



CWS655

900 MHz Wireless Soil-Water Probe



## Cable-Free Sensor

Wireless network means flexibility, cost savings, time savings

### Overview

The CWS655 is a wireless version of our CS655 soil water reflectometer. It has 12 cm rods and monitors soil volumetric water content, bulk electrical conductivity, and temperature. This reflectometer has an internal 900 MHz spread-spectrum

radio that transmits data to a CWB100 Wireless Base Station or to another wireless sensor. The internal radio's frequency is commonly used in the US and Canada.

### Benefits and Features

- › Versatile sensor—measures dielectric permittivity, bulk electrical conductivity (EC), and soil temperature
- › Measurement corrected for effects of soil texture and electrical conductivity
- › Internal frequency-hopping, spread-spectrum radio provides longer range and less interference
- › Battery powered
- › A reliable, low-maintenance, low-power method for making measurements in applications where cabled sensors are impractical or otherwise undesirable
- › Transmissions can be routed through up to three other wireless sensors
- › Compatible with CR800, CR850, CR1000, and CR3000 dataloggers

### Detailed Description

The CWS655 has 12-cm rods that insert into the soil. It measures propagation time, signal attenuation, and temperature. Dielectric permittivity, volumetric water content, and bulk electrical conductivity are then derived from these raw values.

Measured signal attenuation is used to correct for the loss effect on reflection detection and thus propagation time measurement. This allows accurate water content

measurements in soils with bulk  $\leq 3.7 \text{ dS m}^{-1}$  without performing a soil-specific calibration.

Soil bulk electrical conductivity is also derived from the attenuation measurement. A thermistor in thermal contact with a probe rod near the epoxy surface measures temperature. Horizontal installation of the sensor provides accurate soil temperature measurement at the same depth as the water content measurement. For other orientations, the

temperature measurement will be that of the region near the rod entrance into the epoxy body.

## Why Wireless?

There are situations when it is desirable to make measurements in locations where the use of cabled sensors is problematic. Protecting cables by running them through conduit or burying them in trenches is time consuming, labor

intensive, and sometimes not possible. Local fire codes may preclude the use of certain types of sensor cabling inside of buildings. In some applications measurements need to be made at distances where long cables decrease the quality of the measurement or are too expensive. There are also times when it is important to increase the number of measurements being made but the data logger does not have enough available channels left for attaching additional sensor cables.

## Specifications

Measurements Made	Soil electrical conductivity (EC), relative dielectric permittivity, volumetric water content, soil temperature
Water Content Accuracy	±3% VWC typical in mineral soils, where solution EC ±10 dS/m
Required Equipment	CWB100
Rods	Not replaceable
Sensors	Not interchangeable
Weather Resistance	IP67 rating for sensor and battery pack (Battery pack must be properly installed. Each sensor is leak tested.)
Operating Temperature Range	-25° to +50°C
Operating Relative Humidity Range	0 to 100%
Power Source	2 AA batteries with a battery life of 1 year assuming sensor samples taken every 10 minutes. (Optional solar charging available.)
Average Current Drain	300 µA (with 15-minute polling)
Rod Diameter	3.2 mm (0.13 in.)
Rod Length	12 cm (4.7 in.)
Dimensions	14.5 x 6 x 4.5 cm (5.7 x 2.4 x 1.77 in.)

Weight 216 g (7.6 oz)

### Measurement Accuracies

Volumetric Water Content ±3% VWC typical in mineral soils that have solution electrical conductivity ≤ 10 dS/m. Uses Topps Equation (m<sup>3</sup>/m<sup>3</sup>).

### Internal 25 mW FHSS Radio

Frequency	902 to 918 MHz
Where Used	US and Canada
FHSS Channel	50
Transmitter Power Output	25 mW (+14 dBm)
Receiver Sensitivity	-110 dBm (0.1% frame error rate)
Standby Typical Current Drain	3 µA
Receive Typical Current Drain	18 mA (full run)
Transmit Typical Current Drain	45 mA
Average Operating Current	15 µA (with 1-second access time)
Quality of Service Management	RSSI
Additional Features	GFSK modulation, data interleaving, forward error correction, data scrambling, RSSI reporting

For comprehensive details, visit: [www.campbellsci.com/cws655](http://www.campbellsci.com/cws655) 



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