

SCX User Manual

ACC-SYS-000X

Digital TDT® Soil Moisture Sensor Irrigation Timer Add-on Device




Acclima
Closed Loop Irrigation Systems

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SCX Add-On Device

Congratulations on your purchase of the Acclima SCX timer add-on-device, employing the finest soil moisture sensor on the market. You have joined those interested in conserving water— earth's most important resource.

Items needed

Sensor Installation:

- 18 gauge 3-strand burial wire
- Flat blade shovel
- 6" valve box (Optional)
- Wire strippers/Pliers

Controller Installation:

- Med. philips crew driver
- Drill
- Pliers
- Wire strippers

Panel Description



LCD Display Displays soil moisture, temperature, electrical conductivity, watering history and status



Read Sensor Reads sensor, displays and sets the "turn on" moisture threshold



Soil Temp Displays soil temperature, increments up when "Read Sensor" is depressed. Press and toggle "Soil EC" to display °F or C.



Soil EC Displays soil electrical conductivity, Increments down when "Read Sensor" is depressed. Changes between °F or C when "Soil Temp" is depressed.



Sensor Bypass Sets the controller to Bypass mode, disabling the the sensor

How it Works

The SCX uses an Acclima Digital TDT® Soil Moisture Sensor buried in your lawn to accurately monitor the Volumetric Water Content of your soil.

The SCX Controller connects to your existing irrigation timer. You program your timer to water every day. The SCX takes soil moisture readings every 10 minutes. If the water content of the soil is above the "turn on" threshold for your soil then the SCX will suspend the irrigation cycle by interrupting the power to your solenoid valves. During the period where your timer is actively attempting to water, the SCX will prevent watering until 30 minutes of timer inactivity.

If the water content in the soil is below the "turn on" threshold when your timer begins its cycle, the SCX allows power to your solenoid valves and all programmed zones will water. The connection will be maintained for the entire watering cycle and for 30 minutes thereafter – assuring that all zones receive water – even though the sensor may have become wet during the watering cycle.

The SCX has provisions to water 2 zones independent of the sensor to accommodate drought-tolerant planting, cacti, trees, potted plants, etc.

Basic Irrigation Principles

Acclima's Digital TDT® Soil Moisture Sensor allows you to apply two scientific principles long used by horticulturists: (1) Soil Field Capacity and (2) Allowable Depletion.

Field Capacity

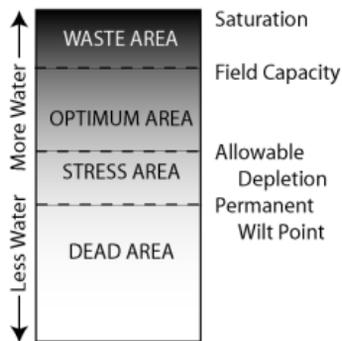
Field Capacity is the water a given soil can hold without percolation to the subsoil. Soil can hold a significant amount of water without percolation, but gravitational forces will draw all water exceeding Field Capacity into the subsoil. **Irrigation beyond Field Capacity is wasteful.** Field Capacity is generally measured as Volumetric Water Content, expressed as a percentage. A Field Capacity of 25% means that the water volume in the soil is 25% of the soil volume. Field Capacities range from about 10% for coarser sands to over 40% for finer clays. Loamy, silty soils fall in between these extremes.

Allowable Depletion

Allowable Depletion is the Volumetric Water Content at which vegetation begins to stress as water is depleted from the soil. The point where the force required to draw water from the soil begins to affect the physical characteristics of the plant is the lowest Volumetric Water Content that your plants should be exposed to. At this point your lawn begins to wilt. **Irrigation below Allowable Depletion stresses your vegetation.** The Allowable Depletion for grasses is in the range of 80% of Field Capacity.

Maintaining Volumetric Water Content between Field Capacity and Allowable Depletion saves water, protects the environment and promotes healthier landscapes. Your SCX can keep your soil moisture within this range.

Soil Moisture Levels



Digitat TDT® Sensor Installation

Selecting the Sensor Location

Select an irrigation zone having the following characteristics; this will be the sensor zone:

- Full sun for most of the day
- Southern or western exposure is best
- Represents the predominant soil type
- Does not receive runoff from car washing, pools, running hoses, driveways, etc
- Near a valve box with no side walks in between

Then carefully select a location within the SENSOR ZONE to bury the sensor having the following characteristics:

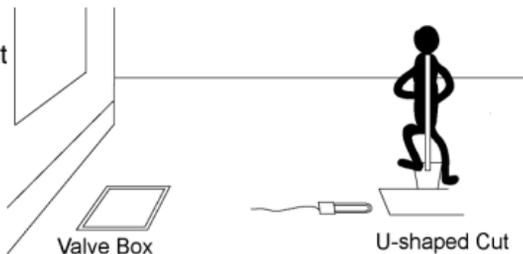
- Well drained—avoid lows spots
- Receives the same hours of sun as the majority of the zone
- Unobstructed access to a valve box
- Not watered by over-spray from adjacent zones
- At least 4 feet from a sprinkler head
- Avoid areas at or near the bottom of a hill
- Avoid areas where the turf is unhealthy
- Avoid areas of heavy foot traffic
- If your water distribution is uneven, ensure that the spot receives average or little below average water coverage for the zone

The sensor must be installed at the center of the turf root mass – where the transpiration occurs – about 4 inches below the surface of the soil.

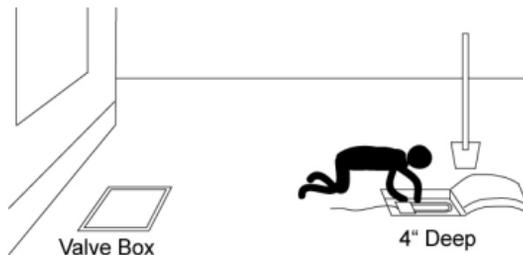
Sensor Installation

Before you install the sensor make sure that the lawn has been recently watered. This will ease digging, insure that the grass recovers more quickly, and balance the first irrigation cycles.

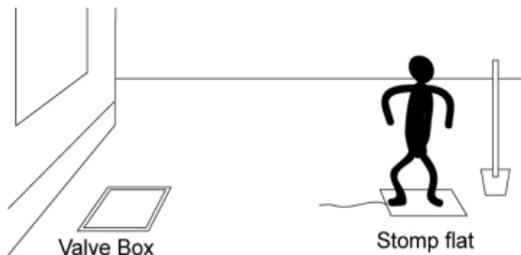
Step 1 Use a flat-blade shovel to cut an 18 inch slit about 4 inches deep in the soil. Insert the sensor into one end of the slit with the top sensor rod about 3 inches from the surface.



Step 2 Arrange the wires from the sensor in the slit and close the slit on the sensor by tromping on either side of the slit.

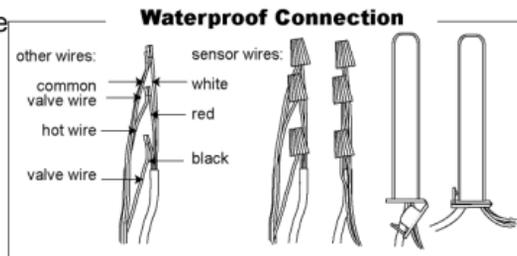


Step 3 Pour a five gallon bucket of water slowly over the sensor installation area.

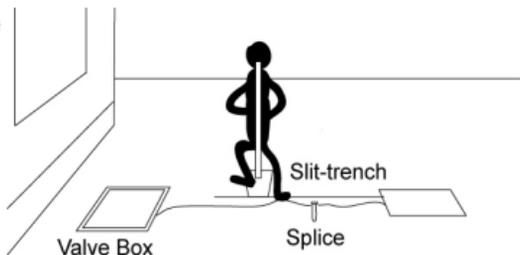


The sensor comes with 3 feet of wire. You will likely need to splice additional wire in order to reach the valve box. Use only direct burial 3-wire 18 gauge cable in a polyethylene sheath from your hardware store or irrigation supplier that is rated for direct burial applications. It is wise to make the splice in a six-inch wiring box that can be installed near the sensor. This provides access to the splice and also serves as a marker for remembering where the sensor is installed.

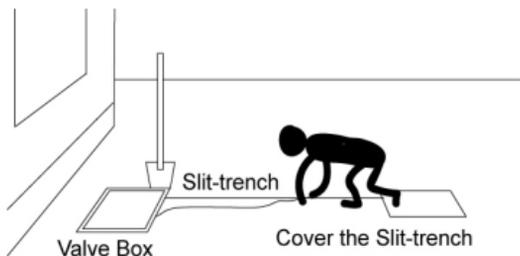
Step 4 When splicing the wires insure that the wires are twisted together and then protected by a wire nut securely screwed onto the twisted wire. Place the wire nuts into a grease cap to prevent corrosion of the wire joint. Close the cover on the grease cap.



Step 5 Dig a slit trench from the sensor to the valve box where the valve is installed that waters the sensor zone.

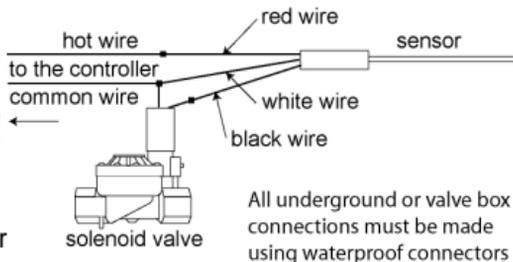


Step 6 Push the sensor wires into the bottom of the slit trench with a stick or other blunt tool. Run the wires under the lower valve box side and into the valve box cavity. Close the trench around the buried wires and tromp down the turf.



Inside the valve box locate the valve that irrigates the zone where the sensor is installed. Two wires come out of the solenoid on the valve. One of them is connected to the 'common' wire from your timer. The other is connected to the 'signal' wire from your timer. Remove the grease caps and wire nuts from both connections.

Step 7 Add the white wire from the sensor to the common wire connection and replace the wire nut and grease cap. Separate the solenoid valve wire from the signal wire to the timer. Connect the black wire from the sensor to this solenoid wire and fasten it with a wire nut. Connect the red wire from the sensor onto the signal wire running back to your timer and fasten it with a wire nut. Protect all three connections with grease caps. Your sensor installation is now complete.



SCX Controller Installation

Mount the SCX control box next to your irrigation timer – close enough for the cable from the SCX to reach inside your timer to the terminals where it will be connected. Use the mounting holes and supplied screws to secure the box to the wall. The mounting holes are aligned for stud mounting if a stud is nearby.

NOTE: Unplug the power to your timer before attempting to wire the SCX control box.

Run the SCX cable into the timer box. Disconnect the common wires going out to your valves from the common terminal in your timer. Connect the black wire from the SCX to the common terminal. Connect the white wire from the SCX to the common wires going out to the valves and secure the connection with a wire nut.

Disconnect the signal wire to the Sensor Zone from the terminal block. Connect the green wire from the SCX to the sensor zone terminal. Connect the removed Sensor Zone signal wire to the red wire from the SCX and secure the connection with a wire nut. Connect the orange wire from the SCX to one of the two 24 volt AC terminals on your timer. If the display on the SCX comes on when you re-apply power to the timer you have selected the correct terminals.

If you intend to use one or two zones as timed zones independent of the sensor, connect the blue and brown wires from the SCX to the terminals that water those zones. Do not disconnect the valve wires from those terminals. Installation is now complete.

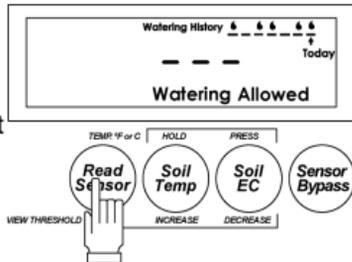
NOTE: Remember to plug in the power to your timer.

SCX Operation

Take a moisture reading

The SCX displays the last moisture reading (taken every 10 minutes). To take a current moisture reading press

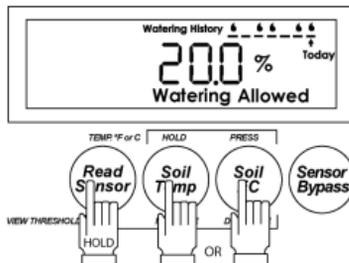
. The display will show "- - -" then display the current moisture.



Set "turn on" moisture threshold

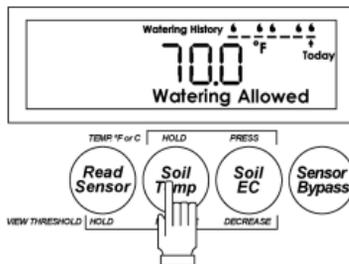
To set the "turn on" moisture threshold press and hold

Read Sensor then toggle the **Soil Temp** or **Soil EC** button to change the threshold.



View soil temperature

To view the soil temperature press

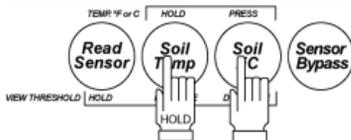


To change from degrees Fahrenheit to Celsius hold

Soil Temp

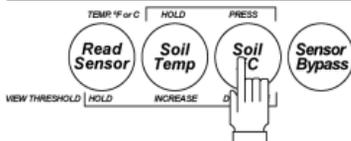
and toggle

Soil EC



View soil EC

Press  to view current soil electrical Conductivity (EC).

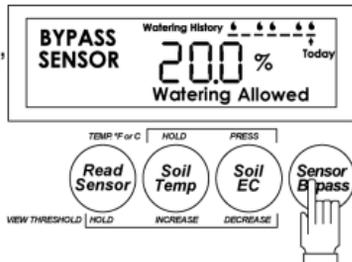


Manual Watering/Bypass

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.

To do this press the  button. The 'SENSOR BYPASS' icon on the display will slowly turn on and off.

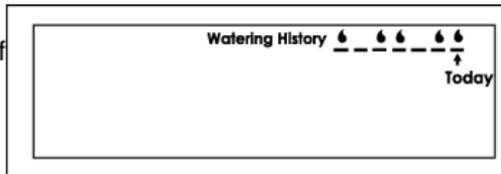
While in this mode actions from your timer will not be inhibited by the SCX control box.



NOTE: Your system will run any programs without restriction, and can start manual watering cycles without intervention. When in the Bypass Sensor Mode if you happen to leave this mode running for several days you will greatly over-water your property since you likely have set your timer to run daily.

Watering History

The SCX displays the past 7 watering attempts. If the controller 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.



Suspended Watering

When the moisture in the soil is above the "turn on" threshold the "Suspended Watering" icon appears. Your system will not water.



Watering Allowed

When the soil moisture is below the "turn on" threshold the "Watering Allowed" icon appears. This icon is also displayed when the "BYPASS SENSOR" is activated. Your system will allow watering.



Setting the Watering Schedule

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:

$$\text{Inches of water} = 0.2 * \text{Field Capacity} * \text{depth}$$

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 following chart 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 you can use the chart to find watering times for your zones. You will need to know the type of sprinkler heads you are using (rotor, spray, impact, MP rotator).

										
		ROTORS			POP-UP SPRAYERS			MP ROTATORS		
Field Capacity	"Turn on" Threshold Setting	Total Run Minutes	Soak Time		Total Run Minutes	Soak Time		Total Run Minutes	Soak Time	
			Run Max.	Soak Min.		Run Max.	Soak Min.		Run Max.	Soak Min.
45%	35%	58	11	25	29	5	25	95	15	25
40%	32%	52	11	25	26	5	25	84	15	21
35%	28%	45	16	23	23	7	25	74	19	12
30%	24%	29	20	19	19	8	24	63	22	4
25%	20%	32	-	-	16	11	13	-	-	-
20%	16%	26	-	-	13	-	-	-	-	-
15%	12%	19	-	-	10	-	-	-	-	-
10%	08%	13	-	-	6	-	-	-	-	-

- Total Run Minutes is total run time required to bring moisture from indicated "turn on" 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 33% Field Capacity and your "turn on" threshold is 25%, 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.

This Guide assumes your irrigation distribution system is properly installed and balanced, operating between 50 and 70 psi in calm wind conditions. Adjustment to your sensor threshold setting or irrigation total run time, soak run time maximum or soak time minimum may be required to fine-tune your particular system. If brown appears in your lawn, have your irrigation maintenance contractor audit your sprinkler system and make distribution adjustments to uniformly irrigate your lawn.

Calculating Field Capacity/Moisture Threshold

Each lawn is different. Your field capacity and "turn on" moisture threshold are unique. The following is the best method to determine your ideal moisture setting. Remember you can adjust your "turn on" threshold at any time.

Field Capacity Method

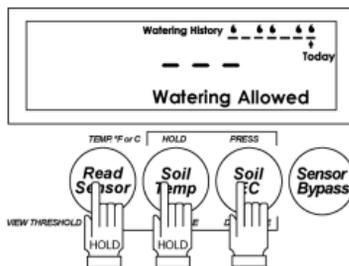
Near sundown, soak the soil to saturation in the area of the sensor. It is important that the area is very wet so that the water is standing on the surface. This can be accomplished with a 5 gallon bucket of water or a garden hose. The next morning before the direct sunlight reaches the sensor location, take a moisture reading by pressing the "Read Sensor" button. This reading is your soil's field capacity.

Your ideal moisture level should be 80% of field capacity. Use the table below to determine your moisture threshold setting.

Field Capacity	10%	15%	20%	25%	30%	35%	40%	45%
"Turn on" Moisture Threshold	8%	12%	16%	20%	24%	28%	32%	38%

Automatic "turn on" threshold Method

Near sundown, soak the soil around the sensor to saturation with a 5 gallon bucket or garden hose. Set your timers to irrigation at 5:00am 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.



When your timer attempts to irrigate the following morning, the controller will take a measurement and automatically set your "turn on" threshold to 80% of field capacity.

NOTE: Be sure to re-set your timer later to irrigated as desired and to program the proper run-time based on your field capacity.

Troubleshooting guide

Potential Problem

The SCX display does not come on.

The SCX does not display a sensor reading after I press the 'Set' button.

Possible Solution

Insure that the power to your timer is on. Insure that the black wire from the SCX is connected to the common terminal in your timer and that the orange wire is connected to the 'hot' wire of the 24 volt ac input to your timer. Try connecting the orange wire to the other 24 volt ac terminal. Make sure that your common wire is not interrupted by an external rain switch.

The wiring in the valve box or at the timer is not correct. Insure that the red wire from the sensor has a wiring path all the way to the red wire in the SCX cable and that the white wire from the sensor has a wire path all the way to the white wire in the SCX cable. No other wires should be connected to the red wire connections. The white wire should be connected to the common wiring for all the valves. Insure that the common wiring is not broken and that the insulation on the underground wiring is not defective.

Potential Problem

The SCX display 'suspended' icon does not come on when the sensor reading is above the threshold setting.
OR The 'allowed' icon does not come on when the sensor reading is below the threshold setting.

Possible Solution

The 'suspended' and 'allowed' states will not change during a watering cycle or for 30 minutes thereafter. Any changes made to threshold settings during a watering cycle will not take effect until 30 minutes after the present cycle has finished. If you need to have it otherwise you will need to disconnect power from the SCX by disconnecting the orange wire. Then upon reconnecting it the new states will take effect.

One or more of my zones does not get watered during a watering cycle.

If you have time gaps in your Timer Program that exceed 30 minutes the SCX will suspend watering after the sensor gets watered and after a 30 minute inactivity gap. Make sure that when using cycle and soak features in your timer that the water is not turned off for more than 29 minutes.

Warranty

Your controller is warranted for THREE YEARS from date of purchase to be free of defective materials and workmanship provided it is used within the working specifications for which the product was designed and under normal use and service. Unless installed by an authorized Acclima trained technician, Acclima assumes no responsibility for installation. Acclima also assumes no responsibility for removal or unauthorized repair.

Acclima's liability under this warranty is limited solely to replacement or repair of defective parts, and Acclima will not be liable for any crop or other consequential damages resulting from any defects in design or breach of warranty. **THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSES** and of all other obligations or liabilities of manufacturer. No agent, employee or representative of the manufacturer has authority to waive, alter or add to the provisions of warranty, nor to make representations or warranty not contained herein.



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