Substrate Sensor Set VWC, EC & Temp (WCS-9) User Manual



OVERVIEW

The TrolMaster WCS-9 Substrate Sensor is a 3-in-1 device designed for the Aqua-X, Hydro-X, Tent-X, and Green-X Control Systems (NFS-1, NFS-2, NFS-3, HCS-2, TCS-1, GCS-1). Represents the pinnacle of the WCS series, engineered to deliver unparalleled precision in monitoring both traditional soil and high-bulk EC soilless substrates. Recognizing the inherent limitations of single-sensor monitoring—which can frequently misrepresent the root zone due to localized anomalies like "hot spots" or water channeling—the WCS-9 introduces an advanced, completely redesigned internal multi-node architecture.

This innovative framework permits the daisy-chaining of up to four individual Sensor Nodes directly into a single Sensor Display. By aggregating data across multiple points in the growing medium, the system calculates and provides a highly accurate and trustworthy average of the root zone's Volumetric Water Content (VWC), Electrical Conductivity (EC), and Temperature.

By providing hyper-accurate, verified root zone data, the WCS-9 serves as the crucial mechanism for TrolMaster's advanced "Feed on Demand" irrigation strategy. This sensor-based control replaces traditional timer-based guessing by utilizing real-time moisture parameters to automatically trigger irrigation events, allowing cultivators to execute precise dry-backs and sophisticated crop steering strategies effortlessly.

Users can monitor the water content, temperature, and EC on their smartphone using TrolMaster's free TM+ Pro App. The app also allows viewing historical data graphs and receiving notifications if sensor readings exceed customised high or low alarm settings.

PACKAGE CONTENTS

- 1 x WCS-9 Sensor Display
- 1 x WN-9 Sensor Node (Additional nodes sold separately)
- 1 x 16ft RJ12 Cable Set
- 1 x T-Splitter

FEATURES

- **Precision Measurement:** Highly accurate, simultaneous readings of VWC, EC, and temperature for soil and high Bulk EC soilless substrates.
- **Data Aggregation:** Calculates a reliable average across multiple sensor nodes.
- **Advanced Daisy-Chain Connectivity:** "1 Sensor Display to multiple Nodes" design minimizes cable clutter. Supports up to 4 nodes.
- **Dynamic Reading Intervals:** Data refreshes every 1 minute normally; every 10 seconds during "Feed on Demand." Immediate refresh possible.
- **Simplified Calibration:** Requires only calibrating 100% VWC in saturated medium. Factory pre-calibrated for Rockwool.
- **"Feed on Demand" Control:** Sensor-based watering (replaces timers) based on actual substrate moisture. Supports crop steering with multiple moisture set point schedules (Morning, Noon, Evening) and precise "shots" using "Max On Time" and "Dry Back time."
- **Affordable Scalability & Free App Access:** Cost-effective to add sensor nodes. Offers free TM+ App access with unlimited historical data.

SPECIFICATIONS

Input Voltage	12V⎓0.1A
Max Input Current	0.1A
Water Content Range	0~100%
EC Range	0~30 mS/cm
Temp Range	32~122°F (0~50°C)
Operating Temperature	32~122°F (0~50°C)
Operating Humidity	≤90%RH
Weight	1.39lbs / 0.63kg
Packaging Dimensions (L*W*H)	138mm x 170mm x 64mm / 5.43in x 6.69in x 2.52in

* **NOTE:** Multiple Water Content Sensors (up to 50 pcs) can be connected to the Aqua-X Pro Control System, and the Display of the Aqua-X Pro Controller will show the average value.

PRODUCT LAYOUT



PRINCIPAL OF OPERATION

Master precision irrigation. Dial in drybacks.

Water content and EC measurement within the growth media are the heartbeat of your cultivation strategy. The WCS-9 redefines substrate monitoring, utilizing sophisticated technology to capture Temperature, Water Content %, and EC across various media types with absolute precision.

Mastering Irrigation with Data:

- **Water Content %:**

  Utilizes robust stainless steel spikes to measure volumetric water content, providing the reliable data needed to "dial in drybacks" and monitor root zone saturation 24/7.

- **Electrical Conductivity (EC):**
  Measures nutrient density. It maintains unparalleled accuracy by automatically accounting for the salinity of your nutrient solution, ensuring dependable EC and Water Content readings even as conditions change.

- **Temperature:**
  A precision temperature sensor embedded directly in the probe tracks the root zone temperature, a vital metric for overall plant health.

"Feed on Demand" Control:

This innovative, sensor-based strategy replaces traditional timer irrigation. It triggers watering events based on the actual substrate moisture level, supporting advanced crop steering. Users can set multiple schedules with different moisture set points (e.g., Morning, Noon, Evening) and configure small, precise irrigation "shots" using "Max On Time" and "Dry Back time."

Simplified Calibration:

The WCS-9 simplifies complexity with a single calibration framework for all substrates. Users only need to calibrate the 100% Volumetric Water Content level in a fully saturated medium. The sensor is also factory pre-calibrated specifically for Rockwool, reducing setup time.

Dynamic Data Refresh:

Under normal conditions, data refreshes every 1 minute. However, during critical "Feed on Demand" irrigation periods, the measurement interval automatically reduces to every 10 seconds to provide hyper-accurate, real-time feedback. Users can also force an immediate refresh by pressing the button on the Sensor Display.

Affordable Monitoring:

The system breaks away from high-priced subscription models by offering free TM+ App access, which includes unlimited historical data monitoring and zero subscription fees.

Advanced Daisy-Chain Connectivity and Scalability:

The system uses a streamlined "1 Sensor Display to multiple nodes" design, significantly reducing cable clutter.

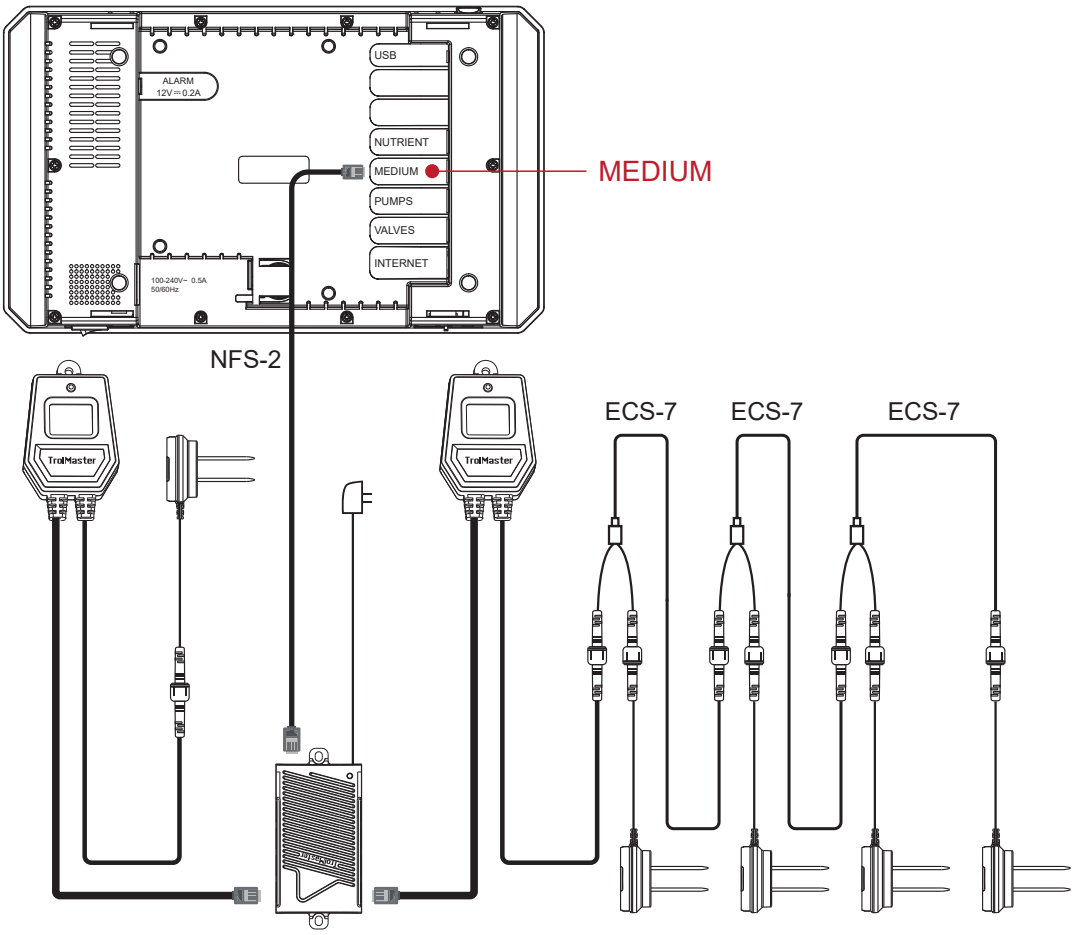
- Each **Sensor Display** module can support and display the average and individual readings for **up to 4 daisy-chained Sensor Nodes.**

- The system offers affordable scalability, allowing growers to add cost-effective sensor nodes without inflating costs.

Seamless Controller Integration:

The WCS-9 is designed for robust compatibility across the TrolMaster ecosystem: **Full Capacity (up to 4 Sensor Nodes per Display):**

LINK UP



Controller	Max Sensor Displays Supported	Capacity (Sensor Nodes per Display)
Aqua-X (NFS-1)	1	Full Capacity (up to 4)
Aqua-X Pro (NFS-2)	50	
Aqua-X Plus (NFS-3)	20	
Hydro-X Pro (HCS-2)	50	
Tent-X (TCS-1)	1	
Green-X (GCS-1)	1	

OPERATION INSTRUCTIONS

1. Installation & Daisy-Chaining

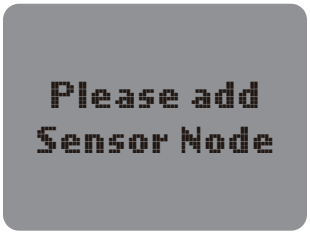
Say goodbye to cable clutter. Connect your Sensor Nodes directly to each other via the daisy-chain cables to form a chain, and plug this chain into the WCS-9 Sensor Display.

Before connecting the WCS-9 Sensor Display to your TrolMaster controller (Hydro-X, Aqua-X, Tent-X, or Green-X) using the RJ12 cable, ensure the controller is updated to the latest firmware version to support the WCS-9 functions.

- **NFS-1/NFS-2/NFS-3:** Connect to the Medium port.
- **HCS-2/TCS-1:** Connect to the Sensors port.
- **GCS-1:** Connect to the Sensors port.

2. Addressing the WCS-9 and Nodes

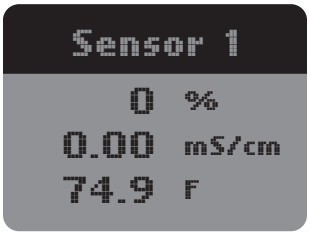
- **Add to Controller:** Press the addressing button on the WCS-9 Sensor Display to link it to your TrolMaster controller (this is the same procedure as older models).
- **Add Nodes:** To pair a specific Sensor Node to the Sensor Display, simply **shake the Sensor Node.**



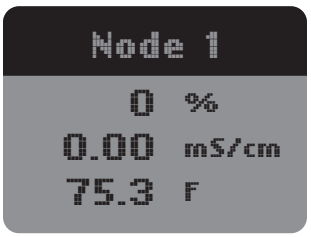
***Note:** If the WCS-9 is added to the controller but no nodes are linked, the screen will display a prompt reminding you to add nodes.

3. Display Navigation

- The WCS-9 defaults to refreshing data every 1 minute.
- In "Feed on Demand" Irrigation mode, the WCS-9 refreshes data every 10 seconds.
- Press the button on the Sensor Display once to immediately force a data refresh.



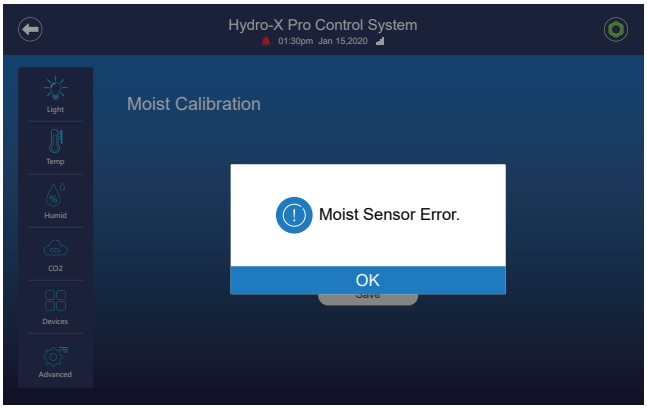
- When multiple **Sensor Nodes** are daisy-chained, the system calculates and displays the **aggregated average value** for all connected points. The title **"Sensor #"** on the screen indicates the specific sequence of the Sensor Display relative to the controller.

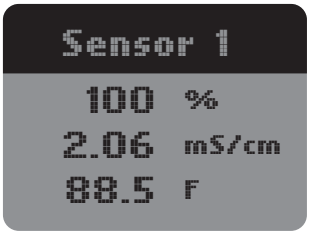


- **Individual Node View:** Press the button on the **Sensor Display** to cycle through individual node readings. The title will update to display as **"Node 1", "Node 2"**, etc.

4. Mounting & Calibration Process

We can only calibrate the Substrate Sensors via the controller; to ensure data accuracy, please observe the following installation guidelines explicitly mentioned for the WCS-9:





1. Insert the **WN-9 Sensor Node** horizontally into a **100% fully saturated grow medium**, positioned approximately 1/3 of the height from the bottom of the container or rockwool block.
2. When deploying **multiple Sensor Nodes** in a daisy chain, ensure each is inserted into an **individual fully saturated medium**. This configuration enables the **simultaneous calibration** of the complete chain in the subsequent step.
3. Navigate to the **Settings** menu on your controller, select **Calibration**, then **Moisture**, and confirm the **100% calibration** for the substrate sensor(s).

   ***Note:** The system requires an initial VWC reading of at least **60%** to validate the **100% calibration** point; if the reading falls below this threshold, an **"Out of Range"** prompt will be displayed.

MAINTENANCE

To ensure the highest accuracy and prolong the life of your WCS-9, observe the following guidelines and avoid conditions that interfere with Water Content (WC) and Electrical Conductivity (EC) readings:

- **Probe Cleanliness:** Always keep the stainless steel node probes free of oil or grease. Oil or grease on the probes will directly interfere with WC and EC readings
- **Cable Management:** Do not stack, tangle, or interlace the connection cables of multiple sensors and nodes.
- **Cable Placement:** Avoid routing or sticking the sensor and node connection cables directly against the rockwool blocks or the grow medium surface, as this can cause data interference.
- **Metal Interference:** Avoid placing rockwool blocks containing Sensor Nodes on interconnected metal trays or brackets.

TROUBLESHOOTING

Calibration "Out of Range" Error:

If calibrating for 100%, ensure the medium is fully saturated. The system rejects 100% calibration if the initial reading is <60%.

Inaccurate or Fluctuating Readings (Interference):

- Ensure that multiple rockwool blocks containing Sensor Nodes are not placed on interconnected conductive metal stands, as this can bridge the electrical signals.
- When calibrating multiple nodes, it is highly recommended to calibrate them one by one. If calibrating simultaneously, insert them into different substrate blocks or separate cups of water. Placing multiple nodes in the same exact block during calibration causes signal interference, and the calibration will fail.

How to Reset / Clear Nodes:



To clear all paired nodes from the WCS-9, press and hold the button on the Sensor Display for 5 seconds.

NOTE: Resetting the sensor serves as a primary fail-safe, enabling users to effortlessly restore the factory default calibration should any manual configuration errors occur.

WARNING: Resetting the sensor permanently deletes all custom calibration history and restores factory defaults.

Resets apply to the entire daisy-chain simultaneously; individual nodes cannot be reset independently. Any reset or node replacement automatically clears the calibration history for every connected node in that chain.

WARNING: **DO NOT** allow the WCS-9 Dry Contact Board to be exposed to water or excessive heat. DO NOT open or attempt to repair or disassemble the controller, as there are no user-serviceable parts inside. Opening the controller will void the warranty. If the surface of the WCS-9 Dry Contact Board is dirty, wipe it with a dry towel. The WCS-9 Dry Contact Board operates under natural ventilation conditions.

AVERTISSEMENT: **NE PAS** exposer la carte de contact sec WCS-9 à l'eau ou à une chaleur excessive. NE PAS ouvrir ou tenter de réparer ou de démonter le contrôleur, car il ne contient aucune pièce réparable par l'utilisateur. L'ouverture du contrôleur annulera la garantie. Si la surface de la carte de contact sec WCS-9 est sale, essuyez-la avec une serviette sèche. La carte de contact sec WCS-9 fonctionne dans des conditions de ventilation naturelle.

For any issues or concerns with our products, DO NOT return them to the store. Please contact our tech support department at **support@trolmaster.com** or call **877-420-9876**.

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