

Irritrol®

PCW CONTROL™ SYSTEM *User's Guide*



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Introduction – Getting Acquainted with the PCW Control System

Irritrol's PCW Control system brings simple, yet sophisticated control to your landscape's automatic sprinkler and lighting system, through the convenience of your personal computer and a wireless, hand-held PC Remote transmitter.

Glossary

To start, take a moment to become familiar with the following list of terms used throughout the PCW Control program software and user's guide.

Active Schedule – The current schedule in use for the Site (also listed at the top of the program window). A site can have any number of saved schedules such as Spring, Summer, and Fall schedules for a site labeled "My House".

Active Site – The current site in use (listed at the top of the screen). The average PCW Control application will have only one site; the location of the yard or landscape controlled by the system. Professional irrigation installers may need multiple sites saved on their computers.

Controller – The electronic unit that stores the current operating program and controls the irrigation valves and/or relays for lighting. As well as a Master Valve/Pump Start circuit and a sensor input, the controller provides connections for up to 12 zones, of which three can be lighting zones. The system can control up to four controllers.

Get Schedule – The function that retrieves and displays the current schedule in the controller.

Master Valve Circuit – A circuit that controls the valve that opens and closes the pipeline supplying the rest of the valves on an irrigation system. The master valve electrical circuit opens the main line when the first valve turns on and shuts off the mainline when the last valve turns off. The Master Valve is used as protection against the continuous flow of an irrigation valve stuck open.

PC-Remote (PC-R) - A multi-function control unit that, connected via USB cord to the Windows-based PC, provides wireless communication with the controller. When disconnected, the handheld remote enables manual operation of the system.

PIN – The 4-digit, personal identification number selectable for the system. The PCW Control software, PC-Remote, and the controller all must have the same PIN. The user-selected PIN helps reduce the chance of unauthorized access to the system.

Pump Start Circuit – The same circuit for a Master Valve, however, instead of energizing a valve, the circuit closes and opens a relay for switching a pump on or off. One side of the relay is energized by 24VAC from the controller and closes a bigger relay between the pump's power source and the pump motor.

Open Site – Clicking this button opens the list of saved sites.

Operating Day Schedule - The sequence of watering days and/or lighting nights selectable by zone.

Week Day – Operation on selected days of the week.

Odd/Even Date – Operation only on Odd or Even numbered dates.

Day Interval – Operation in repetitive days (every two days or every three days, etc.)

Remote Master Valve/Pump Start – The feature that allows a Master Valve or Pump Starter to be connected to Controller #1 only. Other controllers in the system call #1 to activate the Master Valve or pump as needed.

Seasonal Adjust – A percentage increase or decrease in watering time to match seasonal watering needs of the landscape.

Schedule - An automatic operating routine for the irrigation and/or lighting zones. Schedules can be selected, created, edited, saved, and transmitted from the calendar screen.

Scheduling Advisor™ - A feature that allows the user to enter specific details about a watering zone into the system and receive a recommended irrigation schedule. The user can elect to apply the schedule and can also decide on automatic adjustments to the irrigation schedule based on weather updates.

Site - The location of an irrigation and/or lighting system under the PCW Control's command. In most cases, only one site is identified.

Station – Another term for zone (see Zone below).

Zone – A section of the landscape supplied by one irrigation valve (irrigation zone) or lit by one landscape lighting circuit (lighting zone). Irrigation systems are divided up into zones because water pressure and flow will not allow watering all areas at one time and the wide variety of plant material, slope, soil type and sun exposure create differing needs for water application.

Chapter 1 - Getting Started

Irritrol's PCW Control system brings simple yet sophisticated control to your automatic sprinkler and landscape lighting system through the convenience of your personal computer.

The complete PCW Control system installation procedure is provided in the Installation and Setup Guide, form number 373-0761. If you have already completed the installation and setup procedures per the installation guide, continue on to page 4.

Install and Launch the PCW Control Program.

1. Insert the installation CD into your disc drive. In the "My Computer" window, double-click the PCW Control icon.
2. Double-click on **setup.exe**. The PCW Control program and required support software will be installed automatically. Respond to the software installation prompts as necessary.
3. Using the provided USB cable, connect the PC-R to the computer's USB port.
The PC-R will display PC when the connection is established (Figure 1.1).

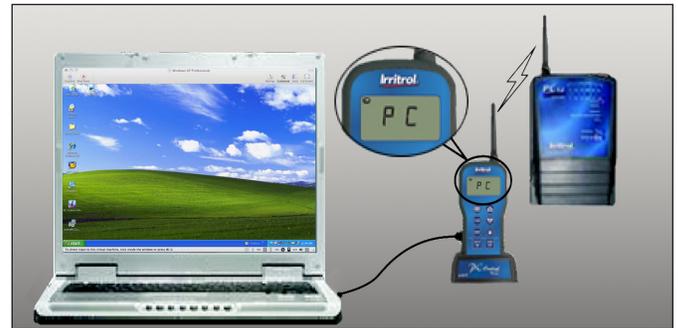


Figure 1.1

4. From the Start menu, launch the **PCW Control** program.
5. At the **Quick Start** dialog box, click the **New Site** option button (Figure 1.2). *The Open Site option is used to open a previously saved site configuration file.*

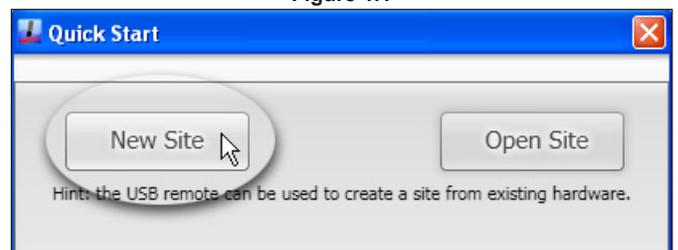


Figure 1.2

Note: A "Site" file specifies how the PCW Control system is configured. A Site requires a name, a PIN code, the number of Controllers in use (1–4), and the initial number of zones to be included in the operating schedule.

6. At the **New Site** dialog box (Figure 1.3), enter the preferred site name.
7. In the **PIN** number field, you may leave the default 0000 PIN code, or enter a preferred four-digit PIN. (See **Change PIN** section, below).
8. The default number of controllers is one. If your site utilizes more than one controller, select the applicable number from the drop-down list.
9. Select the number of zones to be scheduled. *The available zone count in the drop-down list will correlate with the number of controllers selected.*
10. Click the OK button to save the Site file.
11. At the **New Schedule** dialog box (Figure 1.4), enter your preferred Schedule name.

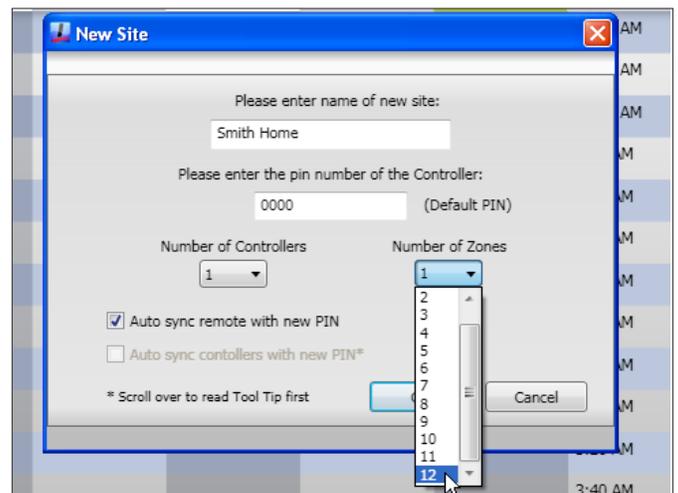


Figure 1.3

• A **Schedule** configures PCW Control system operation based on the active day(s), start time(s), and

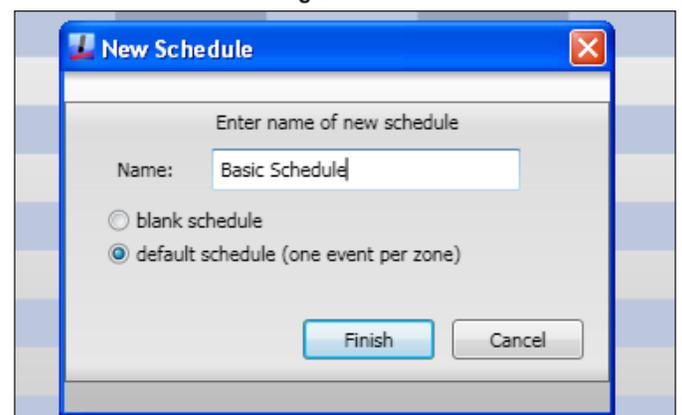


Figure 1.4

run time duration assigned to each zone.

- Any number of schedules can be defined and saved to memory for later recall, however every schedule must have a unique name assignment.

13. Select the **Default Schedule** option to open the new schedule with a run time **Blank Schedule** to start without presets.

14. Click the **Finish Button**.

- The site and schedule name will be displayed at the top of the program window (Figure 1.5).

The PCW Control program should begin communicating with the Controller(s) at this time and will activate the control system; indicated by green signal bars and the Auto On controller status. If a communication link is not established, Unknown Status will be displayed. (Figure 1.6) This condition is usually caused by a mismatching PIN. Verify the PC-R and Controller have a matching PIN and the Controller(s) can be operated manually with the PC-R.

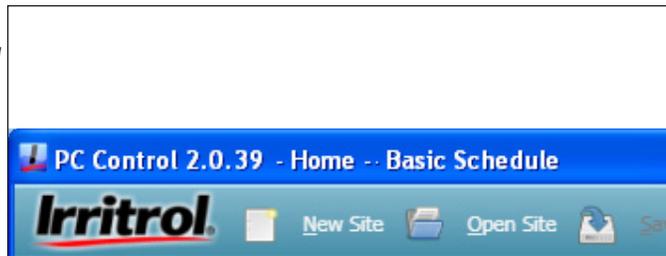


Figure 1.5

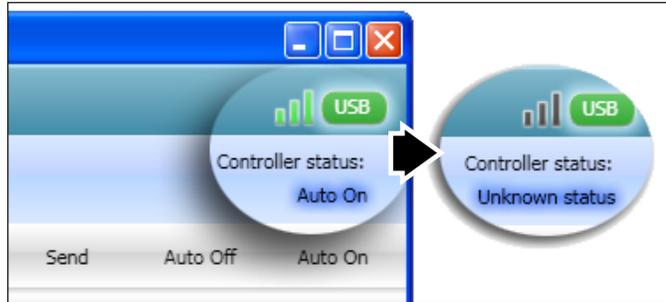


Figure 1.6

Change PIN

⚠ Important PIN Information: As a security measure, the PC-Remote (PC-R) and Controller utilize a four-digit PIN code to enable wireless communication. Both units are initially set to 0000 by default. This is an optional feature and can remain 0000 if desired. If you wish to change the PIN to prevent unintended system operation, read this section.

Changing the system's PIN can only be done from the computer when all the PINs are the same to begin with. The parts of the system, computer, PC-R, and Controller all have to be communicating for "Change PIN" to function. In the case of mismatched PINs (and in the case of multiple Controllers in the system), the PIN and controller number need to be set manually in each controller. See the procedure below:

1. On the front of the Controller, press the "MANUAL" and "AUTO ON" buttons simultaneously to start the "POWER" light blinking and illuminate one of the station lights.
2. With the station lights 1 thru 9 representing PIN digits 1-9 and with 10 representing "0", use the "MANUAL" button to advance to and illuminate the first digit desired for the PIN.
3. Press "AUTO ON" to move the light down from "POWER" to illuminate "SIGNAL". The "SIGNAL" light represents the second PIN digit. Again, use the "MANUAL" button to move to and illuminate the second, desired PIN number and then press "AUTO ON".
4. Repeat the above steps to set the third and fourth PIN digits with "SENSOR" and "MASTER VALVE / PUMP" illuminated respectively.
5. The last digit, represented by the "TEST" light, is for the controller or Controller number. If there is only one controller in the system, set or leave the controller number at "1". If setting up a second controller for the system, use the "MANUAL" button to move to #2 in the "STATION" lights. The controller number selection only goes up to four.
6. Hold down the "AUTO ON" button until the lights start a sequential display and then release the button. The Controller will demonstrate what was set for each of the four PIN numbers and the controller number and will then return to AUTO mode on its own.

Chapter 2 - PCW Control Program Window Overview

The PCW Control program is designed for ease of scheduling, review and system operation. The program window is organized so you can easily setup and review operating schedules, access the weather data, fine-tune system operation, and manually operate the system as needed.

The program window is comprised of five main sections, shown below (Figure 2.1).

A – The dark blue title bar provides the PCW Control application version, currently open site and schedule names, and the minimize/maximize/close window buttons.

B – Directly below is the turquoise Site Menu bar that provides direct access to the site resource folders, save options and system tools. The PC-R remote USB connection and signal strength bars are located on the far right.

C - The light blue section displays current Controller Status information including zone operation, Auto On/Auto Off status, and system activity status.

D – The four main panel tabs of the light gray center section include the Schedule Viewer with Calendar Control center, schedule Advisor, Settings and Manual operation panel.

Located on the right are the Send, Auto Off and Auto On system control buttons. Below the Schedule tab are five schedule function buttons used to create a New schedule, Open a saved schedule, Get Schedule (from Controller), and delete or rename a schedule.

E – The Zone Buttons are arranged across the bottom of the window. Each color-coded button is linked to the corresponding colored/numbered zone segments in the Schedule Viewer. Modifications to individual zones are made through the Zone Button pop-up menu.

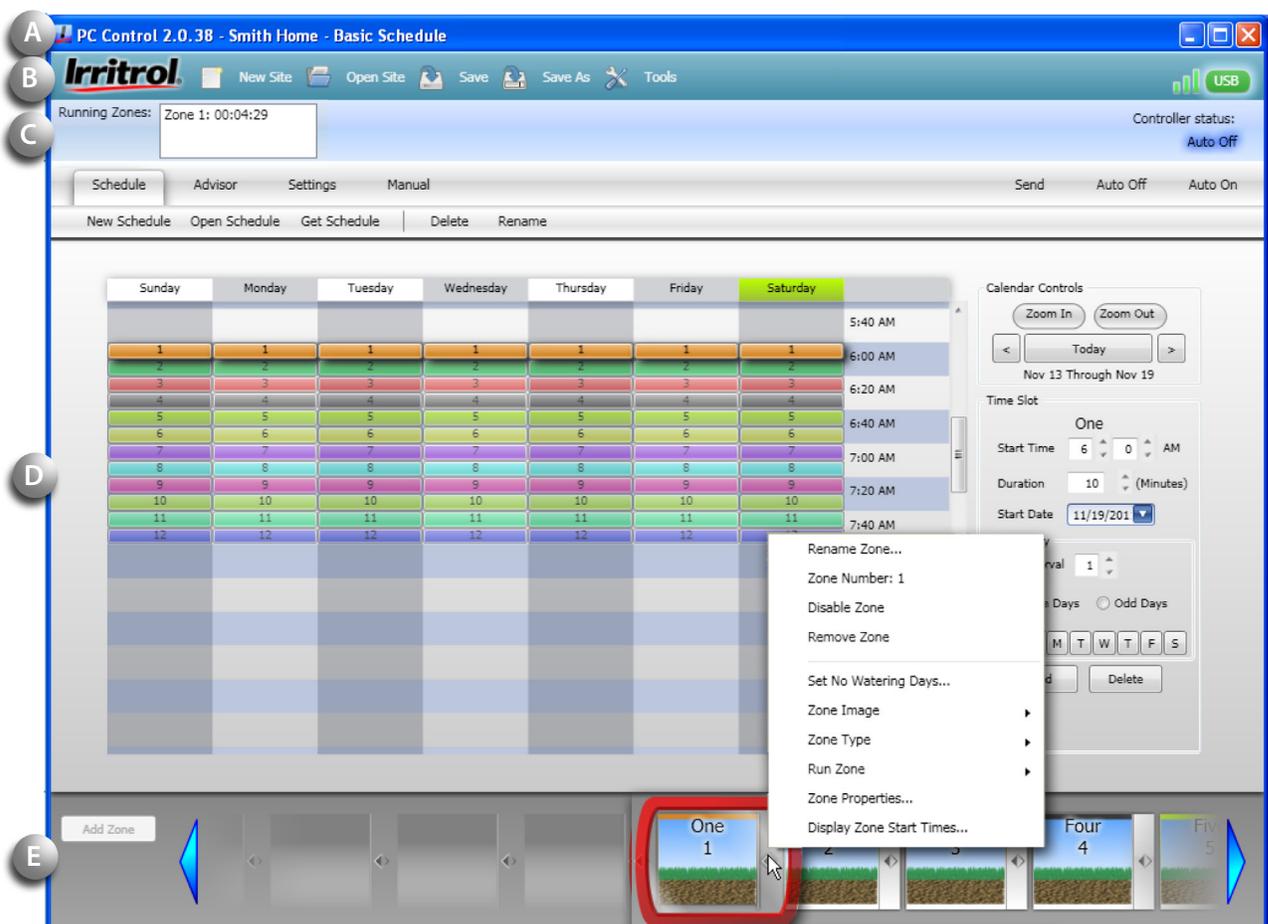


Figure 2.1

The PCW Control Schedule Viewer

The Schedule Viewer (Figure 2.2) is the primary panel where the scheduled operation of each zone is established. The Schedule Viewer is arranged in a 7-day calendar format that initially displays the schedule for the number of zones specified in the New Site dialog box. Each zone has a specific color and number assignment that corresponds to the Zone Buttons at the bottom of the window, and to the field output terminals of the Controller. When the default schedule is selected in the dialog box, each zone will be scheduled to run for 10 minutes, every day, beginning at 6:00 a.m.

Calendar Control Panel

The Schedule Viewer is formatted with the days of the week arranged in columns starting on Sunday, and Start Times arranged in rows, starting at 12:00 a.m. (Midnight). By default, start time is displayed at a 30-minute increment resolution. The **Zoom In** and **Zoom Out** buttons enable the start time resolution to be zoomed in to 5-minute increments, or zoomed out to a 1-hour increments.

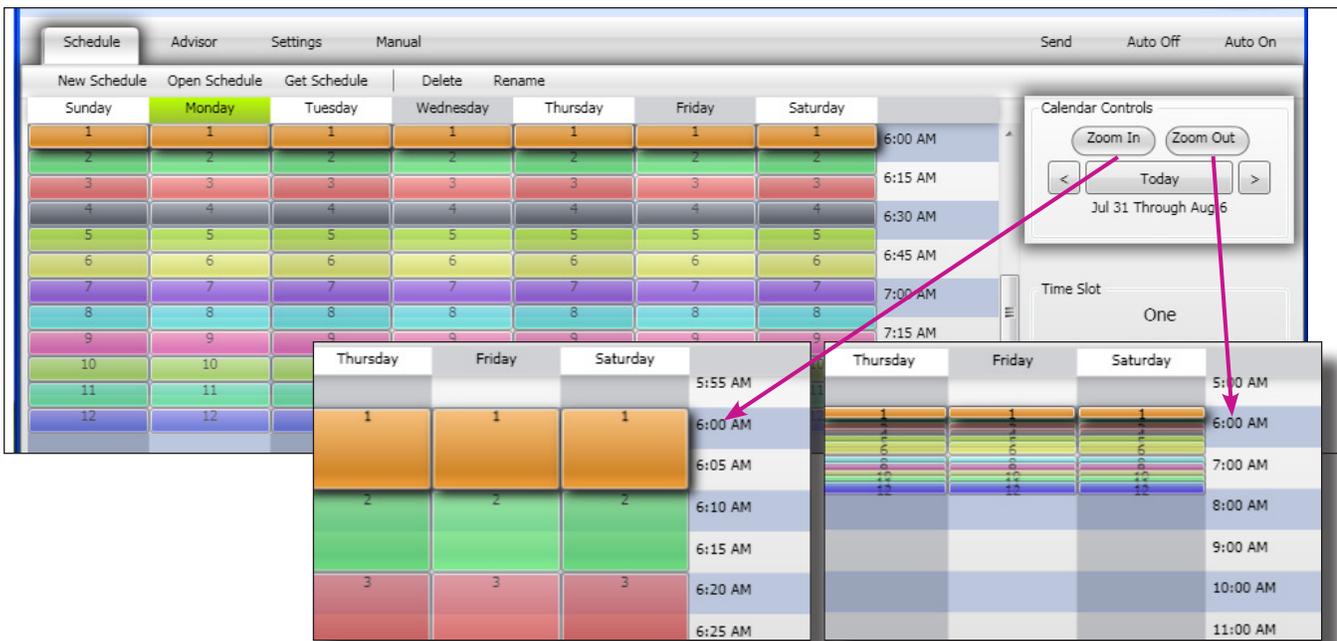
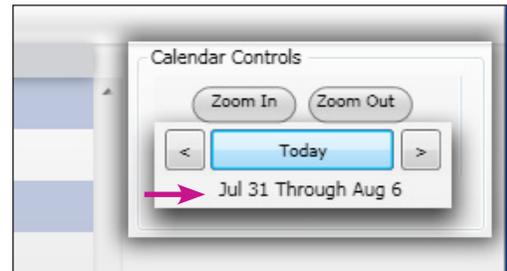


Figure 2.2

Weekly Calendar View

By default, the 7-day schedule will coincide with the current date, verified by calendar dates displayed below the **Today** button. The right and left arrow buttons are provided to shift the schedule view forward and backward through the calendar in 1-week increments. Selecting the **Today** button resets the Schedule Viewer back to the current calendar week.



The Time Slot Editor

The zone Start Time and Run Time Duration can be configured directly within the Schedule Viewer, or by selecting the desired values in the zone Time Slot editor.

To change a zone start time directly in the Schedule Viewer, place the cursor over the desired zone segment to highlight, then click and drag the segment to the desired start time (Figure 2.3).

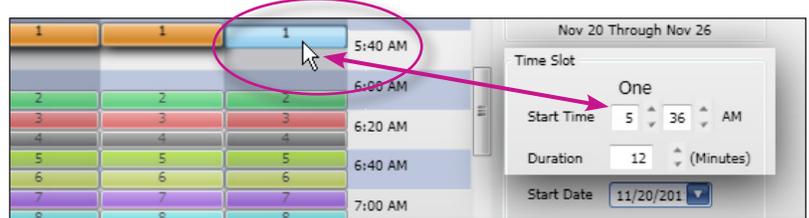


Figure 2.3

To adjust the run time duration, place the cursor on the bottom edge of the segment, then Click and drag to adjust the run time duration, (1–1400 minutes) (Figure 2.4).

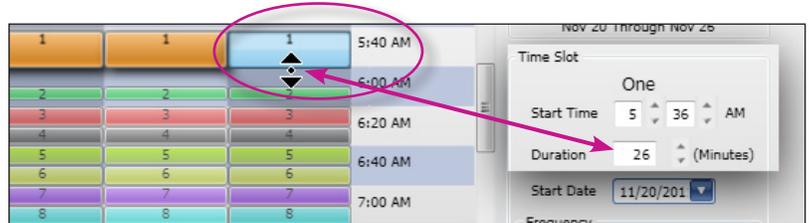


Figure 2.4

To apply additional start times to a zone, press the **Add** button (Figure 2.5). Each zone can have a maximum of 10 start times. Remove a highlighted start time by selecting the **Delete** button.

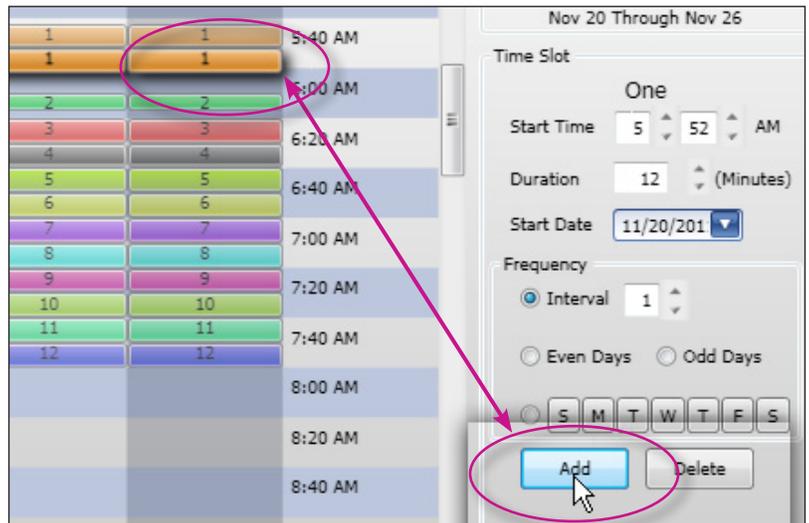


Figure 2.5

Note: By default, zone operation is limited to one zone operating at any given time. An *Overlap Limit* preference on the Settings panel enables up to two additional watering zones to operate simultaneously.

See *Site Settings Panel*, p. 11, for complete information.

Operating Day Schedule

The Operating Day schedule (Figure 2.6) determines which days a zone will be active. When the default schedule is selected, all zones are scheduled to operate every day of the week, (based on a 1-day Interval schedule). Each zone operates independently and can be assigned to any one of the following scheduling options:

- **Interval Schedule** – A skip-day frequency, ranging from 1–31; where 1 equals every day, 2 equals every-other-day, etc., up to one day every 31 days.
- **Even- or Odd-Date Schedule** – Schedules all even or odd calendar dates as active watering days.
- **Weekday Schedule** – Schedules operation by days of the week.

Note: Each zone can have only one operating day schedule. All start times assigned to a zone are assigned to the same operating day schedule.

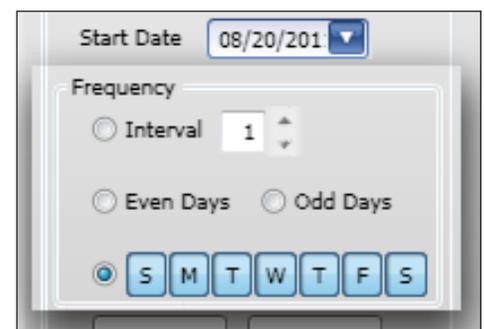


Figure 2.6

The Interval Schedule

To set an Interval schedule, highlight the zone by clicking on a segment bar, or on the corresponding Zone Button. Select the Interval option in the Time Slot editor. Use the up/down arrow scroll box to select the preferred frequency (1–31) (Figure 2.7). Note the arrangement of the zone segment bars in the Schedule Viewer as the Interval frequency is changed.

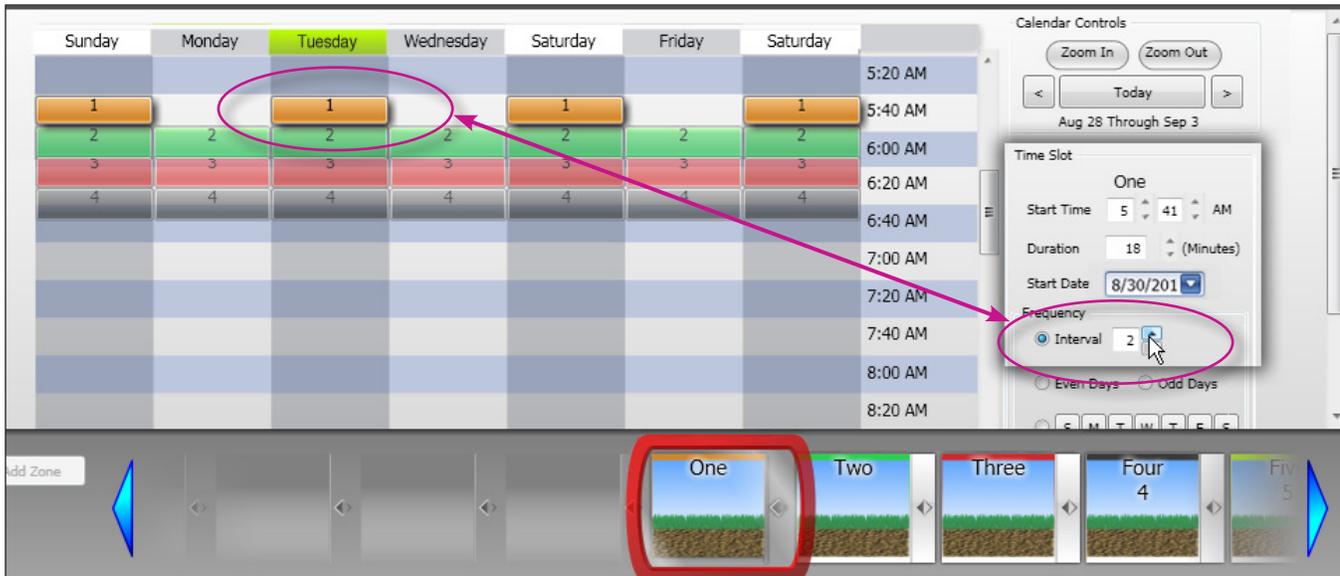


Figure 2.7

To select an alternate Interval start day, click on the blue down-arrow box to display the drop-down calendar. The current Interval start date will be highlighted in dark blue. Click on the preferred start date.

The new start date will be highlighted in dark blue and the original start date will be highlighted in light blue (after the calendar window is closed and reopened). Note the placement of the zone segment bars as the Interval start date is changed. As shown in the screenshot (Figure 2.8) the start date of the 2-day Interval has been changed from Tuesday to Wednesday (Figure 2.9).

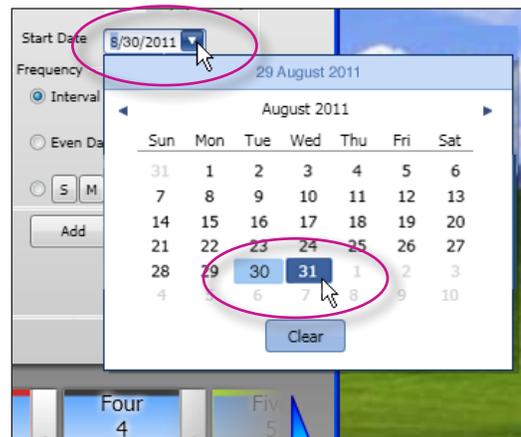


Figure 2.8

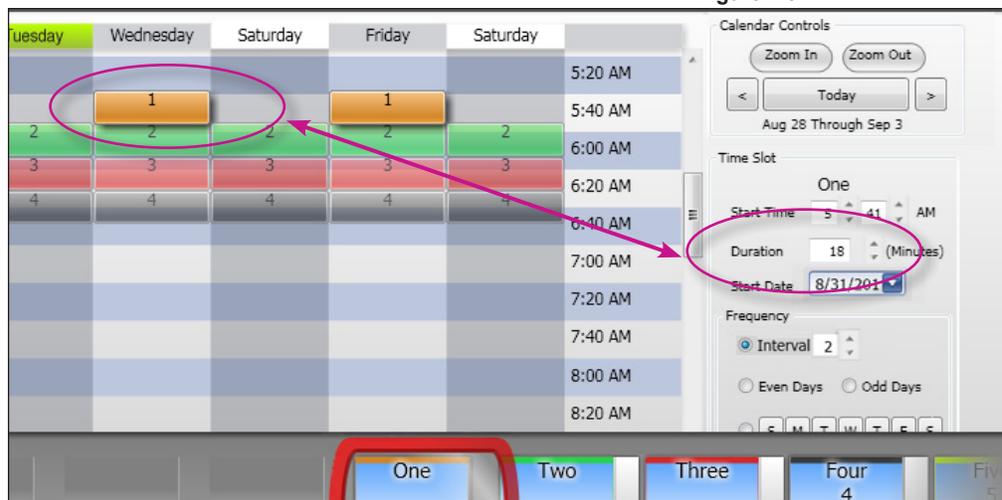


Figure 2.9

The Even or Odd Date Schedule

Setting an Even- or Odd-date schedule is done in the same manner as setting an Interval schedule. Simply select the corresponding button to choose the frequency schedule (Figure 2.10).

Note that in this Odd-day schedule, Wednesday and Thursday will be active. This circumstance will occur at the end of all months with 31 days.

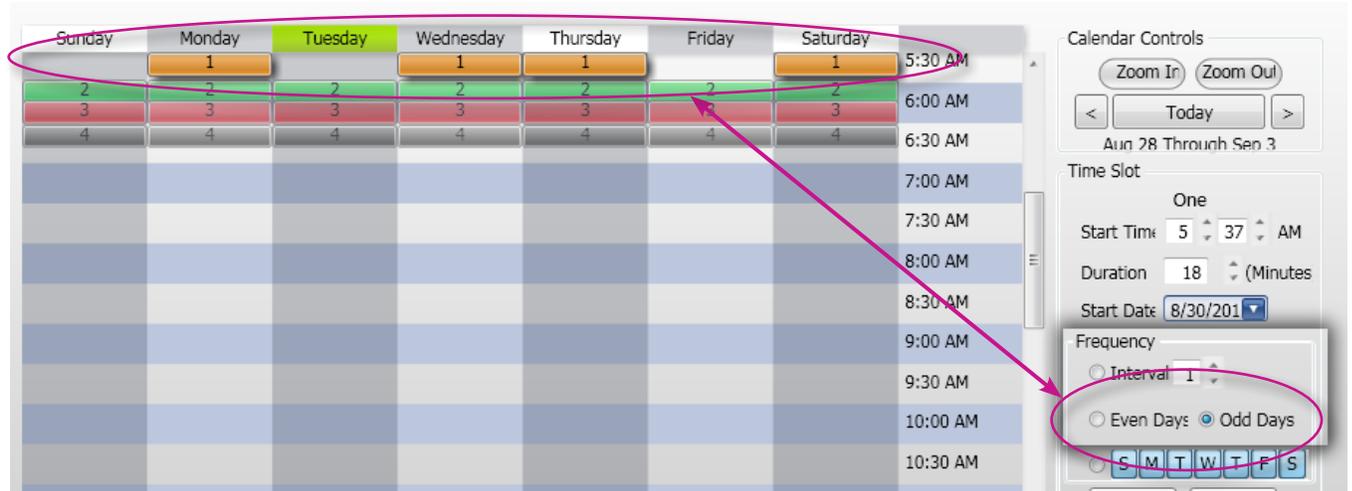


Figure 2.10

The Weekday Schedule

The Weekday schedule enables any day of the week to be selected as active. When initially selected with the weekday button, all days are active. Click on the days of the week to remove them from the schedule.

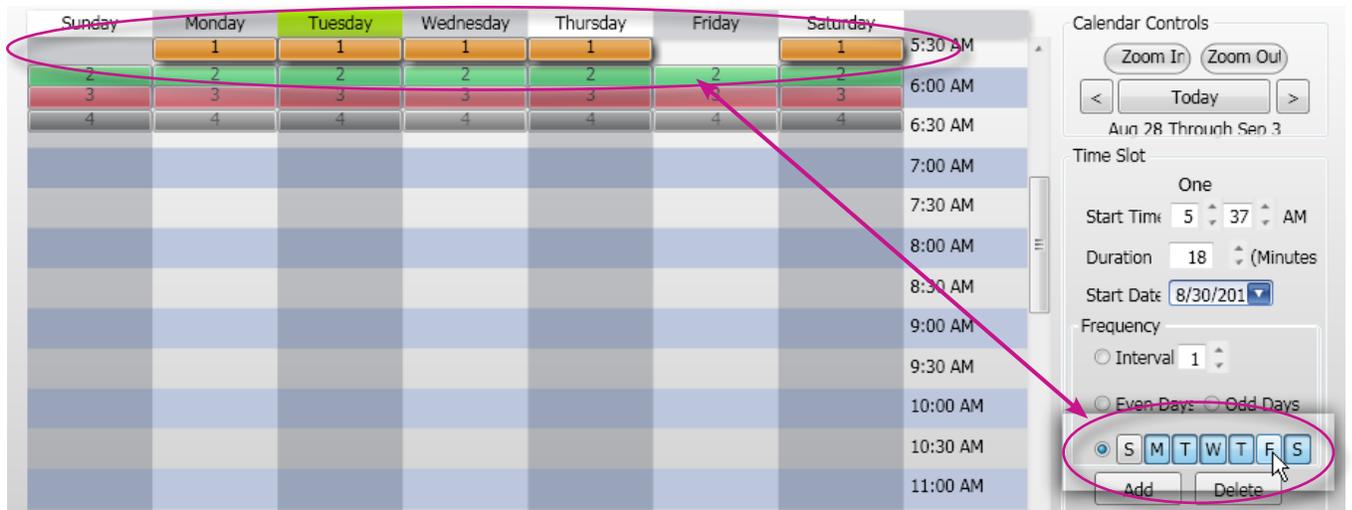


Figure 2.11

In the example above, a Weekday schedule has been selected for Zone 1 with Sunday and Friday as non-operating days (Figure 2.11).

The Zone Buttons

The individual **Zone Buttons**, located in the tray below the Schedule Viewer, are linked to the corresponding Zone Schedule bar segments. In addition, the zone configuration properties are accessed through the Zone Button pop-up menus.

A zone must first be selected to enable it to be edited. Clicking on a Zone Segment or the corresponding Zone Button will position the Zone Button into the Edit Frame. If a Zone Button is not visible in the tray, clicking on the left or right blue arrow buttons will scroll the Zone Buttons into view. (Figure 2.12)

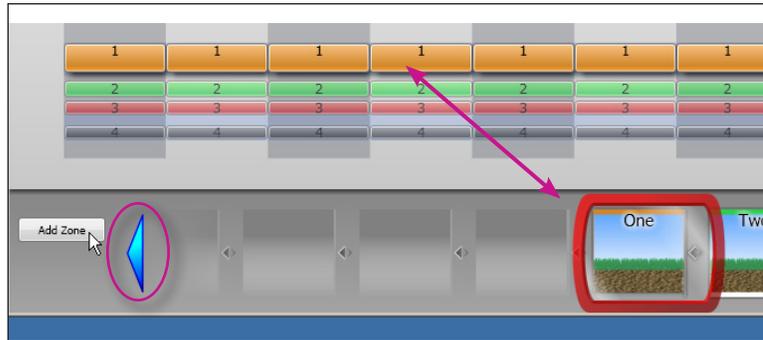


Figure 2.12

Adding Zones

Each site can schedule up to 12 zones. If the site currently has less than 12 zones, selecting the **Add Zone** button will open the Add New Zone dialog box (Figure 2.13). All of the basic zone setup properties can be applied to the new zone through the dialog box.

The next zone in numeric sequence will be added.

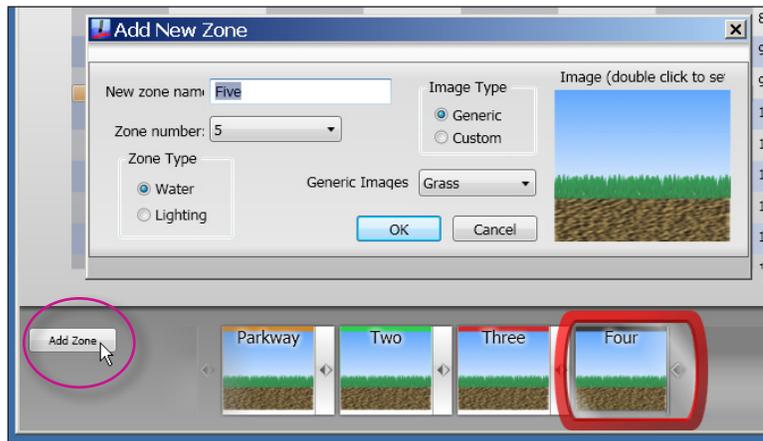


Figure 2.13

The default zone setup properties can be changed as desired, including the zone name, number, type (Water or Lighting) and the Zone Box image (Figure 2.14).

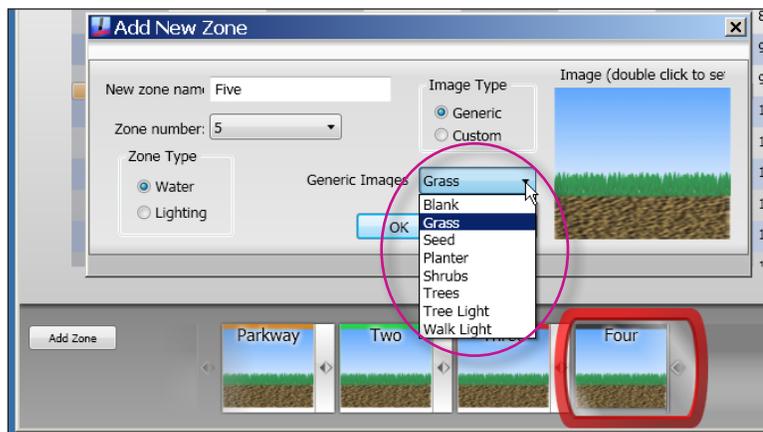


Figure 2.14

Click OK and the new zone will be added to the Zone Box tray (Figure 2.15).

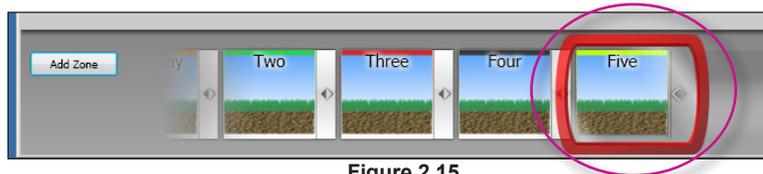


Figure 2.15

Note: Refer to *Time Slot Editor* on page 2 to add a zone start time.

Selecting Water Zone Properties

The Zone Properties configuration menu is accessed by double-clicking the preferred Zone Box. A specific set of properties is provided for watering and lighting applications. By default, the zone property menu for watering application will be displayed (Figure 2.16).

(1) **Type** – All zones are designated for irrigation by default. To designate the zone for landscape lighting, select the **Light** button in the Type option box.

Note: For additional Lighting zone setup options, continue at “Selecting Lighting Zone Properties” on the following page.

(2) **Zone Number** – Enables the default zone number to be reassigned to any currently unused zone number. The drop down menu will list all currently available zone numbers.

Note: The default zone numbers correspond to the station output terminals in the controller regardless of Zone Box content.

(3) **Name** – Enables the zone to be labeled as preferred.

Note: Changes in the Zone Properties menu will not be reflected in the program until the **OK** button has been selected.

(4) **Master Valve / Rain Sensor** – Enable / disable the Master Valve / Pump circuit and/or Rain Sensor for the zone as preferred.

(5) **No-Watering Days** – Enables zone operation to be restricted on specific days of the week. The restricted days will be represented in the Schedule Viewer with a striped segment (Figure 2.17).

(6) **Seasonal Adjustment** – Changes the individual zone run time duration (as indicated in the Schedule Viewer) by a percentage value ranging from 100% (unadjusted value) up to 200%, or down to 10% in 5% increments.

(7) **Change Image** – Enables the Zone Button background image to be changed as desired. An alternate image can be selected from the drop-down menu, or imported directly from your computer by selecting the Custom option (Figure 2.18). The “My Pictures” folder opens when the **Custom** button is clicked.

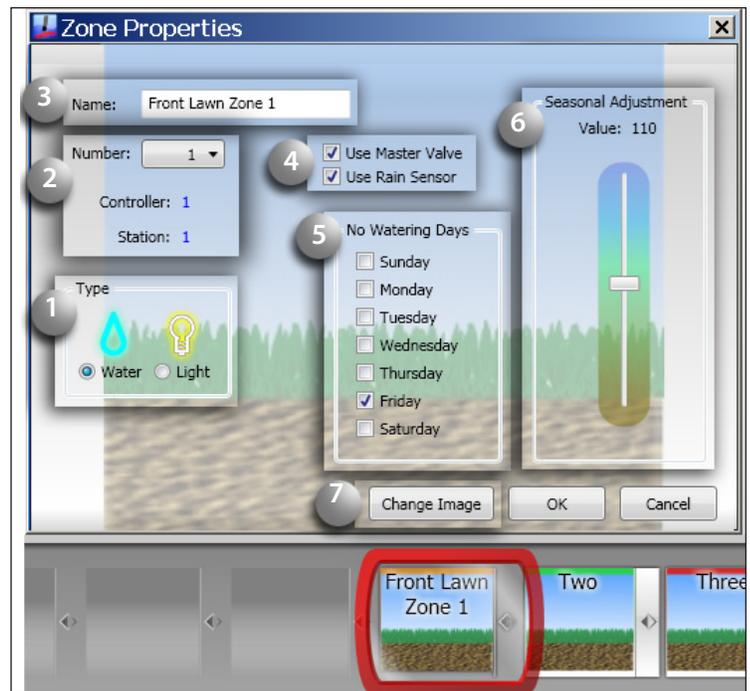


Figure 2.16



Figure 2.17

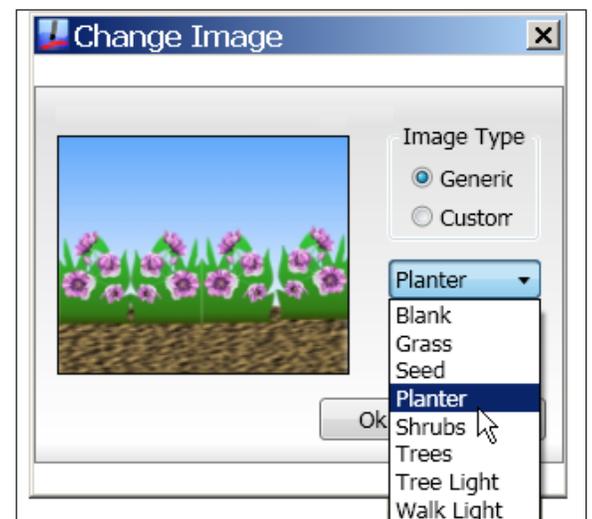


Figure 2.18

Selecting Lighting Zone Properties

The Zone Properties configuration menu is accessed by double-clicking the preferred Zone Box. A specific set of properties is provided for watering and lighting applications. By default the zone property menu for watering application will be displayed (Figure 2.19).

(1) **Type** – To designate the zone for a lighting, select the **Light** button in the Type option box.

(2) **Zone Number** – Enables the default zone number to be reassigned to any currently unused zone number. The drop down menu will list all currently available zone numbers.

(3) **Name** – Enables the zone name label to be changed as preferred.

Note: Local ZIP code must be entered in the Advisor Panel to enable the Sunset/Sunrise lighting zone option. See “The Scheduling Advisor Panel” on page 9 for details.

(4) **Use Sunset Time to Start** – Select this option to automatically begin lighting zone operation at sunset (based on local ZIP code).

(5) **End Time** – Select the **Use Sunrise** button to automatically end lighting zone operation at sunrise. Select the Custom button to enter a preferred end time.

(6) **Change Image** – Enables the Zone Button background image to be changed as desired. An optional image can be selected from the drop-down menu (Figure 2.20), or imported directly from your computer (“My Pictures” folder) by selecting the Custom option. Simply double-click the desired image from “My Pictures” and click “OK” twice.

Note: The following image file formats can be imported: jpg, jpeg, png, bmp, and gif.

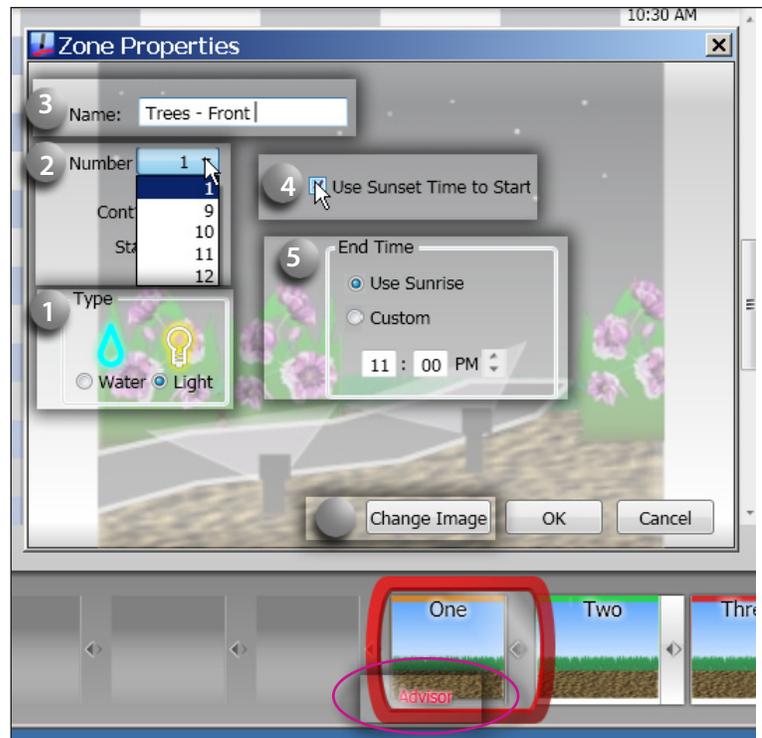


Figure 2.19



Figure 2.20

Zone Control Options

The Zone Control Options menu is accessed by clicking on the gray bar, located on the right side of the Zone button.

The Zone Control Options menu provides an alternate selection path to access specific zone property options. Additional Zone Control options provided on this menu included: **Disable Zone**, **Remove Zone**, **Run Zone**, and **Display Zone Start Times** (Figure 2.21).

Disable Zone: Select this option to disable the zone from operation. Toggles the zone off and on as needed, without deleting the zone setup. The corresponding zone segment will be grayed out and the control frame labeled non-operation as illustrated at right.

Note: The Zone Properties menu is only accessible through the Zone Control Options menu when the zone is in the disabled mode.

Remove Zone: Removes the Zone Button and all information for the zone from the Schedule.

Important: When a zone is removed from the schedule, it can be added back in, but will be last in the Zone Button tray.

Run Zone: Enables the zone to be operated manually for a selected or specified run time duration (Figure 2.22).

Note: Once the zone has been started manually, it can run to completion or can be terminated at any time by selecting Auto Off>Auto On or Manual>Stop.

Display Zone Start Times: Provides an overview of the current start time assignments for the selected zone. To edit a start time, click the start time to highlight, select Edit to display the Zone Start Time edit box. Enter the preferred start time and click **OK** (Figure 2.23).

Important: Zones assigned to the Scheduling Advisor cannot be edited under "Display Zone Start Times".

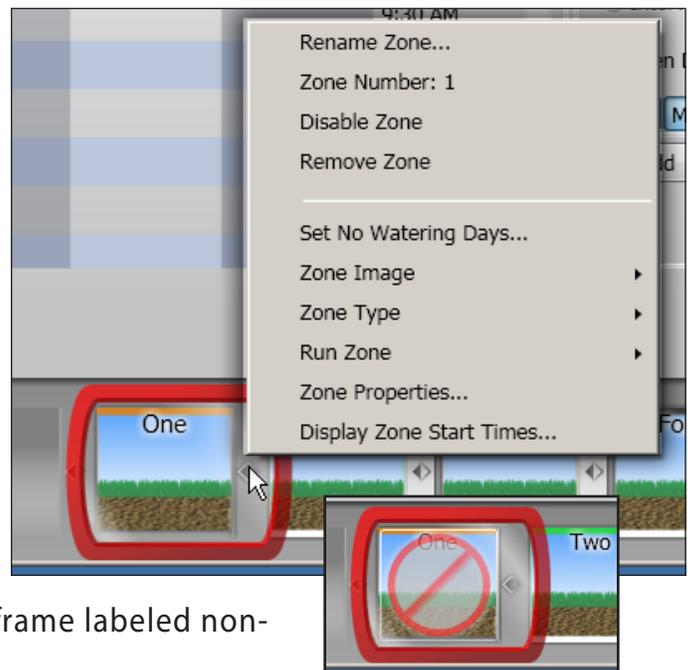


Figure 2.21

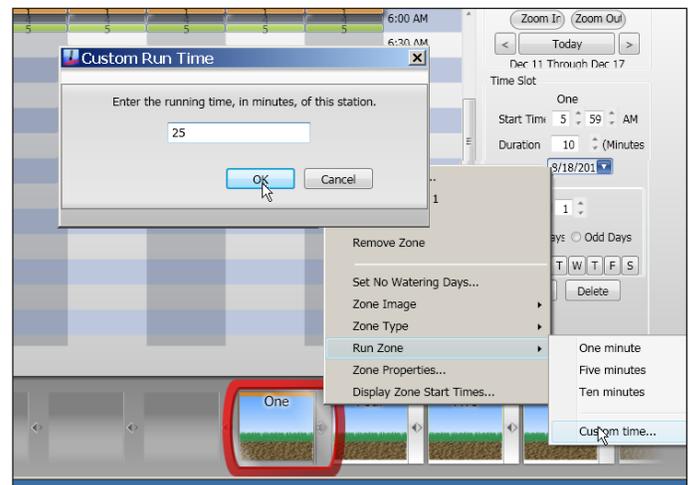


Figure 2.22

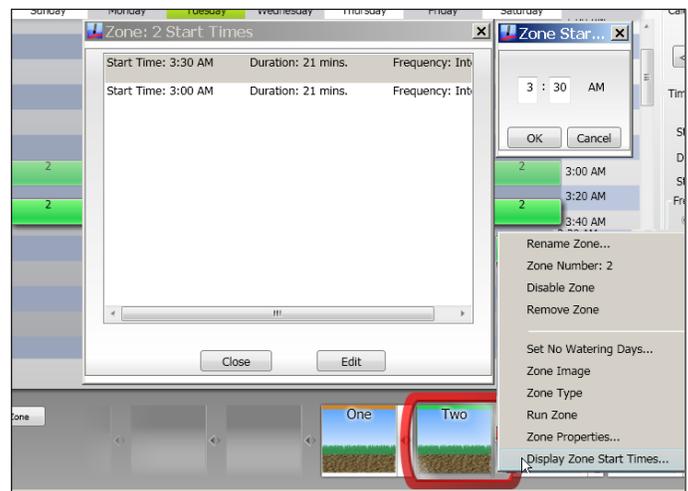


Figure 2.23

The Scheduling Advisor™ Panel

The Scheduling Advisor is a powerful setup tool that automatically creates an effective watering schedule based on specific sprinkler system and landscape parameters, in addition to local weather factors retrieved from the internet.

The upper half of the Advisor panel provides convenient drop-down menus to select five specific watering zone properties. Located to the right of the menus is the Advisor ET Adjustment slider, and Earliest Advisor Start Time setting (Figure 2.24).

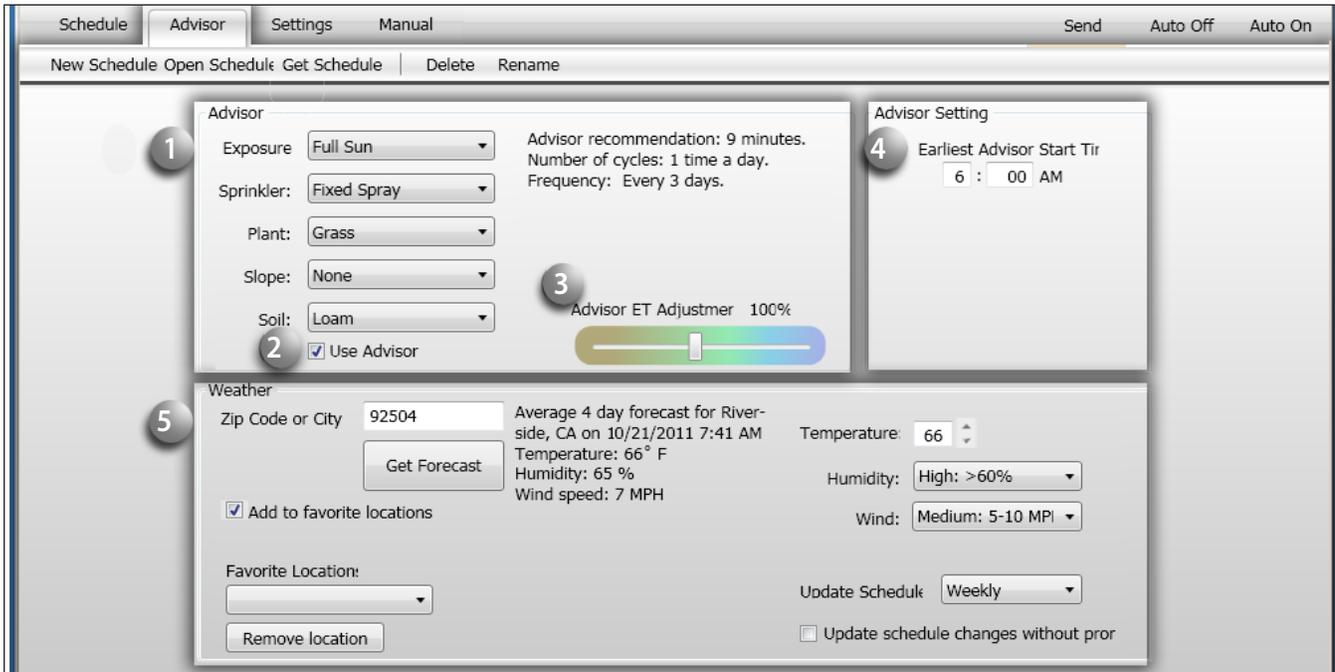


Figure 2.24

(1) Select the appropriate Advisor setting for each of the following characteristics:

- **Sun Exposure** – Full Sun, Part Sun, Part Shade, Full Shade or Custom (by % of exposure)
- **Sprinkler Type** – Single-Stream Rotor, Multiple-Stream Rotor, Fixed Spray, Drip, Bubbler, Microspray, or Custom (by precipitation rate).
- **Plant Type** – Grass, Planter, Shrubs, Trees, or Custom (by plant root depth)
- **Ground Slope** – None, Low, Medium, or High
- **Soil Type** – Sand, Loam, or Clay

(2) Use Advisor check box must be selected to apply the Advisor-defined zone schedule.

(3) **Advisor ET Adjustment:** Use the adjustment slider to increase/decrease overall watering application rate of an Advisor-based schedule.

(4) **Earliest Advisor Start Time:** Restricts the Advisor from scheduling a watering operation before a specified time of day. By default, the earliest start time is set at 6:00 a.m.

(5) **Weather** – The specific weather information required by the Scheduling Advisor is entered in the lower half of the panel. The local **ZIP Code or City** name is entered, and the current weather information is retrieved by selecting the **Get Forecast** button. If multiple site locations are to be used, select the **Add to Favorite Locations** option. The selected locations will be retained in the **Favorite Locations** drop-down list, and can be reinstated or removed as preferred. The **Update Schedule** option enables the watering schedule to be automatically updated via the internet on a daily, weekly, monthly or seasonal basis, with or without prior notification. Click the “Get Forecast” button at the time of day you want the system to retrieve the weather data from then on (set for a time of day that your computer is usually on).

Advisor-Based Schedule

The watering schedule created by the Advisor is described on the Advisor panel and depicted in the Schedule Viewer (Figure 2.25).

The image shows the 'Advisor' configuration panel with the following settings:

- Exposure: Full Sun
- Sprinkler: Fixed Spray
- Plant: Grass
- Slope: None
- Soil: Loam
- Use Advisor

Advisor recommendation: 9 minutes.
Number of cycles: 1 time a day.
Frequency: Every 3 days.

Advisor ET Adjustmer 100%

The Schedule Viewer shows a grid of watering events. A callout box states: "The Advisor for this zone is checked. If you wish to customize this zone please uncheck the Advisor first."

The zone selection area shows four zones: One, Two, Three, and Four. The 'One' zone button has an 'Advisor' icon in the bottom-left corner.

Figure 2.25

Note: The "Advisor" icon will be displayed in the lower corner of a Zone Button when the Scheduling Advisor is controlling the zone watering schedule. The **Use Advisor** option must be unchecked to remove or modify the Advisor-based zone schedule.

The Site Settings Panel

The Site Settings panel provides an array of control options specific to the site configuration (Figure 2.26).

Note: In order for any site configuration change to take effect, the **Apply** button and **Send** tab must be selected. You will be prompted to save the site change(s) during the **Send** process.

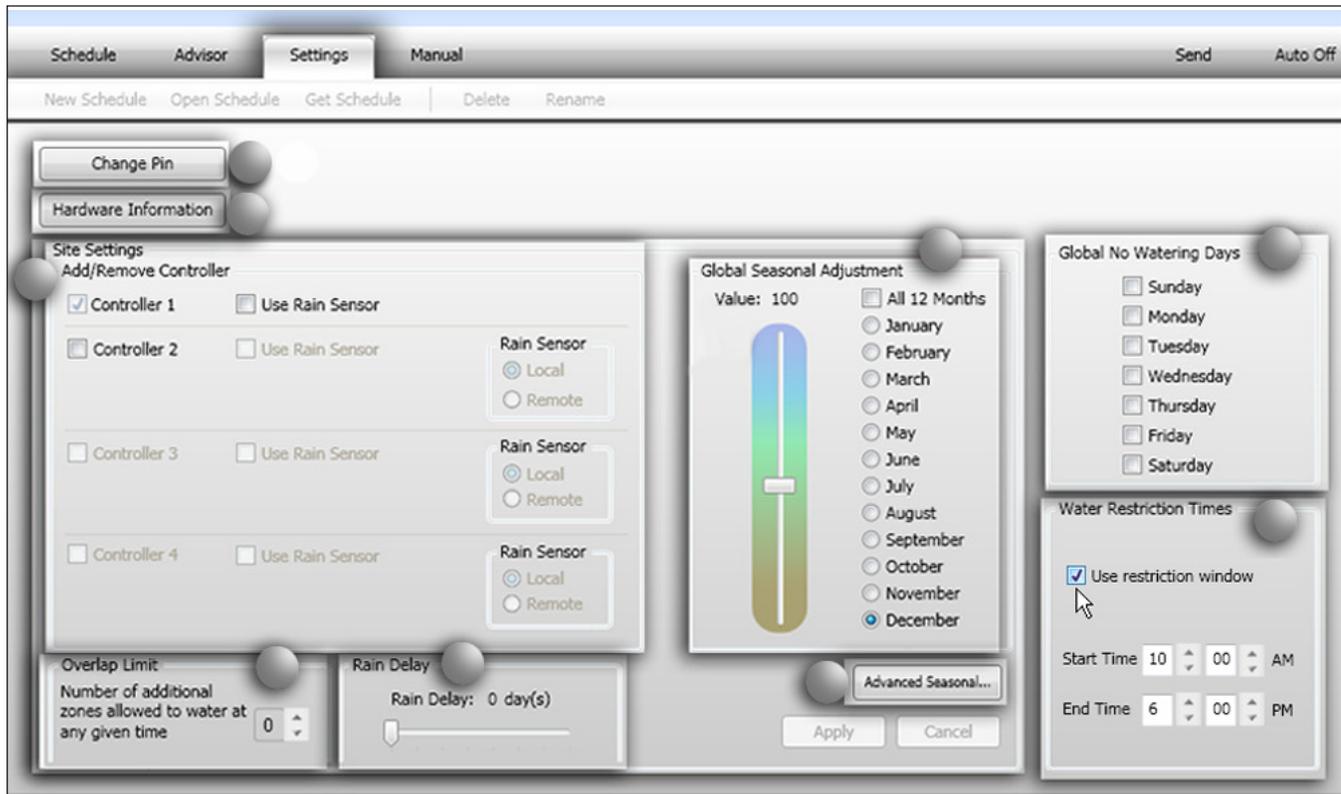


Figure 2.26

Selecting Site Configuration Options

(1) **Change PIN** – The current PIN code can be changed as preferred using the Change PIN option. The current PIN code assigned to the site will be indicated in the Change PIN dialog box when opened (Figure 2.27). Type in a different four-digit PIN and select either of the following **PIN Options** as preferred:

- **Remote and Controller:** (PINs must already match to use this option.) This is the most common selection when changing the PIN code. Choosing this option changes the PIN code in both the PC-Remote and the Controller – ensuring that communication between the components will not be lost.
- **Remote Only:** This selection changes the PIN code in the PC-Remote only, and is generally used by contractors when access to multiple PC-Control irrigation systems is required.

(2) **Hardware Information** – Click to review current controller hardware information including firmware and hardware version, model number and serial number.

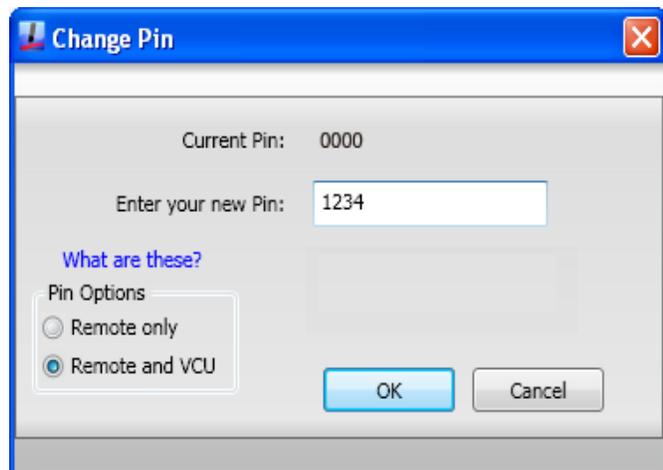


Figure 2.27

(3) Site Settings: Add/Remove Controller – Manage multiple controller operation and rain sensor input within this section of the Settings panel. A check box is provided to enable/disable up to four controllers per site. Each additional controller increases the displayed zone count in Controller 1 up to 12 zones, for a maximum a total of 48 zones.

• **Rain Sensor Options –** Also included in this panel section are the **Rain Sensor** configuration options. To utilize an auxiliary rain sensor with Controller 1, the **Use Rain Sensor** box must be selected and the rain sensor hardware must be connected to the controller.

Note: When the rain sensor option is selected, all zones will be assigned to the rain sensor control, as indicated by RS in the lower right corner of each Zone Box (Figure 2.28)



To isolate a zone from rain sensor operation, such as watering areas not exposed to rainfall, deselect the rain sensor option within the individual Zone Properties menu.

In systems where multiple controllers are utilized, the rain sensor connected to Controller 1 can be linked electronically to each additional controller by selecting the **Remote** option. If an additional controller has a dedicated rain sensor connection, select the **Local** option for that controller.

Note: The Rain Sensor option is selectable by zone within the Zone Properties menu, but must first be enabled in the Site Settings panel to become available within the individual zone setup menu.

Note: Some of the selections in the Settings panel must be saved and uploaded to the controller site to become effective. Selecting the **Apply** button followed by the **Save** and/or **Send** button is required each time a selection is made.



(4) Overlap Limit – By default, the controller is restricted to operate one zone at a time, regardless of the watering schedule. If the irrigation supply source is capable of providing sufficient capacity to operate more than one watering zone at a time, the **Overlap Limit** can be set to enable up to two additional zones to operate simultaneously. “0” equals no overlap, one zone at a time.

⚠ Caution: The maximum field output is 24 VAC, 0.4A per station, with a combined total not to exceed 1.0A (including a master valve or pump start relay and zones designated for lighting). Exceeding this limit will activate the controller’s automatic circuit breaker to restrict field output.

(5) Rain Delay – Automatic controller operation can be manually set to prevent watering from 1 to 7 days by moving the sliding pointer to the right. Automatic operation will resume at the end of the delay period, or can be reinstated at any time by moving the slider back to the left stop. (Not for use with a rain sensor.)

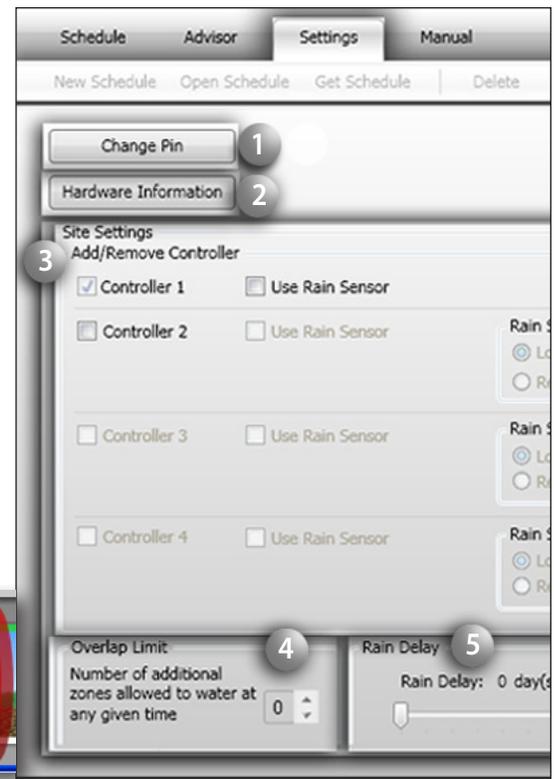


Figure 2.28

Note: The PCW Control program offers a variety of seasonal adjustment options that can be applied globally to the Site and/or Schedule and/or individually to each zone. The percent adjustment for seasonal changes are for systems not using Scheduling Advisor. Refer to **Appendix 2– Advanced Adjustment Features** for detailed information regarding Seasonal Adjustment options.

(6) Global Seasonal Adjustment is used to apply a seasonal adjustment % factor globally to any Schedule opened within the Site. A % adjustment value, ranging from 100% (unadjusted value) up to 200% or down to 10% in 5% increments, can be applied globally to all months of the year or to each month individually as preferred. For individual months, select the month's radio button, then adjust the slider to the % value as preferred. (Figure 2.29)

Each month selected will retain its corresponding adjustment % value after the selections have been applied, saved and sent to the controller.

Note: When the **All 12 Months** option is selected, the adjustment value will change to 10% (by default) for all months. Be sure to set the adjustment slider to the preferred % value.

(7) Advanced Seasonal Adjustments enable seasonal adjustment factors to be applied to specified controllers (in multiple-controller applications), to all zones or individual zones within a schedule.

Note: A seasonal % value adjustment applied to a zone within the **Zone Properties** configuration menu will be reflected in the **Advanced Season Adjust Settings** menu and vice-versa.

(8) Global No-Watering Days – Enables individual days of the week to be restricted from operation for any schedule opened within the site to comply with local water restrictions.

(9) Water Restriction Time – Enables a specific window of time to be established that will restrict all automatic watering operation. By selecting the **Use Restriction Window** option, the restriction window **Start Time** and **End Time** can be established.

Note: When setting the **Start Time** and **End Time**, make sure the appropriate **AM/PM** reference is displayed.

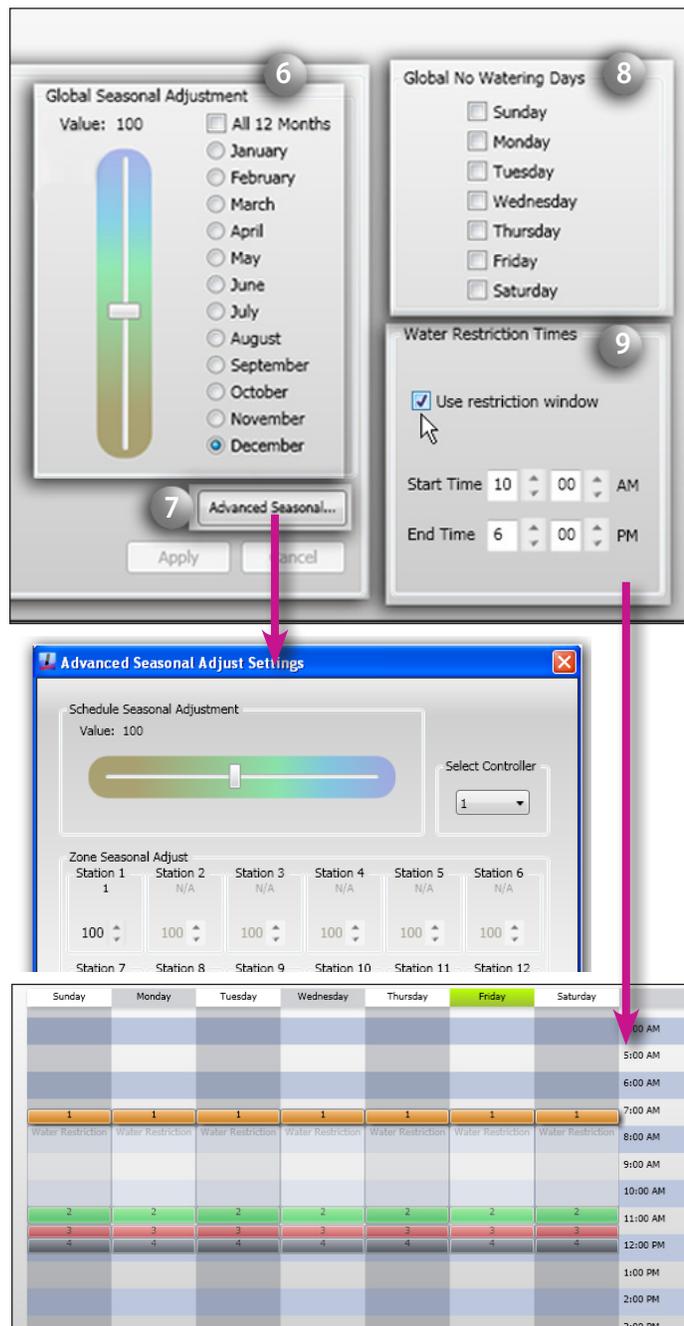


Figure 2.29

Manual Operations Panel

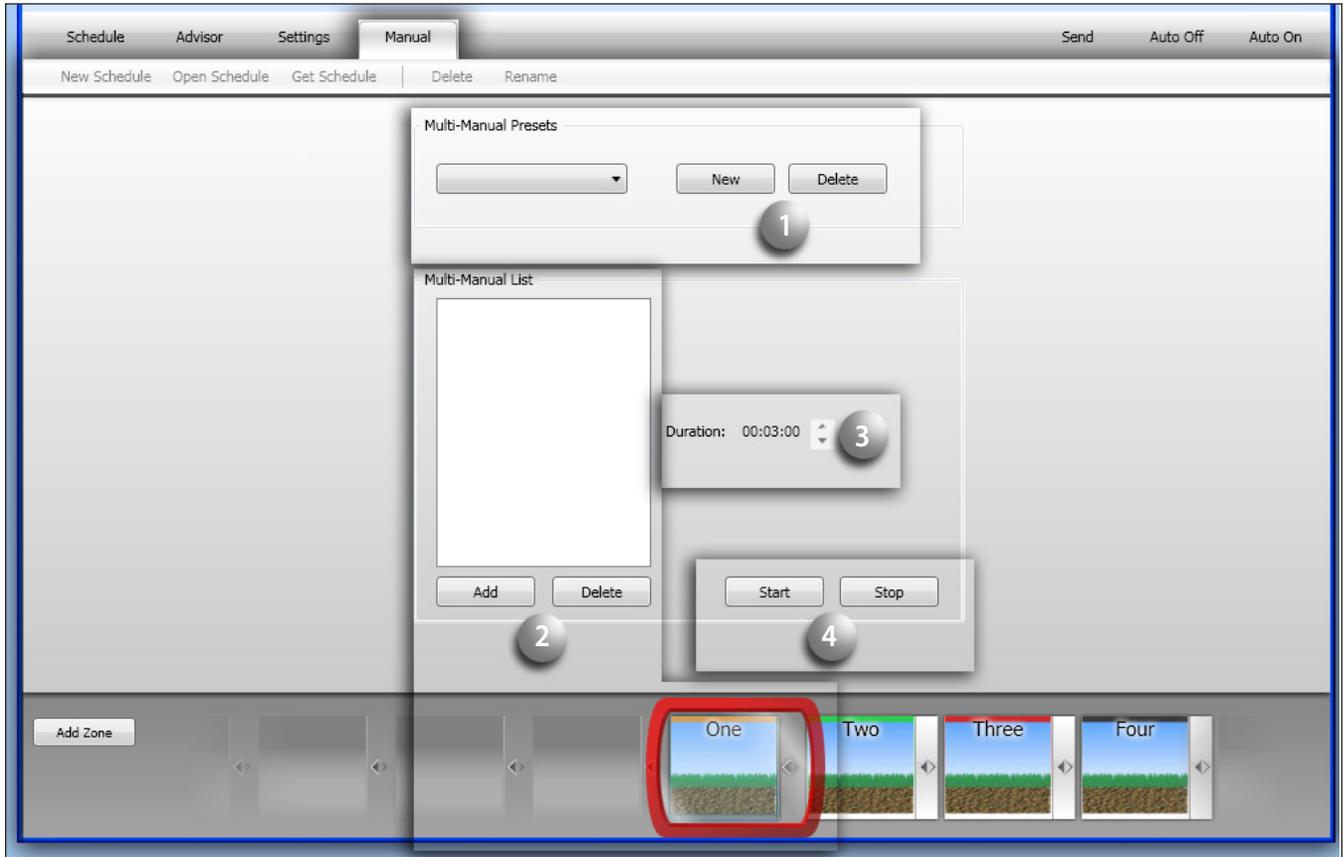


Figure 2.30

Multiple-zone manual watering programs are formatted and controlled in the Manual Operation Panel (Figure 2.30).

(1) Multi-Manual Presets – Preset manual watering programs that the user creates are listed by name in the drop-down menu for easy access and operation. The New and Delete buttons are used to add and delete preset programs as preferred.

(2) Multi-Manual Zone List – The Zone Button in the red Edit Frame will be added to the program list by selecting the Add button. The order in which Zones are added and listed determines the zone operating sequence.

(3) Duration – Each zone is assigned a manual run time duration of 1 minute by default, with an adjustment range of 1 minute to 99 hours.

(4) Start/Stop Buttons – The Start and Stop buttons are used to initiate the preset watering program. To terminate the watering program at any time prior to automatic time-out, press the Stop button.

Note: *The Stop button is also used to terminate a single zone manual watering operation initiated in the Zone Control Options menu.*

Multi-Zone Manual Program Setup

- Select the **New** button to open the **Manual Preset Name** dialog box (Figure 2.31).

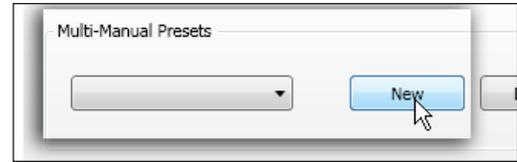


Figure 2.31

- Enter a program name, then click OK (Figure 2.32).



Figure 2.32

- The manual program name will be entered in the **Multi-Manual Presets** drop-down menu (Figure 2.33).

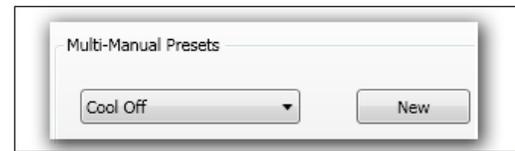


Figure 2.33

- Select the Zone Button followed by the Add button to format the manual watering program list. The zone order selected will be the order of operation during the watering program. Continue to add as many zones to the list as preferred (Figure 2.34).

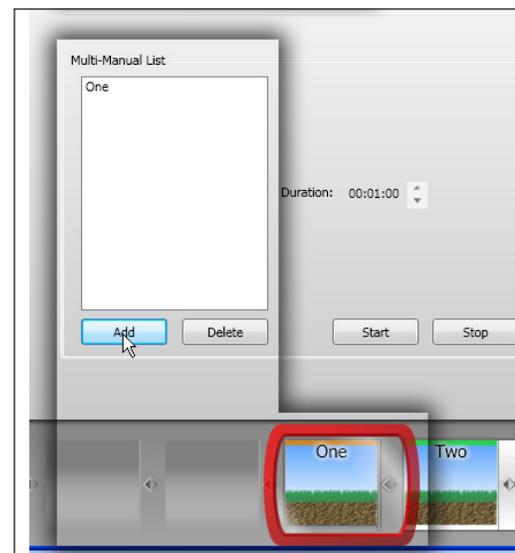


Figure 2.34

- Click on the zone number/name to highlight. Select the amount of zone run time using the scroll arrows. Repeat to assign a run time duration for each zone on the list (as required) (Figure 2.35)
- After setup, the manual program can be accessed by name at any time and started.

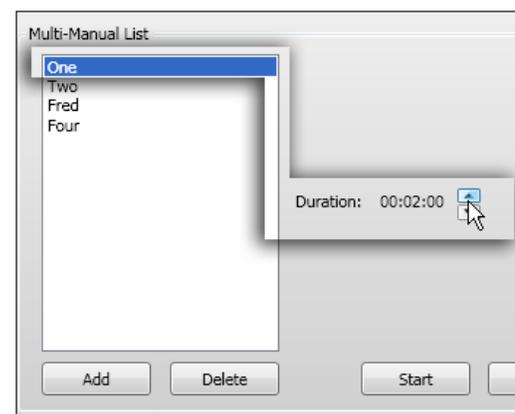


Figure 2.35

Chapter 3 – Hardware Features: PC-Remote and Controller Operations

The system's handheld remote (Figure 3.1) is the primary way to manually send commands to the irrigation controller. The remote has several uses and features.

1. When connected to the computer, the remote relays the schedule changes and manual commands, wirelessly, to the Controller.
2. When handheld and disconnected from the computer, the device can remotely perform the following:
 - a. Turn any zone or station ON or OFF (irrigation or lighting zones)
 - b. Turn the entire system to automatic mode or to system OFF mode
 - c. Turn on all landscape lighting zones (up to three zones maximum at a time)
 - d. Indicate Rain OFF mode because of a wet rain sensor (rain cloud icon)
 - e. Indicate signal strength with the antenna icon
 - f. To preserve battery life, the remote turns itself off after a few seconds of button inactivity (or just hold down STOP until "OFF" appears).

To use the remote, unplug the cord's USB mini-connector from the side of the handheld unit and reinsert the captive plug to help prevent water entry.

1. Wake up the remote by pressing any button for one second. All elements of the display will illuminate for a moment and the then "AUTO" should be displayed (if the controller it found with the same PIN is in automatic mode) or "OFF" for off mode.
2. Turn any station ON by selecting it with the UP or DOWN button and pressing START. Press STOP to stop the station. To advance or change from one running station or zone to start another, use the UP or DOWN arrow button to move from the current station and select a new station number. The previous station or zone will turn off and the selected station will start. Remote or Manual starts override a wet rain sensor and irrigate.
3. A remotely started station has a 10- minute default run time. To change the run, press the SHUTTLE button (arrows pointing both right and left) to start the "10 Min" blinking and then reset the time from 1 to 59 minutes (in 1-minute increments) or from 1 to 4 hours (in 0.1-hour increments). The operating countdown starts immediately for the selected station.
4. A lightning bolt icon in the display indicates a short circuit on one of the zones. The shorted zone light will be blinking on the front of the Controller. The cause of the short must be corrected, then run the station remotely or manually to clear the short indicator.
5. To turn on all landscape lighting zones (3 stations max.) wake the remote and let it find the controller and then press the light bulb button. The lighting zones will turn on for a default time of 1 hour or pressing the light bulb button again will shut them off.
6. To set the remote's PIN, wake the remote and then hold down the two, top buttons for 3 seconds simultaneously. Four digits will appear. Use the UP or DOWN arrow button to set the first digit in the PIN. Then use the shuttle button to move to the next digit to the right. Repeat the steps to set the rest of the 4-digit PIN. Then press START. When the remote finds the Controller with the same PIN, "PIN OK" will appear in the display, then "AUTO" or "OFF" depending upon the Controller's mode.



Figure 3.1

Chapter 4 – Remote Master Valve / Pump Start Feature

The Remote Master Valve / Pump Start Feature is only for systems with more than one controller.

A Master Valve (MV) is an automatic valve that shuts off the water supply pipe when the irrigation system is idle. The master valve reduces the chance of flooding from a zone valve that leaks or has failed while open. The controller turns on the MV when it turns on the first valve in a program and turns off the MV when the last valve has timed out.

A Pump Start circuit is a circuit designed to energize a Master Valve or to operate a pump start relay(24-volt AC). It allows a power source (120 VAC, 220 VAC, etc.) to connect to a pump motor. Like it does for a master valve, the controller switches the pump on with the first station and off again once the last valve closes.

For irrigation systems with one main supply line and multiple controllers, the Remote MV / Pump Start feature allows the other controllers to use the master valve / pump start circuit on Controller Number 1. This saves wire and trenching for multiple pump start circuits. In the system, each controller (2, 3, or 4) is provided the choice of using its own pump start circuit or that of controller #1. In the same way, if controller #1 has a rain sensor, clicking the “Remote” radio button in controller #2’s “Rain Sensor” box tells controller #2 to use controller #1’s rain sensor.

Below, the installer has set Controller #2 to use the master valve of Controller #1 and its rain sensor.

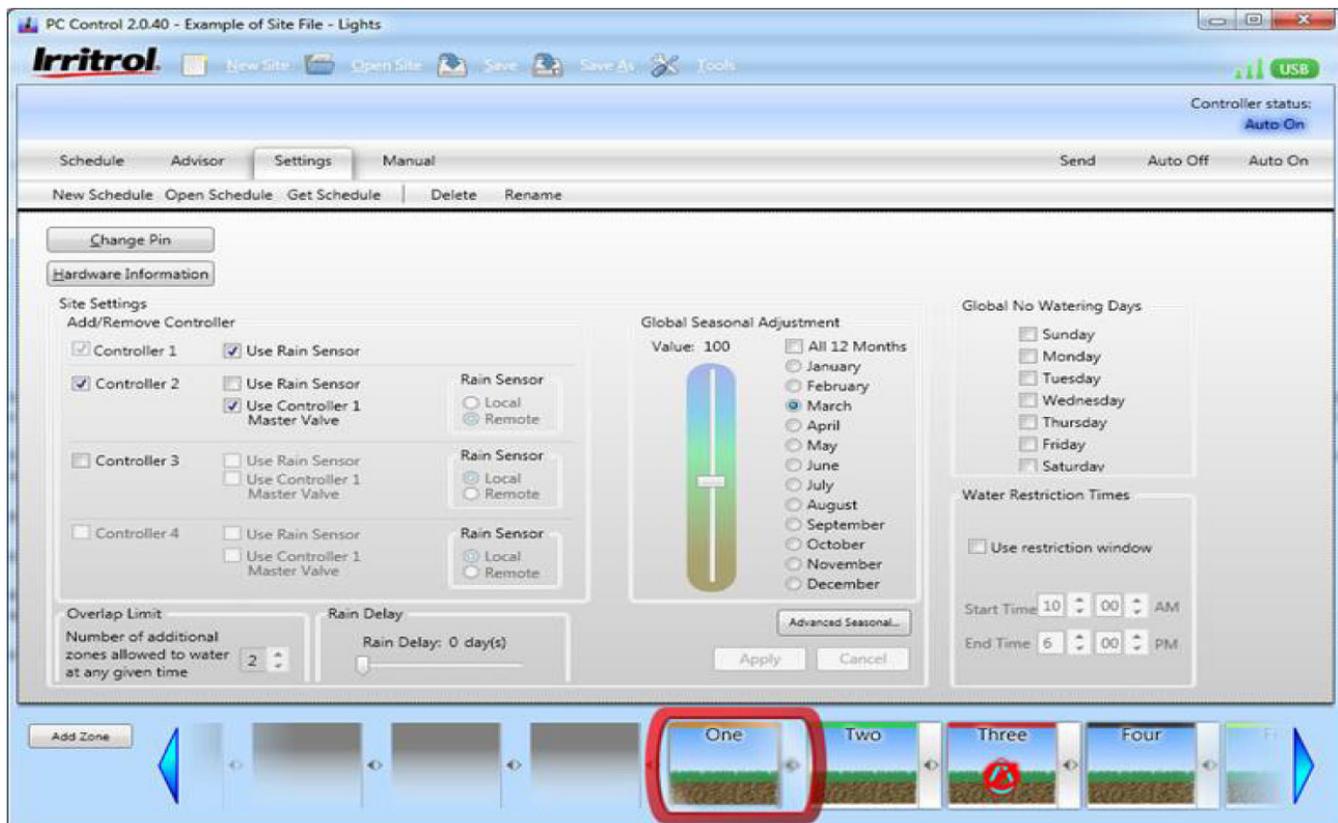


Figure 4.1

Appendix 1 – Frequently Asked Questions

Q: What is the Advisor™?

A: The Advisor is a unique PCW Control program feature that will automatically formulate a zone watering schedule based on specific parameters including, sun exposure, sprinkler type, plant type, terrain slope, and soil type. Observed weather factors, including, temperature, humidity and wind condition can be entered as well, or the local 9–10-day weather forecast, based on city name or ZIP code, is retrieved from weather.com and factored into the schedule. The formulated schedule is then transferred to the Schedule Viewer panel.

Q: What weather data is used by the Advisor?

A: This version of the PCW Control software accesses data from a proprietary weather service. You can choose to automatically update the weather data daily, weekly, monthly, seasonally, or never.

Q: Will the system shut off during rainfall?

A: The Controller is sensor-ready and compatible with most auxiliary rain or rain/freeze sensors. Irritrol rain sensors are recommended and are available in three models: RS1000 - wireless rain sensor, RFS1000 - wireless rain/freeze sensor, and RS500 - wired rain sensor. (Use of a sensor is recommended.)

Q: Can the system save water?

A: Yes, there are several ways the system can save water:

- The system can be shut down for the winter months from the convenience of your computer. (In freezing climates, this does not replace “winterizing” the system with compressed air blow-out.)
- The scheduling Advisor™ will save water by adjusting the irrigation schedule per weather conditions.
- An optimal rain sensor will shut off irrigation during a downpour.

Q: What PCW Control system components can be added or replaced?

A: The following PCW Control system components are available from your Irritrol distributor:

12-Station Indoor Controller w/Remote and Software	Model# PCW-12 INT-PAK
12-Station Add-on Indoor Controller	Model# PCW-12 ADD-INT
12-Station Outdoor Controller w/Remote and Software	Model# PCW-12 EXT-PAK
12-Station Add-on Outdoor Controller	Model# PCW-12 ADD-EXT
PC-Remote w/Stand, USB Cable and Software	Model# PCW-R

The following service parts are also available:

Kit, Service Panel, Lower	P/N 102-4973
Transformer, External, 115-120V, Outdoor Controller	P/N 102-4788
Transformer, Internal, 115-120V, Indoor Controller	P/N 363-4574
Kit, Service Door, Outdoor Controller	P/N 102-4974

Q: Can I access my PCW Control irrigation from work or while traveling?

A: You can use a remote-access application, such as, GoToMy PC® that enables you to access your home computer from any other Internet-connected computer. As long as the PC-Remote is connected to your home computer, you will have complete access to your PCW Control system.

Q: What's the best way to get technical support?

A: Contact Irritrol Customer Support by phone at 1-800-634-8873, weekdays 7:30 a.m.–4:00 p.m., PST, or via e-mail at: pccontrolsupport@irritrol.com. Visit the Irritrol Systems website at www.irritrol.com/pccontrol for product support information.

Q: Why does it matter if a zone is designated for water or lighting?

A: When a zone is designated for lighting control, the optional watering control features; such as, rain sensor, master valve/pump start, and scheduling Advisor options, are not factored into the zone operation. In addition, the PC- Remote handheld provides separate operating controls for watering and lighting zones.

Q: Do I set up a water feature as water zone or a lighting zone?

A: A fountain or water feature should be designated as a lighting zone, since the optional control features provided for irrigation would not be applicable. Make sure the controller station output is not connected directly to the water pump. A 24 VAC relay rated at 0.4A maximum must be used. The Irritrol SR-1 relay unit is designed for this type of application.

Q: How does the contractor change the homeowner's PIN? Does it require a PC or can it be done using just the remote?

A: To change the PIN, the contractor must know the old PIN and use his laptop with the PC remote to change the PIN.

Q: How do I know what software version I have?

A: The software version is shown in the top left corner of the program window. You can also access the system information by selecting **Tools>About** from the main menu.

Q: How do I know if I have the latest version of the software?

A: If you have registered your PCW Control system with Irritrol, you will receive a notice when an updated version of the software is available.

Q: How many schedules can you have in the program? If you're a contractor, how many customer schedules can you save?

A: Currently there is no limit on how many schedules you can have at one time.

Q: Can you schedule a "no" irrigation day?

A: Yes, you have the option to prevent watering on any days of the week. (See No-Watering Days on page 18.)

Q: What happens if you have overlapping zone schedules

A: An overlap option is provided in the **Settings** panel that will enable you to schedule up to three zones to run simultaneously. The default for this option is 0 overlap. Unless it is changed, a prompt will appear if you attempt to schedule two or more zones to run at the same time. The overlap option is generally used to allow lighting and irrigation zones to operate simultaneously.

Q: What is the maximum run time per station?

A: Each zone can be scheduled to run for 1 minute to 24 hours, in 1-minute increments.

Q: Does the controller supply power to the landscape lights?

A: No, the controller provides switching control for a 24 VAC relay with a maximum output of 0.4A per station. The Irritrol SR-1 relay unit is designed to operate a pump starter or outdoor lighting control box from an irrigation system controller.

Q: What if there is a power outage? Would everything still get watered?

A: The Controller will not operate the zones without 115/120 VAC. The “flash memory” in the Controller will retain the current operating schedule indefinitely in the absence of AC power. A fresh 9V battery will maintain the current time/date for 48 continuous hours. Therefore, it’s recommended to change the battery at least once a year—especially if the area is prone to frequent power outages. If the battery is dead (or is not installed), the Controller time/date will be synchronized when contacted by the PCW Control computer program.

Q: If my computer goes down, can I still use the remote?

A: The last schedule uploaded to the Controller will reside indefinitely in memory without being connected to the computer. The system can be operated manually at any time using the hand-held Remote when disconnected from the computer.

Q: What if there is a power surge?

A: The Controller has built-in surge protection designed to divert strong electrical surges to earth ground.

Q: How do I know if there are any electrical short circuits?

A: A built-in electronic circuit breaker will shut down any field output(s) when an over-current condition is detected – generally caused by a faulty valve solenoid or a shorted solenoid wire connection. The offending zone number(s) will be identified on the Controller with a flashing LED. The remaining zones will continue to operate as scheduled.

Q: Can my system be reprogrammed even if my PC is down?

A: If you have your PCW Control system PIN, a professional irrigation contractor equipped with a laptop PC, the remote, and the PCW Control program software can upload schedule changes to your control system.

Q: Can I transfer the PCW Control system setup to a new computer?

A: Yes. Install the software for the PCW Control system in your new computer, download your entire program from the older computer to a CD or thumb drive, and upload that program (on the CD or thumb drive) to the new computer. Use the current PIN to access your controller.

Q: How do I transfer my schedule information from an old computer to a new computer?

A: This is actually quite a lengthy process. See Appendix III for a detailed answer.

Q: I cannot change the PIN in my controller from my computer. The remote changed OK. What should I do?

A: Unless all components (PC, Remote, and Controller) have the same PIN, the PIN in the controller cannot be updated from the computer. (See the note at the end of Chapter 1.)

Q: Where do I find an electronic version of the User’s Guide?

A: Click “Tools” and select “Help Manual”.

Appendix 2 – Advanced Adjustment Features

There are multiple adjustment settings in the software.

- 1) **Seasonal Adjustment**, which can be individually set for each month (NOT if using Scheduling Advisor)
- 2) **Schedule Seasonal Adjustment**, which adjusts all station runtimes on the current schedule
- 2) **ET Adjustment**, which adjusts the ET value used in scheduling calculations
- 4) **Zone Seasonal Adjustment**, which adjusts the selected zone’s runtimes

This appendix will discuss each setting in detail.

Global Seasonal Adjustment

The Global Seasonal Adjustment (Figure A2.1) will adjust all runtimes in the system. The adjustment value is downloaded and stored in the controller. The adjustment values for each month are independent of the others. Once the calendar day rolls over to the next month the controller will automatically start using the current month’s seasonal adjustment value.

If you check the box “All 12 Months” the seasonal adjustment value will drop to 10% (minimum value) to reflect that the user wants to set all the months’ season adjustments. If you select an individual month then the adjustment value will reflect the current seasonal adjustment on that month.

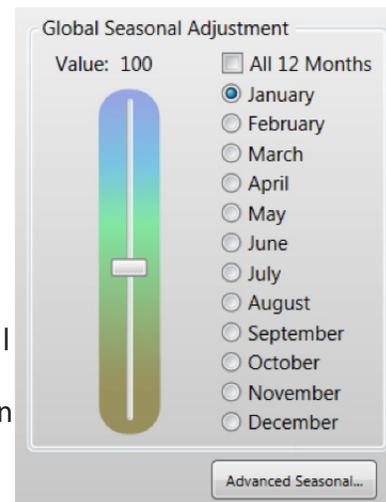


Figure A2.1

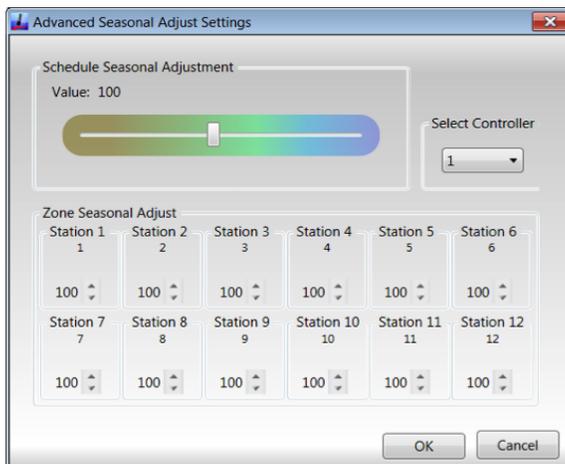


Figure 2

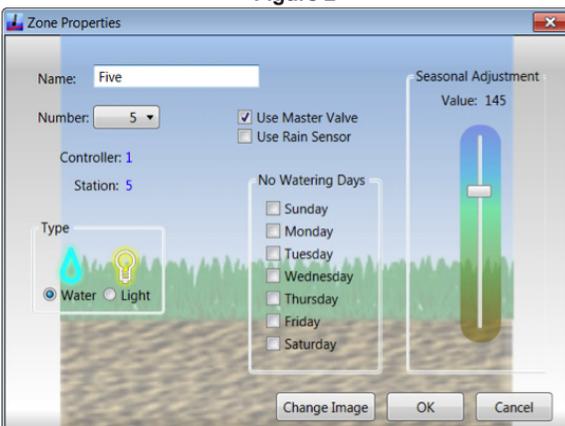


Figure A2.2

Schedule Seasonal Adjustments (Advanced Seasonal)

The Advanced Seasonal Adjust Settings allows the user to modify a whole schedule or specific stations.

The Schedule Seasonal Adjustment (Figure A2.2) affects all stations that have at least one event on the current schedule. The adjusted runtime is a simple multiplication of the percentage with respect to the station’s runtime.

The Zone Seasonal Adjust affects all events for the selected station. The adjusted runtime is a simple multiplication of the percentage with respect to the station’s runtime. The seasonal adjustment for each station can be accessed through the Zone Properties (Figure A2.3).

If there is more than one controller in the system, change the “Select Controller” option to display the selected controller’s stations.

ET Adjustment*

The Advisor ET Adjustment (Figure A2.3) allows the user to adjust the watering recommendations provided by the scheduling advisor. The ET adjustment is NOT a simple multiplication of the runtime. Instead, the adjustment changes the ET value used to create the watering suggestions so a change of 10% in the adjustment might reflect the advisor suggesting an increase of 20% to your runtime, not a 10% increase.

If the Global Seasonal Adjustment is not at 100% the Advisor will inform the user so that they can make more accurate decisions when adjusting the ET value.

*(NOT compatible with Scheduling Advisor)

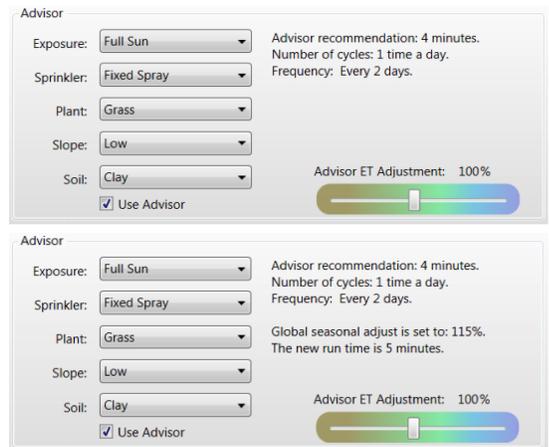


Figure A2.3

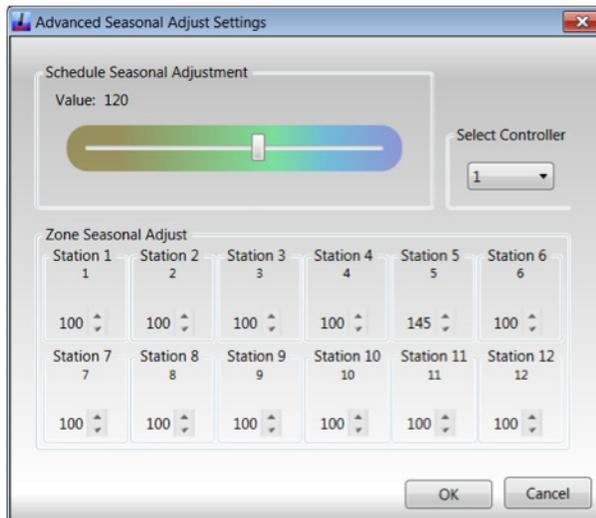


Figure A2.4

Working with Different Adjustments:

The user can affect the runtimes in various ways using the different adjustment settings. In the example below, each zone has a single watering event set to run for ten minutes, and the global seasonal adjustment set to 100%.

By changing the Schedule Seasonal Adjustment to 120% (Figure A2.4) the new runtimes for the stations are twelve minutes.

Notice, that zone five is set to 115% for the Zone Seasonal Adjustment. When viewing the schedule zone five has a runtime of seventeen minutes, whereas all the other stations have a twelve minute runtime (Figure A2.5). This is consistent with the multiple seasonal adjustments interacting with each other.

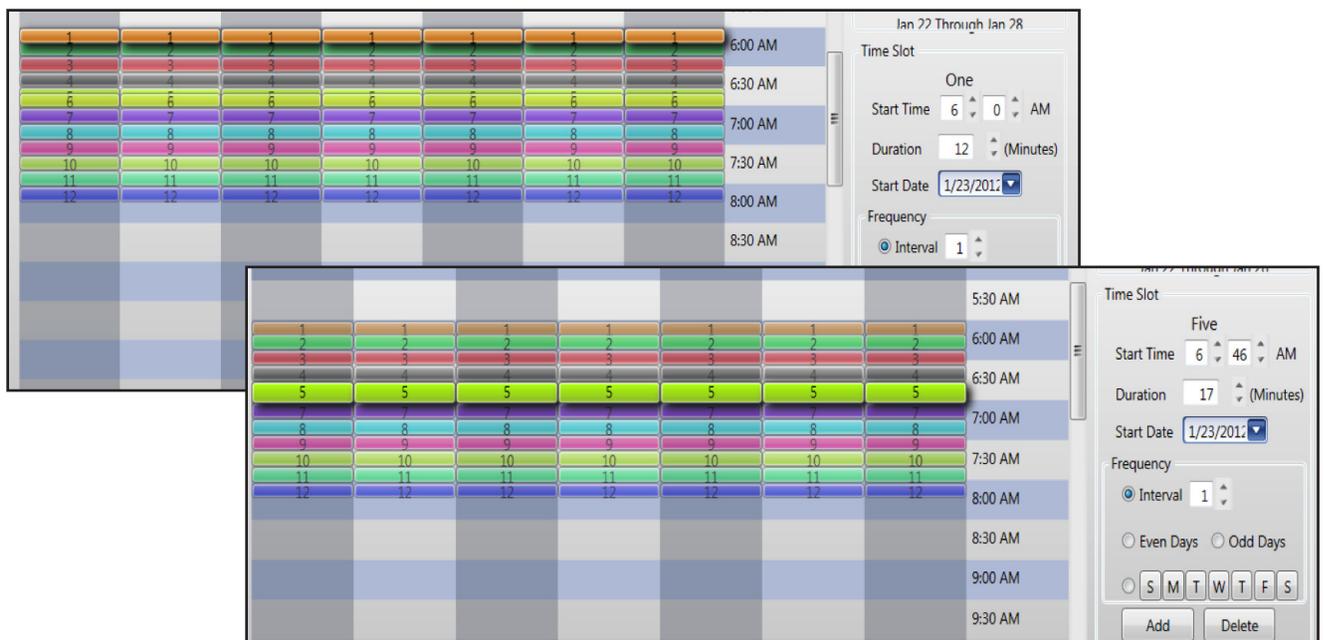


Figure A2.5

Appendix 3 – Transferring Irrigation Schedules

It is possible to transfer irrigation schedule files from one computer to another. Irrigation schedule files are XML files stored in a hidden folder on the hard drive of the host machine. If rights have not been set to view hidden files and folders, that is the first step. Below are directions for Windows 7.

1. Set up View options to view hidden files and folders.

- a. Double-click any folder icon to open a Windows 7 window.
- b. On the now visible window, click on the **Organize** button (top left) (Figure A3.1).
- c. Select "Folder and search options..."
- d. Click the **View** tab.
- e. In the Advanced Settings area, select "Show hidden files, folders, and drives" radio-button (Figure A3.2).
- f. Click **OK**.

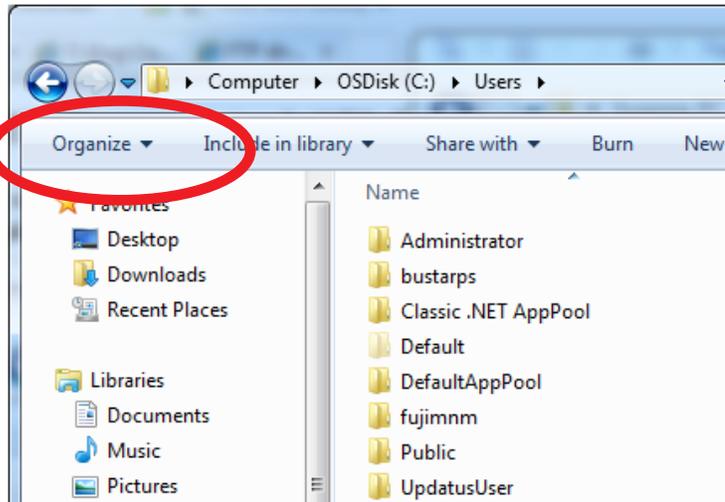


Figure A3.1

2. The default location for the XML file installation is **C:\Users\[login name]\AppData**. Navigate there.

If the AppData folder is not visible, go back to step 1.

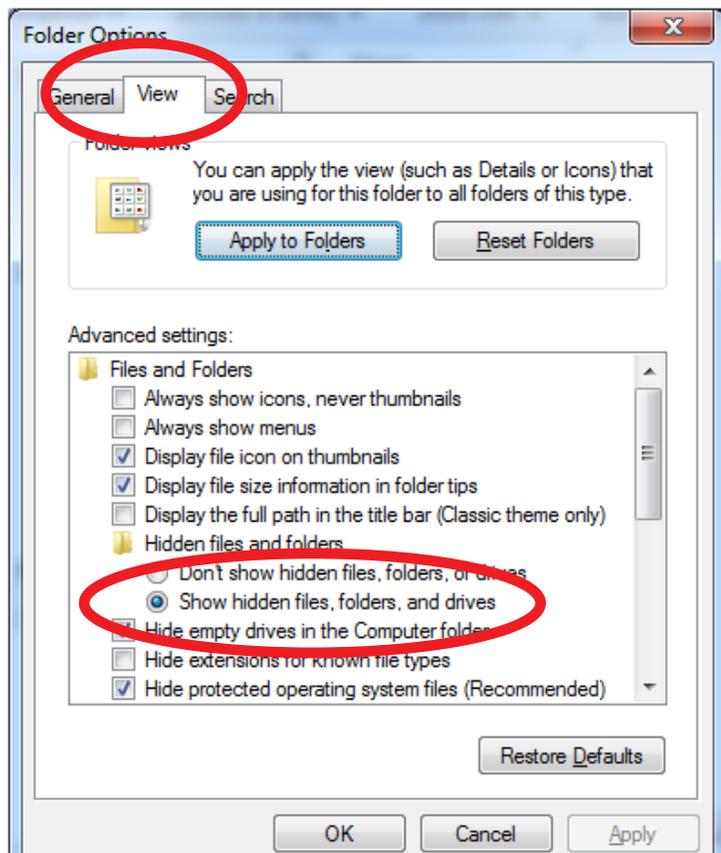


Figure A3.2

3. Double-click the **AppData** folder, then the **Roaming** folder, then the **Irritrol** folder.

There is the default irrigation schedule location.

4. Sweep all files in that window with your mouse (Figure A3.3), copy (Ctrl-C), then paste (Ctrl-V) them into a thumb drive window.

5. Put the thumb drive into the new computer.

6. Navigate to the same location on this computer. **C:\Users\[login name]\AppData\Roaming\Irritrol**.

If the AppData folder is not visible for this computer, follow Step 1 for this computer.

7. Paste all files from the thumb drive into this new window. "Copy and Replace" if prompted.

8. Launch the PCW Control software and click on "Open Site".

9. All files should be present and ready to use (Figure A3.4).

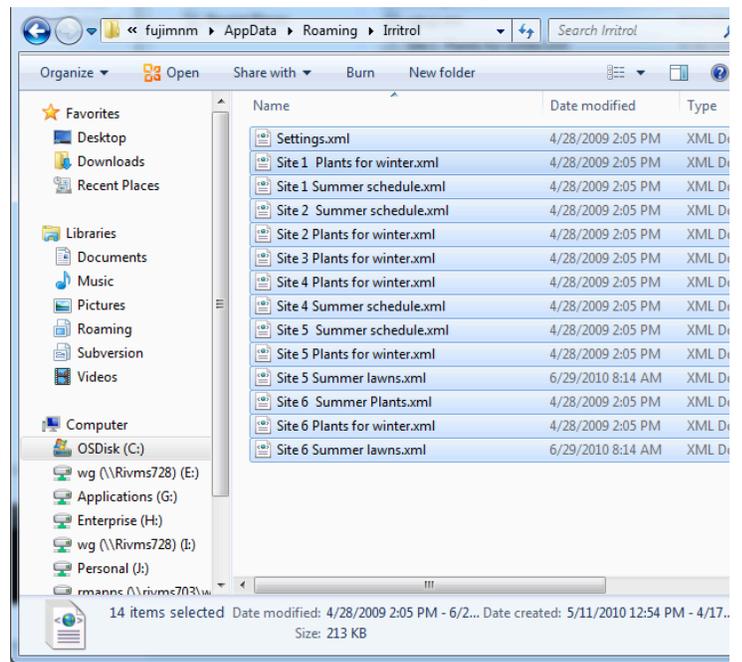


Figure A3.3

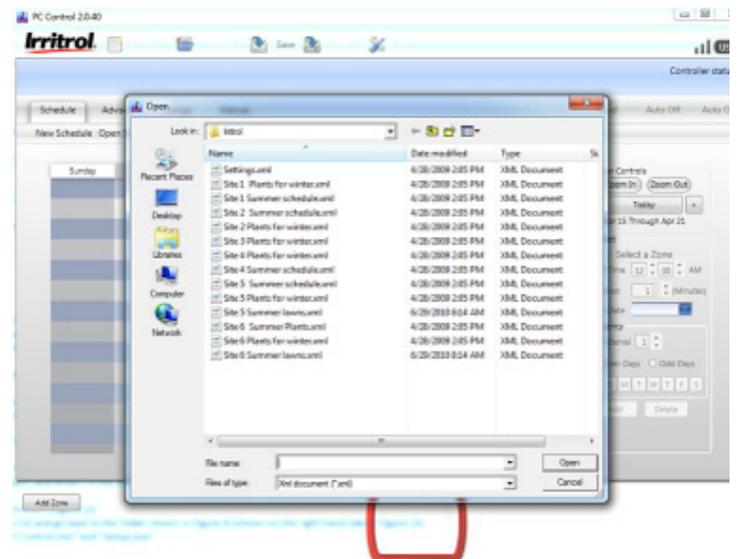


Figure A3.4

Troubleshooting Guide

Symptom	Possible Cause	Solution
I have a new computer, or, I lost the CD. Where do I get the software?	N/A	Download the latest software at http://www.pc-controller.com/PCW_Control.zip
How do I uninstall version 1.1.56 or earlier?	The uninstall for versions 1.1.56 and earlier does not work.	Download our uninstall utility at http://www.pc-controller.com/uninstall.exe .
My remote indicates there is no communication when I turn it on.	If the controllers are turned on and match the PIN in the remote, then most likely the cause is from firmware.	When the remote is turned on, press the top two buttons, side-to-side arrows and the up arrow buttons. When your PIN is displayed press the Start button. Your communication should be working now.
All three signal bars in the software are gray.	Communication between the software, remote, and controller(s) is not working. Most likely the PIN values do not match.	Check each hardware device and the PIN value in the software to confirm that they are the same.
My remote displays "NO SIGNAL" and "NOT ACCEPTED".	Controller and remote have different PIN codes.	See the Change PIN section in this User's Guide .
The remote will not communicate with additional controllers.	Most likely caused by not manually setting the additional controller's PIN and controller number.	Check each controller and set the correct PIN and controller number. All controllers come from the factory set with PIN 0000 and as controller #1.
The remote displays "E1".	Most likely caused by a defective IC in the remote.	Please contact Irritrol Support for warranty replacement.
Under "Display Zone Start Times", I highlight the start time but my edit won't change on the calendar.	Zones assigned to the Scheduling Advisor cannot be edited in this mode.	Click on the Advisor tab, click on the zone in question and then uncheck "Use Advisor". Zone is now editable.
The remote only displays 12 stations for a system that contains multiple controllers and more than 12 stations.	The main controller (controller #1) has not been updated with the additional controllers and station information. This is the master controller of the system.	Open the XML file that you are using for the multiple controller system, and after establishing communication, update the controllers by pressing the "Send" button.
Software displays "Invalid Data Array" message when updating the controllers.	Possible invalid characters sent or received from the controller(s).	Try pressing the "Send" button again. If the message is still displayed contact Irritrol Support so that you can send your XML file for review.
The software displays "time out" when sending a schedule or updating the controller(s).	Bad radio frequency interference in your environment, or the controller(s) are too far away. The range for communication is 1000 feet using line of sight. This will vary depending on your environment.	If you have a laptop, move around your property and see if you can establish a more consistent connection. If you are using a desktop you can unplug the remote and use a simple "Auto On/Off" test by walking around your property and confirming the communications are received by the controller(s).

Troubleshooting Guide (continued)

Symptom	Possible Cause	Solution
Where are my schedules and/or files located?	The schedules are contained in the XML files. Each XML file can contain numerous schedules. You can save these files to any directory, such as My Documents.	Windows 7 - C:\Users\USER_ACCOUNT\AppData\Roaming\Irritrol
The software crashes or does not respond when I open a file or when using a default site.	Either the file you are trying to open or the default file the software is trying to open is missing some information.	Open the file using MS Word or any other text editor and see if there are any Schedules that are missing the <Events> tags. If these schedules are present, then remove them and save the file. If this does not work then please contact Irritrol Support so that they can review your file.
The irrigation does not come on according to the schedule shown in the software.	Most likely the controller(s)' date and time are off.	Under Tools->Preferences, click the option to synchronize controller(s) time. Next, hit the "Send" button in the software to update the date and time in the controller(s).
I cannot click and hold the bottom edge of the zone segment to change the watering duration.	The zone is assigned to the Scheduling Advisor.	To customize the zone, click on the ADVISOR tab, when the zone is highlighted, uncheck "Use Advisor".
I have most of my zones on the Scheduling Advisor, and I have checked "Update schedule changes without prompting", but I do not see scheduling changes with the weather changes.	The computer is turned off at the time of day the system was told to check the weather on the internet.	Click on "Get Forecast" at the time you want the system to regularly retrieve the weather information. Make sure it is a time of day your computer is on and connected to the internet.
My system is using the Scheduling Advisor, but keeps on watering even when it's raining.	The internet weather is unaware of local showers.	For the most water savings based on the weather, we recommend the addition of an Irritrol rain or rain/freeze sensor.

FCC Part 15 Rule

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment causes interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful: "How To Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4 s.