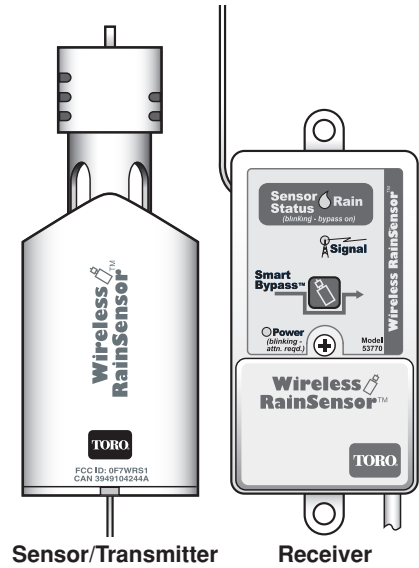


Wireless RainSensor™

Model 53770

User's Guide

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Introduction

The Toro Wireless RainSensor connects to your irrigation system controller/timer to suspend automatic watering operation in the event of rain. Designed for ease of installation, your sensor-controlled irrigation system will be up and running in minutes.

Before attempting the installation, please read through these instructions in their entirety, and refer the installation instructions for your irrigation system controller/timer in regards to connecting a rain sensor or rain switch. The Wireless RainSensor is designed to work with either Normally Open or Normally Closed sensor circuits.

⚠ Important: Please note the following information regarding installation and use of the Wireless RainSensor components:

- The RainSensor Receiver is designed to operate with 24 V ac power only. Connecting the Receiver wiring to 120/240 V ac power may result in severe equipment damage.
- Installation methods must comply with all applicable national and local building codes. If you are unsure about proper wiring practices, have a qualified contractor perform the installation for you.
- The Receiver cover should always be used when the Receiver is installed outdoors.
- The Sensor/Transmitter should never be submerged in water or installed inside a rain gutter.

Component Overview

Receiver (Figure 1)

- 1 - Weather-resistant Cover:**
Slides upward to remove. Protects the Receiver module when located outdoors. Keep the cover installed at all times other than when manually operating the Receiver.
- 2 - Antenna wire:**
Straighten the antenna wire vertically for the best reception.
- 3 - Sensor Status Indicator:**
Steady light - Sensor is active.
Blinking light - The RainSensor Receiver has been bypassed for one rain cycle (Smart Bypass button pressed).
- 4 - Signal Indicator:** Indicates the quality of last received signal.
Steady light - good signal.
Blinking light - fair signal.
No light - poor signal (relocate the Sensor/Transmitter).
- 5 - Smart Bypass™ Button:**
Press to temporarily override the sensor when active. Sensor operation will reset automatically. To manually exit the bypass mode, press button again.
- 6 - Power Indicator:**
Steady light - 24 V ac power is connected.
Blinking light - Sensor/Transmitter battery power low, or other communication problem.
No light - Unit is off or is disconnected from 24 V ac.

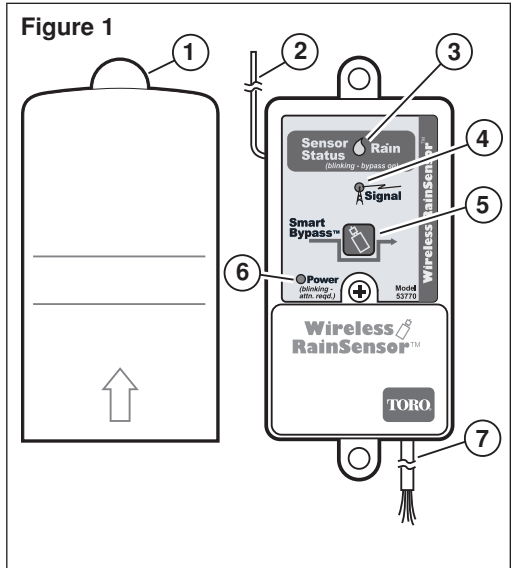
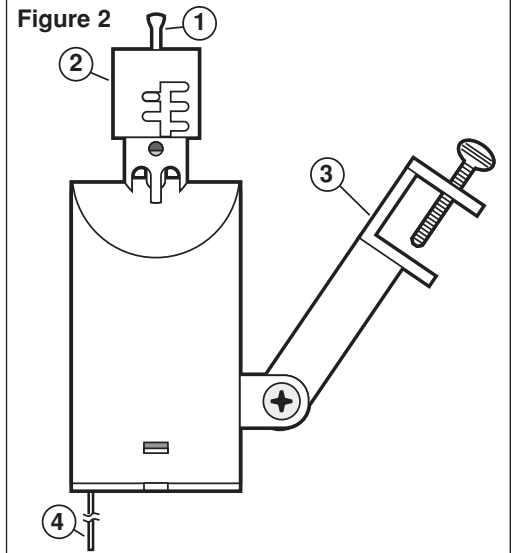


Figure 2



- 7 - Multi-wire Cable** - 20" color-coded wires provided for controller connections.

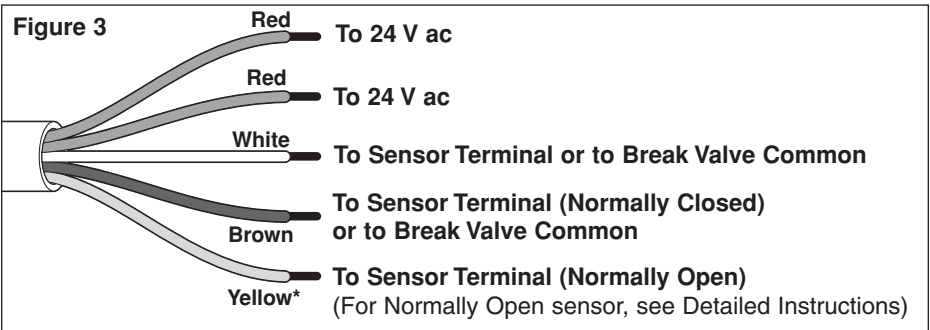
Sensor/Transmitter (Figure 2)

- 1 - Test Spindle** - Press down and hold to manually test Sensor/Transmitter operation.
- 2 - Rainfall Adjustment Cap** - Adjusts the Sensor/Transmitter to signal the Receiver when the accumulated rainfall reaches 1/8", 1/4", 1/2", 3/4" or 1".
- 3 - Universal Mounting Bracket with Quick-Clip™** - Simplifies installation on rain gutter, side of roof, shed, fence, etc. Enables the Sensor/Transmitter to be mounted on an angled surface then easily adjusted to the vertical position.
- 4 - Antenna Wire** - Straighten downward for maximum range.

Quick Start Installation Instructions

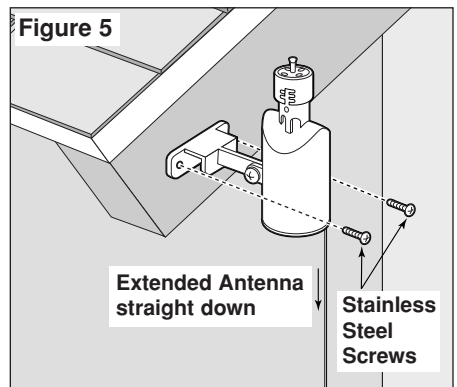
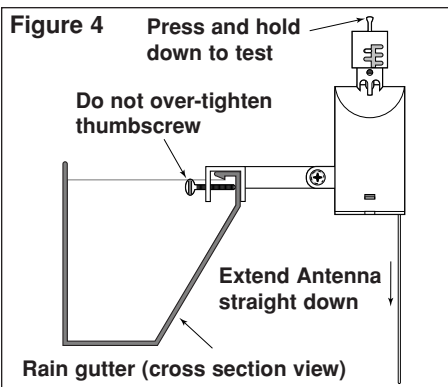
The following instructions are provided for the experienced installer. If you are installing a Toro Wireless Rainsensor for the first time, use the Detailed Installation Instructions starting on page 4.

1. Disconnect power to the irrigation system controller.
2. Always mount the Receiver **FIRST**, adjacent to the controller with either the provided stainless steel screws or double-sided foam tape.
3. Refer to **Figure 3**. Attach White and Brown (or Yellow*) control wires to the controller's Sensor terminals in any order OR, to break the valve common:
 - a. Disconnect valve common wire and common pump/master valve wire (if present).
 - b. Attach White wire to common wire(s) with a wire connector.
 - c. Attach Brown wire to common terminal on controller (Yellow wire is not used in this connection).



4. Connect the Red wires to the controller's 24 V ac power source terminals.
5. Straighten the Receiver antenna wire upward and the Sensor/Transmitter antenna wire downward.
6. While holding the Sensor/Transmitter at close range to the Receiver, press and hold the Test Spindle to test the wiring. The Power, Signal and Sensor Status indicators should be ON.
7. Adjust the Rainfall Adjustment Cap to the desired rainfall activation amount.
8. Mount the Sensor/Transmitter in an unobstructed location away from sprinklers. See **Figures 4** and **5**.

⚠ Important: Reconfirm proper operation of the Wireless RainSensor at the final mounting location.



Detailed Installation Instructions

There are two main components of the Wireless RainSensor: the Receiver and the Sensor/Transmitter. The Receiver is installed adjacent to the irrigation system controller. The Sensor/Transmitter is installed outdoors where it is exposed to unobstructed rainfall.

Mounting the Receiver

1. Mount the Receiver **FIRST**, adjacent to the controller with either the provided stainless steel screws or double-sided foam tape. The connection wire cable is 20" long, so before attaching the Receiver, make sure the wires will easily reach the controller's connection terminals.

Wiring the Receiver

There are two parts involved in wiring the Receiver:

Part 1: Attach the Receiver control wires.

Part 2: Attach the low-voltage power wires to supply 24 V ac to the Receiver.

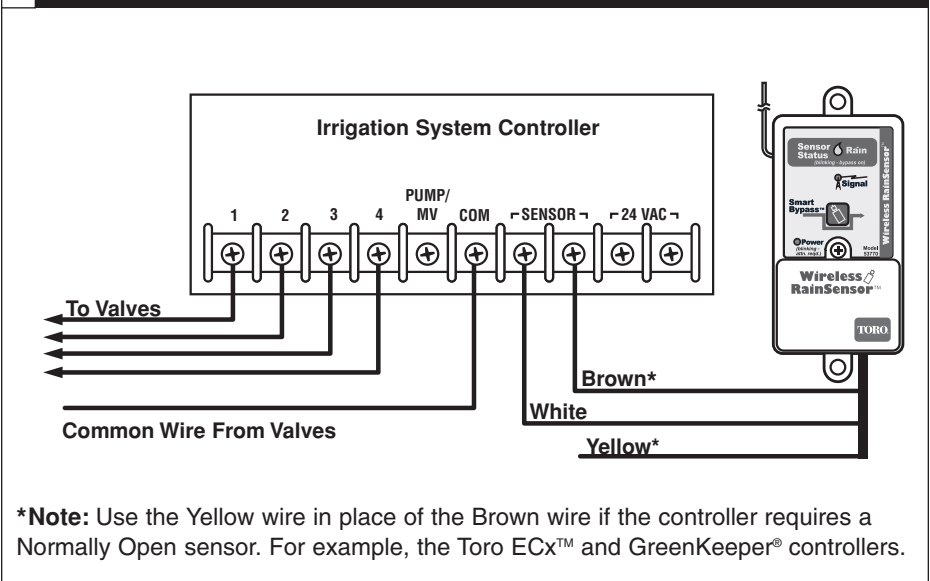
Part 1 - Control Wire Connection

The Receiver control wires are used to interrupt the common wire of the valves or they can be connected directly to the sensor input terminals of the controller (if provided).

1. Disconnect power to the controller.
2. Follow applicable wiring procedure **A** or **B** or **C**.

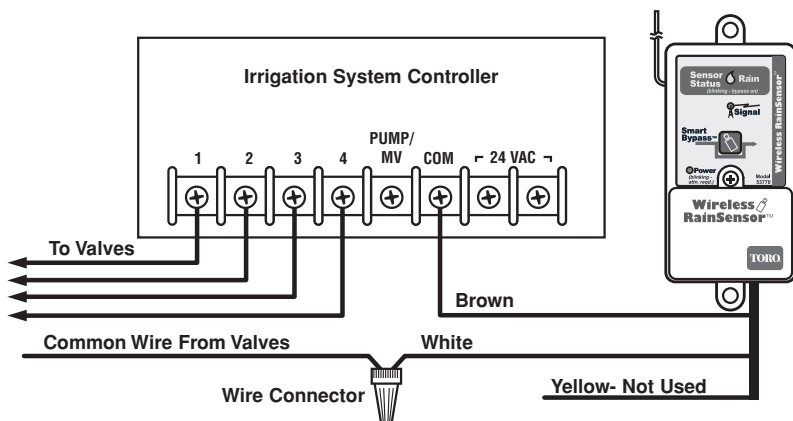
Note: The following diagrams are representations only and do not depict actual controller layouts. Refer to the installation instructions provided with your controller for specific wire connection information.

A Controllers with sensor inputs , with or without pump start /master valve:



Locate the controller sensor terminals (generally marked "SENSOR", "SEN" or "S") and directly connect the White and Brown* wires to these terminals in any order. There may be a jumper wire or tab connecting the terminals that must be removed and/or a sensor control or bypass switch that must be activated.

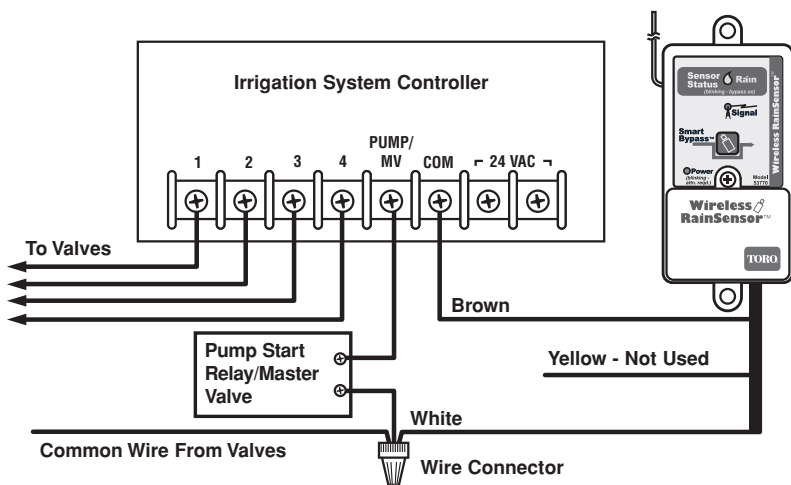
B Controllers with no sensor inputs and no pump start or master valve:



Remove the valve common wire from the valve common terminal (generally marked “C”, “COM”, or “VC”). Join this wire to the White wire using a wire connector. Attach the Brown wire to the valve common terminal.

Note: The yellow wire is not used in this application.

C Controllers with pump start or master valve and no sensor inputs:



Remove all common control wires from the valve common terminal(s) of the controller (generally marked “C”, “COM”, or “VC”). Join these wires to the White wire using a wire connector. (Be sure to include the common wire from the pump start relay or master valve in this connection). Attach the Brown wire to the valve common terminal.

Note: The yellow wire is not used in this application.

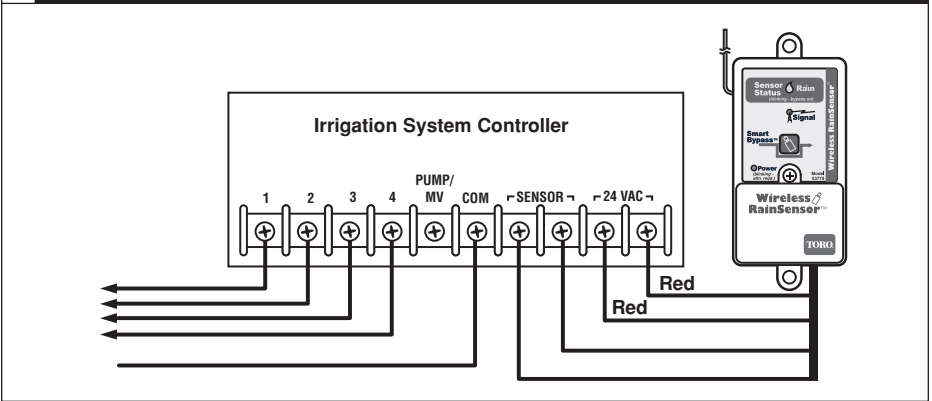
Part 2 - Power Wire Connection

Note: The Receiver requires 24 V ac to operate. It should only be connected to an irrigation controller that uses a 24 V ac UL listed Class 2 transformer to supply power.

⚠ Caution: Do not connect the Receiver directly to 120/240 V ac power as this may result in irreversible damage. If you are in doubt, contact a qualified installer or electrician.

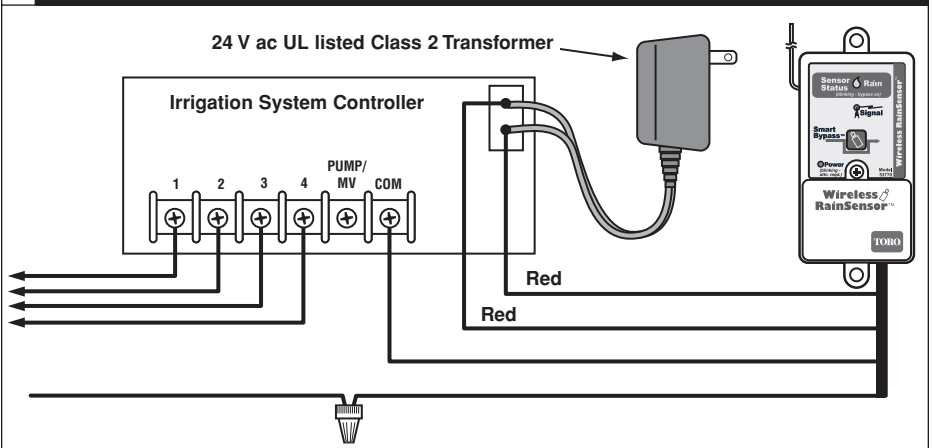
1. Disconnect power to the controller.
2. Follow applicable wiring procedure **A** or **B**.

A Controllers with 24 V ac connection terminals.



Terminals for 24 V ac power are present on the majority of controllers. Typical markings are “24 VAC”, “24 and 24”, “0 and 24” and “Hot Post and 24.” Verify correct voltage, then simply attach the two Red power wires to these terminals leaving existing connections in place.

B Controllers with no 24 V ac connection terminals.



On controllers with no 24 V ac terminals, connect the two Red power wires to the transformer's secondary 24 V ac power wires where they attach to the controller's circuit board.

Note: This procedure will require a solder or wire-splice connection. If you are unsure how to do this correctly, contact a qualified contractor or electrician for assistance.

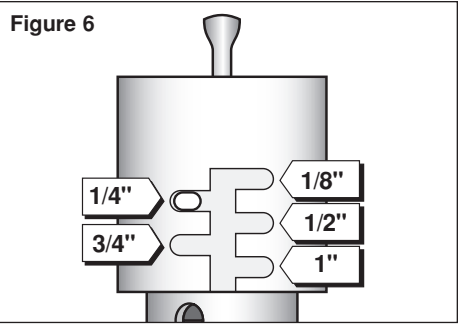
Initial Receiver Testing

Reconnect power to the controller and verify the Receiver's Power Indicator is illuminated. Hold the Sensor/Transmitter at close range to the Receiver, then lightly press and hold the Test Spindle. The Sensor Status Indicator should illuminate and remain on until the Test Spindle is released. The Signal Indicator should also illuminate during the test to verify good signal strength. If either indicator does not illuminate, recheck your wiring. **Verify that both antennas are fully extended and straight.**

Rainfall Adjustment (Figure 6)

Prior to installing the Sensor/Transmitter, check the current setting on the Rainfall Adjustment Cap. The RainSensor can be adjusted to detect average rainfall amounts of 1/8", 1/4", 1/2", 3/4" or 1" before suspending watering.

To adjust, turn the cap from the current setting and engage the stationary pins with the desired slot position. Be sure to align the slot and pin properly as this adjustment does not require excessive force.



Note: Avoid using the 1/8" setting in high-humidity conditions.

Sensor/Transmitter Installation

Select an installation site for the Sensor/Transmitter as close to the Receiver as possible to avoid interference of the wireless signal. The Sensor/Transmitter must be installed where it has unobstructed exposure to rainfall and the sunlight conditions are similar to those of the landscape being watered. Make sure the RainSensor will not be in contact with spray from the sprinklers or runoff from the roof.

Testing Signal Strength at the Installation Site

Before installing the Sensor/Transmitter, test the signal strength again from the selected installation site. The Receiver's Signal Indicator verifies the strength of the last valid received signal. To clear the Signal Indicator from the previous test, simply press the Smart Bypass button once, then once again to exit the bypass mode.

Test the Sensor/Transmitter as described in "Initial Receiver Testing" above. A steady Signal light indicates a good signal. A flashing indicator light indicates a fair signal. If the indicator does not illuminate, the Sensor/Transmitter is not providing a valid signal for operation. Refer to "Solving Reception Problems" on page 10 before continuing.

Testing Control System Operation

To test the Wireless RainSensor operation with the irrigation system controller, activate a watering zone which is visible from the Sensor/Transmitter location.

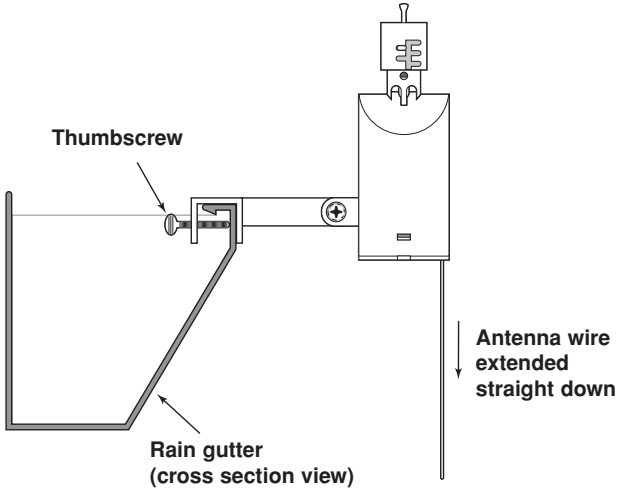
Note: The manual activation cycle of some controllers bypasses the sensor inputs. If the Receiver is connected to the controller's sensor inputs, you will need to run an automatic/timed watering program for these types of controllers.

With the sprinklers on, manually activate the Sensor/Transmitter by pressing and holding the Test Spindle. The sprinklers should shut off within a short time. If they do not shut off, recheck the Receiver wiring connections at the controller. If the controller has a sensor control or bypass switch, make sure the switch is set to the position that will enable the sensor circuit to be active.

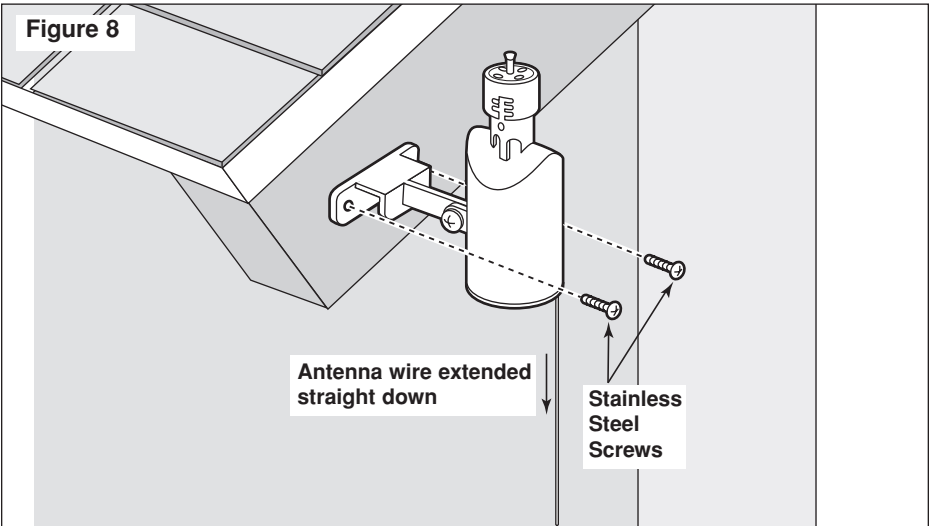
Installation Procedure

The Sensor/Transmitter should be mounted vertically with the antenna wire extending straight down. Avoid installations where the antenna wire would contact any metal object.

Figure 7



A rain gutter is an ideal location for the Sensor/Transmitter. Simply position the bracket with the thumbscrew under the gutter lip and tighten to secure (do not over-tighten). See **Figure 7**.



The Sensor/Transmitter can also be mounted on any suitable solid structure such as the side of the roof, a shed or fence using the two supplied stainless steel screws. See **Figure 8**.

Once securely fastened, adjust the Sensor/Transmitter on the mounting bracket as needed to align the Sensor/Transmitter housing vertically.

RainSensor Operation

Normal Operation

When the RainSensor activates due to sufficient rainfall, the Sensor Status Indicator will remain illuminated on the Receiver and the sprinkler system will remain inactive until the moisture-absorbent discs inside the Sensor/Transmitter have dried out. The rate at which the discs dry out will vary dependent on ambient conditions such as temperature, sun exposure, humidity and wind—the same conditions your soil experiences. This allows the Wireless RainSensor to reset when watering is needed again, enabling the sprinkler system to resume normal operation.

Smart Bypass

Your Wireless RainSensor can be temporarily deactivated by using the built-in Smart Bypass button. Simply press this button once to bypass current RainSensor control. The Sensor Status light will blink until the next time the Sensor/Transmitter dries out and automatically resets. Pressing the Smart Bypass button again resumes the RainSensor control. Pressing the Smart Bypass button while the RainSensor control is not active (dry) will cause the Receiver to ignore the next Sensor/Transmitter signal.

Power Down

To turn the Receiver OFF entirely, press and hold the Smart Bypass button until the Sensor Status Indicator begins blinking rapidly (5–7 seconds). Release the Smart Bypass button and confirm the Power Indicator goes out and flashes periodically. Simply press the Smart Bypass button once to turn the Receiver back on.

Receiver Learn Mode

If it becomes necessary to set the Receiver's address code to that of a new Sensor/Transmitter, press and hold the Smart Bypass button until the Status and Signal indicators blink in unison (10+ seconds). Activate the corresponding Sensor/Transmitter at close range (by pressing down on the Test Spindle) to change the existing Receiver code to that of the new Sensor/Transmitter. The indicators will stop blinking upon learning the new code. Pressing the Smart Bypass button again will exit the learn mode if no valid code is received.

Attention Required

When the Power Indicator blinks, it indicates that either of the following conditions exists:

- The Sensor/Transmitter's battery is getting low and should be replaced when convenient. The Wireless RainSensor will function properly for some time after this indicator is present. Refer to "Sensor/Transmitter Battery Replacement" on page 10.
- If the batteries are good, a problem with communication is indicated. Relocating the Sensor/Transmitter may be necessary to provide a better signal. Refer to "Solving Reception Problems" on page 10.

Sensor/Transmitter Battery Replacement

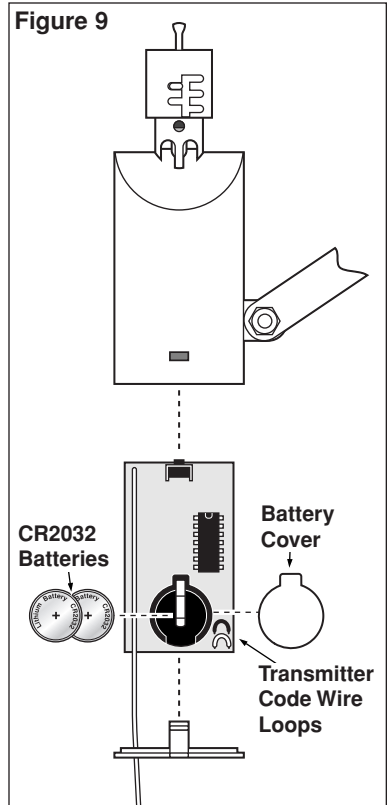
1. Remove the bottom housing cover of the Sensor/Transmitter by gently pressing in and down on the lower opposing tabs using a small flat-blade screwdriver, then carefully slide the circuit board out. See **Figure 9**.
 2. Remove the battery cover and batteries. Replace using two 3V CR2032 (or equivalent) batteries. Install with positive (+) side of the batteries facing up.
- Note:** Properly dispose of used batteries per the battery manufacturer's recommendations.
3. Reassemble the unit in reverse order.

Changing the Sensor/Transmitter Code

The transmission code of Wireless RainSensor system is identified by stickers located on the Sensor/Transmitter and Receiver. Although, in most cases, even if two identical units are installed, unwanted activations would only occur if the two Sensor/Transmitters were set for different rainfall amounts. However, the code may be manually changed as follows:

1. Remove the bottom cover of the Sensor/Transmitter by gently pressing in and down on the the lower opposing tabs using a small flat-blade screwdriver, then carefully slide the circuit board out. See **Figure 9**.
2. Identify the code wire loops (small black wire and white wire loops) and cut one or both loops using end-cutting pliers.
3. Reassemble the Sensor/Transmitter and follow the procedures provided in "Receiver Learn Mode" on page 9.

Figure 9



Troubleshooting

Signal Indicator (Installation Validation™)

The Signal Indicator provides instant signal strength feedback for the installer. The indicator always shows the strength of the last signal received. In order to clear this signal, simply press the Smart Bypass button once; pressing the button again will exit the bypass mode.

Solving Reception Problems

The Wireless RainSensor operates under Part 15 of the FCC rules. This means that it has to comply with certain standards and is only allowed to transmit up to a certain power level. In rating transmitters of any form, typically a line-of-site value is used in order to show the relative effectiveness of a transmitter and allow a transmitter and receiver to be compared to one another using a fair method. The Wireless RainSensor operates up to 300' line-of-site. This means that in an open field, with no obstructions, the Sensor/Transmitter and Receiver pair will successfully communicate up to 300' apart. However, in almost all installations, there are obstacles between the Sensor/Transmitter and Receiver such as walls, floors, etc.

The obstacles will all affect the transmitted signal and typically reduce the radiated power that will be read by the Receiver. Different objects such as walls and floors affect the transmitted signal differently depending on the material composition, geometry and thickness. Typically, most residential and light commercial construction materials do not reduce the effective transmitted signal enough to pose problems under normal installation conditions. However, there are some installations with very thick, dense walls, or that involve large amounts of radio frequency interference (electrical switching rooms etc.) where the effective range of the Wireless RainSensor may be greatly reduced.

Some helpful tips on mounting the Sensor/Transmitter and Receiver for the best Radio Frequency (RF) performance:

- Always try to keep the antennas straight and fully extended (straight up on the Receiver and straight down on the Sensor/Transmitter).
- Try to maintain a parallel orientation of one antenna to the other. Avoid installing either unit where the antennas are in close proximity to large metal objects.
- Attempt to mount the units as close together as possible to reduce the potential for interference or signal reduction. If the signal strength is not good in one location, try another location - even as little as a few feet of movement can change from a weak spot to a strong spot. Interior locations where cell phones or cordless phones have trouble with reception may indicate areas with poor RF signal transmission.
- If possible avoid an installation where the Sensor/Transmitter is located exactly above the Receiver. Move the Sensor/Transmitter slightly offset to one side. When the RF signal is passing through walls, keep in mind that it has less thickness to penetrate when it passes straight through the wall. In other words, passing diagonally through a wall increases its effective thickness. Because every installation is different, the ONLY guaranteed method to verify an installation is to physically TRY IT!

Electromagnetic Compatibility

Domestic: This device complies with FCC rules Part 15. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference that may be received, including interference that may cause undesirable operation. This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a FCC Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient the receiving antenna, relocate the remote control receiver with respect to the radio/TV antenna or plug the irrigation controller into a different outlet so that the irrigation controller and radio/TV are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. 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.

FCC ID: OF7WRS1

IC: 3949104244A

Specifications:

Receiver Mounting Options: Stainless steel screws and/or double-sided foam tape.

Sensor/Transmitter Mounting Options: Quick-Clip™ rain gutter bracket and roof eaves/fascia mounting bracket with stainless steel screws.

Sensor/Transmitter Range: Up to 300' line-of-site.

Sensor Type: Industry-standard hygroscopic disc stack with adjustable rainfall sensitivity.

Transmitter Battery Type: (2) 3V cells - CR2032 (or equivalent).

Average Battery Life: Five years

Operating Temperature Range: -20°F to 120°F

Receiver Power Input: 22–28 V ac/V dc, 100mA (from existing controller/timer with Class 2, UL-approved transformer).

Relay Contacts Output: Normally Open (NO) and Normally Closed (NC) 3A at 24 V ac.

Receiver Controls: Sensor Status Indicator, Signal Indicator, Smart Bypass Switch, Power Indicator with low battery/poor communication warning.

UL Listed

The Toro Promise — Limited One-Year Warranty

The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrants, to the owner, against defects in material and workmanship for a period of one year from the date of purchase.

Neither The Toro Company nor Toro Warranty Company is liable for failure of products not manufactured by them even though such products may be sold or used in conjunction with Toro products.

During such warranty period, we will repair or replace, at our option, any part found to be defective.

Return the defective part to the place of purchase.

Our liability is limited solely to the replacement or repair of defective parts. There are no other express warranties.

This warranty does not apply where equipment is used, or installation is performed, in any manner contrary to Toro's specifications and instructions, nor where equipment is altered or modified.

NEITHER THE TORO COMPANY NOR TORO WARRANTY COMPANY IS LIABLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE USE OF EQUIPMENT, INCLUDING BUT NOT LIMITED TO: VEGETATION LOSS, THE COST OF SUBSTITUTE EQUIPMENT OR SERVICES REQUIRED DURING PERIODS OF MALFUNCTION OR RESULTING NON-USE, PROPERTY DAMAGE OR PERSONAL INJURY RESULTING FROM INSTALLER'S NEGLIGENCE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

ALL IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR USE, ARE LIMITED TO THE DURATION OF THIS EXPRESS WARRANTY.

Some states do not allow limitations of how long an implied warranty lasts, so the above limitation may not apply to you.

This warranty gives you specific legal rights and you may have other rights which vary from state to state.

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