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# AGRICULTURE SENSOR

## APPLICATION NOTE

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<b>Document Type:</b>	<b>Application Note</b>
<b>Document Number:</b>	<b>T0005978_AN</b>
<b>Document Issue:</b>	June 23, 2020
<b>Document Status:</b>	Release
<b>Product Name:</b>	<b>Agriculture Sensor</b>
	T0005982 (Agriculture Sensor, Soil Surface Mount Module, NA)
	T0005983 (Agriculture Sensor, Soil Surface Mount Module, EU)
<b>Product Code:</b>	T0005986 (Agriculture Sensor, Elevated Mount Module, NA)
	T0005987 (Agriculture Sensor, Elevated Mount Module, EU)

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## Document Revision

Revision	Issue Date	Status	Editor	Comments
0.1	May 22, 2020	Draft	Mark Oevering	First draft
0.2	May 25, 2020	Draft	Mark Oevering	Added figures
1.0	June 23, 2020	Release	Mark Oevering	Added Sales Codes, Section 1.2

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# 1 Introduction

## 1.1 Overview

The purpose of this document is to describe the different installation options that are available with both models of the Agriculture Sensor.

There are things to be conscious of with each sensor model and installation option that will be highlighted in subsequent sections.

## 1.2 Order Codes

The Agriculture Sensor exists in two product variants; the Soil Surface Mount, and the Elevated Pole Mount. The table below lists the sales codes for the two variants:

Sales Code	Description	Accessories
AGRSNPUS915	Agriculture Sensor Surface Mount, US 915 MHz	none
AGRSNPAU915	Agriculture Sensor Surface Mount, Australia 915 MHz	none
AGRSNPKR920	Agriculture Sensor Surface Mount, Korea 920 MHz	none
AGRSNPAS923	Agriculture Sensor Surface Mount, Asia 923 MHz	none
AGRSNPEU868	Agriculture Sensor Surface Mount, Europe 868 MHz	none
AGRSNPIN865	Agriculture Sensor Surface Mount, India 865 MHz	none
AGRSNPRU864	Agriculture Sensor Surface Mount, Russia 864 MHz	none

AGRSNNUS915	Agriculture Sensor Elevated Pole Mount, US 915MHz	none
AGRSNNAU915	Agriculture Sensor Elevated Pole Mount, Australia 923MHz	none
AGRSNNKR920	Agriculture Sensor Elevated Pole Mount, Korea 920MHz	none
AGRSNNAS923	Agriculture Sensor Elevated Pole Mount, Asia 923MHz	none
AGRSNNEU868	Agriculture Sensor Elevated Pole Mount, Europe 868MHz	none
AGRSNNIN865	Agriculture Sensor Elevated Pole Mount, India 865MHz	none
AGRSNNRU864	Agriculture Sensor Elevated Pole Mount, Russia 864MHz	none

AGRSNAUS915	Agriculture Sensor Elevated Pole Mount, US 915MHz	1 WATERMARK, 1 THERMISTOR
AGRSNAAU915	Agriculture Sensor Elevated Pole Mount, Australia 923MHz	1 WATERMARK, 1 THERMISTOR
AGRSNAKR920	Agriculture Sensor Elevated Pole Mount, Korea 920MHz	1 WATERMARK, 1 THERMISTOR
AGRSNAAS923	Agriculture Sensor Elevated Pole Mount, Asia 923MHz	1 WATERMARK, 1 THERMISTOR
AGRSNAEU868	Agriculture Sensor Elevated Pole Mount, Europe 868MHz	1 WATERMARK, 1 THERMISTOR
AGRSNAIN865	Agriculture Sensor Elevated Pole Mount, India 865MHz	1 WATERMARK, 1 THERMISTOR
AGRSNARU864	Agriculture Sensor Elevated Pole Mount, Russia 864MHz	1 WATERMARK, 1 THERMISTOR

AGRSNBUS915	Agriculture Sensor Elevated Pole Mount, US 915MHz	2 WATERMARKS, 2 THERMISTORS
AGRSNBAU915	Agriculture Sensor Elevated Pole Mount, Australia 923MHz	2 WATERMARKS, 2 THERMISTORS
AGRSNBKR920	Agriculture Sensor Elevated Pole Mount, Korea 920MHz	2 WATERMARKS, 2 THERMISTORS
AGRSNBAS923	Agriculture Sensor Elevated Pole Mount, Asia 923MHz	2 WATERMARKS, 2 THERMISTORS
AGRSNBEU868	Agriculture Sensor Elevated Pole Mount, Europe 868MHz	2 WATERMARKS, 2 THERMISTORS
AGRSNBIN865	Agriculture Sensor Elevated Pole Mount, India 865MHz	2 WATERMARKS, 2 THERMISTORS
AGRSNBRU864	Agriculture Sensor Elevated Pole Mount, Russia 864MHz	2 WATERMARKS, 2 THERMISTORS

### 1.3 Installation Options

The table below illustrates the measurement capabilities of each installation option.

Measurement type	Soil Surface Mount	Elevated Pole Mount Option 1*	Elevated Pole Mount Option 2	Elevated Pole Mount Option 3
Battery status	X	X	X	X
Soil Moisture (GWC)	X	NA	NA	NA
Soil Temperature	X (only when shaded – see Sec. 2.1)	NA	NA	NA
Ambient Temperature	X (only when shaded – see Sec. 2.1)	X – via thermistor	X – via onboard transducer	NA
Ambient Relative Humidity	X (only when shaded – see Sec. 2.1)	NA	NA	NA
Ambient Light Intensity	X	X	NA	X
Ambient Light Alarm	X	X	NA	X
Input 3 for Thermistor	NA	X	X	X
Input 4 for Thermistor	NA	X	X	X
Watermark 1 (Soil Water Tension)	NA	X	X	X
Watermark 2 (Soil Water Tension)	NA	X	X	X
Accelerometer Data	X	X	X	X
Orientation Alarm	X	X	X	X

**\*This installation option requires one additional thermistor, contact TEKTELIC.**

## 2 Soil Surface Mount Installation Options

### 2.1 Soil Surface Mount Option 1

The Soil Surface Mount Agriculture Sensor is intended to be used in both indoor and outdoor applications. When used outdoors in direct sunlight, the integrated ambient temperature, relative humidity, and soil temperature readings will be influenced by solar heat. The sensor will also be influenced by solar heating of the ground around the sensor. To minimize this influence the sensor must be shaded from direct sun light. This can be accomplished by:

- a) installing the sensor in shade provided by the plants, buildings, or
- b) using a cover over top of the sensor. These covers are called Stevenson Screens. Example designs can be found at this link:

[https://en.wikipedia.org/wiki/Stevenson\\_screen](https://en.wikipedia.org/wiki/Stevenson_screen)

If a cover of a different type is to be used (eg. pail, plastic bin), it must be able to “breathe” in some manner to achieve accurate ambient temperature, relative humidity, and soil temperature readings.

An important caveat with covering the sensor in this manner is that the light readings from the ambient light sensor (ALS) will be very low and not reflect the real amount of light in the environment. Also, the sensor will be measuring temperature and relative humidity at ground level instead of the typical 1m to 2m above ground level.

These options are illustrated in Figures 1 and 2 below:

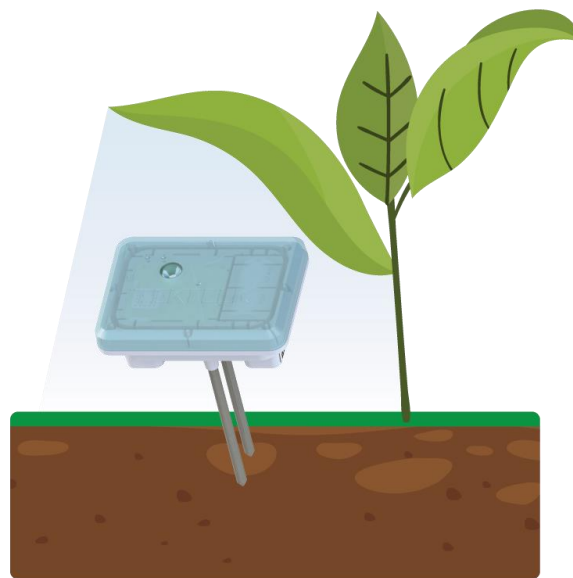


Figure 1 – Soil Surface Mount Sensor Option 1a

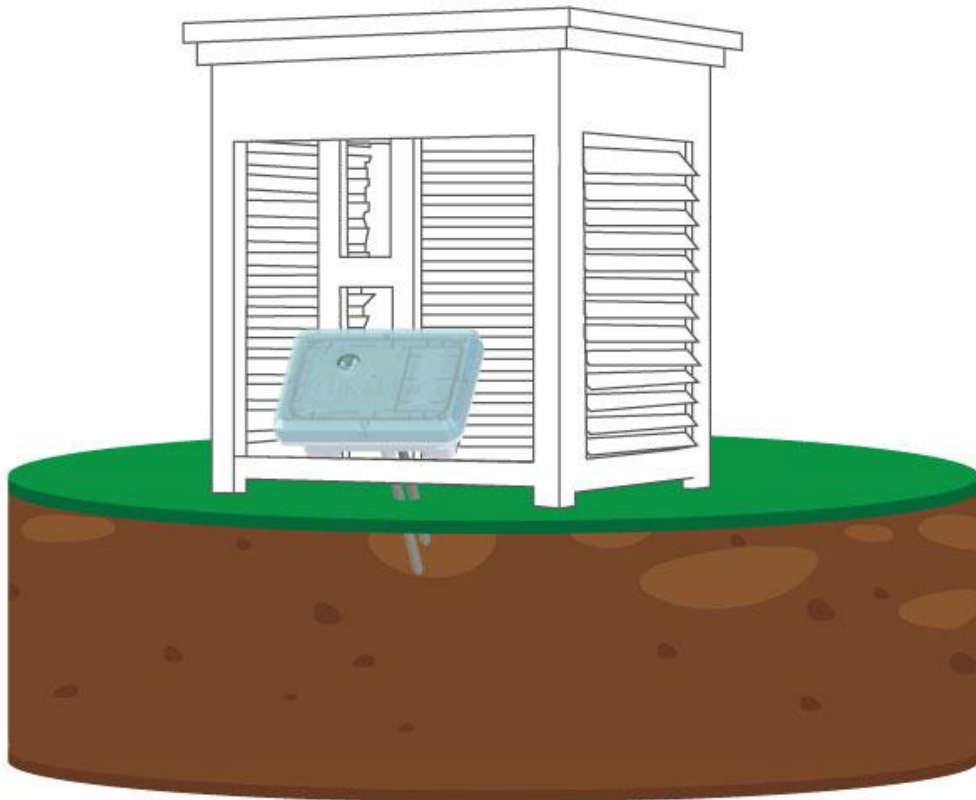


Figure 2 – Soil Surface Mount Sensor Option 1b



### 3 Elevated Pole Mount Installation Options

The Elevated Pole Mount Agriculture Sensor can support two thermistors for measuring temperature, and two Watermark probes for measuring soil water tension. The thermistors add value to the readings from the watermark probes by offering higher accuracy in the soil water tension. The Elevated Pole Mount Agriculture Sensor is intended for use in both indoor and outdoor applications, however, similar caveats exist pertaining to reading ambient temperature and relative humidity with the on-board transducer: the sensor must be shaded from the sun in some manner. If the sensor must be exposed to direct sun light, there is a workaround for measuring ambient temperature, which is outlined in Option 1.

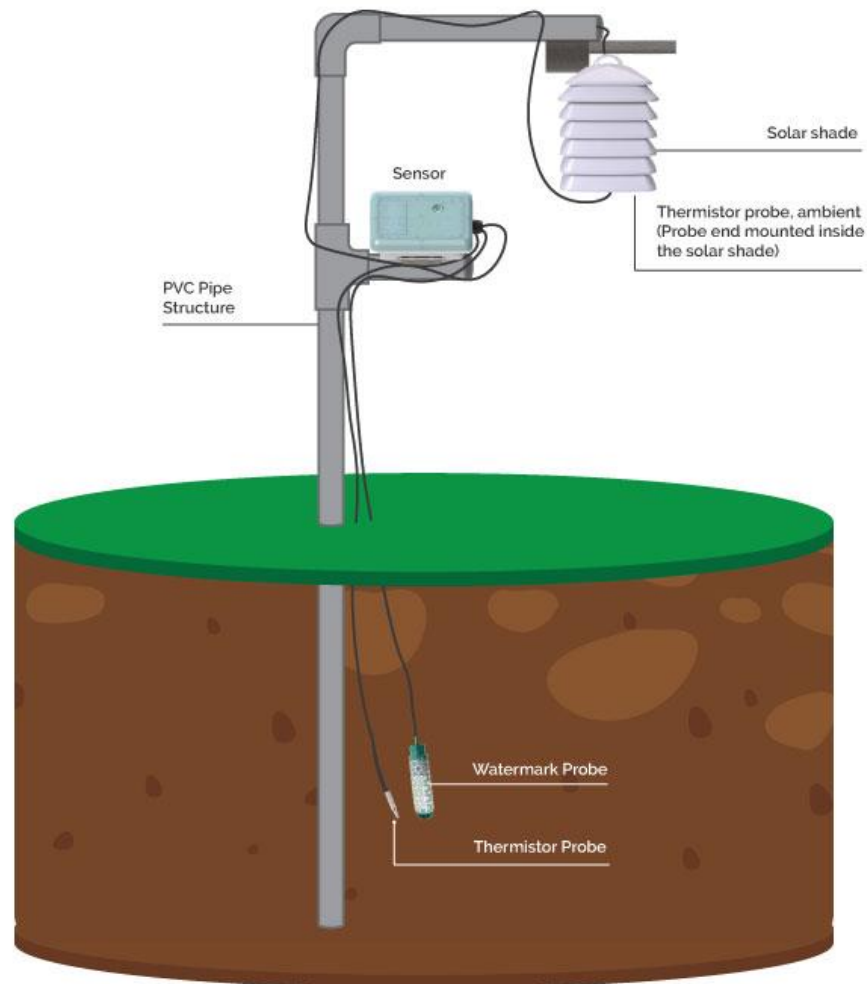
#### 3.1 Elevated Pole Mount Option 1

In this option, one of the thermistors can be placed inside a solar shade to measure ambient temperature accurately. Another thermistor is buried in the ground to get an accurate soil temperature reading, and a Watermark probe is buried in the ground to measure soil water tension.

Solar shades can be purchased through AcuRite:

<https://www.acurite.com/solar-radiation-shield.html>

Figure 3 below illustrates how the thermistors and Watermark probe can be set up.



**Figure 3 – Elevated Pole Mount Option 1**

### **3.2 Elevated Pole Mount Option 2**

In this option, the solar shade is placed over the sensor. One thermistor and Watermark set can be buried to a certain depth determined by the user, while another thermistor and Watermark set can be buried deeper than the first set. Ambient temperature and humidity readings from the on-board transducer are possible with this installation. The only caveat with this option is that no ambient light reading can be provided by the sensor.

Figure 4 below illustrates this installation:

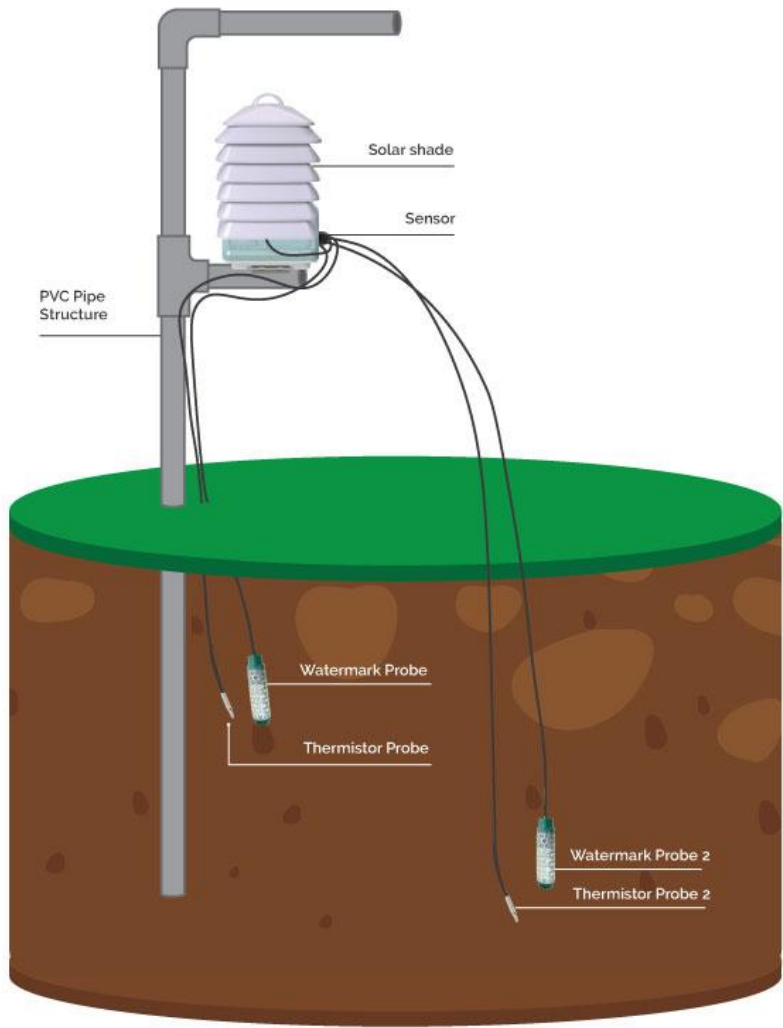
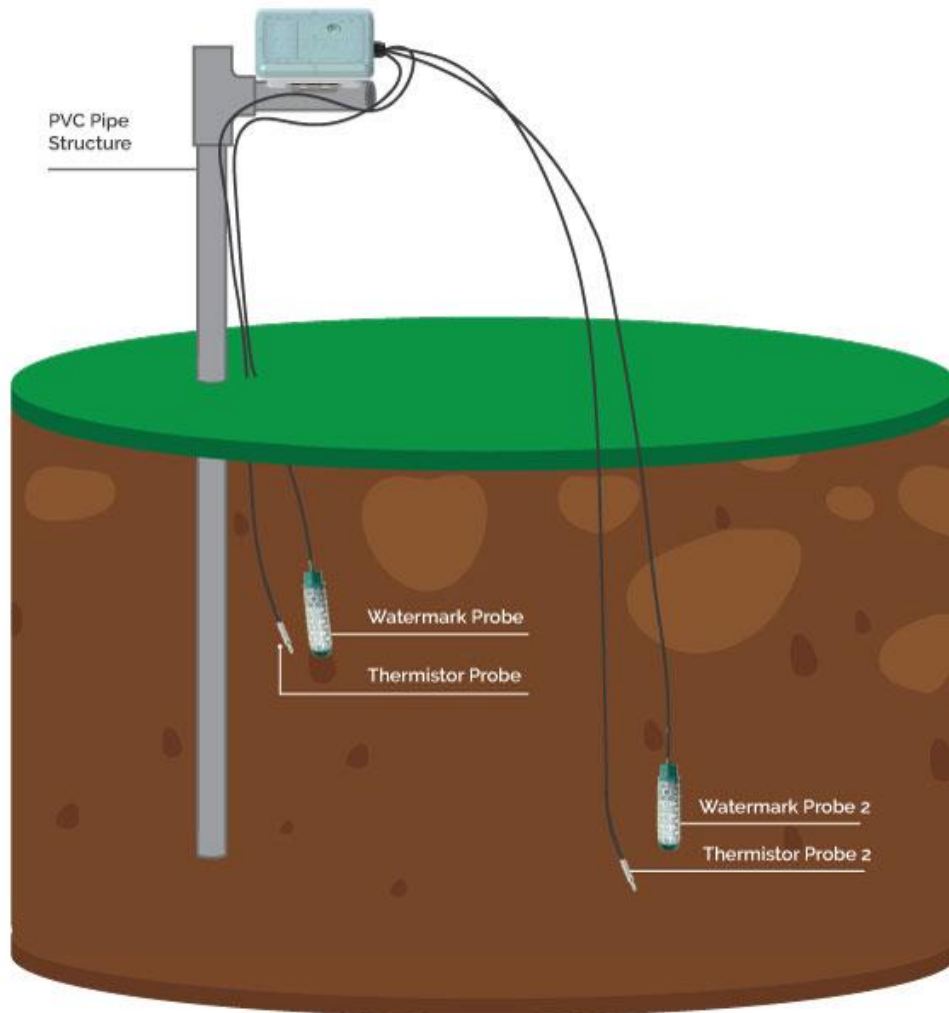


Figure 4 – Elevated Pole Mount Option 2

### 3.3 Elevated Pole Mount Option 3

The third option is a variation of option #2 in that no solar shade is used over top of the sensor. Two sets of thermistors and watermarks are buried in the soil at different depths. Ambient light can be measured in this installation option. Ambient temperature and relative humidity would be measured inaccurately in this option.

Figure 5 illustrates this installation option:



**Figure 5 – Elevated Pole Mount Option 3**