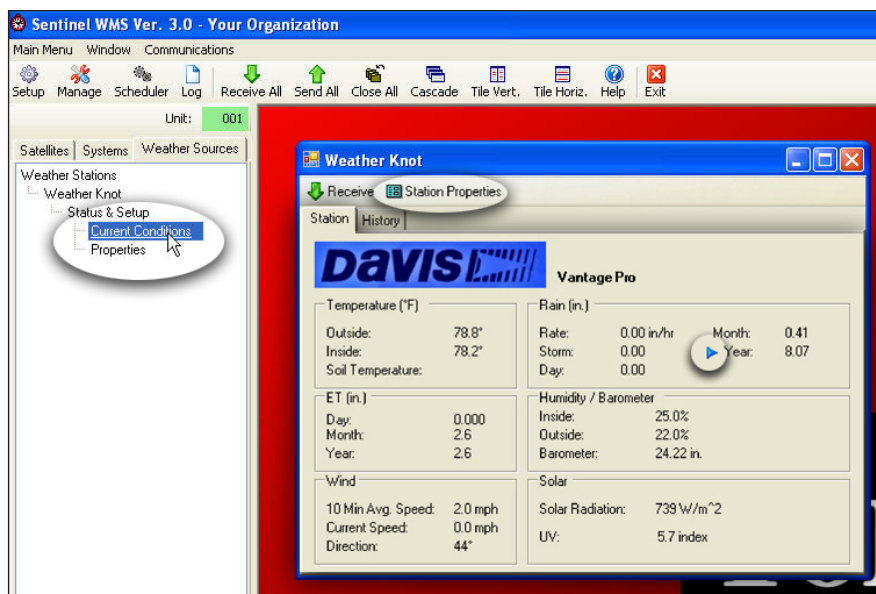
2. Choose the Receive ⬇ button to download all available weather data from the Weather Station.
3. Choose the Blue arrowhead ▶ to open the Weather Monitor window.

4. To review the current Weather Station properties, choose the Station Properties toolbar ⊞ Station Properties button to open the **Station Properties** window.
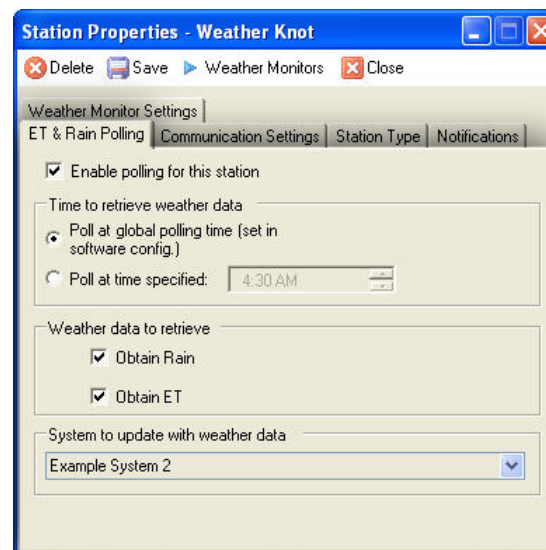
The History Tab

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.

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