

BaseStation 1000 Irrigation Controller Lower Threshold Moisture Sensor-Based Watering

If you have a Baseline soil moisture sensor (biSensor™) installed in your landscaping and connected to your BaseStation 1000 irrigation controller, you can program the controller to water based on the moisture levels in the soil. This watering strategy can reduce outdoor water use by up to 62 percent or more over traditional irrigation methods. And, by watering your plants when needed, you can increase landscape health, promote deeper root growth, and make your plants more disease resistant.

The BaseStation 1000 irrigation controller supports several biSensor-based watering strategies, but Baseline recommends the lower threshold (also referred to as “less than limit” or “lower limit”) configuration as a general watering strategy.

Overview of Soil Moisture Levels

The amount of moisture held in the soil varies depending on the type of soil and the amount of time between watering events. When you’re using a sensor-based watering methodology, you should have a general understanding of the water holding capacity of various types of soil. We’ve included a brief description of the standard soil moisture content levels in this document. You can learn more about soil moisture content, soil classification, and infiltration and water movement in Baseline’s document titled [Watering with Soil Moisture Sensors](#).

Soil moisture content is identified by the following levels:

Saturation: At the saturation level, nearly all of the spaces between soil particles are filled with water. As a rule, irrigators do not want to saturate the soil because it cuts off the plant’s supply of oxygen, which, in effect, drowns the plant.

Field Capacity: When soil is at the field capacity level, it means that all excess moisture has drained freely from that soil. The amount of remaining moisture is the field capacity. To irrigate properly, you would turn off the water when the soil in the root zone of the plants reaches field capacity. A Baseline biSensor measures field capacity in the calibration process and uses this value as the basis for other settings.

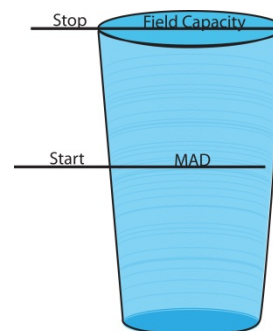
Maximum Allowed Depletion (MAD): In most cases, the maximum allowed depletion level is just before the plants begin to show visible signs of stress. Irrigators typically start watering at or before MAD is reached because they don’t want their landscapes to show signs of stress. MAD is not measured because it is based on observation and opinion. The biSensor can automatically set a MAD threshold for you based on the measurement of field capacity; however, keep in mind, this setting is based on a calculation, and we encourage our customers to fine tune their thresholds.

Permanent Wilting Point: At the permanent wilting point, the level of water in the soil is not sufficient to meet the plant’s needs.

Lower Threshold Moisture Sensor-Based Watering

When you configure the BaseStation 1000 to use the lower threshold watering strategy, you are telling the controller to start watering when the biSensor detects that the moisture content in the soil is below the lower limit, which is equivalent to the maximum allowed depletion (MAD). The controller stops watering when it reaches the end of the runtime. Then the biSensor will monitor the moisture content until the MAD level is reached and watering will start again.

Note: Make sure your program's runtime is sufficient to raise the moisture content in the soil to field capacity. You should put down at least $\frac{1}{2}$ - $\frac{3}{4}$ inch of water each time the controller is allowed to water.



Overview of the Steps for Configuring the Lower Threshold Watering Strategy

Perform the following steps to configure the controller for lower threshold watering:

Step 1 – Install the biSensor in the landscaping according to the instructions that came with the device.

Step 2 – In the BaseStation 1000 controller, search for and assign the biSensor.

Step 3 – Set up the biSensor and assign that sensor to the zone that will water it.

Step 4 – Assign the zones in the area that is monitored by the biSensor to a program by giving the zones runtimes.

Step 5 – Set up the Soak Cycles for the program.

Step 6 – Set a Moisture Start condition for the program.

Step 7 – Set the limit: you can find the limit manually or you can calibrate the biSensor to find the limit.

Step 8 – Set the controller to run.

Step 1 – Installing the biSensor

The biSensor needs to be placed in the effective root zone of the plant it is monitoring. Usually the biSensor will be making the irrigation decision for many plants or even multiple zones of plants with similar water needs, so it should be placed in the effective root zone of a representative plant.

Take note of the serial number of the biSensor that you are installing in the landscape. You will need this number when you program the controller.

Follow the wiring instructions in the biSensor installation guide to connect the biSensor to the two-wire path or to the biSensor ports on the controller or on the powered biCoder.

Make sure that you maintain polarity on the wire connections.

Fasten the wiring with wire nuts, and then test communication with the controller before you complete the installation with waterproof connectors.

Step 2 – Assigning the biSensor in the Controller

1. On the BaseStation 1000 controller, press the **Search & Assign** button. The Search & Assign menu displays.
2. Press the **↑** or **↓** button to highlight the **Moisture Sensor** option, and then press the **OK** button to select it. The Moisture Sensor screen displays.
3. If the **Device Assignment** option is highlighted, press the **OK** button to select it. If Device Assignment is not highlighted, press the **↑** or **↓** button to highlight it, and then press the **OK** button. The Moisture Assignment screen displays.
4. When the **Search** option in the Action column is highlighted, press the **OK** button to search for biSensors.

When the controller finds the devices, their serial numbers display in the Action column.

5. Press the **↑** or **↓** button to move through the list of devices in the Action column. Highlight the serial number of the biSensor that you installed in the landscape.
6. Press the **⇒** button to move to the Moisture Sensor column.
7. Press the **↑** or **↓** button to move through the list. Highlight the number that you want to assign the biSensor to.
8. Press the **OK** button. The serial number of the device that you selected in the Action column now displays next to the number in the Moisture Sensor column.

Step 3 – Assigning the biSensor to the Zone

1. Press the **Search & Assign** button. The Search & Assign menu displays.
2. Press the **↑** or **↓** button to highlight the **Moisture Sensor** option, and then press the **OK** button to select it. The Moisture Sensor screen displays.
3. Press the **↑** or **↓** button to highlight the **Device Setup** option, and then press the **OK** button. The Moisture Device Setup screen displays.
4. Press the **↑** or **↓** button to highlight the biSensor number in the left column, and then press the **⇒** button to move to the **Enabled** field.
 - If the device is currently enabled, a **checkmark displays** in the Enabled field. Press the **+** or **-** button to remove the checkmark.
 - If the device is currently disabled, **there is no checkmark** in the Enabled field. Press the **+** or **-** button to replace the checkmark.
5. Press the **↓** button to highlight the **Zone** field.
6. Press the **+** or **-** button to move through the list of zones, and then stop when the zone that you want to associate the biSensor with displays in the field.

Step 4 – Assign the biSensor Zones to a Program

Put all zones that you want to water with the lower threshold strategy into one program by giving them runtimes.

1. Press the **Program Setup** button. The Program Setup menu displays.
2. If the program that you want to modify displays in the upper-left corner of the screen, continue to step 3. Otherwise, press the **PRG** button until the program that you want to modify displays in the upper-left corner of the screen.

Note: To move backwards in the list of programs, press and hold the PRG button, and then press the – button repeatedly.

3. The **Zone Runtimes** option should be highlighted. If it is not highlighted, press the ↑ or ↓ button to highlight it, and then press the **OK** button. The Zone Runtimes screen displays. Zones are identified with a sequential number and by the serial number of the attached biCoder.

Note: Baseline recommends that, regardless of watering strategy, you program each zone to water long enough to put down at least ½ inch of water each time the controller is allowed to water.

4. Notice that the minutes placeholder in the **Zone 1** field is highlighted.

| Prq 1 | Zone Runtimes |
|---------------|---------------|
| 1-E012471: | 0:30:00 |
| 2-E012472: | 0:30:00 |
| 3-0006641: | 0:30:00 |
| 4-0006642: | 0:30:00 |
| 5-0006643: | 0:30:00 |
| ZONE 1 | |

- To move to the hour placeholder, press the ← button.
- To move to the seconds placeholder, press the ⇒ button.
- To change the time, press the + or – button.

Note: To rapidly increase or decrease the value, press and hold the + button or the – button.

- To move to a different zone, press the ↑ or ↓ button.

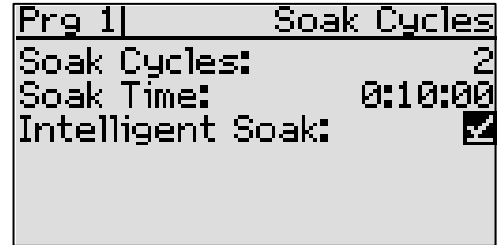
Step 5 – Setting Up the Soak Cycles for the Program

When you set a program to start based on a biSensor reading that is less than the limit, you should set up at least 3 soak cycles with a soak time that is at least twice as long as the cycle time, and enable Intelligent Soak Cycles™. Soak cycling breaks the total runtime into shorter water “cycles” with “soak” periods in between to allow time for water to soak into the soil. Intelligent Soak Cycles prioritize runtimes for zones that have already started to water over zones that have not started in order to maximize watering efficiency and minimize total irrigation time.

1. Press the **Program Setup** button. The Program Setup menu displays.
2. If the program that you want to modify displays in the upper-left corner of the screen, continue to step 3. Otherwise, press the **PRG** button until the program that you want to modify displays in the upper-left corner of the screen.

Note: To move backwards in the list of programs, press and hold the PRG button, and then press the – button repeatedly.

3. Press the \uparrow or \downarrow button to highlight the **Soak Cycles** option, and then press the **OK** button. The Soak Cycles screen displays.
4. Notice that the **Soak Cycles** field is highlighted. Press the **+** or **-** button to change the number to indicate how many soak cycles will occur.
5. Press the \downarrow button to highlight the **Soak Time** field. Press the **+** or **-** button to change the time in this field to indicate how long you want the applied water to soak in.
6. Press the \downarrow button to highlight the **Intelligent Soak** field. If you want to enable Intelligent Soak for this program, press the **OK** button to display a checkmark in the field.

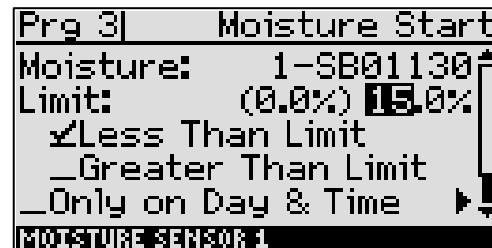


When you enable the Intelligent Soak™ feature, the BaseStation 1000 uses intelligent watering algorithms that apply cycles in the optimal order to maximize water penetration and minimize evaporation loss. If there are many zones in a program, zones will be cycled and soaked until all have been completed. Zones that have completed their soak cycles are prioritized higher than zones that are still waiting to water so the first zones to start watering will be the first to complete.

Step 6 – Setting Up a Moisture Start Condition for the Program

1. On the BaseStation 1000 controller, press the **Program Setup** button. The Program Setup menu displays.
 2. Press the **PRG** button until the program that you set up to water based on biSensor readings displays in the upper-left corner of the screen.
- Note:** To move backwards in the list of programs, press and hold the PRG button, and then press the **-** button repeatedly.
3. Press the \downarrow button to highlight the **Setup Prg. Start** option, and then press the **OK** button. The Setup Prg. Start screen displays the list of start conditions.
 4. Press the \downarrow button to highlight the **Moisture Start** option, and then press the **OK** button. A checkmark displays next to the Moisture Start option.
 5. Press the \Rightarrow button to configure the moisture start settings.

6. Notice that the serial number for one of your biSensors is highlighted in the **Moisture** field. If this is the serial number for the biSensor that monitors the zones in this program, no change is required. If you need to use a different biSensor, press the **+** or **-** button to select a different serial number.
7. Press the \downarrow button to highlight the **Limit** field. Leave the default entry in the field for now. You will enter the limit later.



Note: In the Limit field, the value in parentheses is the most current reading from the soil moisture biSensor. Keep in mind that the biSensor is read every 10 minutes.

8. Press the \downarrow button to highlight **Less Than Limit**, and then press the **OK** button.

9. Make sure **Only on Day & Time** is not selected.
10. Do not start the **Calibration**.

Step 7 – Setting the Limit

When you use the lower threshold watering strategy, you are telling the controller to start watering when the biSensor detects that the moisture content in the soil is below the lower limit, which is equivalent to, or slightly above, the maximum allowed depletion (MAD).

Remember that MAD is typically based on observation and opinion. You can use one of the following methods to determine the lower threshold value.

- Allow the landscape to dry out to the point where it should be watered again, and then take a biSensor reading. This value is the lower threshold.
- Run a biSensor calibration. When you enable calibration, the process either starts immediately or at the next day and time start. The program puts down 150% of the required water (based on the runtime of the zone) and then waits for 24 hours. The calibration reading is taken when the soil moisture is at field capacity, and the MAD limit is calculated mathematically.

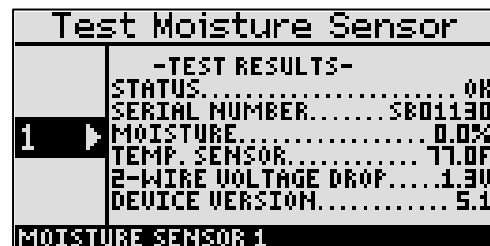
Taking a biSensor Reading and Manually Entering the Lower Threshold

1. Run the program that the biSensor is associated with.
2. Temporarily disable the program to allow the landscaping to dry to what you would consider MAD:
 - a. On the BaseStation 1000 controller, press the **Program Setup** button. The Program Setup menu displays.
 - b. Press the **PRG** button until the program that you set up to water based on biSensor readings displays in the upper-left corner of the screen.

Note: To move backwards in the list of programs, press and hold the PRG button, and then press the – button repeatedly.

- c. Press the ↓ button to highlight the **Enable/Disable** option, and then press the **OK** button.
 - d. Press the **OK** button to remove the check mark from the **Enabled** field.
3. Allow the landscape to dry out to the point where it should be watered again.
4. On the BaseStation 1000 controller, press the **Test** button. The Test menu displays.

5. Press the ↑ or ↓ button to highlight the **Test Moisture Sensor** option, and then press the **OK** button. The Test Moisture Sensor screen displays.
6. Press the ↑ or ↓ button to select the biSensor that is installed in the landscape.
7. Press the **OK** button to test the biSensor.



Note: If any zones or programs are running when the test is activated, watering will pause for 10 minutes. The test results display the moisture percentage.

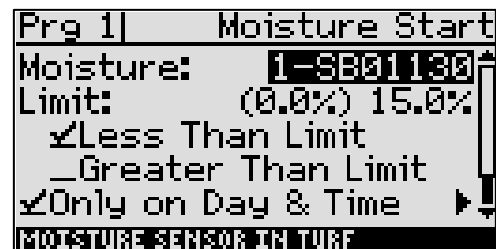
Lower Threshold Moisture Sensor-Based Watering

8. Write down the moisture reading.
9. Press the **Program Setup** button. The Program Setup menu displays.
10. Make sure that the program that you set up to water based on biSensor readings displays in the upper-left corner of the screen. If it doesn't, press the **PRG** button until the correct program displays.

Note: To move backwards in the list of programs, press and hold the PRG button, and then press the – button repeatedly.

11. Press the ↓ button to highlight the **Setup Prg. Start** option, and then press the **OK** button. The Setup Prg. Start screen displays the list of start conditions.
12. Press the ↓ button to highlight the **Moisture Start** option, and then press the **OK** button. A checkmark displays next to the Moisture Start option.

13. Press the ⇒ button to configure the moisture start settings. The Moisture Start screen displays.
14. Press the ↓ button to highlight the **Limit** field, and then press the + or – button to change the number in the field to match the moisture reading that you wrote down in step 8.



Note: In the Limit field, the value in parentheses is the most current reading from the biSensor. Keep in mind that the biSensor is read every 10 minutes.

15. Make sure there is a checkmark in the **Less Than Limit** field. If not, press the ↓ button to highlight the field, and then press the **OK** button.
16. Press the ↓ button to highlight the **Only on Day & Time** field, and then press the **OK** button.
17. Press the ⇒ button to configure the day and time start settings. If you need help configuring the settings, refer to Setting Start Conditions for a Program in the BaseStation 1000 User Manual.

Note: An active program must have at least one start time. Programs that have no start times will not run.

18. Make sure that **Start** displays in the **Calibration** field. This means the calibration is not enabled.
19. Return the program status to **Enabled**:
 - a. Press the **Back** button to return to the Program Setup menu.
 - b. Press the ↓ button to highlight the **Enable/Disable** option, and then press the **OK** button.
 - c. Press the **OK** button to replace the check mark in the **Enabled** field.
20. Set the controller to run by pressing the **RUN** button.

Running a biSensor Calibration

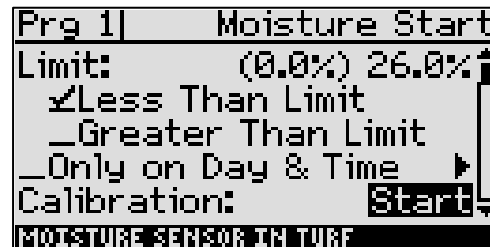
The biSensor can automatically set a lower threshold for you based on the measurement of field capacity; however, keep in mind, this setting is based on a calculation, and we encourage our customers to fine tune their thresholds.

1. Press the **Program Setup** button. The Program Setup menu displays.
2. Make sure that the program that you set up to water based on biSensor readings displays in the upper-left corner of the screen. If it doesn't, press the **PRG** button until the correct program displays.

Note: To move backwards in the list of programs, press and hold the PRG button, and then press the – button repeatedly.

3. Press the ↓ button to highlight the **Setup Prg. Start** option, and then press the **OK** button. The Setup Prg. Start screen displays the list of start conditions.
4. Press the ↓ button to highlight the **Moisture Start** option, and then press the **OK** button. A checkmark displays next to the Moisture Start option.
5. Press the ⇨ button to configure the moisture start settings. The Moisture Start screen displays.
6. Press the ↓ button to highlight the **Calibration** field.

- If the calibration has not been enabled, the **Start** option displays on the right side of the screen. To start the calibration, highlight the **Start** option, and then press the **OK** button.
- If the calibration has been enabled, the **Stop** option displays on the right side of the screen. To stop the calibration, highlight the **Stop** option, and then press the **OK** button.



7. Set the controller to run by pressing the **RUN** button.

After you enable the calibration, the process either starts immediately or at the next day and time start. The controller adds 50% to the runtime of each zone in the program that's being calibrated. This additional runtime should water the landscape up to Saturation level. When the program is finished, the controller waits 24 hours for the landscape to dry to field capacity, and then it takes the calibration reading. The controller uses this reading to calculate the lower threshold, and that value is automatically entered into the Limit field.

After the calibration cycle runs one time, it is disabled in the controller.

Step 8 – Setting the Controller to Run

When you have finished making changes, press the **RUN** button.