Nube-iO
Wireless Droplet Sensors
Installation and User Manual

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1.   Document Summary

This Installation Manual contains technical specifications, installation instructions, ordering info, and communication guidelines for the Droplet series of Wireless Environmental Sensors.

2.   Product Description

The Droplet is Nube-iO's multi-purpose wireless (LoRa) IoT environmental sensor. Designed to capture the most useful sensor data, in a small package, with minimum install time.
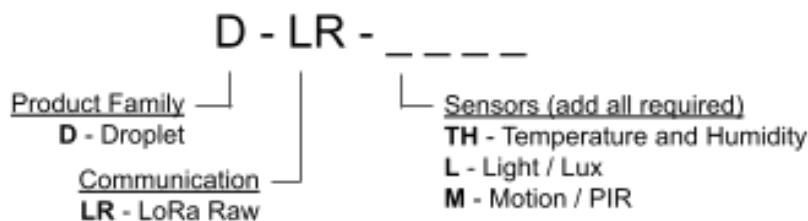
Measuring Temperature, Humidity, Light (Lux), and Motion , the Droplet sensors collect the most useful environmental data that can be used to monitor, control, and utilize spaces better.

The Droplet is a surface mount sensor, making installation time trivial by eliminating sensor wiring. This greatly reduces cost, and interruption to the building occupants.

LoRa wireless IoT technology provides a very long transmission range that is energy efficient and less susceptible to object interference than other wireless technologies.

Powered by 3 x AA batteries, Droplet sensors have a runtime of 3-5 years depending on the configured push rate.
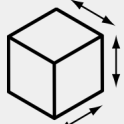
3.   Ordering Information

D-LR-TH	LoRa RAW wall mount sensor. Temperature, Humidity.
D-LR-THL	LoRa RAW wall mount sensor. Temperature, Humidity, Light/Lux.
D-LR-THLM	LoRa RAW wall mount sensor. Temperature, Humidity, Light/Lux. Motion (PIR).
D-LR-TH-A	LoRa RAW wall mount sensor. Temperature, Humidity (Version with Improved accuracy). For use in medical applications or critical monitoring areas. Typical Range -40°C to 125°C.

Model	Condition	Typical	Max
HS3001	-10°C to 80°C	±0.2°C	±0.3°C
HS3002	-10°C to 80°C	±0.2°C	±0.3°C
HS3003	0°C to 70°C	±0.25°C	±0.35°C
HS3004	0°C to 70°C	±0.3°C	±0.5°C

4. Technical Specifications

4.1. Physical Attributes

Depth: 25.5mm 1.0 inches

Height: 86mm 3.39 inches

Width: 86mm 3.39 inches

Dimensions	**Height:** 86 mm	/	3.39 inches
	Width: 86 mm	/	3.39 inches
	Depth: 25.5 mm	/	1.0 inches
Operating Temperature	-10°C to 80°C		
Enclosure	ABS Plastic, DIN Rail Mount, IP40 Rated		

4.2. Power Requirements

Battery	**Power Supply**	3 x AA Batteries
	Runtime	3-5 years (depending on configure push rate)

4.3. Communication

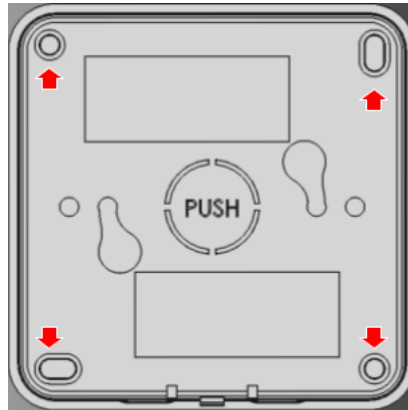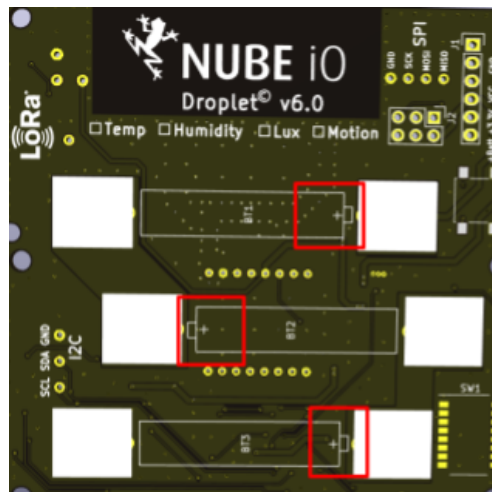|		
LoRa	**Lora Raw Wireless**	LoRa wireless IoT technology provides a very long transmission range that is energy efficient and less susceptible to object interference than other wireless technologies. **Supported Frequencies:** AU915, US915, AS232, EU863 **Spreading Factor:** 7 **Bandwidth:** 250 kHz

5. Installation and Configuration

5.1. Mounting

The Nube-iO Droplets are 86mm x 86mm. They are designed to be mounted on flat surfaces using screws or double sided tape. They can be mounted vertically or horizontally. The sensor should always be mounted in a location such that it will not experience very high or low temperatures, liquids or high humidity. Mounting locations should be selected such that the sensor will experience conditions representative of the entire sensing space.

5.2. Power

The Nube-iO Droplet sensors are powered by 3 x AA Batteries as shown below. Battery runtime should be between 3-5 years depending on the configured push rate (more data pushes means lower battery runtime).
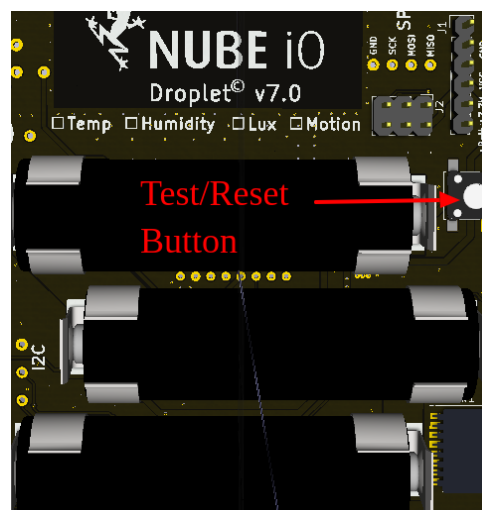
5.3.   Sensor Positioning and LoRa Signal Quality

Droplet sensors utilize LoRa IOT Wireless radio technology. This wireless system features long range, and good object penetration. However, care still must be taken to position sensors such that they have a good communication signal with the LoRa Gateway.   The quality of the communication signal depends on the **distance from the LoRa Gateway**, and the **objects between the Droplet sensor and the LoRa Gateway**. For a detailed description of the factors involved in designing and troubleshooting LoRa network positioning, see the LoRa Installation Best Practices documentation (link in Section 6.1)

5.4.   Onboard Reset/Push Button

Droplet sensors have a small Reset Button within the sensor. This Reset Button is used to trigger a data push. This function is frequently used when deploying and testing Droplet sensors. The Reset Button is also used in some configuration steps.   Location is shown below.

5.5. Onboard DIP Switch Configuration

Droplet sensors have a bank of 8 small DIP switches within the sensor. These DIP switches are used to configure the functionality of the sensor. These DIP switches are located near the batteries on the sensor PCB. Remove the sensor from the back plate to find the DIP switches within. DIP switches are ON/1 when pushed UP, and they are OFF/0 when they are pushed down.
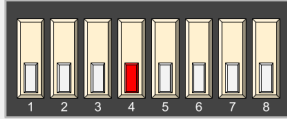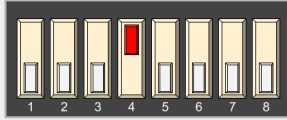
5.5.1. Push Rate

DIP switches 1-3 are used to set the push rate of the Droplet sensor. The sensor will send the sensor data at the configured period as configured by these first 3 DIP switches.

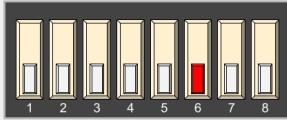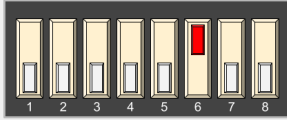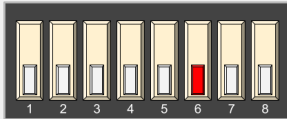| Push Rate	DIP Switch Configuration (RED Switches Only)
15 Minutes	
30 Seconds	
1 Minute	
3 Minutes	
5 Minutes	
10 Minutes	
30 Minutes	
1 Hour	

5.5.2.   Motion / PIR Interrupt

DIP switch 4 configures the Motion/PIR interrupt. When DIP switch 4 is set ON/1 the Droplet sensor will send a data push immediately when motion is detected for the first time in each configured Push Rate Period.   This is intended to give an instant indication of motion in space.   When DIP 4 is OFF/0 the Droplet sensor will only send data pushes at the configured Push rate Period.

Motion/PIR Interrupt	DIP Switch Configuration (RED Switches Only)
OFF	
ON	

5.5.3.   Reset Sensor ID

DIP switch 6 will cause the Droplet sensor to self-assign a new Sensor ID. This is seldom used. The Droplet sensor is generally labeled with the original Sensor ID, using this Sensor ID Reset will cause the Droplet sensor to no longer use the previous Sensor ID.
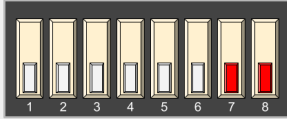
Follow the below instructions to reset the Sensor ID:

Procedure Step	Description	DIP Switch Configuration (RED Switches Only)
1	Normal Operation	
2	Set DIP switch 6 to the ON/1/UP position.	
3	Push the Reset Button. Wait 10 Seconds.	See Section 5.4 for Reset Button Location.
4	Set DIP switch 6 to the OFF/0/DOWN position.	
5	Push the Reset Button. Wait 10 Seconds.	See Section 5.4 for Reset Button Location.
6	Droplet should have a new Sensor ID. The Sensor ID will need to be discovered by monitoring the Gateway Controller LoRa Service for data pushes (which includes the NewSensor ID) as the Reset/Push Button is pressed.	

5.5.4.   Testing Mode

DIP switches 7 and 8 are used to set the Droplet sensor in Testing Mode. In Testing Mode the Droplet Sensor will temporarily self-assign a known Sensor ID and send a Data Push every 6 seconds.   Testing Mode is enabled when either DIP switch 7 OR 8 are ON/1/UP. Testing Mode aids in identifying and positioning the Droplet sensor.

Testing Mode Function	DIP Switch Configuration (RED Switches Only)
Testing Mode: OFF **Sensor ID:** Individual Sensor ID **Push Rate:** As Configured by DIP Switches 1-3	
Testing Mode: ON **Sensor ID:** AAB2AAAA **Push Rate:** 6 Seconds	
Testing Mode: ON **Sensor ID:** BBB2BBBB **Push Rate:** 6 Seconds	
Testing Mode: ON **Sensor ID:** CCB2CCCC **Push Rate:** 6 Seconds	

5.5.5.   DIP Switch Configuration Table

DIP Switch Settings									
DIP Switches 1-3 Data Interval/Push Rate	Interval	30 sec	1 min	3 min	5 min	10 min	15 min	30 min	1 hour
	Switches 1,2,3	100	010	110	001	101	000	011	111
DIP Switch 4* PIR Interrupt Enable	Set switch to ON/1 to enable data push on Motion (PIR) detection.								
DIP Switch 5 No Function	No Function								
DIP Switch 6 Hard Reset	Hard reset. When the switch is set to ON/1 a new Sensor ID will be assigned everytime the device is powered up.								
DIP Switches 7-8 Testing Mode - Sensor ID Assignment	If switches 7 or 8 are set to 1 (Testing Mode), this will override other Push Rate settings and assign a fixed Sensor ID and send data at a 6 second Push Rate. When both switches are set to 0, the device will use its configured push rate, and self assigned Sensor ID. Switch Position / Sensor ID Assignment: 00 — Self Assigned ID 10 — AAB2AAAA - 6 Sec Intervals 01 — BBB2BBBB - 6 Sec Intervals 11 — CCB2CCCC - 6 Sec Intervals								

Only on D-LR-THLM

6. Additional References

This section provides additional information for your reference.

6.1. Nube-iO Documentation References

Name/Code	Explanation	External Reference
Rubix Compute	Gateway Controller	Link
Edge28	Edge IO Programmable Controller	Link
Droplet	Wireless Environmental Sensor	Link
MicroEdge	Wireless Low Level Asset Monitoring Device	Link
Rubix Wires	Browser Based Flow Programming Interface	Link
Rubix Platform	Browser Based Device/Data Management Interface	
LoRa Installation Best Practices	Technical document describing the factors involved in designing and troubleshooting LoRa networks.	

6.2. Other Technology/Service References

Name	Description	External Reference
GCP	Google Cloud Platform	Link
Edge	Edge computing is a distributed computing paradigm	Link
IO (Input/Output)	Communication process between a computer or device	Link
VPN	A virtual private network (VPN) extends a private network across a public network	Link
BACnet	BACnet is a building automation protocol	Link
MQTT	A lightweight messaging protocol for small sensors	Link
Modbus	Modbus is a building automation protocol	Link
LoRa	LoRa is a long range, low power wireless chipset and protocol	Link
LoRaWan	LoRaWan is the network layer on LoRa	Link
Haystack	Standardize semantic data models for IoT data	Link
API	Application programming interface	Link