# SMRT-Y

## Soil Moisture Sensor

User Manual

Manual del usuario

Guide de l'utilisateur

Benutzerhandbuch

Manuale dell'utente

Gebruikershandleiding

Manual do Utilizador

Εγχειρίδιο χρήσης

Kullanıcı Kılavuzu

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## Introduction

Congratulations on your purchase of the Rain Bird SMRT-Y Soil Moisture Sensor kit, utilizing the the most advanced technology available on the market. You have joined those interested in conserving water, Earth's most important resource, while optimizing the root health of your turf and trees.

### *Items Needed*

Before you start installing your new Rain Bird Soil Moisture Sensor:

**for Sensor Installation (SMRT-SMS)**

- Use 18 AWG wire or equivalent for splicing and burial
- Grease caps or equivalent waterproof connectors (3)
- 7" valve box (optional)
- Flat blade shovel
- Wire strippers/pliers

**for User Interface Installation (SMRT-Y)**

- Medium Philips screw driver
- Drill
- Wire strippers/Pliers
- Connect to a UL listed irrigation controller or equivalent

### *Panel Description*


LCD Display — Displays soil moisture, soil temperature, electrical conductivity. It also displays Watering history (see page 12).

Read Sensor — Read sensor displays and sets the moisture threshold. This threshold is the volumetric soil moisture level at which the SMRT-Y disrupts irrigation.

Soil Temp — Displays soil temperature. Increments up when "Read Sensor" is depressed. Press and toggle "Soil EC" to display Fahrenheit or Celsius

Soil EC — Displays soil electrical conductivity, increments down when "read Sensor" is depressed. Changes between Fahrenheit and Celsius when "Soil Temp" is depressed.

Bypass — Sets the SMRT-Y user interface to Bypass mode, disabling the sensor.

### *How it Works*

The SMRT-Y uses a Digital Time Domain Transmissometry Soil Moisture Sensor buried in your lawn to accurately monitor the Volumetric Water Content of your soil. The SMRT-Y user interface connects to your existing irrigation controller. Your controller is programmed to water on a regular basis. The SMRT-Y takes soil moisture readings every 10 minutes. If the water content of the soil is above the set threshold for your soil, then the SMRT-Y will suspend the irrigation cycle by interrupting the power to your solenoid valves. This power is restored after 30 minutes of controller inactivity.

**NOTE**: Taking a manual reading during a controller cycle or within 30 minutes after the end of a cycle will not affect the Water Suspended/Allowed mode of the user interface. If you push "Read Sensor" during this period, the user interface may show a moisture reading above the moisture threshold. The interface will not change state or suspend irrigation until a reading is made outside of this time period. This assures that all programmed zones receive water during an allowed controller cycle.

If the water content in the soil is below the threshold when your controller begins its cycle, the SMRT-Y allows the controller and its irrigation programs to operate normally. The connection will be maintained for the entire watering cycle and for 30 minutes thereafter. The SMRT-Y has provisions to water two zones independent of the sensor to accommodate drought-tolerant planting, cacti, trees, potted plants, drip zones, etc (see page 14).

### *Preparation*

1. Ensure that the property has been irrigated within the past 12 hours. This will make digging easier and lessen the likelihood of turf root damage.
2. Review each irrigation zone and identify the primary plantings (turf, shrubs, flowers, etc.). Record zone type (drip, vs. sprinkler) and where it is located on the property. For the turf zones, record whether the zone is full sun, partial sun or shade. Finally, record each zone's current controller settings.
3. Ensure each zone operates properly.
4. Choose a full sun turf zone for the sensor installation (see Figure 1 & 2).
5. From the homeowner or maintenance contractor, determine and record the most frequent watering intervals and run times that have been used in past peak season settings.

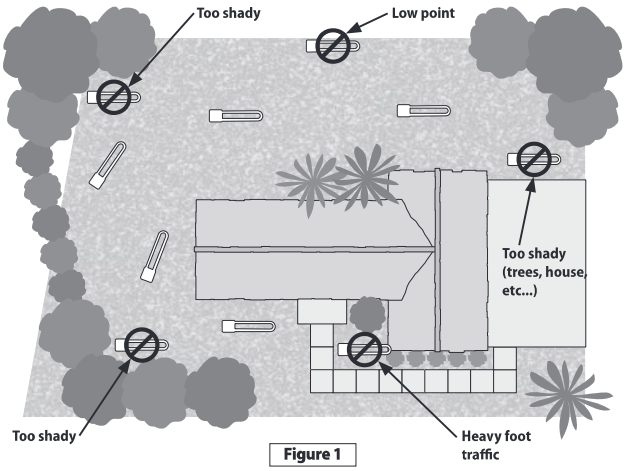



**Figure 1**
**Sensor Location Selection**

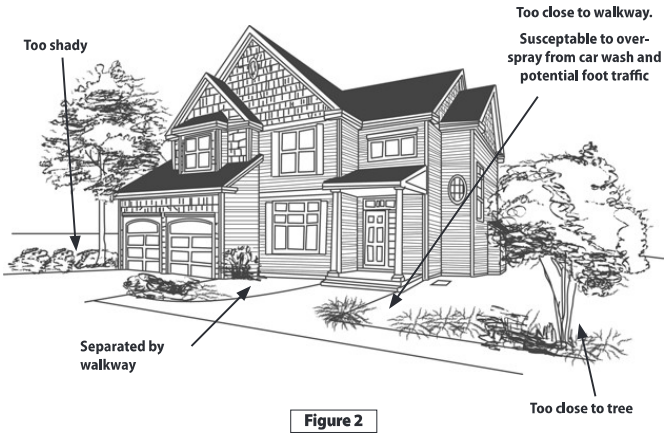



**Figure 2**
**Unacceptable Sensor Locations**

## SMRT-SMS Soil Moisture Sensor Installation

1. Manually turn on the zone where the sensor is to be installed and the adjacent zones. Observe the water distribution patterns and select the sensor installation spot.

   **NOTE:** Avoid placing the sensor where water will accumulate from runoff such as near driveways, sidewalks, depressions and at the base of berms or hills.

2. Pick a spot where the turf is healthy and the subsoil allows drainage. Place the sensor at least 4 feet away from sprinkler heads and in an area that is irrigated by only the one selected zone.

3. Locate the nearest valve box to the chosen sensor installation spot. Identify and mark both ends of a zone wire in the valve box and at the controller. You can do this by manually bleeding a valve in the valve box to find out what zone it controls. Place a piece of electrical tape on the zone wire connected to that valve. Then place a piece of electrical tape on the other end of that wire in the controller box. Make sure that the selected wire is the zone wire and not the 'common' wire.

   **NOTE:** Avoid selecting a zone which powers more than one solenoid. The green wire from the SMRT-Y user interface must be connected to a zone which activates a single valve solenoid.

4. Using a flat bladed shovel, define three sides of a square 18" wide by 18" in length and 6" deep. This slit should be U shaped (see figure 3). Work the shovel under the sod at a depth of about 4 inches and roll back the sod leaving exposed soil 3 to 4 inches deep. About 6 inches from one side of this opening, dig a similar opening and hole to accommodate a 7" valve box. This valve box (wiring box) will be used to splice additional wire from the sensor to the zone wire identified in Step 3. Dig a slit trench from the 7" wiring box location to the base of the 18" square opening created for the sensor (see Figure 4).
5. Place the sensor horizontally in the loose soil at the bottom of the U-shaped cavity with the sensor wires running along the trench that leads to the wiring box. Pack loose soil firmly around the sensor rods to a depth of about ½ inch. Then pull the sod back over the sensor and pack it down firmly.

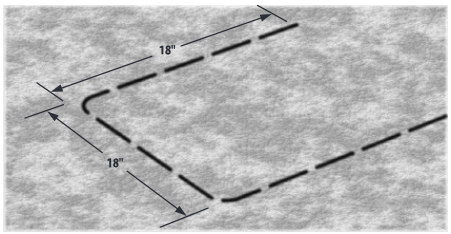



**Figure 3**

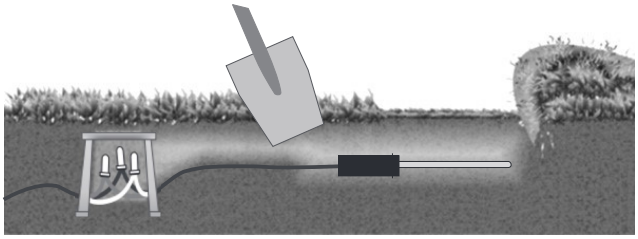


**Figure 4**

6. Within the wiring box, connect the sensor wires to the extension cable that leads to the valve box. Use grease caps for all connections after confirming proper system operation. If the extension cable wire colors do not match the wire colors from the sensor, write down the extension cable wire colors that correspond to the Red, White and Black wires from the sensor.
7. In the valve box, disconnect the marked zone wire from the valve and connect it to the extension cable wire previously attached to the Red sensor wire. No other wires should be attached to this connection. Re-connect the disconnected valve wire to the Black sensor wire extension. Connect the White sensor wire extension to the common wire in the valve box. Make sure all valves in the valve box share the same common connection with the White sensor wire (see Figure 5). Use grease caps for all connections after confirming proper system operation (see wiring diagram included in your kit).

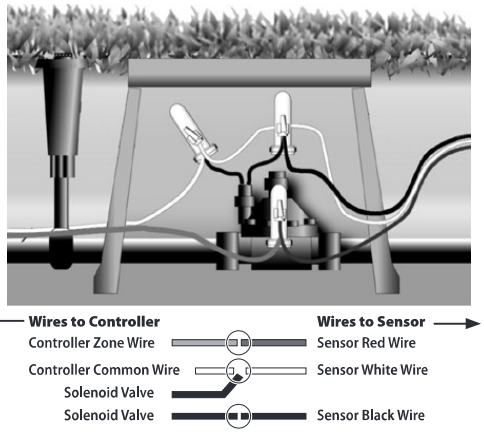



**Figure 5**
**Valve Box Connections**

For a weather proof connection (see Figure 6) please use:

- A 7 inch round Valve Box (Rain Bird item #VB-7RND)
- Grease Caps or equivalent waterproof connectors (Rain Bird direct bury connector #DBTWC25)
- Use 18 AWG direct burial polyethylene insulated wire (or equivalent) for splicing and burial

**8.** Finally, pour a five gallon bucket of water slowly over the sensor installation area.

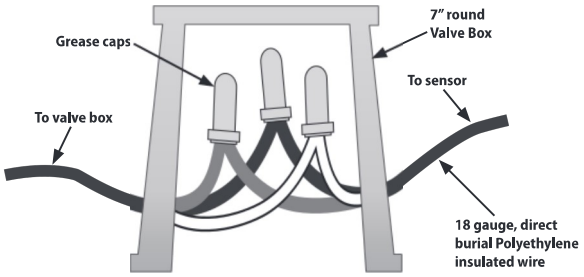



**Figure 6**
**Wiring Box Connections**

## SMRT-Y User Interface Installation:

### *Overview*

Mount the SMRT-Y user interface on the wall near the controller. Route the SMRT-Y cable to the controller. Disconnect all wires attached to the common terminal and re-connect them to the White SMRT-Y wire.

**NOTE:** If there is more than one field common, connect all common wires to the White SMRT-Y wire.

Connect the Black SMRT-Y wire to the common terminal. Disconnect the marked zone wire from its terminal and connect it to the Red SMRT-Y wire. Connect the Green SMRT-Y wire to the terminal from where the zone wire was removed. Connect the Orange SMRT-Y wire to the 24 volt AC 'hot spot' or transformer terminal (see Figure 8).

### *Detailed Procedure*

**1.** Disconnect the wire or wires that are connected to the "COM" (or Common) terminal on your controller. Connect the Black wire from the SMRT-Y user interface to the controller's COM terminal (see Figure 7).

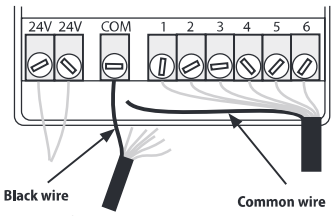



**Figure 7**

2. Connect the Orange wire from the SMRT-Y to one of the 24 VAC terminals on your controller. In order to determine which of the 24V terminals to connect the Orange wire to, touch the Orange wire to each of them with the controller powered on (AC adapter plugged in). Use the terminal which activates the SMRT-Y display (see Figure 8).

**NOTE:** Be sure to unplug the power once you determine the correct 24V terminal. Do not disturb the power supply wires connected to these terminals. Leave them connected as they are.

Unplug the AC power supply and secure the Orange wire in that terminal along with the existing wire. (Some controllers have a terminal marked 'TEST' or 'HOT SPOT' that can be used to connect the Orange wire.)

**Be sure to connect the correct 24V terminal**

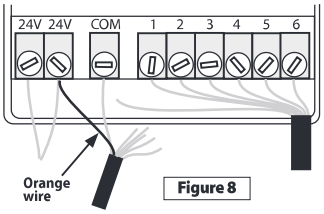



**Figure 8**

**NOTE:** Some controllers do not provide internal access to the AC power terminals. In this case a 24 volt AC adapter is available at your local sprinkler supply store. You will need to connect one of the AC adapter wires to the COM terminal (which will also have the Black wire from the SMRT-Y attached) and the other adapter wire connects to the Orange wire coming from the SMRT-Y.

3. Connect the wire or wires you disconnected from the 'COM' terminal to the White wire from the SMRT-Y cable using a wire nut (see Figure 9).
4. Disconnect the target zone wire identified and marked earlier (zone #1 in figure 10). Connect it to the Red wire of the SMRT-Y user interface with a wire nut (see Figure 10).

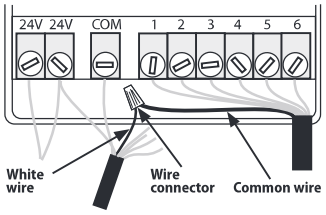



**Figure 9**

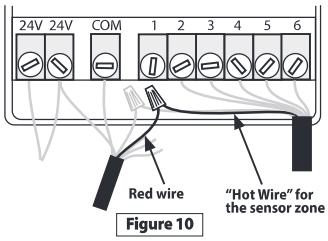



**Figure 10**

5. Connect the Green wire from the SMRT-Y user interface to the zone terminal, where the marked zone wire was originally connected (see Figure 11).
6. Turn on the controller and allow the SMRT-Y user interface to take a soil moisture reading. The reading should appear in the display after 4-5 seconds. If the reading is zero the wiring to the sensor is not correct and will need to be reviewed and corrected. If the reading is not zero, the wiring is correct and you may finish up the grease cap installation on the sensor wiring. Verify soil Temperature and soil Electrical Conductivity as well.

***Congratulations, you are done with the installation!***

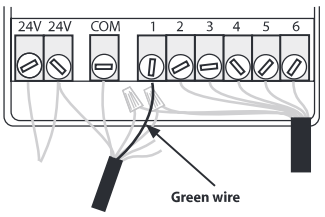
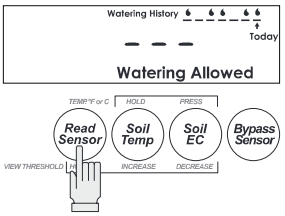



**Figure 11**

## SMRT-Y Operation

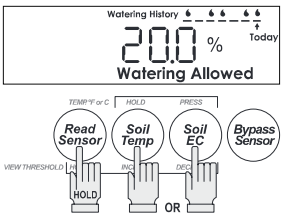
### *Take a Moisture Reading*

The SMRT-Y displays the last moisture reading (taken every 10 minutes). To take a current moisture reading, press **Read Sensor**. The display will show "- - -" then, display the current moisture.



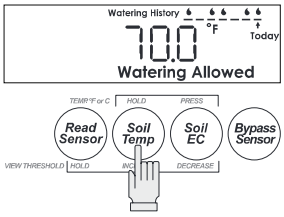

### *Set the Moisture Threshold*

To set the moisture threshold, press and hold Read Sensor then toggle the Soil Temp button to increase the threshold or the Soil EC button to decrease the threshold (see page 13).



### *View Soil Temperature*

To view the soil temperature, press **Soil Temp**.

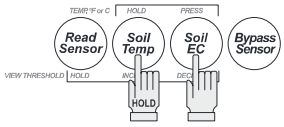






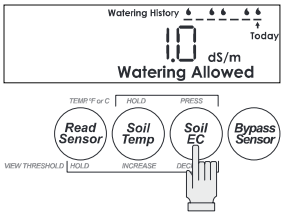
### *Change Temperature Format*

To change from degree Fahrenheit to Celsius, hold **Soil Temp** and toggle **Soil EC**.


### *View Soil EC*

Press **Soil EC** to view current soil Electrical Conductivity (EC).





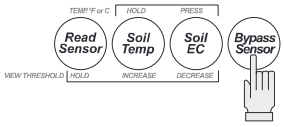


### *Manual Watering/Bypass*

If you wish to test your sprinkler system, or manually water a zone, you will need to bypass the sensor function so that it will not interrupt the power to your valves.

In order to do this, press the **Sensor Bypass** button. The "BYPASS SENSOR" icon on the display will slowly turn on and off.

While in this mode, actions from your controller will not be inhibited by the SMRT-Y user interface.

### *Watering History*

The SMRT-Y user interface displays the past 7 watering attempts. If the SMRT-Y allowed watering, a drop is displayed. If the system was suspended, it will be blank. 'Today' indicates the most current watering cycle. The history updates 30 minutes after each cycle.


### *Suspending Watering*

When the moisture in the soil is above the moisture threshold, the 'Suspended Watering' icon appears. Your system will not irrigate.


### *Watering Allowed*

When the soil moisture is below the moisture threshold, the 'Watering Allowed' icon appears. This icon is also displayed when the 'BYPASS SENSOR' is activated. Your system will irrigate normally.


## Setting the Watering Schedule

Field Capacity is the amount of water your soil will hold at equilibrium. The amount of water required to bring the moisture content of the soil from 80% of Field Capacity to 100% of Field Capacity is given by the formula:

Inches of water = 0.2 * Field Capacity * depth

If your Field Capacity is 25% and you are watering to a depth of 8 inches, then the amount of water needed is **0.2 * 0.25 * 8 = 0.4 inches**

If you know the effective precipitation rate of your sprinklers, then the watering time is given by:

Run time minutes = 60 * Inches / Effective Precipitation Rate

If your Effective Precipitation Rate for the example above is 0.5 inches per hour, then the minutes watering time is **60 * 0.4 / 0.5 = 48 minutes.**

The chart on the next page offers a simple way to set watering times for all zones in your system. It is based on the formulas given above. After you have measured the Field Capacity of your soil (see next page), you can use the chart to find watering times for your zones. You will need to know the type of sprinkler heads installed and their precipitation rates.

| Irrigation Run-time Guide | | ROTORS | | | POP-UP SPRAYS | | | ROTARY NOZZLE | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Field Capacity | Moisture Threshold Setting | Total Run Minutes | Soak Time Run Max. | Soak Time Soak Min. | Total Run Minutes | Soak Time Run Max. | Soak Time Soak Min. | Total Run Minutes | Soak Time Run Max. | Soak Time Soak Min. |
| 45% | 36% | 58 | 11 | 41 | 29 | 5 | 43 | 95 | 15 | 30 |
| 40% | 32% | 52 | 11 | 32 | 26 | 5 | 34 | 84 | 15 | 21 |
| 35% | 28% | 45 | 16 | 25 | 23 | 7 | 28 | 74 | 19 | 12 |
| 30% | 24% | 39 | 20 | 19 | 19 | 8 | 24 | 63 | 22 | 4 |
| 25% | 20% | 32 | 34 | 4 | 16 | 11 | 13 | 53 | 25 | 0 |
| 20% | 16% | 26 | 48 | 0 | 13 | 13 | 13 | 42 | 30 | 0 |
| 15% | 12% | 19 | 88 | 0 | 10 | 17 | 9 | 32 | 33 | 0 |
| 10% | 8% | 13 | 300 | 0 | 6 | 21 | 6 | 21 | 37 | 0 |

- Total Run Minutes is total run time required to bring moisture from the indicated moisture threshold to Field Capacity
- Soak Time Run Maximum is minutes allowed before surface accumulation causes runoff
- Soak Time Soak Minimum is minutes of soaking required to absorb surface accumulation.
- Match your zone sprinkler head type and Field Capacity. If your pop-up sprayer zone has 35% Field Capacity and your moisture threshold is 28%, your total run time is 23 minutes. Set your controller to irrigate a total of 23 minutes, using a soak cycle with a maximum 'on' time of 7 minutes and a minimum 'soak' time of 28 minutes.

## Calculating Field Capacity / Moisture Threshold

Each lawn is different. Your Field Capacity and moisture threshold are unique. The following is the best method to determine your ideal moisture threshold setting. Remember that you can adjust your moisture threshold at any time.

### *Field Capacity Method*

Near sundown, soak the soil to saturation in the area of the sensor. It is important that the area is very wet so that the water is standing on the surface.

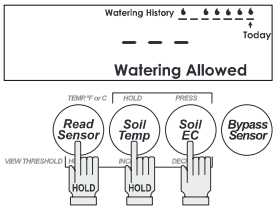
This can be accomplished with a 5 gallon bucket of water or a garden hose. The next morning, before the direct sunlight reaches the sensor location, take a moisture reading by pressing the 'Read Sensor' button. This reading is your soil's Field Capacity. Your ideal moisture threshold setting should be 80% of Field Capacity.

### *Automatic Moisture Threshold Method*

Near sundown, soak the soil around the sensor to saturation with a 5 gallon bucket. Set your controller to irrigate at 5:00 am the following morning.

Finally, simultaneously press and hold both the 'Read Sensor' and 'Soil Temp' buttons while you depress and release the 'Soil EC' button once. The Suspended Watering mode and Watering Allowed mode will start blinking.

When your controller attempts to irrigate the following morning, the SMRT-Y will take a measurement and automatically set your moisture threshold to 80% of Field Capacity.



## System Setup

1. Set the controller to water all the zones at the highest frequency expected during the peak of the season. This may be every day.
2. Set the zone watering times as they were previously set by the contractor or homeowner.
3. Set the auto-threshold-set feature on the SMRT-Y user interface by simultaneously pressing in and holding the "Read Sensor" and "Soil Temp" buttons and then pressing the "Soil EC" button once. If you have set the feature properly the 'Suspended' icon and 'Allowed' icon will alternately flash. These icons will continue to flash until the threshold has been automatically set.
4. Ensure the controller is set to run the next morning before the sun shines on the sensor area. This interval defines the auto-set period.
5. Ensure 'Bypass Sensor' is not flashing in upper left corner of the LCD display. If flashing, press 'Bypass Sensor' button to allow Soil Moisture Sensor operation.
6. Flood the sensor area with a five gallon bucket of water prior to leaving the property. Also flood the slit trench marks in the sod.

### *Recommended Follow-up*

1. The watering moisture threshold is determined during the auto-set period. Sometime after the first controller run, press the 'Read Sensor' button on the SMRT-Y user interface to view the watering moisture threshold. The displayed number is the moisture level in the root zone that will permit irrigation.
2. Re-set the zone run times by referring to the run-time chart and instructions. To use the chart you will need the moisture threshold setting obtained in the previous step and the precipitation rates of the zones.

## Optional wiring for Xeriscape or flower beds

You may have zones you wish to water regardless of the moisture level measured by your sensor. For example, a flower bed drip or a desert landscaping zone. The SMRT-Y can accommodate up to two such zones.

### *How to connect them:*

1. Identify the zone(s) that fit into this category. Note which terminal(s) they are connected to on your controller.
2. Loosen the screw that connects such zone wire to your controller.
3. Strip the wires and connect the Blue wire from the SMRT-Y user interface to the same terminal as the zone wire.

   **NOTE:** There will now be two wires connected to this terminal; a Blue wire going to the SMRT-Y user interface and a zone wire going to the valve.
4. If you have a second zone to run independently of the moisture sensor, connect the Brown wire from the SMRT-Y user interface to the second terminal. Now these two zones will run independent of moisture sensor.
5. Turn on the controller and allow the SMRT-Y user interface to take a soil moisture reading. The reading should appear in the display after 4-5 seconds. If the reading is zero the wiring to the sensor is not correct and will need to be reviewed and corrected. If the reading is not zero, the wiring is correct and you may finish up the grease cap installation on the sensor wiring.

## Special Notes

1. This Soil Moisture Sensor is compatible with installations using pump start relays.
2. You can use this Soil Moisture Sensor with installations running multiple stations or valves simultaneously.
3. This SMRT-Y Soil Moisture Sensor can be used with a Rain Bird Rain Sensor (part number: RSDBEX). The system will operate as follows:

- Connect the Rain Sensor to the sensor terminals inside your controller as directed.
- Connect the SMRT-Y user interface to the controller as described in this manuel.
- When the rain sensor is activated, the common wire will be disrupted and the power to the SMRT-Y user interface may be disabled. If this occurs, the display will go blank and the user interface will cease to function until the rain sensor has dried out. The SMRT-Y programming will not be lost. Even if the user interface was in bypass mode, that mode will be restored when power is reapplied.
- When power is restored the SMRT-Y user interface will immediately take a moisture reading and set either the 'Suspended' or 'Allowed' mode. The 30 minute timeout requirement will be reset so that the mode change will occur immediately.

4. Long-term exposure to direct sunlight could damage the SMRT-Y LCD display. Use the protective cover (see Figure 12) when installed in direct sunlight.

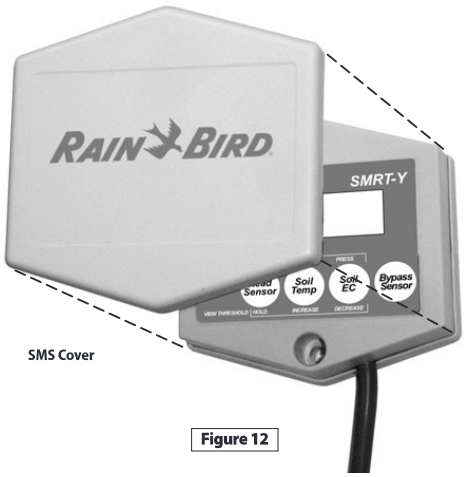



**Figure 12**

## Troubleshooting

| Symptom | Possible Cause | Correction |
|---|---|---|
| The display is blank. | · The power is not connected.<br>· The controller is not plugged in.<br>· Rain Sensor has been activated | · Re-establish power to the SMRT-Y user interface by connecting the Orange wire to the correct 24 VAC terminal on your controller.<br>· Plug in the power cord on your controller. |
| The display shows "00" | · The sensor is disconnected. | · Verify if Rain Sensor is activated. Review the SENSOR INSTALLATION section.<br>· Check all connections to the sensor and from the SMRT-Y user interface to your controller. |
| The system is not watering. | · Your controller is not set.<br>· The soil moisture is not below the moisture threshold setting. | · Be sure your controller is set and running.<br>· Take a soil moisture reading. If the reading is above the threshold, the system should not be watering due to sufficient moisture level. |
| There is no change in the system's watering. | · The COM wire is disconnected.<br>· The SMRT-Y user interface Green or Red wire is not connected to the correct zone. | · Check the COM wire connection.<br>· Check all SMRT-Y user interface wiring. |

In compliance with European directive 2002/96/CE and nom EN50419:2005, this device must not be thrown away with household garbage. The device must be the object of an appropriate, selective removal procedure in order to recuperate it. Your cooperation will contribute to the respect for the environment and the protection of our natural resources.

www.rainbird.com/smrty

**Rain Bird Corporation**
6991 E. Southpoint Road
Tucson, AZ 85756 USA
Phone: +1 (520) 741-6100
Fax: +1 (520) 741-6522

**Rain Bird Corporation**
970 West Sierra Madre Avenue
Azusa, CA 91702 USA
Phone: +1 (626) 812-3400
Fax: +1 (626) 812-3411

The Intelligent Use of Water™
**www.rainbird.com**

**Rain Bird International, Inc.**
1000 West Sierra Madre Ave.
Azusa, CA 91702 USA
Phone: +1 (626) 963-9311
Fax: +1 (626) 852-7343

**Rain Bird Europe SNC**
900 Rue Ampère, BP 72000
13792 Aix en Provence Cedex 3
FRANCE
Tel: (33) 4 42 24 44 61
Fax: (33) 4 42 24 24 72
rbe@rainbird.fr - www.rainbird.eu

**Rain Bird France SNC**
900 Rue Ampère, BP 72000
13792 Aix en Provence Cedex 3
FRANCE
Tel: (33) 4 42 24 44 61
Fax: (33) 4 42 24 24 72
rbe@rainbird.fr - www.rainbird.fr

**Rain Bird Ibérica. S.A.**
Polígono Ind. Prado del Espino
C/Forjadores, nº 12
28660 Boadilla Del Monte Madrid
ESPAÑA
Tél: (34) 91 632 48 10
Fax: (34) 91 632 46 45
rbib@rainbird.fr - www.rainbird.es

**Rain Bird Desutschland GmbH**
Oberjesinger Str. 53
71083 Herrenberg-Kuppingen
DEUTSCHLAND
Tel: (49) 07032 99010
Fax: (49) 07032 9901 11
rbd@rainbird.fr - www.rainbird.de

**Rain Bird Sverige AB**
Fleningeväen 315
260 35 Ödåkra
SWEDEN
Tel: (46) 42 25 04 80
Fax: (46) 42 20 40 65
rbs@rainbird.fr - www.rainbird.se

**Rain Bird Turkey**
İstiklal Mahallesi,
Alemdağ Caddesi, Nº 262
81240 Ümraniye İstanbul
Türkiye
Phone: (90) 216 443 75 23
Fax (90) 216 461 74 52



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## Dystrybucja

**CONTRA**

**FHU Contra Agnieszka Bylska**
**Poznańska 168**
**87-100 Toruń**
**Tel: 56 664 49 44**
**www.enawadnianie.pl**