



CHALAT TUBE User Manual

IoT-Based Water Level Measuring Sensor in Rice Field [AWD Tube]

4th Edition

Last Update: 2025/03/27

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1. Product Specifications

Chalat Tube is an IoT-based water level measuring sensor developed by CHALATEX to support Alternate Wetting and Drying (AWD) irrigation in rice fields. It helps farmers monitor water levels remotely, optimize irrigation schedules, reduce water consumption, and lower greenhouse gas emissions.

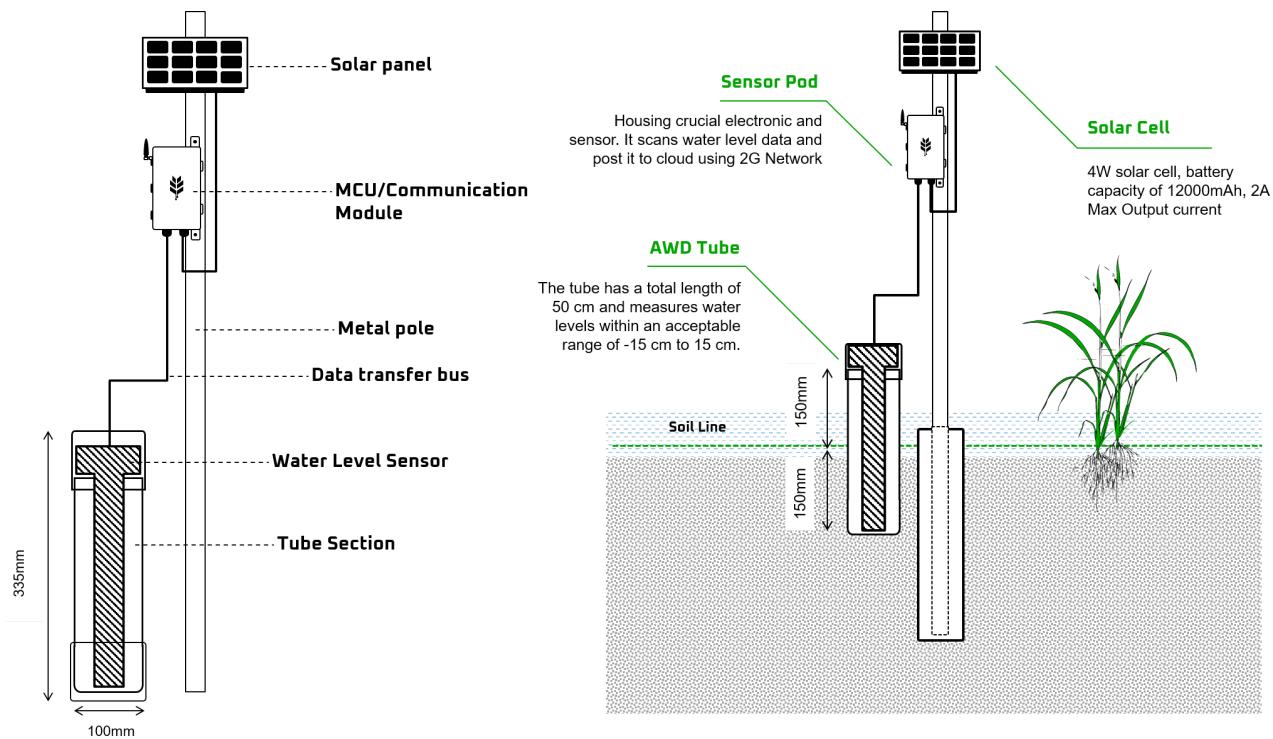


Figure 1.1: Chalat Tube sensor infographic. Product section and dimension (left), product description (right)



Figure 1.2: Chalat Tube Water Rice Field Water Level Sensor (v4.0). Fully assembled sensor PCB housing inside plastic enclosure (left) 30 30-channel analog-based water level sensor (middle), solar panel with built-in battery pack (right)

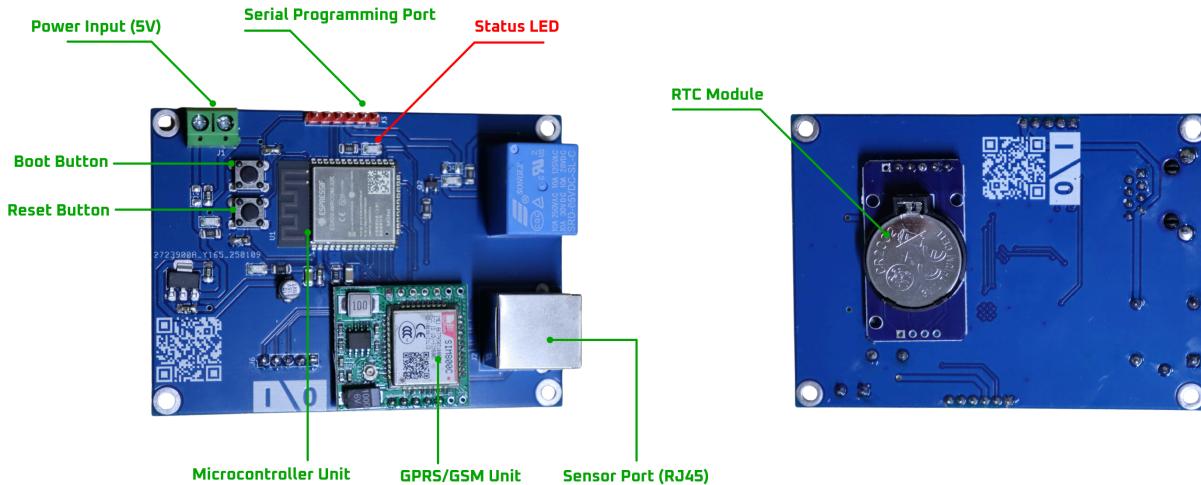


Figure 1.3: Chalat Tube PCB Hardware Overview

N.O.	ITEM	TECHNICAL DESCRIPTION
1	Brand	Chalat Tube 4.0
2	Model	CX-AWD-202502
3	Communication	2G
4	Protocol	HTTP
5	MCU	ESP32
6	GSM/GPRS	SIM800C
7	SIM Type	M2M
8	Measuring Value Range	-15.00cm to 15.00cm (15cm below and above soil line)
9	Measuring frequency per day	4, 6, 12, 24 (hours)
10	Sensor type	Analog
11	Reading accuracy	± 10.0 mm
12	Power consumption	200mA to 1.5A (Active Mode), 2.5 µA (hibernation)
13	Solar Cell	4W

14	Battery capacity	12000mAh
15	Battery output	5V, 2A(Max)
16	Diameter	100mm (Tube)
17	SIM Card Slot	Micro
18	Solar power connector	DC Jack 5.5 x 2.1mm

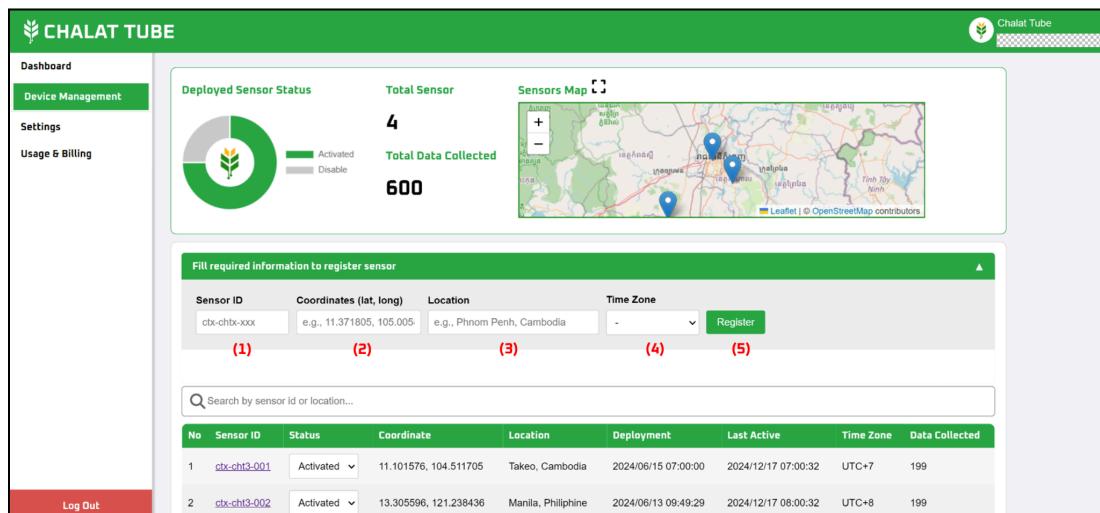
Figure 1.4: Table of Sensor Technical Specifications

2. System Configuration

The user must complete a two-step configuration process to ensure and verify ownership of the sensor and manage its operation based on user preferences.

2.1. Register sensor from Web App

1. register/login to Chalat Tube Web App (<https://chalat-tube.web.app/>)
2. Navigate to **Device Management**



The screenshot shows the ChalatTube Web app interface. The top navigation bar includes the ChalatTube logo and a 'Device Management' button. The left sidebar has 'Device Management' selected. The main content area has a 'Deployed Sensor Status' section with a green circular icon showing 4 activated sensors. It also shows 'Total Sensor' (4), 'Total Data Collected' (600), and a 'Sensors Map' with several blue location markers. Below this is a form titled 'Fill required information to register sensor' with fields for Sensor ID (ctx-ctx-xxx), Coordinates (lat, long) (e.g., 11.371805, 105.005), Location (e.g., Phnom Penh, Cambodia), Time Zone, and a 'Register' button. The Time Zone dropdown is highlighted with a red box and labeled '(5)'. At the bottom is a table of registered sensors with columns: No, Sensor ID, Status, Coordinate, Location, Deployment, Last Active, Time Zone, and Data Collected. Two entries are listed: 1. ctx-ctx-001 (Activated, 11.101576, 104.511705, Takeo, Cambodia, 2024/06/15 07:00:00, 2024/12/17 07:00:32, UTC+7, 199) and 2. ctx-ctx-002 (Activated, 13.305596, 121.238436, Manila, Philiphine, 2024/06/13 09:49:29, 2024/12/17 08:00:32, UTC+8, 199). A 'Log Out' button is at the bottom left.

Figure 2.1: ChalatTube Web app interface for sensor management

3. Entering Required Device Information

- (1)- Entering valid Sensor ID (ctx-ctx-XXxxxxxx). Please note that you cannot use the same ID again once registered.
- (2)—Enter a valid format of sensor coordinates (lat, long). This will record geopoints where you place the sensor. You can edit later based on preference.

(3)- Entering location address. This will record the address where you place the sensor. You can edit later based on preference.

(4)- Entering local timezone

(5)- Register Button

4. Click **Register**

2.2. Configure sensor operation preference

1. Connect the sensor to a 5V power source
2. Confirm slow blinking **Status LED** on the Microcontroller (about 1-second interval). This indicates that the sensor is now in configuration mode.
3. Check your available WiFi and search for the name “**CHLAT-TUBE-CONFIG**”
4. Connect to this WiFi. It should navigate you to the browser to access the configuration page. If not, manually access it by entering **192.168.4.1** in the browser address bar. The configuration page should look something like this.
5. Enter the following required information

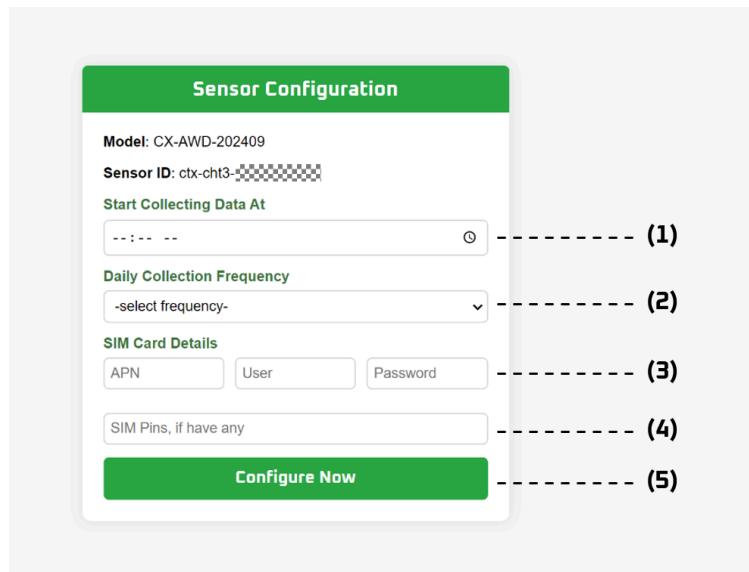


Figure 2.2: Chalatube Hardware Configuration Guide

(1) Time to start collecting data (required**)**

(2) Frequency of data collection per day (required**)**

(3) SIM Card APN (required**), User, and Password are optional**

(4) Enter SIM PIN if you have any (Optional)

(5) Configure Button

6. Press the **Configure Now** Button
7. If you need to configure it again, press the **reset button**, then hold the **boot button** for 5 seconds until the **Status LED** Glows Up. The device will return to configuration mode, and you can restart it again.

The sensor will now be ready to send the data to the user.

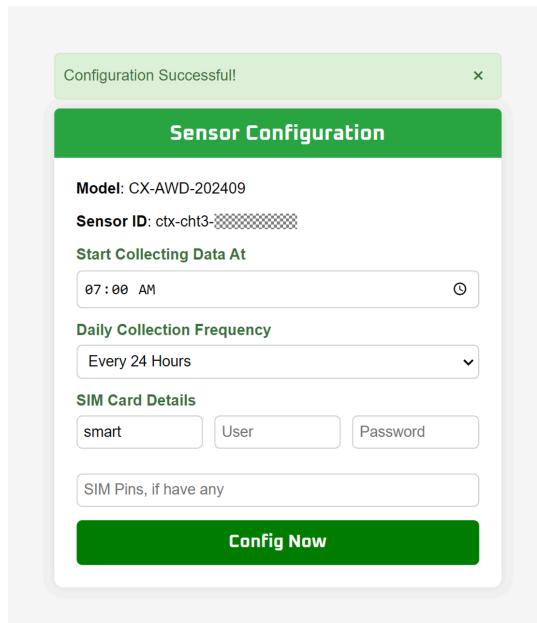


Figure 2.3: ChalatTube Successful Hardware Configuration Display

3. Sensor Field Set-Up Guide

Assuming that you have completed the sensor register and configuration, you can now follow a few more steps to set up the sensor in the field.

1. insert the Mirco SIM Card into the SIM Module Slot (as shown picture below). please make sure that the SIM Card you intend to use has a data plan. you may also need to check the network coverage of your local provider to see what works best.

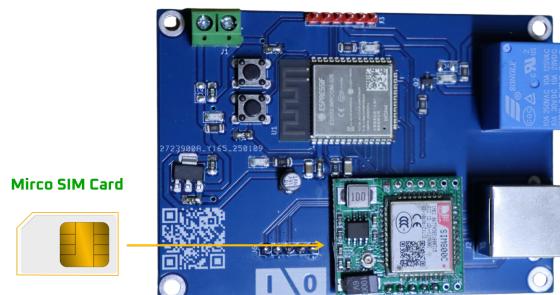


Figure 3.1: Guide to insert micro SIM card into GPRS/GSM Module

2. Find the RTC Module and insert the battery (CR2032) in case the module doesn't come with a battery.
3. Power up the sensor with a 5V power source.
4. Test and debug the sensor as follows (in case you need to):
 - If the **Status LED** blinks once, it indicates that the SIM Card may not be inserted properly or have proper service.
 - If the **Status LED** blinks 3 times rapidly, it indicates that the SIM Module has set up its modem successfully and is ready to connect to the network.
 - If the **Status LED** rapidly blinks 6 times and then remains on, it indicates that the sensor has connected to the network successfully. Otherwise, the sensor will reset and reattempt. The sensor will be able to use this established connection to send data to the cloud.
 - After sending data to the cloud, the sensor will blink 5 times slowly, set up a wake alarm, and go into hibernation mode.
5. after completing the above steps, you can go for the field installation. You can install the sensor as our diagram below.

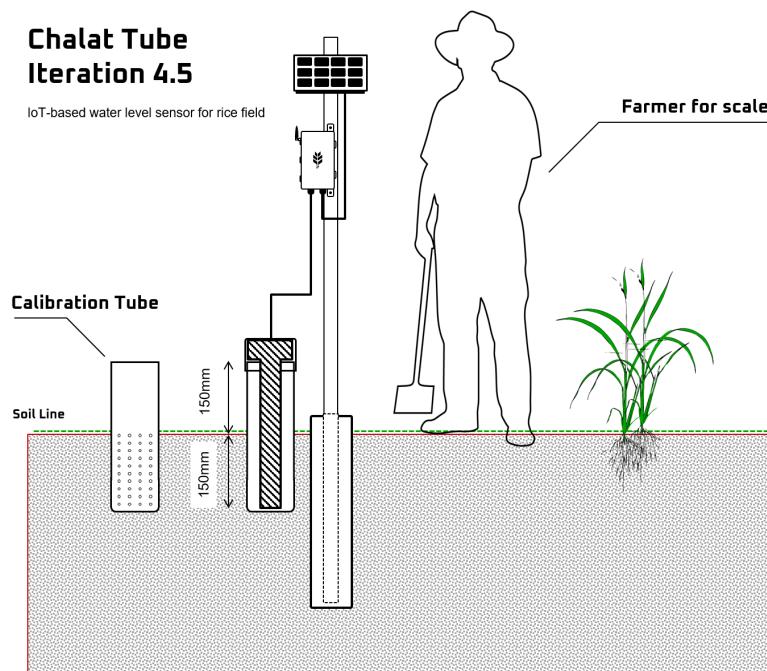


Figure 3.2: Guide to ChalatTube Field Installation

6. Bury 15cm of the tube into the soil. The buried section of the tube will be marked on the tube. In case the earth is soft, it's a good practice to wrap a few layers of net to prevent more earth from entering the tube.
7. Set up a wooden/metal pole near the tube and install the sensor pod and solar panel.
8. Plug the solar connector into the sensor pod DC Jack.



Figure 3.3: Chalat Tube Sensor Installed in the rice field located at Bati District, Takeo Province, Cambodia (07/04/2025)

4. Web App Overview

4.1. Dashboard

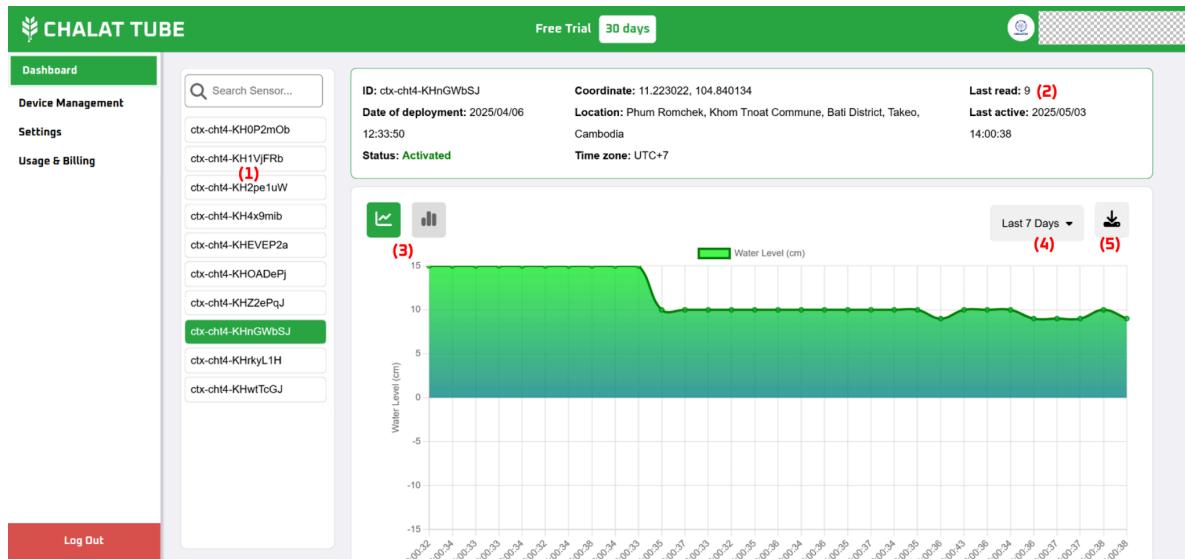
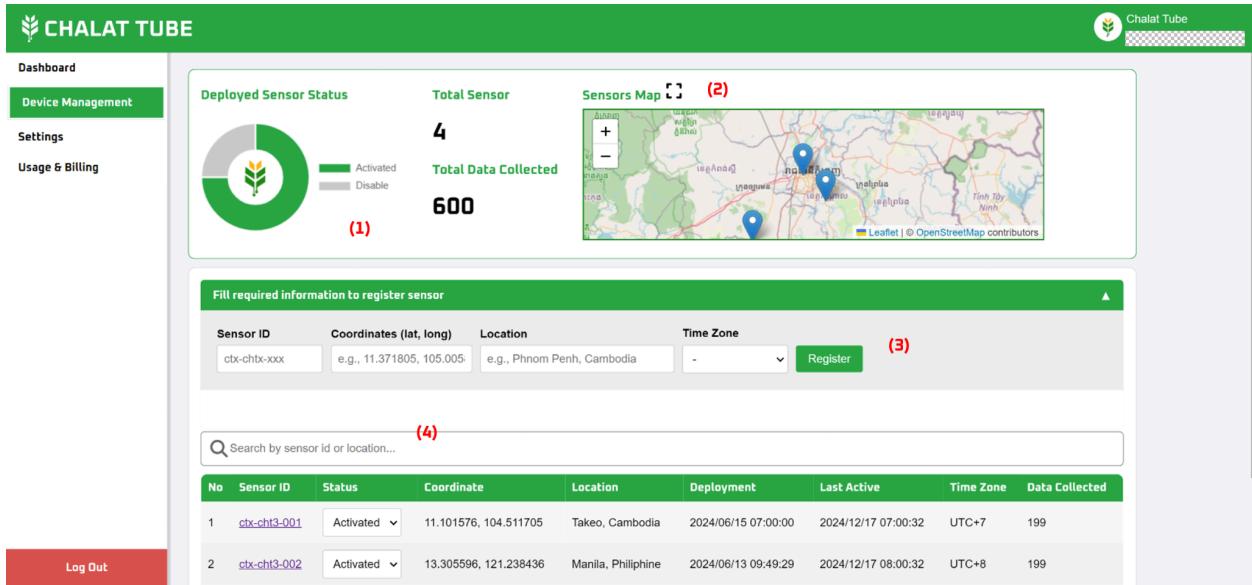


Figure 4.1: Chalat Tube Web App Dashboard Overview

- (1)- Sensors that you register and own. You can click on each sensor ID to access its details and data.
- (2)- Summary details of specified sensor ID
- (3)- Chart Display Options
- (4)- The time Range Selector that you specified to update the chart display
- (5)- Chart download options (.png, .jpg, .csv)

4.2. Device Management



The screenshot shows the Chalat Tube Device Management Overview page. The top navigation bar includes the Chalat Tube logo, a search bar, and a user profile icon. The left sidebar has links for Dashboard, Device Management (which is selected and highlighted in green), Settings, and Usage & Billing. The main content area is divided into several sections:

- Deployed Sensor Status:** A circular chart showing the number of activated and disabled sensors. A callout (1) points to the chart.
- Total Sensor:** Displays the total number of sensors (4) and total data collected (600).
- Sensors Map:** A map showing the locations of deployed sensors with blue markers. A callout (2) points to the map.
- Fill required information to register sensor:** A collapsible form with fields for Sensor ID (ctx-ctxx-xxx), Coordinates (lat, long) (e.g., 11.371805, 105.005), Location (e.g., Phnom Penh, Cambodia), and Time Zone (-). A callout (3) points to the 'Register' button.
- Search bar:** A search bar with the placeholder "Search by sensor id or location..." and a magnifying glass icon. A callout (4) points to the search bar.
- Deployed Sensors Table:** A table listing two sensors. Each row includes an embedded link to view sensor data. The columns are: No, Sensor ID, Status, Coordinate, Location, Deployment, Last Active, Time Zone, and Data Collected.

Log Out button is located at the bottom left of the sidebar.

Figure 4.2: Chalat Tube Web App Device Management Overview

- (1)- Short Analysis (number of activated and disabled sensors, total number of sensors, and total data collected.)
- (2)- Simple Map Display of sensors you own and deploy.
- (3)- Collapsible form for sensor registration
- (4)- Sensor table where each row displays an embedded link to view sensor data, status, coordinate, location, deployment date, last active date, local timezone, and total data collected by that sensor. Status, Coordinate, and Location are editable. The table also has a search bar where you can search the sensor using ID or a known location.