

# Calibration Equations for HOBO® RXW-T11 and RXW-T12 Soil Moisture Sensors Application Note



## Introduction

This application note provides the calibration equations required to convert the volumetric water content (VWC) readings from HOBOnet® T11 (RXW-T11-xxx) and HOBOnet T12 (RXW-T12-xxx) soil moisture sensors for different media. These sensors are factory calibrated for most mineral soils. Additional calibration steps are only required when using the sensors in soilless media. The following sections explain how to calibrate VWC readings for common types of soilless media.

## Mineral Soil Calibration

Based on testing by the sensor manufacturer METER, the T11 and T12 sensors are calibrated for use in most mineral soil types with electrical conductivities from 0 to 8 dS/m saturation extract. The calibration equation for volumetric water content ( $\theta$ ) is given by:

$$\theta_H = 3.879 \times 10^{-4} \times RAW - 0.6956 \quad \text{Equation 1}$$

where  $\theta_H$  is the VWC value provided in HOBOLink®. No additional calibration is needed when the sensors are used in most mineral soil types.

## Soilless Media Calibration

The T11 and T12 sensors are suitable for use in common types of soilless media, such as potting soil, perlite, and peat. Measuring VWC in these media requires a two-step adjustment to the calibration provided for  $\theta$  in Equation 1.

To calibrate the sensor readings for soilless media:

1. Convert  $\theta_H$  values to RAW values using this equation:

$$RAW = \frac{\theta_H + 0.6956}{0.0003879} \quad \text{Equation 2}$$

2. Convert the RAW values derived from Equation 2 into VWC values for soilless media using this equation.

$$\theta_n = 6.771 \times 10^{-10} \times RAW^3 - 5.105 \times 10^{-6} \times RAW^2 + 1.302 \times 10^{-2} \times RAW - 10.848 \quad \text{Equation 3}$$

where  $\theta_n$  is the VWC for soilless media. This calibration will lead to an accuracy of better than 0.05 m<sup>3</sup>/m<sup>3</sup> for non-soil substrates.

Enter these equations into a spreadsheet, such as Microsoft® Excel® to automate the conversion for a HOBOLink data series.