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Smart Water Application Technologies/SWAT Calibration Report

Testing Agency: Center for Irrigation Technology http://cati.csufresno.edu/cit/

Testing Period: April 2003 to May 2006

Product Type: Soil Moisture Sensor

Product Make and Model: Acclima Digital TDT Sensor Model #T003-004

Product Description: Sensor measures soil volumetric water content

SWAT Protocol*: Turf and Landscape Irrigation Equipment - SOIL MOISTURE SENSORS
Phase 1: Indoor Lab Screening Tests - 4th Draft Testing Protocol

The concept of soil moisture sensors has an extensive history of scientific study and documentation. The objective of Phase 1 lab tests is to determine sensor calibration curves over a range of conditions that affect soil moisture, including soil type, temperature and salinity. Phase 1 testing determines sensor response over manufacturer specified test ranges to continue into Phase 2. At that time the soil sensor will be integrated with an irrigation controller to measure irrigation adequacy and efficiency in a virtual landscape using the current performance criteria of 0.40 inches of rainfall and 2.50 inches of ETo.

Phase 1 Soil Moisture Sensor testing does not test the efficacy of a sensor over the entire range of soil moisture conditions possible and does not measure the integration of a soil sensor with a controller to manage irrigation.

Sensor performance curves were developed to determine the relationship between sensor readings and soil moisture content for a soil filled container. Relationships are determined for a range of soil textures, ambient temperatures and water conductivity values.

***All SWAT protocols may be viewed at www.irrigation.org**

Phase 1 SWAT Calibration Summary: Acclima Digital TDT Soil Moisture Sensor

Measures are between field capacity (i.e. practical soil water holding capacity) and a selected drying range specified by the manufacturer over which the sensor was tested.	**Functions**
Test of Soil Moisture Sensor	**Response Function Developed[1]**
Response in Fine-Textured Soil	Linear (Y = 0.562X + 0.175)
Response in Medium-Textured Soil	Linear (Y = 1.030X - 0.031)
Response in Coarse-Textured Soil	Linear (Y = 1.035X – 0.033)
Response in Soil at 20 °C (68 °F)	Linear (Y = 0.933X + 0.016)
Response in Soil at 30 °C (86 °F)	Linear (Y = 0.928X - 0.028)
Response in Soil Susceptible to Freezing	Linear (Y = 0.996X – 0.015)
Response in Fine-Textured Soil to Irrigation with 1.5 dS/m salinity water	Linear (Y = 0.401X + 0.263)
Response in Medium-Textured Soil to Irrigation with 1.5 dS/m salinity water	Linear (Y = 0.937X – 0.011)
Response in Medium-Textured Soil to Irrigation with 3.0 dS/m salinity water	Linear (Y = 0.855X - 0.007)
Response in Coarse-Textured Soil to Irrigation with 1.5 dS/m salinity water	Linear (Y = 1.030X – 0.033)

[1]Regression equations of the data gathered vs. moisture content as measured by gravimetric sampling, or the measured weight of water in the soil samples. The dynamics of variable manufacture selected calibration endpoints preclude the applicability of correlation coefficients for inter-test or inter-sensor comparisons. A Nonlinear designation means a regression equation other than a straight line was used to best describe the relationship.

Product Detail Supplied by Manufacturer

Acclima TDT Soil Moisture Sensor **www.acclima.com**

Operation	Features	Additional Hardware
Digital TDT Absolute-reading soil moisture sensor device	❑ Provides stable readings across wide range of soil temperature and EC conditions. ❑ Can act as a moisture transducer in a closed-loop irrigation system without need for periodic adjustment. ❑ Can measure soil and irrigation system properties, thereby can setup control system automatically. ❑ After setup and install, no future adjustment needed.	**Closed-loop irrigation control systems available:** ❑ CS3500 Water on Demand: 2-wire, 64 zone, internet accessible, onboard data storage, 4 simultaneous zone scheduling with flow control, setup/reporting software ❑ SC24/36 Suspended Cycle: Conventional wired, 24/36 zone, 4 simultaneous zone scheduling with flow control ❑ SC6/12 Suspended Cycle: Conventional wired 6/12 zone residential, indoor and outdoor models, microclimate control ❑ SCX Suspended Cycle Add on Device: Interrupts conventional timers, auto setup, performance reporting