



# Weather Reach Receiver

Model WR-7

## Users Guide

Irrisoft



# Weather Reach Receiver

Model WR-7

## Users Guide

### Support

Visit our website at: [www.weatherreach.com](http://www.weatherreach.com)

For technical support contact: [support@irrisoft.net](mailto:support@irrisoft.net)

For product information contact: [sales@irrisoft.net](mailto:sales@irrisoft.net)

Irrisoft Inc.  
PO Box 6266  
North Logan, UT 84341.6266

Voice: 435-755-0400

Fax: 435-755-0415

Version 2 Rev 4/2004

Copyright © 2002, 2003, 2004 Irrisoft, Inc.  
ALL RIGHTS RESERVED

- 1. INTRODUCTION.....1**
  - EVAPOTRANSPIRATION (ET) ..... 1
  - THE WEATHER REACH SYSTEM..... 1
  - WEATHER REACH SERVICE PROVIDER..... 2
  - WEATHER REACH RECEIVER..... 2
  - SPECIFICATIONS..... 3
- 2. GETTING STARTED .....5**
  - ET OUTPUT ..... 5
  - ADDITIONAL OPTIONS ..... 6
  - ACTIVATION..... 7
- 3. INSTALLATION.....8**
  - WARNINGS ..... 8
  - CHECK LIST..... 8
  - SELECT LOCATION..... 8
  - MOUNTING..... 9
  - GROUNDING ..... 10
  - PROVIDE POWER..... 10
  - WIRE CONNECTIONS..... 11
  - WIRING DIAGRAMS ..... 11
  - ON-SITE RAIN GAUGE ..... 14
- 4. GENERAL OPERATION ..... 15**
  - DISPLAY..... 15
  - ACTIVE DISPLAY MESSAGES ..... 16
  - INDICATOR LIGHTS ..... 17
  - CONTROL BUTTONS ..... 17
  - MENUS..... 17
  - WEATHER INFO ..... 18
  - STATUS ..... 19
  - MODE ..... 19
  - SETTINGS ..... 20
- 5. ET ENABLE ..... 22**
  - ET BALANCE (IRRIGATION REQUIREMENT) ..... 22
  - SETTINGS ..... 23
  - GUIDELINES FOR INITIAL SETTINGS ..... 27
  - OPERATING THE SYSTEM ..... 29
  - IRRIGATE MENU ..... 29
  - STATUS MENU..... 30
  - FINE TUNING THE SYSTEM ..... 31
- 6. ET TRIGGER ..... 32**
- 7. ET PULSE / RAIN PULSE..... 34**

**8. RS-232 .....36**  
**11. TROUBLESHOOTING.....38**  
**12. WARRANTY & LIMITED LIABILITY.....41**

## 1. Introduction

Weather conditions have a direct affect on plant water use. Irrigation managers have watched weather conditions for centuries to schedule irrigation. In the last 20 years landscape irrigation systems have used automated weather stations, connected to computer systems, to control irrigation on golf courses, parks, colleges, businesses and other large turf applications. Weather Reach provides this same benefit in a simple, a cost-effective solution, for commercial and residential properties.

This chapter provides an overview how landscape water use is calculated based on weather conditions. In addition there is an overview of the Weather Reach System.

### Evapotranspiration (ET)

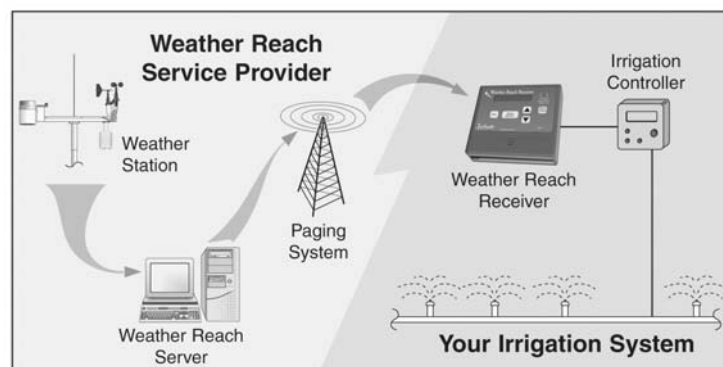
Evapotranspiration is the amount of water lost from the soil or leaf surface by evaporation and water passing through the plants by transpiration. Evapotranspiration is typically expressed in inches of water per hour or day. Evapotranspiration ( $ET_{OS}$ ) losses can be estimated using meteorological data measured with a weather station.

Weather parameters used to calculate ET include: solar radiation, air temperature, wind speed and relative humidity. Solar radiation is the primary energy source influencing ET. Air temperature to a lesser extent also provides this energy. In dry conditions the vapor pressure deficit is greater which means ET will be higher compared to a humid environment. Wind replaces saturated air with drier air. Without wind the ET rate decreases.

### The Weather Reach System

The Weather Reach System provides a way for weather data to reach landscape irrigation systems to control the amount of water applied to the landscape.

There are two parts to the Weather Reach System. A Weather Reach Service Provider manages a network of weather station and broadcasts the weather data via a radio signal to Weather Reach Receivers, which are connected to the irrigation system.



## Weather Reach Service Provider

Weather Reach Service Provider (WRSP) retrieves weather data from local weather stations then broadcasts the information using a local paging radio signal. The data contains the most recent conditions including:

- Temperature
- Humidity
- Wind
- Rainfall
- Solar Energy

The WRSP determines the time and frequency of data transmissions. The weather information may be transmitted as often as once an hour or only once a day. Check with the local WRSP for more information.

### Activation

Weather Reach utilizes the Motorola Flex paging system. Weather Reach Receivers must be programmed with the proper pager codes to receive data. Authorized Weather Reach Distributors must activate the pager to work with the selected WRSP.

### Weather Regions

Data from more than one weather station may be broadcast by the WRSP. The weather region code must be entered that corresponds to the desired local weather station. Contact the Weather Reach Authorized Distributor or local WRSP for the weather region code corresponding to the weather station that most accurately represents the site conditions. During Activation the desired weather station can be set in the Weather Reach Receiver.

## Weather Reach Receiver

A Weather Reach Receiver assists an irrigation controller to water based on current weather conditions. A Weather Reach Receiver is not an irrigation controller, but an accessory to a controller. When the Weather Reach Receiver receives a weather signal it calculates ET then interfaces with the irrigation controller.

There are several interface options to provide automated control of the irrigation system based on ET and weather conditions. The Weather Reach Receiver, model WR-7, works with most 24-volt irrigation controllers. The capabilities of the controller used on-site dictate the WR-7 features that can be used.

The WR-7 has four different ways that ET can be used to control an irrigation system:

- **ET Enable** – The "common" output of a controller is interrupted until a programmed ET threshold is reached to control irrigation frequency based on ET.
- **ET Trigger** – When an ET threshold is reached the Weather Reach Receiver trips a relay to signal an irrigation controller that irrigation is needed.
- **ET Pulse** – The Weather Reach Receiver creates a switch closure for every 0.01" of ET to compatible ET-based irrigation controllers.
- **RS-232** – Compatible irrigation controllers directly access ET and weather data from a WR-7 via a serial port.

## Additional Features

In addition the WR-7 can provide:

- **Rain Pulse Output** - One switch contact for each 0.01" of rainfall.
- **Rain Tip In** – Accepts input from an on-site tipping bucket rain gauge.
- **Weather Interrupts** – Interrupts irrigation if certain weather conditions exist.
  - Low Temperature
  - High Wind Speed
  - Rainfall
- **Weather Display** – Current weather conditions received from the local weather station can be displayed.

## Specifications

### Electrical Specifications

- **Power Supply\*** - 12 to 28 VAC or 12 to 35 VDC @ 0.1 Amp max.
- **Contact Load** - 5 Amp max. @ 50 VAC max.
- **Operating Temperature Range** - 15° - 70°C (5° - 160°F).
- **Terminal Wire Gauge** - 14 to 22 awg.
- **Ground Lug Wire Gauge** - 14 to 18 awg.
- **Serial Communications** - RS-232 (RJ45 connector)
- **Antenna Connection** – BNC Female, 930 MHz.
- **Rain Gauge Sensor Voltage** - 3 VDC

\* A power cable (included) connects to the irrigation controller 24 VAC power supply. If needed, a separate power supply is available.

### Cabinet - Indoor Wall Mount

- Width 5.25"
- Height 4.8"
- Depth 1.5"

### Optional Accessories

- **WR-PS** - 110 VAC Plug-in Power Supply Transformer
- **WR-ANT-B** - External Antenna for WR-7. Requires RG-58 (up to 25') or RG-8 (greater than 25') 50-Ohm antenna cable (not included) with BNC male connectors. The WR-7 contains a paging radio receiver with a built-in antenna. Locations with a weak paging signal may require an external antenna.
- **WR-OE** - WR-7 Outdoor Enclosure – Industrial Lockable Fiberglass NEMA 4X cabinet with 110 VAC outlet. 11-5/8" H x 9-1/2" W x 4-1/4" D.
- **WR-TE525-L30** - Texas Electronics® 6" Tipping Bucket Rain Gauge (0.01" tip) w/ 30' Cable.
- **WR-PRG** - Pronamic® Tipping Bucket Rain Gauge (1mm/ tip) w/ 30' Cable.

### ET Formula

Evapotranspiration ( $ET_{OS}$ ) is calculated by the WR-7 using data broadcast via the paging system. The WR-7 uses the Standardized Reference Evapotranspiration Equation with a short grass reference, prepared by the American Society of Civil Engineers. Hourly wind speed, air temperature, relative humidity and solar radiation values are broadcast via paging. Often, wind can fluctuate from one site to another, while the other weather parameters remain more constant over a wide area. The wind value can be scaled by a percentage to compensate for variations in prevailing conditions.

## Crop Coefficients

Crop Coefficients ( $K_C$ ) are used to modify  $ET_{OS}$  to meet the specific needs of the landscape,  $ET_{OS} \times K_C = ET_C$ . There are both regional and seasonal variations in  $K_C$  values. The Weather Reach Service Provider enters a  $K_C$  value in the software that is included with the data sent via the paging system. Advanced users who only want  $ET_{OS}$  can program the WR-7 to ignore the broadcast  $K_C$  value.

In addition a local crop coefficients ( $K_{C-local}$ ) value may also be entered at the WR-7.  $(ET_C \times K_{C-Local}) = ET_{C-Local}$ . Most applications will not need to use the local  $K_C$  value but it allows the user to adjust  $ET_C$  to meet specific on-site needs.

## 2. Getting Started

The Weather Reach Receiver provides ET-based control to irrigation system controllers. The first steps to getting started are:

- Selecting a ET Output
- Additional Options
  - Weather Interrupt
  - On-site Rain Gauge
- Activation

Once activated the Weather Reach Receiver can be installed, see chapter 3.

### ET Output

Due to the variety of controllers the Weather Reach Receiver offers four ET outputs. Select the needed output based on the specific application.

- ET Enable (chapter 5)**
- ET Trigger (chapter 6)**
- ET Pulse (chapter 7)**
- RS-232 (chapter 8)**

#### ET Enable

The irrigation requirement is equal to ET minus effective rainfall. The Weather Reach Receiver maintains a moisture balance by accumulating the irrigation requirement. The “common” output of a controller is interrupted until the “ET” balance reaches a programmed threshold. Watering only occurs when soil moisture is depleted to an allowable level. The controller is programmed to apply the amount of water needed to refill the soil reservoir. Irrigation frequency is controlled based on ET.

Rainfall values measured by an on-site rain gauge or from the local weather station are used to calculate the irrigation requirement. Irrigation is interrupted based on the amount of rainfall. Excessive rain is ignored; the Weather Reach Receiver determines effective rain based on user settings.

There are two ET Enable circuits, A & B. Each can be programmed with a different ET threshold and landscape adjustment percentage. Typically A might be for lawn valves and B could control shrub valves. A & B can also be programmed to have group “A” valves water one day and group “B” valves water the next day.

**Application:** This output is used to control most irrigation controllers that use a common circuit to provide 24-volt power to control valves.

#### ET Trigger

The WR-7 closes a switch contact to trigger irrigation when ET accumulates to a programmed ET Threshold. The WR-7 ET Trigger uses the ET Pulse and Rain Pulse connections to provide a timed switch closure. The switch closure duration is programmable. There are two ET Trigger circuits, A & B. Each can be programmed with a different ET threshold and landscape adjustment percentage. Typically “A” might be for lawn valves and “B” could control shrub valves.

**Application:** This mode is used to send a sensor start signal to an irrigation controller. The controller must recognize a momentary switch closure as a signal that irrigation should occur.

## ET Pulse

The ET value is output in the form of a momentary switch closure, one “pulse” or switch contact for every .01” of ET. The pulse duration and frequency is programmable.

**Application:** There are controllers that recognize a pulsed switched closure input as an ET value and use the value to adjust irrigation schedules. There is a device known as an electronic “ET Gauge” or atmometer that controller manufacturers use as an ET source. It creates a 4 second switch contact for each .01” of ET. The WR-7 provides a similar output.

## RS-232

Weather and ET data in the WR-7 can be directly accessed via the RS-232 port or serial port. The host device polls the WR-7 for information and must follow specific protocols to retrieve the data.

**Application:** An irrigation controller or serial device must have an RS-232 port configured to directly access the data.

## Additional Options

### On-site rain gauge

Rainfall can be localized. The Weather Reach Receiver has an option to use a tipping bucket rain gauge to measure rain at the site. This measurement would be used instead of the rainfall measured at the weather station. See chapter 3 on installation for more details.

### Weather Interrupt

The WR-7 controls a normally closed relay contact to interrupt irrigation in the event certain weather conditions occur. There are three “sensor interrupt” conditions that may be programmed to control the Weather Interrupt circuit.

1. Low Temperature
2. High Wind
3. Rain

When the condition no longer exists the contacts close, allowing irrigation to resume. The user is alerted when a weather condition interrupts irrigation.

**Application:** Irrigation controllers accept sensor interrupts that prevent irrigation when a sensor condition is met. The controller’s valve common wire can be routed through this circuit.

### Activation

Weather data is broadcast as part of a wireless paging signal to the Weather Reach Receiver. The paging radio must be programmed or activated to receive the signal. During the activation process the Weather Reach Receiver is also programmed based on site-specific needs.

An Authorized Weather Reach Distributor activates the WR-7 with local pager codes needed to receive data from the Weather Reach Service Provider (WRSP). The following information is needed before activation:

- Select a WRSP.
- Confirm that the Authorized Weather Reach Distributor is authorized to activate Weather Reach Receivers serviced by the selected WRSP.
- Site Elevation – feet above sea level.

In addition the site-specific settings can be programmed at the same time. The Authorized Weather Reach Distributor can offer assistance to help determine the best initial settings.

For more information regarding the programmable settings refer to the chapter of the selected ET Output.

**Note:** Site conditions will most likely require modifications to the programmed settings. They can be changed directly using the WR-7 keypad and display.

## 3. Installation

This chapter provides the details for proper installation. The ET outputs and options should have already been determined and the Authorized Distributor should have already activated the Weather Reach Receiver.

### Warnings

- This controller must be installed in compliance with local electrical codes.
- To prevent electrical shock, or damage to the device, make sure that all supply power is **OFF** to the device, the irrigation controller or any equipment being connected. Electrical shock can cause severe injury or death.
- 12 to 28 Volts AC or 12 to 35 Volts DC is to be used to power this unit. **DO NOT** connect it to 120 volts or greater.
- A ground wire **MUST** be connected for electrical surge, equipment and personal protection.

### Check List

- Select Location
- Mounting
- Provide Power
- Grounding
- Wire Connections

### Select Location

Follow these guidelines to select a location for the WR-7:

- It is best to install it adjacent to the irrigation controller.
- The WR-7 is not weather resistant. Install indoors or in a weather resistant enclosure.
  - An optional outdoor enclosure designed for the WR-7, is available. Use the model WR-OE a WR-7 outdoor enclosure, a heavy duty, lockable fiberglass NEMA 4X cabinet.
- Avoid electromagnetic interference by not installing it near motors, transformers or other high current electric equipment.
- Mount near eye level for easy viewing.

## **Pager Test – (If needed)**

The WR-7 uses a paging radio receiver. An internal antenna is preinstalled. In most cases the built-in antenna is sufficient.

If you suspect possible problems with the paging signal a test can be performed to verify that the WR-7 receives the weather data. Follow these steps to perform the test:

1. Provide temporary power to the WR-7. (See this section – “Provide Power”, for requirements.)
2. Set the WR-7 to “Test Counter”.
  - a. Press Menu / Select.
  - b. Press the Up or Down arrow to find Status and press Menu / Select.
  - c. Press the Up or Down arrow to find Test Counter and press Menu / Select.
  - d. The display will have Test Counter on the top line and 0 on the bottom line.
3. Set the device in the location where it will be mounted. Close any cabinet doors or other doors that may affect radio reception.
4. Monitor the Test Counter. The number of messages is displayed. The number and frequency of messages will vary. Check with the WRSP or distributor to get an idea of the frequency of messages. In some areas data may only be sent daily.
5. If no messages are received verify the WRSP is broadcasting data and the device has been correctly activated. If the system is working properly and the device is properly programmed try a different location or an external antenna.

## **External Antenna**

The WR-7 contains a paging radio receiver with a built-in antenna. In most cases this antenna will be sufficient. If pages are regularly missed, an external antenna may be connected and mounted in a location with better reception.

Cable to the antenna should be RG-58 or RG-8 50-Ohm coaxial cable with a BNC male connector on each end. Cable length using RG-58 cable should not exceed 25 feet. Cable length using RG-8 cable should not exceed 100 feet.

Use the optional WR-ANT-BNC external antenna. Select a location with better radio reception and test.

Due to local conditions some locations may require a different antenna. Contact Irrisoft Inc. for additional antenna options.

If the antenna is mounted outdoors seal the cable connection with a watertight sealant.

## **Mounting**

Before mounting make sure the power is disconnected. And remove the lower access panel.

The WR-7 has four mounting holes on the back of the cabinet; three keyhole slots and one round hole at the bottom.

Install two appropriate fasteners to the wall 4” apart for the two outside upper keyholes. For narrow stud installations install one appropriate fastener for the middle keyhole.

Use the keyhole slots to hang the cabinet on the fasteners. Make sure the fastener shaft slides up into the narrow part of the keyhole. The fastener head should not extend into the cabinet so far that it could contact the circuit board. Verify the cabinet is snug against the mounting surface. If necessary, tighten the fasteners.

Install the last fastener through the round lower mounting hole. This can be accessed just below the bottom edge of the circuit board. Care should be taken to not damage the circuit board. Confirm the cabinet is securely fastened.

## Grounding

Connect a 14 gauge, or larger, ground wire to the ground wire lug. **GROUNDING IS REQUIRED** for surge, equipment and personal protection.

## Provide Power

**WARNING** - To prevent electrical shock make sure the power supply is OFF before connecting wires to any of the devices. Electrical shock can cause severe injury or death

All electrical connections and wire runs must be made in accordance with local building codes.

Power for the WR-7 can come from one of two sources. The power requirement is 12 to 28 Volts AC or 12 to 35 Volts DC and draws a maximum 0.1 Amp max. Remove the lower access panel to get at the plug-in power connection.

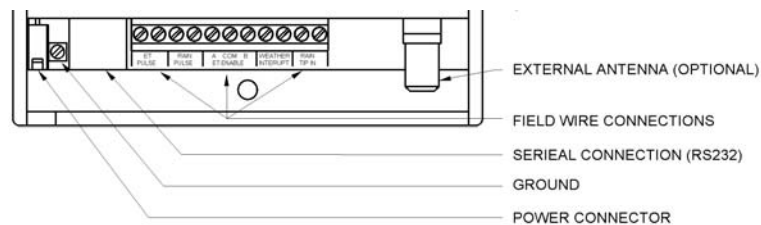
### Option 1

The WR-7 comes with a power cable that can be connected to a 24-volt AC source within the irrigation controller. The current draw is less than one standard valve solenoid. Check the controller owner's manual to verify that accessory devices can be powered from the controller power supply.

### Option 2

Use a WR-PS – plug-in power supply transformer. This plugs into a standard 110-volt AC outlet.

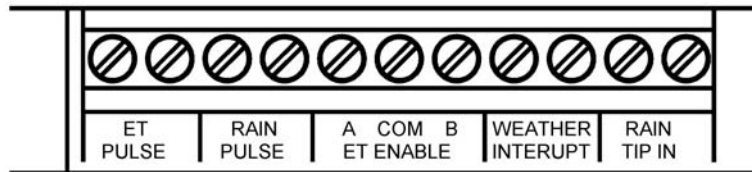
**Note:** The WR-PS power supply must be used when using the RS-232 connection to a serial device.



## Wire Connections

**Warning:** Power must be disconnected to the WR-7 and the irrigation controller before connecting field wires.

The following control terminals are available:



**ET Pulse** – This terminal provides a switch closure for every 0.01" of ET to compatible ET-based irrigation controllers.

**Rain Pulse** - This terminal provides a switch closure for every 0.01" of rain to controllers that accept input from a tipping bucket rain gauge.

**ET Enable A and B Common** – The "common" output of a controller is interrupted until a programmed ET threshold is reached to control irrigation frequency based on ET. When using the ET Trigger mode a relay is tripped to signal an irrigation controller that irrigation is needed. With power OFF these circuits are normally closed. With power on the contacts remain open until irrigation is enabled.

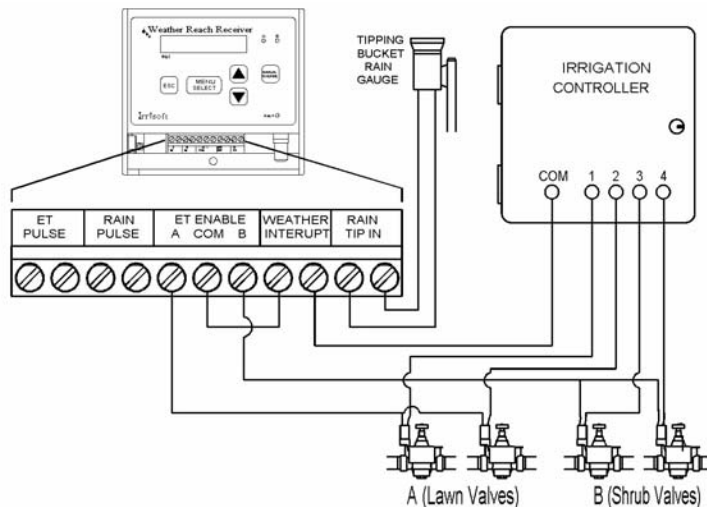
**Weather Interrupt** – This connection is normally closed unless a programmed Weather Interrupt condition exists.

**Rain Tip In** – Connect an on-site tipping bucket rain collector to these terminals.

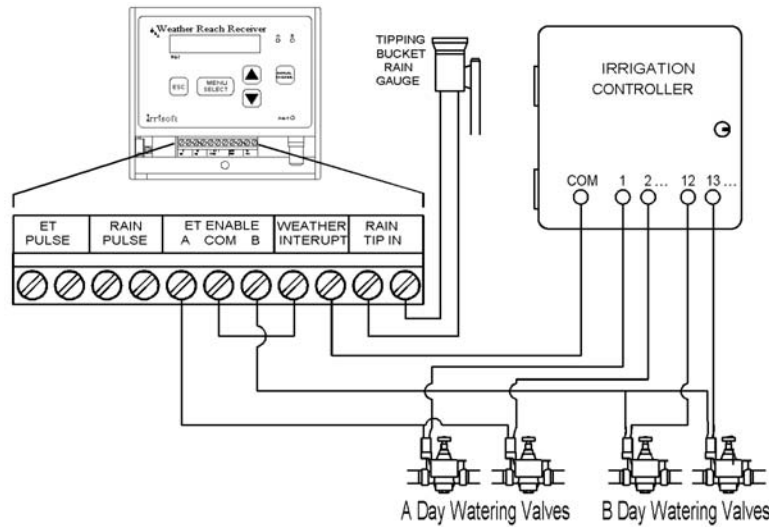
## Wiring Diagrams

The ET output and selected options affect the wiring schemes, see chapter three to determine the features that will be used.

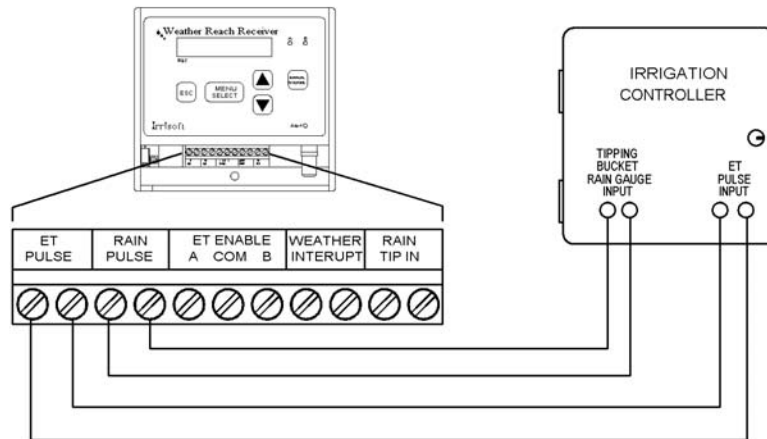
**ET Enable** - The following diagram shows a typical wiring using the Weather Interrupt option and an on-site tipping bucket rain collector.



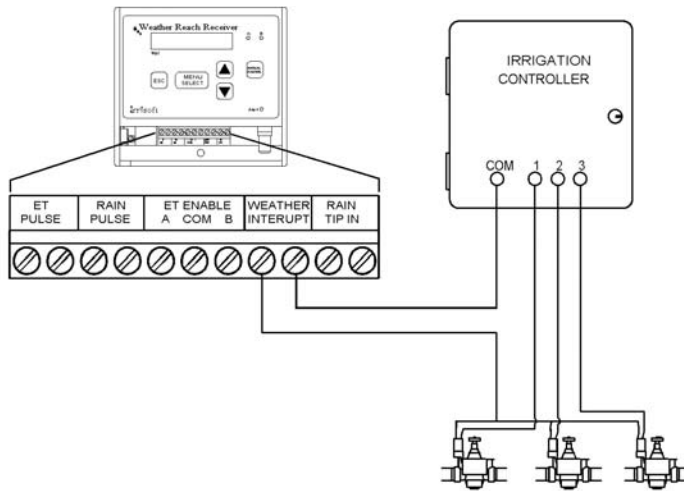
**ET Enable with A then B** – Use this method for large turf applications where watering needs to be spread over two days. In the A then B Enable mode, valves on the “A” common water one day then valves on the “B” common water the next day. See chapter 5 on ET Enable mode for programming details.



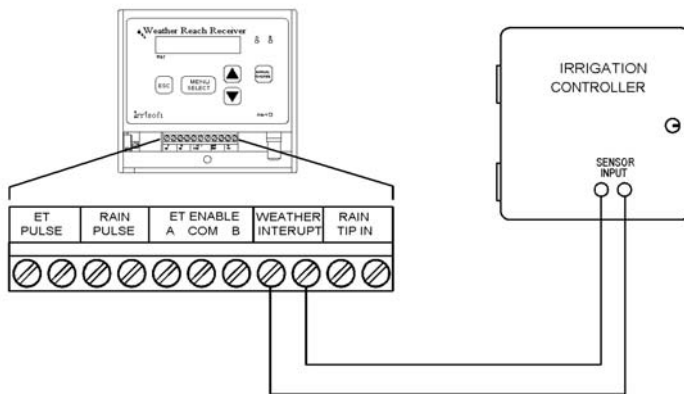
## ET Pulse and or Rain Pulse



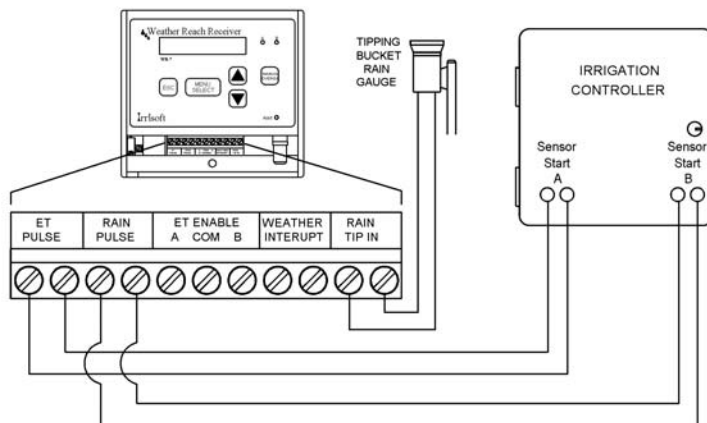
**Weather Interrupt** – The controller’s common is routed through the WR-7.



**Weather Interrupt** – A controller may accept a sensor input to interrupt irrigation if a “sensor” condition is met. The WR-7 will emulate a low temperature, high wind speed or rain sensor by opening the Weather Interrupt contacts when any one of these programmed conditions are met.



**ET Trigger** – The WR-7 will signal a controller to initiate an irrigation cycle by creating a momentary switch closure when an ET Threshold is reached. To trigger set points or thresholds may be programmed, A and B. An ET adjustment and effective rainfall settings can also be applied. The ET Trigger is wired into the ET pulse and Rain Pulse terminals, A & B respectively.



## Pump, Master Valve or other device Warning

Care must be taken if the irrigation controller controls a pump, master valve or other devices. The WR-7 may be used to interrupt output from the irrigation controller to control valves. If pumps, master valves or other devices are also powered by the same or separate common wire an interrupt generated by the WR-7 could create problems with the pump, master valve or other devices. Test the system through all scenarios to verify that system operation will not adversely affect the pump, master valve or other devices operated by the irrigation controller.

## On-Site Rain Gauge

A local, on-site, rain collector can be connected to the WR-7. The rain gauge must be a tipping bucket rain gauge with an output measurement at either .01" or 1 millimeter per tip. The rainfall value can be used instead of the rainfall value included in the weather data broadcast.

The rain gauge contacts can be either normally open or normally closed. The WR-7 power **MUST** be OFF when connecting the rain gauge. Connect to the Rain Tip In terminal.

There are two rain gauges available from Irrisoft that have been tested and approved for use with the WR-7.

- **WR-TE525-L30** - Texas Electronics® 6" Tipping Bucket Rain Gauge (0.01" tip) w/ 30' Cable
- **WR-PRG** - Pronamic® Tipping Bucket Rain Gauge (1mm/ tip) w/ 30' Cable

The following settings should be programmed when using an on-site rain collector. These settings can be set during the activation process.

### Settings / System Menu

- **Rain Source** – Select Local when an on-site tipping bucket rain collector is connected to the Rain Tip-in terminal.
- **Rain per Tip** - If a Local Rain Source is selected then this screen is visible. Enter the amount of rain recorded by one tip of the tipping buck rain collector, either .01" or 1mm per tip. Most rain collectors measure .01" per tip. The Weather Reach WR-PRG Pronamic Rain Gauge records 1 millimeter per tip.

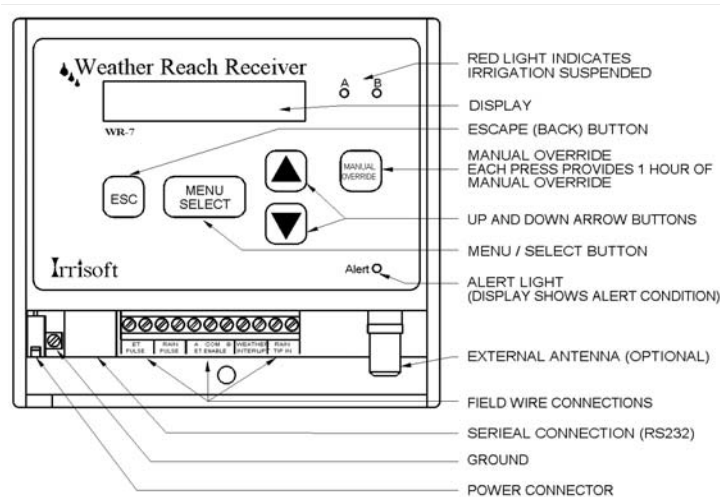
**Note:** Power to the WR-7 **MUST** be DISCONNECTED when connecting a rain collector.

## 4. General Operation

This chapter includes general operating and an overview of programming instructions. There are separate chapters to provide detailed instructions to program and operate the WR-7 based on the chosen ET mode and optional features.

This chapter contains information in the following areas:

- Display
- Active Display Messages
- Indicator Lights
- Control Buttons
- Menus



## Display

### Home

The default or startup screen displays the following information:

- Current Date & Time – The weather data broadcast to the WR-7 includes current date and time. On initial startup or after data is cleared the date starts with 01Jan 00. When the WR-7 begins to receive data the clock is set. Date and time are kept current by the received data.
- ET for the last 24-hours – The amount of calculated evapotranspiration during the last 24-hours is displayed. On startup this value will be 0 and accumulate over the course of time.

### LCD Contrast

Temperature conditions affect the LCD contrast. To set the LCD Contrast screen press the ESC button once from the Home screen. Use the Up or Down arrow Key to adjust the contrast. When finished, press the Menu / Select button to return to the Home Screen.

**Blank or Black Display** - Having incorrect LCD settings may cause a blank or black display. Press the ESC key six times assures that you are in the LCD contrast screen. Then use the up or down arrow to adjust the contrast.

## Active Display Messages

The home screen may also flash messages indicating conditions that may be important.

**ET Window Open** – When using the ET Enable output and the ET Window is open the Home screen will alternate between the current Date & Time and “ET Window Open”. (See chapter 5 on ET Enable)

**Daily Window Open** – When using the ET Enable output with a programmed Daily Window the Home screen will alternate between Date & Time and “Day Window Open” when the Daily Time Window is open. (See chapter 5 on ET Enable)

**Weather Interrupt** – If one or more of the Weather Interrupt conditions is met the home screen will toggle between Date & Time and one or more of the following messages:

- Low Temp Off
- High Wind Shut Off
- Rain Shut Off

For more information on Weather Interrupts see information later in this chapter.

**Mode** – If the mode has been set to anything other than Auto ET the home screen will toggle between Date & Time and the selected mode.

- Mode = Off
- Mode = Default ET
- Mode = Override

More information on Mode follows in this chapter.

**Missed Messages** – Each day 24 separate weather data messages are sent to the WR-7. Each message contains data for one hour. The frequency of data broadcasts is controlled by the WRSP. Data may come each hour, several times a day or once a day. The WR-7 is expecting 24 messages each day. Should a message be missed the WR-7 compensates for missed messages. If the missed messages percentage misses drops reaches 35% the alert light is turned on and the percentage of missed data is displayed.

**Pager Failure** – The WR-7 monitors the paging receiver to verify that it is ready to receive data. If the WR-7 detects a problem the Home screen will toggle between Date & Time and a Pager Failure alert.

**Service Disabled** – Weather Reach Service Provider agreements vary by region. The Weather Reach Service Provider can send a command that disables weather data reception if there was no payment for services.

If service is disabled the Weather Reach Receiver goes into Default Mode. It will continue to operate but will use the default ET value. In this condition the default value should be changed as landscape water requirement changes over the course of the season.

The Weather Reach Service Provider can send another command that restores service to the Weather Reach Receiver.

**Broadcast Interrupt** – The Weather Reach Service Provider can send a command that will interrupt irrigation. The interrupt lasts through the next scheduled ET Window. Your Weather Reach Service Provider provides a policy that explains the circumstances that may arise requiring the use of this command.

## Indicator Lights

There are three indicator lights:

- **Two Red Lights A & B** – Indicating irrigation has been suspended when lit. If either or both of these lights are on, glowing red, irrigation has been suspended by either a Weather Interrupt or the ET Enable Mode.
- **Yellow Alert** – If there is a condition that user should be aware of the Alert light will glow yellow. The alert condition will be shown in the display when set to the Home screen.

## Control Buttons

**Menu / Select** – The Home screen shows ET for the last 24 hours and Date & Time. To access the menu press Menu / Select button. A flashing asterisk \* indicates the current cursor location. The up or down arrow will change whatever is shown at the cursor. Once the desired option is found use the Menu / Select button to select the program feature.

**Note:** Only the bottom row of text is changed with the arrow keys. Once the desired menu is found press the Select button. The selected feature is displayed on the top line and menu option or values may be changed on the bottom line.

**Up and Down Arrow** – Menus or the program values that can be changed always are displayed on the bottom line. Use the Up or Down arrow to make the change. Press and hold a button to continually advance the setting.

**Esc (escape)** - Pressing this key takes the menu back one step. When finished making changes to select feature press the Esc key to go back a step or continue to press it to return to the Home screen.

**Manual Override** – The indicator lights will glow red indicating either the A or B ET Enable circuit or a Weather Interrupt is preventing irrigation. Press the Manual Override button to enable irrigation for one hour. Pressing this button more than once will add additional time in 1-hour increments.

## Menus

The menus are dynamic. The ET Output setting determines which menu options are displayed. Within each menu item there are several submenus. Go into the submenus to view information or modify program settings. Refer to the individual ET Output chapter for information on the available submenu screens.

- **Weather Info** – View current weather conditions and ET.
  - **Rain**
  - **Air Temperature**
  - **Wind Speed**
  - **Relative Humidity**
  - **ET**
- **Irrigate** – Display current information relative to ET control of the irrigation system. (Not used with ET Pulse output)
- **Status** – Check system activity.
- **Mode** – Set to Auto ET / Off / Override / Default ET.
- **Settings** – View and modify control settings.
  - **ET**
  - **Weather Interrupt**
  - **System**

## Weather Info

Current weather information can be viewed on the WR-7. The weather information is included in the data broadcast by the Weather Reach Service Provider (WRSP). The data is measured at the weather station accessed by the WRSP and is as current as the last broadcast. If a local rain gauge is used, this information is substituted for the regional rainfall amounts. The following data can be viewed:

### Rain

Rainfall values are either from the broadcast weather data or a local rain gauge. See Settings / System / Rain Source.

- **24 Hr** = Total measured rainfall recorded for the last 24 hours.
- **7 Day** = Total measured rainfall recorded for the last 7 days.

### Air Temperature

- **Current** – Last recorded hourly average temperature.
- **Hi** – The day's highest temperature recorded since midnight.
- **Lo** - The day's lowest temperature recorded since midnight.

### Wind Speed

- **Current** – Last recorded hourly average wind speed.
- **Hi** – The day's highest hourly average wind speed recorded since midnight.
- **Lo** - The day's lowest hourly average wind speed recorded since midnight.

Wind values are hourly averages. Peak wind velocity is not displayed.

### Relative Humidity

- **Current** – Last recorded relative humidity.
- **Hi** – The day's highest relative humidity recorded since midnight.
- **Lo** - The day's lowest relative humidity recorded since midnight.

Humidity values are hourly averages.

### ET

- **Last 24 Hr** – Total calculated ET for the last 24 hours.
- **7 Day** - Total calculated ET for the last 7 days.

## Status

- **Last Broadcast** – Weather data is “Broadcast” via paging. The last date and time data was received is displayed. The WRSP controls the frequency of the broadcast. It may be as often as hourly to once per day.
- **Last Interrupt** – The date, time and condition that caused the last Weather Interrupt is displayed.
- **Broadcast Crop Coefficient** – The WRSP includes a Crop Coefficient with the broadcast weather data. The value is displayed here. This value is used to adjust ET to more accurately represent regional conditions. This value can change through the year. This regional adjustment will help keep the ET value correct.
- **Missed Data** – The percentage of missed weather messages is displayed here. Each day 24 separate weather data messages are sent to the WR-7. Each message contains data for one hour. The frequency of data broadcasts is controlled by the WRSP. Data may come each hour, several times a day or once a day. The WR-7 is expecting 24 messages each day. The WR-7 compensates for missed messages. If the percentage of missed messages drops below 65% the alert light is turned on and the percentage of missed data is displayed.
- **Test Counter** – When the display is left in this position it begins counting the number of messages that are received, regardless of the selected weather region. This is used to verify that messages are being received. A WRSP may be broadcasting for more than one Weather Region. Check with the WRSP or local distributor to know how many messages are typically sent each hour. Let this test run long enough to verify that data will be received. If data is not being received the WR-7 may need to be moved or an external antenna may need to be used.

## Mode

- **Auto ET** – To enable all automatic functions set the Mode to Automatic ET.
- **Default ET** – The default mode can be set manually. Or, if no data is received after 25 hours the WR-7 goes into the default ET mode and uses the default ET value. A daily default ET value is programmed in Settings / ET. Each hour 1/24th of the daily default ET value is outputted to the ET pulse and added to the ET balance.

The Smart Default feature looks back at ET for the last 7 days and automatically calculates and sets the Default ET. When first getting started an initial default value should set and based on the current average daily ET. Then, over time the default ET value will be updated to reflect current conditions.

- **Override** - Pressing the Manual Override button activates the Override mode. The WR-7 may suspend irrigation because the ET threshold is not met or has been interrupted due to a programmed Weather Interrupt. Each press of the button allows one-hour of override. After the override times out current interrupt conditions resume. To cancel an override, use the down arrow to reduce the override time to 0. The other way to cancel the Override is to return the Mode to Auto ET.
- **Off** – Setting the Mode to off suspends all automatic events. Irrigation is enabled on both the ET Enable and the Weather Interrupt.

## Settings

### System

- **Weather Region** – Enter the Weather Region number that corresponds to the weather station that most closely represents the location of this device. A Weather Reach Service Provider may be broadcasting data for more than one weather station. Check with the Weather Reach Service Provider for a list of available weather regions.
- **Rain Source** – Select either the Broadcast rainfall value or Local if an on-site tipping bucket rain collector is connected to the Rain Tip-in terminal.
- **Rain per Tip** - If a Local Rain Source is selected then this screen is visible. Enter the amount of rain recorded by one tip of the tipping buck rain collector, either .01” or 1mm per tip. The Weather Reach WR-PRG Pronamic Rain Gauge records 1 millimeter per tip.
- **Metric / English** – Select either Metric or English Units. (

**Note:** Settings are not automatically converted review all settings

- **Broadcast Crop Coefficient** – Select to Use or Ignore the crop coefficient broadcast by the Weather Reach Service Provider. Some control systems manage the crop coefficient. In most cases select to use the broadcast value to adjust ET.
- **Serial Number** – The serial number is programmed during the activation process. It is displayed here but cannot be edited.
- **Password** – To limit access to the Settings menu a password may be set. To program a password use the up or down arrow keys to select the desired password. The value can be set from 1 to 255. Once set, the password must be used to gain access to the Settings menus. A password setting of “0” disables password protection.
- **ET Output** – There are four ET Output settings:
  - **ET Enable (chapter 5)**
  - **ET Trigger (chapter 6)**
  - **ET Pulse (chapter 7)**
  - **RS-232 (chapter 8)**

For more information regarding this setting see chapter 2 – Getting Started. Also refer to the individual chapter for the specific ET Output.

**Note:** The selected ET Output determines the menus that are available and the output control. Care should be taken when changing this setting.

- **Restore Default** – Press the Down arrow 10 times to restore all factory default settings.

**Note:** Factory default settings are not meant as typical settings. If default settings are set it will be necessary to program all settings based on site-specific conditions.

- **Clear Data** – Press the Down arrow 10 times to clear all current and stored values.

### ET

Additional settings are available based on the selected ET Output. Go to the specific ET Output chapter for more information.

### Weather Interrupt

The WR-7 can provide “sensor interrupts” for an irrigation controller. Weather data is being broadcast to the WR-7. When any one of these conditions is met, the Weather Interrupt control circuit opens to interrupt irrigation. The controller’s common wire must be routed through the Weather Interrupt terminals. The interrupt is canceled when the condition no longer exists.

- **Temperature** – Enter the lowest temperature that irrigation is allowed. Any time the current temperature is at this value irrigation will be suspended through the Weather Interrupt circuit.
- **Wind** - Enter the highest wind speed that irrigation is allowed. Anytime the current wind speed is at this value irrigation will be suspended through the Weather Interrupt circuit.

**Note:** Wind speed received by the WR-7 is an average hourly wind speed. Wind gusts or maximum wind are not used to create a Weather Interrupt.

- **Rain** – Enter the amount of accumulated rainfall required to interrupt irrigation. This value is compared with the amount of rain recorded for the last 24 hours.

## 5. ET Enable

Evapotranspiration (ET) losses accumulate over time. Once soil moisture is depleted to a certain level, it is time to irrigate. The amount of water applied during an irrigation event should refill the root zone. This water is lost, over time due to evaporation and transpiration. Once the soil moisture has been depleted it is time to irrigate again. The frequency of irrigation is controlled based on ET and effective rainfall.

The sprinkler valve “common” wire is routed through the ET Enable circuit. The WR-7 will prevent irrigation, by interrupting the common, until ET losses have accumulated to a programmed threshold.

### ET Balance (Irrigation Requirement)

The irrigation requirement is equal to ET minus effective rainfall. When soil moisture is depleted to an allowable level it is time to irrigate. The ET Balance is a theoretical accumulated soil moisture depletion value or irrigation requirement. During the course of the day ET accumulates, adding to the ET balance. When the ET Balance reaches the ET Threshold irrigation is enabled. Rainfall values are subtracted from the ET Balance. When irrigation occurs the ET Threshold value is deducted from ET balance.

The current ET Balance is displayed in the Irrigate menu. Monitor the current balance to determine how close the ET Balance is relative to the ET Threshold. The ET Balance may be manually adjusted to delay or hasten the ET Enable condition.

The following example illustrates the ET balance with .5” of water applied with each watering.

- **ET is added to the balance.**
- **Rain and irrigation are subtracted from the balance.**

Day	ET	Rain	Irrigation	ET Balance
1	.23			.23
2	.17			.40
3	.19		.50	.09
4	.26			.35
5	.16		.50	.01
6	.10	.11		.02
7	.21			.23
8	.19			.42
9	.20		.50	.12
10	.24			.36
11	.12	1.3		-.25 *
12	.21			-.04
13	.23			.19
14	.24			.42

\* **Note:** A heavy rainfall can take the ET Balance to a negative value. Use the “Extra Rain” setting for A & B to set a lower limit to the ET Balance.

The ET Balance can be manually adjusted as needed. See section on Operation.

## Settings

There are several ET Enable control settings. All of these values are programmed during the activation process but can be adjusted in the Settings / ET menu.

- **ET Threshold**
- **ET Adjustment**
- **Effective Rain Limits**
- **Irrigation Detection**
- **ET Watering Window**
- **Daily Watering Window**
- **Local Crop Coefficients**
- **Wind Adjustment %**
- **Default Day ET**
- **A & B Mode**

### ET Threshold

**Menu / Settings / ET / Start A (or B) When ET =** Enter the ET threshold which must be met to enable irrigation for A or B.

An ET Threshold is programmed in the WR-7. Irrigation is suspended until the ET Balance reaches the ET Threshold.

Program the irrigation controller to water every day. The ET Threshold value should be the amount of water applied on an irrigation day. The watering days will vary automatically according to ET and rain.

There are two programmable ET Thresholds, A and B. These two control circuits are typically used for lawn and shrub zones. Lawn areas can be given one threshold. Shrubs typically do not need to be watered as often and could be controlled through the ET Enable B with a different threshold setting.

### ET % Adjustment

**Menu / Settings / ET / Adjust A (or B) ET%** - Enter the percent adjustment for ET.

The ET value being added to the ET Balance can be adjusted by a percentage. This percentage, often referred to as a landscape factor, can be used to adjust ET to meet a variety of site-specific conditions. The plant species, density and microclimate can affect the ET adjustment percentage.

Typically the ET Adjustment will be used to adjust ET for lawn and shrub areas. Additional station fine-tuning should be done at the controller by adjusting the station run-time.

An ET Adjustment may be entered separately for the A and B ET Enable circuit.

## Effective Rain Limits

Rainfall amount and intensities can be widely varied. A heavy down pour may be prone to run-off, where a gentle rain will soak into the ground. Heavy accumulations may soak well below the roots, and would no longer be available to the plants. Soil moisture content when a rainstorm begins also affects how much rain would be effective. To restrict the amount rain recognized by the system two effective rainfall limits should be programmed.

1. **Menu / Settings / ET / Maximum Hourly Rain** – Enter the maximum amount of rain that should be accepted each hour in the ET balance. Rain that falls faster than the soil can absorb may become run-off and may not be available to the plants.
2. **Menu / Settings / ET / Extra Rain A (or B)** – Enter the number of inches of extra rain that the soil can hold.

Normal watering cycles are meant to bring the soil moisture level to field capacity. Heavy rainfall will bring the soil moisture content beyond field capacity to a saturated level. This setting is amount of extra rain the soil will absorb beyond field capacity. Additional rainfall beyond this limit will percolate below the root-zone and may not be available to the plant.

ET is added to the ET Balance (irrigation requirement) while rain is subtracted. As rainfall amounts accumulate the ET Balance can go below zero and become a negative number. The Extra Rain setting creates a negative limit to the ET Balance. An Extra Rain setting of .25 would limit the ET Balance to minus .25.

Soil conditions affect the moisture holding capacities. An initial Extra Rain could be approximately 50% of the ET Threshold.

## Irrigation Detection

The WR-7 confirms that the irrigation controller watered by detecting current to the valves. If the controller was programmed to NOT water on a specific day, irrigation will remain enabled until a 24-volt output from the controller is sensed during the next Time Window.

## ET Watering Window

**Menu / Settings / ET / ET Window Start** – Check the irrigation controller settings for the earliest programmed start time for the day. Enter the ET Watering Window Start about 30 minutes prior to this time.

The WR-7 needs to know when irrigation is scheduled in the controller. The ET Watering Window start should be set for 20 to 30 minutes before an irrigation cycle is programmed in the irrigation controller to start. The ET Window length is the total number of hours it takes to complete the watering cycles.

**Menu / Settings / ET / ET Window Length** – Determine how many hours it typically takes to irrigate. Enter that time plus some additional time to assure watering is completed.

The ET Window controls two features:

1. If the ET Balance has not reached the ET Threshold by the opening of the ET Window, irrigation will remain suspended until the next ET Window. This prevents the system from being enabled part way through a watering cycle.

**Note:** If it begins raining once the ET Window has opened, the ET Enable circuit will continue to allow irrigation. The rainfall value will be subtracted from the ET Balance and is applied to the next irrigation cycle. Use a rain interrupt to suspend irrigation during the irrigation cycle. The rain interrupt threshold is programmed in the Weather Interrupt settings.

2. **Electrical Current Detection** - The WR-7 has a sensor to detect if electrical current activates a valve solenoid. This sensor is used to verify that the system watered. This sensor is active only during the ET Window. Any irrigation occurring outside the ET Window is ignored and not subtracted from the ET Balance.

The display indicates when the ET Window has opened.

When the ET Window closes, the ET Enable circuit is reset based on the current ET Balance. Before closing the ET Window the current sensor checks to see if watering is occurring. If current is detected the relay is NOT reset but waits for an hour and checks again. This will prevent the Weather Reach Receiver from interrupting an irrigation cycle. However, the total watering window must not exceed 23 hours and must fall within the ET Window.

## Daily Time Window

The Weather Reach Receiver, operating in the ET Enable mode, manages the output of the common from the controller to all valves. Irrigation is either enabled or disabled based on the ET Balance during the ET Window. There may be some valves that do not need to water based on ET. A Daily Time Window can be used to enable watering as scheduled in the irrigation controller. Valves that need to operate on a fixed schedule should be programmed in a separate program in the controller and set to come on after the ET Window closes.

The Daily Time Window enables irrigation one hour after the ET Window closes. To program a Daily Time Window enter the number of hours the Daily Window should be open. When the Daily Time Window is open the common circuit is closed enabling the common output from the controller to the valves.

**For example**, given the following settings:

ET Window = 10:00 PM

ET Window Length = 7 hours

Daily Window Length = 2 hours

10:00 PM to 5:00 AM – ET Watering Window

5:00 AM to 6:00 AM – Pause

6:00 AM to 8:00 AM – Daily Watering Window

Valves that need ET-Based control should be programmed to operate between 10:00 PM and 5:00 AM. Non-ET-Based valves should be programmed to start after 6:00 AM and finished before 8:00 AM. Please note this is an example, these settings may be programmed to meet site-specific needs.

The watering days for valves scheduled to operate in the Daily Window must be programmed in the irrigation controller.

There are several applications that this feature may apply to:

- Annual flowers that need daily watering.
- Initial plant establishment.
- Projects without a spare common wire for shrubs.

## A & B Mode

**Menu / Settings / System / A & B Enable Mode** – Select either:

- **A and B** – This is the standard default settings. A and B Enable circuits will operate completely independent of each other. Use this setting unless the Water A then B feature is needed.
- **A Then B** – This option limits only one of the ET Enable circuits from watering the same night. The A circuit would water through one Time Window cycle and the next night the B circuit would water.

Some controllers are, at times, programmed to water a portion of the valves one night and the balance the next night. This is often the case with large turf projects. The WR-7 can be programmed to accommodate this condition. To utilize this feature several things must be correctly set:

1. The valves to be watered on one 24-hour period must be on a separate common wire from those to be watered the next 24-hour period.
2. The ET Enable Mode must be set to “A Then B”.
3. The ET Threshold values and ET Adjustment percentages MUST be programmed to the same value.
4. The irrigation controller should be programmed to water ALL valves every day. Days can be turned off to accommodate facility use and maintenance schedules.
5. “A” valves should be programmed in one program and “B” valves programmed in another program. Both programs should be set to start every night. Both programs must be programmed to operate concurrently.
6. The Weather Reach Receiver will only operate one group each night, “A one night, then “B” the next.

When using the A then B setup the WR-7 will suspend irrigation until the ET Balance reaches the ET Threshold for A. If the controller is set to water that day, those valves connected to the A common will water. The next day the B ET Enable circuit will water those valves connected to the B circuit, assuming the controller is programmed to water. If a water day was turned off, the electric current sensor will keep that circuit enabled until irrigation occurs.

## Local Crop Coefficient

**Menu / Settings / ET / Local Crop Coefficient** – Enter a global Crop Coefficient percentage value.

A Crop Coefficient ( $K_C$ ) percentage may be entered to adjust ET to meet local site conditions. This could be used in addition to the  $K_C$  value broadcast by the Weather Reach Service Provider. If the  $K_C$  value broadcast by the Weather Reach Service Provider is adequate leave the Local Crop Coefficient set at 100%.

$$ET_{OS} \times \text{Broadcast } K_C \times \text{Local } K_C = ET_C \text{ used by the system}$$

**Note:** Advanced users can have the Broadcast  $K_C$  value ignored. See Settings / System / Broadcast Crop Coefficient

## Wind Adjust %

**Menu / Settings / ET / Wind Adjust %** - Enter a percentage adjustment to the wind value.

In some cases prevailing wind conditions may vary from the weather station location. The wind value included in the broadcast dataset can be scaled by a percentage to compensate for variations in site conditions.

## Default Day ET

**Menu / Settings / ET / Default Day ET** – Enter the average current daily ET value.

The default ET value is used if no data is received after 25 hours. In the default mode 1/24th of the daily default ET value is output to the ET pulse and added to the ET balance.

The Smart Default feature looks back at ET for the last 7 days and automatically calculates and sets the Default ET. When first getting started an initial default value should set and based on the current average daily ET. Then, over time the default ET value will be updated to reflect current conditions.

## Guidelines for Initial Settings

The following information is a general guideline. More specific information on irrigation scheduling can be obtained from the Irrigation Association, [www.irrigation.org](http://www.irrigation.org).

Soil holds a certain amount of water based on soil type, root depth and compaction. Once soil moisture is depleted to a certain level it is time to irrigate. The irrigation controller should be programmed to apply a certain amount of water, measurable in inches, to replace the water lost due to ET. The frequency of irrigation is based on how soon soil moisture is depleted.

There are two key factors that must be determined.

- Allowable Depletion
- Zone Run Time

### Allowable Depletion = ET Threshold

Determine the amount of water, in inches, that can be depleted from the soil before irrigation is needed. This value is the same as the ET Threshold. Soil type and root depth are the main factors controlling this value. Soil moisture levels should not be allowed to go so low to impact plant health. As a general rule the industry recommends that available soil moisture can be depleted 50%. The following chart can be used to estimate allowable soil moisture depletion based on the 50% rule.

Allowable Depletion

Soil Type	Available Water* Inch / Inch	MAD %**	Calculated Allowable Depletion					
			Root Depth in Inches					
			2	4	6	8	12	18
Sand	0.02	60%	0.02	0.05	0.07	0.10	0.14	0.22
Fine Sand	0.06	60%	0.07	0.14	0.22	0.29	0.43	0.65
Loamy Sand	0.07	60%	0.08	0.17	0.25	0.34	0.50	0.76
Sandy Loam	0.12	50%	0.12	0.24	0.36	0.48	0.72	1.08
Sandy Clay	0.16	50%	0.16	0.32	0.48	0.64	0.96	1.44
Loam	0.17	50%	0.17	0.34	0.51	0.68	1.02	1.53
Sandy Clay Loam	0.15	50%	0.15	0.30	0.45	0.60	0.90	1.35
Silty Loam	0.20	50%	0.20	0.40	0.60	0.80	1.20	1.80
Clay Loam	0.20	50%	0.20	0.40	0.60	0.80	1.20	1.80
Silt	0.17	50%	0.17	0.34	0.51	0.68	1.02	1.53
Silty Clay Loam	0.20	50%	0.20	0.40	0.60	0.80	1.20	1.80
Silty Clay	0.16	40%	0.13	0.26	0.38	0.51	0.77	1.15
Clay	0.15	30%	0.09	0.18	0.27	0.36	0.54	0.81

\* Soil Conservation Service Nation Engineering Handbook, September 1997

\*\* Irrigation Association Best Management Practices – Landscape Irrigation Scheduling and Water Management, September 2003

A common range for an allowable depletion is .35 to .65 inches of water for turfgrass.

- Program the allowable depletion amount as the ET Threshold.

**Zone Run Time**

Now that you have determined how many inches of water should be applied to fill the root zone, how many minutes does each valve need to run to apply this amount of water?

An irrigation system applies water at a given rate, known as precipitation rate, expressed in inches per hour. The precipitation rate varies based on the sprinkler nozzle, pressure spacing and layout. There are several ways to determine the precipitation rate.

1. The irrigation designer can use a formula to estimate the precipitation rate.
2. Refer to the manufacturer sprinkler performance charts.
3. Perform a catch-can test to measure the amount of water applied by the sprinklers.

When you know how fast the sprinklers apply water, precipitation rate, and how much water should be applied then the zone run-time can be calculated.

$$\text{Run Time} = \frac{\text{ET Threshold} \times 60}{\text{Precipitation Rate}}$$

The zone run-time may need to be adjusted based on sprinkler distribution uniformity.

The following chart can be used to estimate the valve run time.

<b>Minutes of Valve run-Time</b>			
<b>Precipitation Rate - Inches per Hour</b>	<b>Inches of water</b>		
	<b>0.35"</b>	<b>0.5"</b>	<b>0.65"</b>
<b>2.00</b>	11	15	20
<b>1.75</b>	12	17	22
<b>1.50</b>	14	20	26
<b>1.25</b>	17	24	31
<b>1.00</b>	21	30	39
<b>0.90</b>	23	33	43
<b>0.80</b>	26	38	49
<b>0.70</b>	30	43	56
<b>0.60</b>	35	50	65
<b>0.50</b>	42	60	78
<b>0.40</b>	53	75	98

Often the soil cannot absorb water as fast as the sprinklers apply it, causing run-off. The total valve run-time may need to be split into several cycles to allow the water to soak between cycles.

- Program the controller so that each valve, for one 24-hour period, applies the amount of water set in the WR-7 as the ET Threshold.
- Program the controller to water every night. The WR-7 ET Enable control will prevent irrigation until the ET Threshold has been reached. Specific days may be turned off for certain events, the WR-7 will detect that irrigation did not occur and allow watering the following period.
- Program the ET Adjustment % based on the plant type, density and microclimate.

## Operating the System

Once installed and programmed there are three key settings that should be monitored:

**ET Threshold** – This setting controls the frequency of watering. Watering occurs once soil moisture has been depleted to an allowable level. The cycle run-times programmed in the control must be set to apply enough water to refill the root zone. For example if the ET threshold is set to .5” the controller run-times should be set so the sprinklers apply .5” of water.

**Time Windows** – The programmed Time Windows (ET Window and Daily Window) needs to correspond to the programmed start times in the controller. The window length needs to correspond to the total system operating time. These settings do not need to be exact. Extending the Time Windows programmed in the WR-7 beyond the actual controller time window provides for a margin of error.

**Current ET Balance** – The Weather Reach Receiver automatically controls the ET Balance. ET is added to the balance and rain and irrigation events are subtracted from the balance. When first setting up the system the current ET Balance should be set to allow watering when the user feels it needs to start. This would be based on the current soil moisture content and average daily ET. To manually adjust the balance go to Menu / Irrigate A (or B) ET Balance. Use the arrow keys to adjust the current ET Balance. Note the ET Threshold setting is also displayed. When the ET Balances is increased to equal the threshold setting irrigation will be enabled.

Note: If the ET Window is currently open, irrigation is already suspended and the balance is adjusted to enable irrigation, the suspend lights will not go off. The watering cycle will be allowed during the next ET Window.

## Irrigate Menu

The irrigation requirement is ET minus effective rain. The Irrigate menu displays the current information relative to irrigation.

### Rain

Rainfall values come from either the broadcast weather data or a local rain gauge. See Settings / System / Rain Source.

- **24 Hr** = Total measured rainfall recorded for the last 24 hours.
- **7 Day** = Total measured rainfall recorded for the last 7 days.

### ET

- **Last 24 Hr** – Total calculated ET for the last 24 hours.
- **7 Day** - Total calculated ET for the last 7 days.

### A (and B) ET Balance

This screen displays the current ET Balance (irrigation requirement) and the Threshold setting. When the ET Balance reaches the ET Threshold irrigation is enabled.

The ET Balance changes over time. Four factors influence the ET balance:

1. ET gets added to the balance every time weather data is received, typically once per hour.
2. Rain is subtracted from the balance. The Maximum hourly rainfall rate and Extra Rain settings may limit the amount of rain subtracted from the balance.
3. Irrigation, when detected is subtracted from the balance. The irrigation value subtracted from the balance is equal to the ET Threshold.
4. The user can manually adjust the balance.

## Status Menu

- **Irrigate A or B Counter** – The number of times the ET Threshold has been reached and irrigation was detected is accumulated and displayed on this screen. Press the Down arrow nine times to clear and reset the counter. There is a screen for both A and B.
- **Last Irrigate A or B** – The last date and time irrigation was sensed is displayed. An electric current sensor detects when the irrigation controller attempted to turn on a valve. This sensor is only active during the ET Window. Manual daytime watering occurring outside the ET Window is not recorded as a Last Irrigate.

Note: The Weather Reach Receiver does not log irrigation operated during the Daily Watering Window. These logs only report

ET Enable Control Menus	
<b>Weather Info</b>	<b>Mode</b>
<b>Rain</b>	Auto ET
Last 24 Hr	Default ET
7 Day	Override
<b>Air Temperature</b>	Off
Current	
Hi	<b>Settings</b>
Lo	<b>ET</b>
<b>Wind</b>	Start A When ET =
Current	Adjust A ET%
Hi	Start B When ET =
Lo	Adjust B ET%
<b>Humidity</b>	Maximum Hourly Rain
Current	Extra Rain A
Hi	Extra Rain B
Lo	Time Window Start
<b>ET</b>	Time Window Length
Last 24 Hr	Daily Window Length
7 Day	Local Crop Coefficient
	Wind Adjust %
	Default Day ET
<b>Irrigate</b>	<b>Weather Interrupt</b>
<b>Rain</b>	Temperature Interrupt
Last 24 Hr	Wind Interrupt
7 Day	Rain Interrupt
<b>ET</b>	<b>System</b>
Last 24 Hr	Weather Region
7 Day	Rain Source
A ET Balance	Rain per Tip
B ET Balance	A & B Mode
<b>Status</b>	Metric / English
Irrigate A Counter	Broadcast Crop Coefficient
Irrigate B Counter	Serial Number
Last Irrigate A	Password Yes / No
Last Irrigate B	ET Output
Last Broadcast	Restore Default
Last Interrupt	Clear Data
Broadcast Crop Coefficient	
Missed Data	
Test Counter	

ET-based watering cycles.

## Fine Tuning the System

The system will require monitoring and adjustments.

The system may be under watering or over watering. Several things could cause these problems.

- **Frequency** – Adjust the ET Threshold
- **Run-Time** – Adjust the irrigation controller valve run time
- **ET** – Adjust the ET %

**Frequency** - If it seems the system waters too often the ET Threshold should be raised. The valve run-times may also need to be raised. Lowering the ET Threshold will increase irrigation frequency.

Having a deeper root system develops drought tolerance and a healthier landscape. Less frequent, deep watering will develop the roots. This is a gradual process. Over time a period of time the valve run-time can be increased. When increasing run-time, decreasing the frequency of irrigation by increasing the ET Threshold.

**Run-Time** – Station run-time must be set so the sprinklers apply enough water to refill the root-zone. With an ET Threshold set at .5” the sprinklers should apply .5” of water during the watering period. A soil probe is a good tool to use to evaluate the effectiveness of the irrigation schedule. After a nights watering check the soil to see if the water soaked down to the desired level. Microclimate conditions may require an adjustment of the run-times.

The irrigation controller should be set to apply a given amount of water. Once that water has evaporated it is time to water again. The Weather Reach Receiver must be programmed to know how much water the irrigation controller applies.

**ET** - The ET value calculated by the WR-7 may need to be adjusted by using the ET Adjustment for A or B. Lowering the percentage will reduce the amount of water applied.

### Field Observations

When evaluating the performance of the irrigation system areas may be too dry or wet. To trouble shoot the problem determine if:

- **A dry spot within a zone** - A dry spot is typically an indication of a sprinkler coverage problem.
- **Dry or over-watered zone** - When a zone is too wet or dry the valve run-time should be adjusted in the controller.
- **Dry or over-watered site** - If the entire site is too wet or dry settings in the Weather Reach Receiver should be adjusted. Increasing the ET Threshold will decrease the frequency of watering.

## 6. ET Trigger

The ET Trigger mode signals an irrigation control system that watering is needed. The irrigation controller needs to recognize the signal and start a watering cycle at the programmed time. (Not all controllers have the capability of recognizing a sensor start signal.) The ET Trigger output operates in a similar fashion as the ET Enable output. It uses many of the same settings, but there are a few major differences.

- **Settings / System / ET Output Mode** – This must be set to ET Trigger.
- **Settings / System / Trigger Seconds** – When the Trigger occurs it closes the ET Pulse (A) and Rain Pulse (B) switch contacts. The duration of the switch closure, programmed in seconds, is entered on this screen.
- **Settings / ET Enable / Trigger Time** – This is programmed to control the time of day the Trigger is activated. It may be set to a specific time or “Any Time”.
  - **Programmed Time** – Enter the time of day when the Trigger should be activated once the ET Balance has reached the ET Threshold.
  - **Any Time** – Once the ET Balance reaches the ET Threshold (for A or B) the ET Trigger is activated. The “Any Time” setting can be found between 11:50 PM and 12:00 AM in the Trigger Time screen.

**Refer to the ET Enable chapter for details on all other ET settings.**

<b>ET Trigger Output Menus</b>	
<b>Weather Info</b>	<b>Mode</b>
<b>Rain</b>	Auto ET
Last 24 Hr	Default ET
7 Day	Override
<b>Air Temperature</b>	Off
Current	
Hi	<b>Settings</b>
Lo	<b>ET</b>
<b>Wind</b>	Start A When ET =
Current	Adjust A ET%
Hi	Start B When ET =
Lo	Adjust B ET%
<b>Humidity</b>	Maximum Hourly Rain
Current	Extra Rain A
Hi	Extra Rain B
Lo	Trigger Time
<b>ET</b>	Local Crop Coefficient
Last 24 Hr	Wind Adjust %
7 Day	Default Day ET
<b>Irrigate</b>	<b>Weather Interrupt</b>
<b>Rain</b>	Temperature Interrupt
Last 24 Hr	Wind Interrupt
7 Day	Rain Interrupt
<b>ET</b>	<b>System</b>
Last 24 Hr	Weather Region
7 Day	Rain Source
A ET Balance	Rain per Tip
B ET Balance	A & B Mode
	Trigger Seconds
	Metric / English
<b>Status</b>	Broadcast Crop Coefficient
Irrigate A Counter	Serial Number
Irrigate B Counter	Password Yes / No
Last Irrigate A	ET Ouput
Last Irrigate B	Restore Default
Last Broadcast	Clear Data
Last Interrupt	
Broadcast Crop Coefficient	
Missed Data	
Test Counter	

## 7. ET Pulse / Rain Pulse

Several controllers recognize a momentary switch closure as .01" of ET. The controller uses this value to automatically adjust irrigation schedules. As weather data is received the WR-7 calculates ET. The ET Pulse contacts are closed for each .01" of calculated ET. The contacts are normally open. There are several settings that control this circuit.

The WR-7 can provide a momentary switch closure that emulates a tipping bucket rain gauge. The irrigation controller must recognize this type of input for a rain value. Rainfall amounts are included in the weather data broadcast by the WRSP.

The contacts are normally open. The output occurs when the received weather data contains a rainfall value. There are several settings that control these circuits.

### System Settings

**Menu / Settings / System / ET Output Mode** – The output mode should be set to ET Pulse.

**Menu / Settings / System / Pulse per Minute** – The pulse output rate can be set to either 1 or 10 pulses per minute. Once programmed this rate applies to the Rain pulse output also. The rate is determined by the capabilities of the controller reading the pulses.

**Menu / Settings / System / ET Pulse Duration** – The time the relay contacts remained closed for each contact is a variable that can be programmed. The duration is determined by the capabilities of the controller reading the pulses.

**Menu / Settings / System / Rain Pulse Duration** – The time the relay contacts remained closed for each contact is a variable that can be programmed. The duration is determined by the capabilities of the controller reading the pulses.

### ET Settings

**Menu / Settings / ET / Local Crop Coefficient** – A Crop Coefficient ( $K_C$ ) percentage may be entered to adjust ET to meet local site conditions. This could be used in addition to the  $K_C$  value broadcast by the Weather Reach Service Provider. If the  $K_C$  value broadcast by the Weather Reach Service Provider is adequate leave the Local Crop Coefficient set at 100%.

$$ET_{OS} \times \text{Broadcast } K_C \times \text{Local } K_C = ET_C \text{ used by the system}$$

**Note:** Advanced users can have the Broadcast  $K_C$  value ignored. See Settings / System / Broadcast Crop Coefficient

**Menu / Settings / ET / Wind Adjust %** - The wind value included in the broadcast dataset can be scaled by a percentage to compensate for variations in prevailing conditions. Often, wind can fluctuate from one site to another, while the other weather parameters remain more constant over a wider area.

**Menu / Settings / ET / Default Day ET** –Enter the average current daily ET value.

The default ET value is used if no data is received after 25 hours. The default mode can also be set manually. In the default mode 1/24th of the daily default ET value is output to the ET pulse and added to the ET balance.

The Smart Default feature looks back at ET for the last 7 days and automatically calculates and sets the Default ET. When first getting started an initial default value should set and based on the current average daily ET.

**ET Pulse Output Menus****Weather Info****Rain**

Last 24 Hr

7 Day

**Air Temperature**

Current

Hi

Lo

**Wind**

Current

Hi

Lo

**Humidity**

Current

Hi

Lo

**ET**

Last 24 Hr

7 Day

**Status**

Last Broadcast

Last Interrupt

Broadcast Crop Coefficient

Missed Data

Test Counter

**Mode**

Auto ET

Default ET

Override

Off

**Settings****ET**

Local Crop Coefficient

Wind Adjust %

Default Day ET

**Weather Interrupt**

Temperature Interrupt

Wind Interrupt

Rain Interrupt

**System**

Weather Region

Rain Source

Rain per Tip

Pulse Per Minute

ET Pulse Duration

Rain Pulse Duration

Metric / English

Broadcast Crop Coefficient

Serial Number

Password Yes / No

ET Output

Restore Default

Clear Data

## **8. RS-232**

A serial port or RS-232 connection can be used to directly retrieve data from the WR-7. An irrigation controller must have an RS-232 port configured to access the data. The MODBus protocol is used. The WR-7 is the “slave”, waiting to respond to requests for specific data.

As weather data is received the WR-7 calculates ET. Compatible controllers or serial devices directly access ET and weather data to automatically adjust irrigation schedules.

The RS-232 port accepts an RJ-45 cable connection.

### **Settings**

The ET output must be set to RS-232. Normally this is programmed during Activation. To verify, go to Menu / Settings / System / ET Output and select RS-232.

### **Operation**

There are many options available to the serial device accessing the data. Refer to the users guide from the manufacturer of the compatible controller or serial device for more information.

### **POWER SUPPLY WARNING**

When connecting the model WR-7 Weather Reach Receiver to a compatible controller or serial device the via the RJ-45 RS-232 connection, use a model WR-PS Weather Reach plug-in power supply to provide to the model WR-7 Weather Reach Receiver. Failure to do so may cause damage to the serial devices.

<b>RS-232 Output Menus</b>	
<p><b>Weather Info</b></p> <p><b>Rain</b>                      Last 24 Hr                      7 Day</p> <p><b>Air Temperature</b>                      Current                      Hi                      Lo</p> <p><b>Wind</b>                      Current                      Hi                      Lo</p> <p><b>Humidity</b>                      Current                      Hi                      Lo</p> <p><b>ET</b>                      Last 24 Hr                      7 Day</p> <p><b>Irrigate</b></p> <p><b>Rain</b>                      Last 24 Hr                      7 Day</p> <p><b>ET</b>                      Last 24 Hr                      7 Day                      A ET Balance                      B ET Balance</p> <p><b>Status</b>                      Irrigate A Counter                      Irrigate B Counter                      Last Irrigate A                      Last Irrigate B                      Last Broadcast                      Last Interrupt                      Broadcast Crop Coefficient                      Missed Data                      Test Counter</p>	<p><b>Mode</b>                      Auto ET                      Default ET                      Override                      Off</p> <p><b>Settings</b></p> <p><b>ET</b>                      Start A When ET =                      Adjust A ET%                      Start B When ET =                      Adjust B ET%                      Maximum Hourly Rain                      Extra Rain A                      Extra Rain B                      Time Window Start                      Time Window Length                      Daily Window Length                      Local Crop Coefficient                      Wind Adjust %                      Default Day ET</p> <p><b>Weather Interrupt</b>                      Temperature Interrupt                      Wind Interrupt                      Rain Interrupt</p> <p><b>System</b>                      Weather Region                      Rain Source                      Rain per Tip                      Pulse Per Minute                      ET Pulse Duration                      Rain Pulse Duration                      A &amp; B Mode                      Metric / English                      Broadcast Crop Coefficient                      Serial Number                      Password Yes / No                      ET Ouput                      Restore Default                      Clear Data</p>

## 11. Troubleshooting

### The Display is blank.

1. Confirm power is connected
2. LCD Display contrast may need to be adjusted. Press the ESC key six times to get to the LCD contrast screen. Then use the up or down arrow to adjust the contrast.

### The Alert light is on.

With the display in the home position (ET with current date & time) a message will toggle between the date & time Alert condition.

1. **Missing data** – If the percentage of received messages drops below 65% the alert light will be on and the percentage on received messages is displayed. A missed message can be caused by several conditions.
  - a. Power off when a message was sent.
  - b. Local radio interference
  - c. Pager system failure
  - d. Problem with the Weather Reach Service Provider

Because there are 24 messages each day a missed message should not be a problem. The Weather Reach Receiver will automatically compensate for missed messages. If the problem persists contact the installer.

2. **No Weather Data** – If no weather data is received for 25 hours the WR-7 goes into a Default Mode, and uses the default ET value.
3. **Pager Failure**
  - a. Disconnect power to the WR-7, wait 1 minute and reconnect.
  - b. If the problem persists return to the distributor for service.
4. **Low Temperature Off** – Irrigation is suspended because the current temperature is below the Temperature Interrupt setting.
5. **High Wind Shut Off** – Irrigation is suspended because the current wind speed is above the Wind Interrupt setting.
6. **Rain Shut Off** – Irrigation is suspended because the rainfall value for the last 24 hours is above the Rain Interrupt setting.

### You need to turn a valve on, but the irrigation suspended when lit lights are on.

1. Press the manual override button. Each time it is pressed one hour of manual override is allowed.

### The landscape is not getting enough water.

Several things could be causing this problem.

1. The valve run-time set on the irrigation controller may not be long enough.
2. The ET Threshold may be too high. By lowering the threshold the frequency is increased.
3. A crop coefficient or ET adjust % may be too low.

## **The landscape is getting too much water.**

Several things could be causing this problem.

1. The ET Threshold may be too low. By raising the threshold the frequency is decreased.
2. The valve run-time set in the irrigation controller may be too long.
3. A crop coefficient or ET adjust % may be too high.

## **When did it last water?**

Go to Menu / Status / Last Irrigate A or B. The date and time irrigation was detected is displayed.

## **How many times has it watered?**

Go to Menu / Status / Irrigation A or B Counter. The number of times irrigation has occurred is displayed. Press the Down Arrow nine times to reset the counter.

## **I need to have the water off on certain days for an event or maintenance.**

Set the irrigation controller to water on the days that are available for irrigation. If the ET Threshold is met but the controller did not water that day, the electrical current detection will determine that irrigation did NOT occur and the ET Enabled mode will continue to the next watering period.

## **Irrigation is suspended but you want to water tonight.**

Check the ET Balance. Once the ET Balance reaches the ET Threshold irrigation is enabled. The balance can be manually adjusted. Go to Menu /Irrigate / ET A (or B) Start. Adjust the ET Balance up, using the Up Arrow button to so the ET Balance equals the ET Threshold. The Irrigation Suspended When Lit light will go off. (If the ET Window is already open the watering will be enabled during the next ET Window period)

## **Using the ET Enable output and the irrigation suspended when lit lights are always off watering every night.**

1. The ET Threshold could be too low.
2. The ET Window setting may not correspond to the time irrigation is scheduled to occur. Irrigation detection is only active during the ET Window. If the watering cycle occurs outside the programmed ET Window, irrigation is not detected and the ET Balance is not adjusted.

## **After a rainstorm it resumes watering too soon.**

1. The Maximum Hourly Rain setting may be limiting the amount of rainfall applied to the ET Balance.
2. The Extra Rain for A or B may be too low.
3. Crop Coefficient or Landscape adjustment percentages may be too high.

4. The broadcast rainfall value may not correctly represent actual site conditions. Connect a local tipping bucket rain collector.

## **After a rainstorm it doesn't resumes watering soon enough.**

The Extra Rain setting for A and B creates a limit to the amount of rain accumulated in the ET Balance. The Extra Rain setting is the additional moisture holding capacity beyond the ET Threshold setting. The Extra Rain setting varies based on site conditions; use a value equal to 50% of the ET Threshold as a starting point. This setting establishes the lower limit to the ET Balance. An Extra Rain setting of .25 would limit the ET Balance to -.25.

## **It was raining and the sprinklers were running.**

1. If the ET Balance is equal to the ET Threshold at the opening of the ET Window, irrigation will remain enabled through the ET Window. Rain that falls during normal irrigation will be accounted for in the ET Balance.
2. Accumulated rain may not have been sufficient to interrupt irrigation. Review the Weather Interrupt / Rain Interrupt settings.
3. Check the Rain Interrupt setting in the Weather Interrupt menu. This setting may need to be set to a lower limit.

## **I want to use a different weather region.**

1. Check with the Weather Reach System Service Provider to select a different weather data source. Determine the weather region number.
2. Go to Menu / System / Settings / Weather Region. Select and change to the desired weather region.

## 12. Warranty & Limited Liability

Irrisoft warrants products to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise, subject to the following conditions:

Irrisoft's obligation under this warranty is limited to repairing or replacing (at Irrisoft's option) products that have been returned prepaid to Irrisoft. Irrisoft will return warranted equipment by surface carrier prepaid. This warranty shall not apply to any Irrisoft products that have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. Under no circumstances will Irrisoft Inc. reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This warranty, and Irrisoft's obligation there under, is in lieu of all other warranties, expressed or implied, including warranties of suitability and fitness for a particular purpose. Irrisoft is not liable for indirect, incidental or consequential damages, including but not limited to: vegetation loss, cost of substitute equipment, additional services required, property damage or personal injury. This warranty does not apply where the equipment is used or installed in any manner contrary to product specification and instructions, nor where equipment is altered or modified. No agent or representative has the authority to waive, alter or add to the provisions of this warranty.

The WR-7 comes with default settings. These settings can be overridden when the Weather Reach Distributor programs site specific settings. Settings entered by the Weather Reach Distributor are programmed as probable initial settings. Many conditions affect each of the above settings. The Installer, Distributor, Weather Service Provider and Irrisoft Inc. make no guarantee that these settings or the default settings correctly meet the needs for the specific site. The Owner will need to adjust settings to meet specific site conditions.

The Weather Reach Service Provider (WRSP) accesses weather data from local weather stations and contracts with a paging service company. The WRSP operates independent of the Installer, Distributor, paging company and Irrisoft Inc. Neither the Installer, neither the paging company, neither Distributor nor Irrisoft Inc. are responsible for the weather data transmitted by the Weather Reach Service Provider. Weather conditions can vary; the Weather Reach Service Provider does not represent the broadcast data represents actual site conditions. The Owner will need to monitor site conditions and adjust the irrigation system to meet the water requirements of the landscape. By installing the WR-7 the Owner agrees to hold all above parties harmless in the event some condition arising out of the use of this device causes any damage.