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VIVID V3

User Guide

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Table of Contents

List of Tables

List of Figures

1 Product Description

1.1 Overview

The VIVID v3 sensor is a low-power, IP65-rated, low-cost LoRaWAN device designed for commercial and residential indoor monitoring applications. This sensor includes an enhanced Passive Infrared (PIR) system designed for both ceiling and wall-mount presence detection. In addition, the device provides core sensing capabilities including temperature, humidity, ambient light, acceleration, and battery status reporting.

Table 1-1 summarizes the features available for the VIVID v3 sensor.

Table 1-1: VIVID v3 Available Features

Sensor Function	VIVID v3
Temperature	✓
Relative Humidity	✓
Accelerometer	✓
Light Detection	✓
Magnetic Switch	✓
Presence Detection	✓

The functions indicated in Table 1-1 are briefly explained as follows:

- **Temperature & Relative Humidity:** Transducer reports temperature and relative humidity of the local environment.
- **Accelerometer:** Configurable triggers allow the sensor to detect if it has been moved.
- **Light Detection:** Light transducer reports the presence or absence of light using a configurable intensity threshold.
- **Magnetic Switch:** Digital On/Off sensing with an internal magnetic switch.
- **Presence Detection (PIR):** A top-mounted PIR transducer detects the presence of people or objects within the sensor's field of view (FoV).

Figure 1-1: VIVID v3 Sensor Model

Table 1-2: VIVID v3 Model Numbers and Order Codes

Description	Product Model	Order Code	Region	Product PCBA Code
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PEU868	EU868	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PUS915	US915	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PAU915	AU915	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PMA869	MA869	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PAS9231	AS923	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PAS9232	AS923-2	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PAS9233	AS923-3	T0009388
VIVID SMART ROOM SENSOR V3	T0009397	SMT3PAS9234	AS923-4	T0009388

1.2 Physical Interfaces

Figure 1-2 illustrates the customer accessible interfaces for VIVID v3

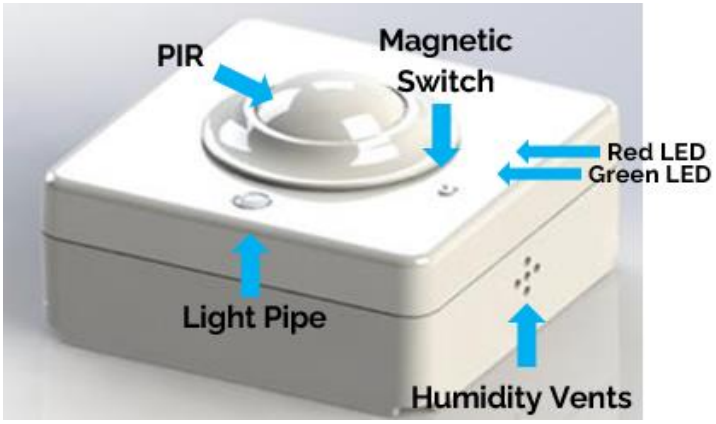

Figure 1-2: The VIVID v3 External Interface Layout

1.3 Specifications

The VIVID v3 Sensor specifications are listed in Table 1-3.

Table 1-3: VIVID v3 Sensor Specifications

Parameter	Requirement
Use Environment	IP65, Indoor, commercial and residential.
Operating Temperature	0°C–60°C 10°C–40°C for optimal battery life
Storage Temperature	-30°C–60°C 0°C–30°C for optimal battery life
Relative Humidity	5%–95%, non-condensing
Size	43 mm x 43 mm x 33 mm
Weight	37.7 g (with battery)
Power Source	CR2477 Battery operated, with FET-based reverse polarity protection.
Network Technology/Frequency band	LoRaWAN in the following regions: EU868, US915, AU915, AS923, IN865, KR920, DN915, RU864
Air Interface	LoRa
Expected Battery Life	> 3.5 years VIVID v2/v3 model with the baseline use case[1]
Maximum Transmit Power	13 dBm
Number of Indicator LEDs	2 (one green, one red)
Measurement Sensing Functions	Temperature, humidity, light, acceleration, remote digital and analog sensing, orientation with respect to gravity
Detection Sensing Functions	Magnetic field, presence
Temperature Measurement Accuracy	<±0.3°C between 0°C and 5°C±0.2°C between 5°C and 60°C
Humidity Measurement Accuracy	<±4% between 0% to 20%, and 80% to 100%±2% between 20% and 80%
Light Sensitivity	Detection of weak light to typical light conditions (5 lux to 1000 lux) Peak sensitivity at 500 nm
Accelerometer Sensitivity	16 mg/LSB, 32 mg/LSB, 64 mg/LSB, 192 mg/LSB corresponding to ranges of:±2 g,±4 g,±8 g,±16 g
Magnetic Switch Actuation Distance	Operating range: 5–15 AT Requires about 10 gausses at edge of sensor to activate Actuation distance ranges from 5 to 25 mm, depending on the magnet's orientation. Experiment with different magnet orientations to find the one that provides the optimal actuation distance for your use case.
Remote Temperature Sense	A Remote thermistor probe (thermistor) (recommended 10 kΩ) can be connected to external connector Measurement range:

[1] The baseline use case:

Temperature: 23°C

Tx power: 13 dBm

LoRa SF: 10

Tx periodicity: 4 times/hour for 10 hours and 2 times/hour for 14 hours (= 68 times/day)

Parameter	Requirement
	• -55°C–125°C (CWF3AA103G3380) • -25°C–105°C (NTCAIMME3)
Presence Detection	Mounting options: • Ceiling mount ○ X-angle: 86° ○ Y-angle: 74° ○ Height: 2.67 m • Wall mount ○ X-angle: 94° ○ Y-angle: 20° ○ Z-range: 4 m

2 Installation

2.1 Included Product and Installation Material

The following items are included with each sensor package:

- VIVID v3 sensor
- Mounting Bracket Kit

NOTE: To ensure safe installation and maintenance, please read Safety Precautions.

2.2 Unpacking and Inspection

The following should be considered during the unpacking of a new VIVID v3 Sensor:

1. Inspect the shipping carton and report any significant damage to TEKTELIC.
2. Unpacking should be conducted in a clean and dry location.
3. Do not discard the shipping box or inserts as they will be required if a unit is returned for repair or re-configuration.

2.3 Commissioning

Each sensor has a set of commissioning information that must be entered into the network server for the sensor to be able to join the network and begin normal operation once activated. For instructions on how to do this please refer to the Network Server Quick Start Guide you get in the box with the device (also available online in the Knowledge Hub*)*.

You can find the commissioning keys inside the device box. If you don't have the box, raise a ticket in our support portal and provide the T-Code, Revision and Serial Number on the label placed on the device.

2.4 Power Up/Down Procedure

Once the sensor information has been added to the Network Server, follow these steps to access and replace the coin cell battery:

1. Using a flat tool, turn the battery lid counterclockwise until the arrow on the lid aligns with the unlock symbol.
2. Remove the battery lid and take out the coin cell battery.
3. Locate the sticker on the bottom of the coin cell. Remove the sticker.
4. Reinsert the coin cell battery with the positive terminal facing outward from the device.
5. Reinsert the battery lid and use the flat tool to turn the battery lid clockwise until the arrow aligns with the lock symbol.

Figure 2-1: Battery Lid

2.5 Default Configuration

The default configurations for VIVID v3 are listed in Table 2-1.

Table 2-1: VIVID v3 Default Configurations

Reported Data	VIVID v3
Battery Data	1 hour
Ambient Temperature	1 hour
Relative Humidity	1 hour
Magnetic Switch	Every actuation
PIR status	• When the PIR detects presence • When the PIR no longer detects presence

2.6 Reconfiguration

The VIVID v3 Sensor supports a full range of over the air (OTA) configuration options. Specific technical details are available in the corresponding VIVID v3 Technical Reference Manual (TRM) document. All configuration commands need to be sent OTA during the sensor's downlink (DL) receive (Rx) windows.

2.7 Mounting

The VIVID v3 Sensor is mounted using the supplied mounting bracket by attaching it with screws (included) or a zip-tie (not included), as seen in the figure below.

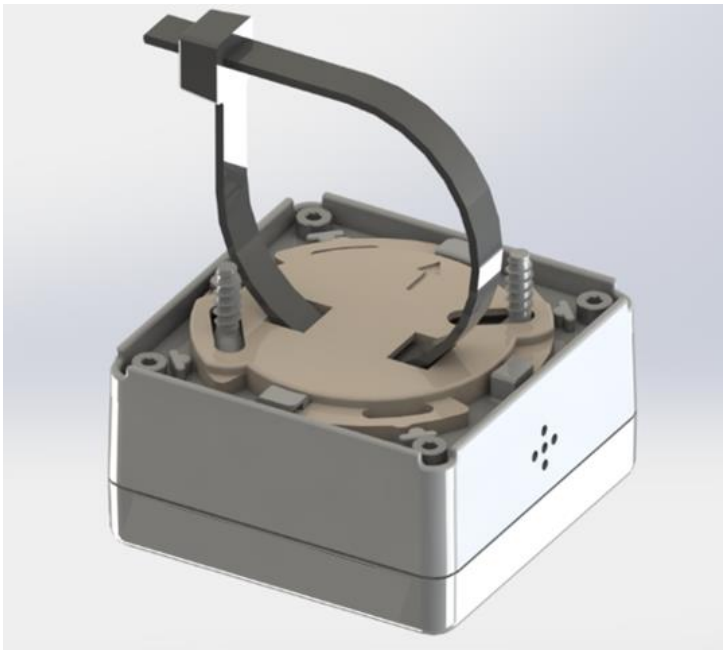

Figure 2-2: Mounting Bracket

Figure 2-3 demonstrates how to easily mount the VIVID v3 Sensor using the two included screws and mounting bracket.

Figure 2-3: Wall Mount Application

2.8 LED Behaviour

See Figure 2-4 for the location of the sensor LEDs. The expected LED behaviors for various states are described in Table 2-2.

Figure 2-4: LEDs

Table 2-2: VIVID v3 LED Behaviour

Step	State	LED Behavior	Meaning
1	Power On	Both LEDs briefly on	Power applied
		LEDs turn off	
		One LED blinks briefly	
2	After Boot Pattern	System LED blinks	All health checks passed
		LoRa LED blinks	One health check failed. Consider battery replacement or moving to suitable temperature environment
3	Join Procedure	System LED blinks continuously	Sensor joining network
		LoRa LED blinks	LoRa activity on sensor (transmitting or receiving packets, including join request packets)
4	Normal Operation	LoRa LED blinks	LoRa activity on sensor (transmitting or receiving packets)
		Any other LED pattern	Low battery

NOTE: If the LED behavior for steps 1-2 repeat continuously, the battery no longer has enough charge to power the join procedure. Therefore, the battery should be replaced. Refer to Section 4 for more information.

3 Operation and Functions

3.1 Temperature and Relative Humidity Transducer

The VIVID v3 contains a temperature and relative humidity (RH) transducer. Vents on the enclosure allow air to contact the transducer. Response time can be reduced by forcing air to move over the vent as seen in Figure 3-1.

Figure 3-1: Humidity Vents

VIVID v3 supports reporting ambient temperature, MCU temperature and RH values periodically (most common use case) and on a user-defined threshold basis. Alarm points can be set individually for ambient temperature, RH, and MCU temperature. The frequency of measurements is user configurable with different sample rates if the measured value is within the normal operating window (see Section 2-5).

3.2 Acceleration Transducer

VIVID v3 features a 3-axis accelerometer for acceleration sensing, which can be turned off to save power. It supports two interrupt-based accelerometer events, both with configurable thresholds:

1. **Acceleration Event**: Triggered by exceeding an acceleration threshold. The accelerometer is disabled for a set debounce time to prevent multiple reports for a single event.
2. **Impact Alarm Event**: Activated when an impact alarm threshold is surpassed a configurable number of times within a set period. The alarm clears after a grace period with no impacts.

Both acceleration and impact alarm functions can be toggled independently.

- Accelerometer readings can be in X-Y-Z vector or magnitude form.
- Axes (X, Y, Z) can be enabled or disabled independently; disabled axes output zero.
- Sampling rate is adjustable (possible options: 1 Hz, 10 Hz, 25 Hz, 50 Hz, 100 Hz, 200 Hz, or 400 Hz). Higher rates detect shorter events but drain battery faster. Default is 1 Hz.

NOTE: Higher sample rates enable the detection of shorter acceleration events but consume more battery power.

3.3 Ambient Light Transducer

The VIVID v3 features an ambient light sensor located on the top surface, measuring light intensity through a light pipe, as seen in Figure 3-2.

Figure 3-2: Light Pipe

Ambient light sensor can report both light intensity (periodically) and light status (dark or bright) based on a configurable threshold:

- **Light Measurement**: Sensitive to human visible light, peak sensitivity at 550 nm. Sensing range: 5 lux to 1000 lux.
- **Threshold Adjustment**: Light threshold is adjustable from 0 to 63. If light status (dark/bright) doesn't match detected intensity, an event is reported. This event reporting can be enabled or disabled.

3.4 PIR (Presence Detection) Transducer

Figure 3-3: PIR Lens

The VIVID v3 is equipped with a detection system that utilizes a Passive Infrared (PIR) transducer, as seen in Figure 3-3. The PIR transducer can report presence through a lens visible on the top surface of the VIVID v3 sensor's enclosure.

NOTE: Avoid exposing the PIR lens to strong UV light such as direct sunlight. Do not paint the surface of the lens or attempt to clean it. Any deformation of the lens will distort the sense pattern.

To conserve battery usage, the VIVID v3 Sensor only reports presence when it is first detected and then when it is no longer detected. Specific technical details are available in the corresponding TRM document.

3.5 Magnetic Switch

The VIVID v3 sensors contain a magnetic switch. The location of the switch is shown in Figure 3-4 below.

The VIVID v3 Sensor can be configured to activate based on the state of this switch and to report after a user-configurable count of switch events. To activate the switch, a magnetic field of about 10 gauss (1 milli-tesla) must be applied to the edge of Sensor.

NOTE: A magnet required to activate the switch is not provided in the box. Standex-Meder M4, M5 or M13 magnets are suggested but any magnet of sufficient strength can be used.

The switch function can be configured to sense open to close events, close to open events or both types of events. For example, if the Sensor is being used for sensing access to a door and is set to read both event types, it will record an event each time the door is opened and each time it is closed. The reporting of these events can be set by the customer to report after a number of events has occurred. If it is set to 0, no events are reported. If it is set to 1, it reports after each event.

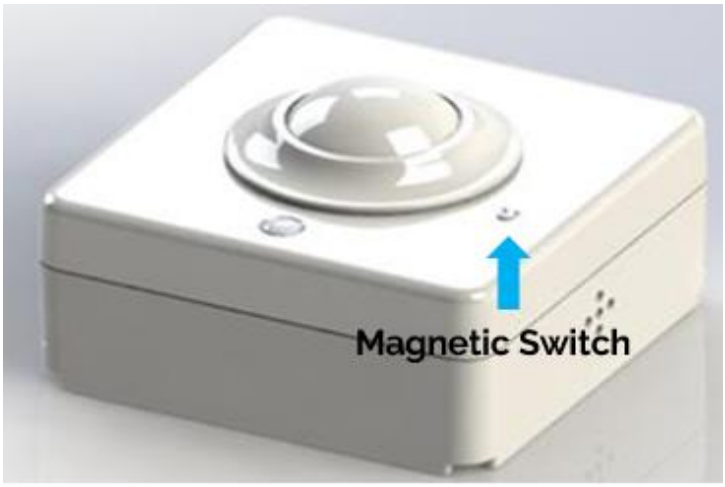

Figure 3-4: Magnetic Switch

NOTE: Input pulse frequency must be less than 20 Hz (for both Reed Switch and External Connector).

4 Battery Replacement

The VIVID v3 Sensor is powered by a standard CR2477 coin cell.

Warning

The VIVID v3 Sensor contains a coin cell battery.

Do not ingest battery, Chemical Burn Hazard.

If a battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death.

Keep new and used batteries away from children.

If the battery compartment does not close securely, stop using the product and keep it away from children.

If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

Caution – Risk of fire or explosion if the battery is replaced by an incorrect type.

Caution – This product contains a coin / button cell battery. If the coin / button cell battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death.

Use only approved CR2477 cells when replacing the battery. The following are approved replacement cells:

- Panasonic (model CR2477)
- Sony (model CR2477)
- EVE Energy (model CR2477)
- Jauch (model CR2477)

To access the battery, please follow the steps listed below:

1. Turn the battery lid counterclockwise until the arrow on the battery lid aligns with the unlock symbol, using a flat tool, such as a coin.
2. While holding the sensor with the bottom facing up, remove the battery lid from the device.
3. With the battery lid removed, the coin cell battery is accessible.
4. Remove the coin cell from the holder.
5. Place the new cell in the holder. The top of the coin cell is marked with a + symbol indicating the positive terminal. This positive terminal must face outward from the device, meaning it is visible after insertion.
6. Check for LED activity. If the LEDs are lit, the battery replacement was successful.
7. Replace the battery lid and turn it clockwise until the arrow on the battery lid aligns with the lock symbol, using a flat tool.

5 Device Configuration with ATLAS

To perform more configuration or read the data of VIVID v3 device you can use TEKTELIC's complementary service, ATLAS at www.atlas.tektelic.com.

There are two ways to access ATLAS:

1. Using in Offline mode

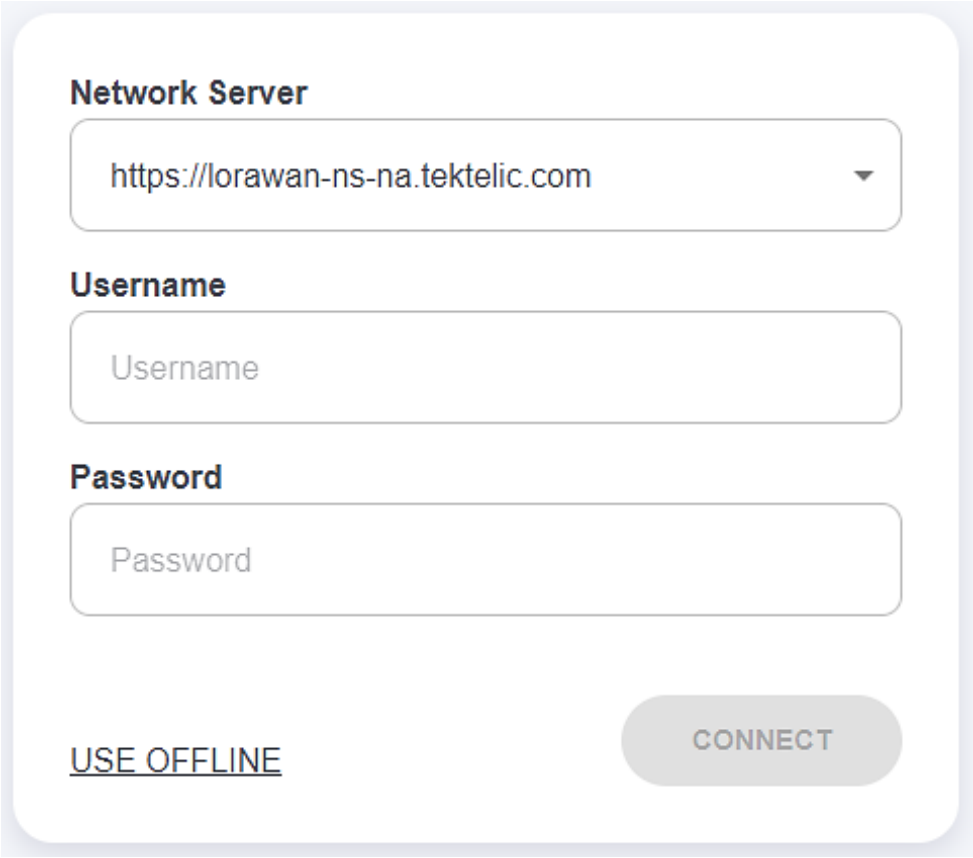

Figure 5-1: Login as Offline Mode

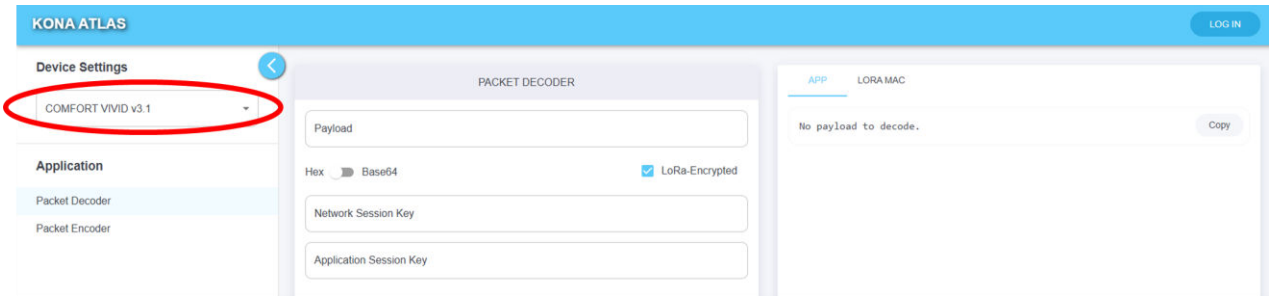

Figure 5-2: Select Decoder

2. With your TEKTELIC Network Server Credentials

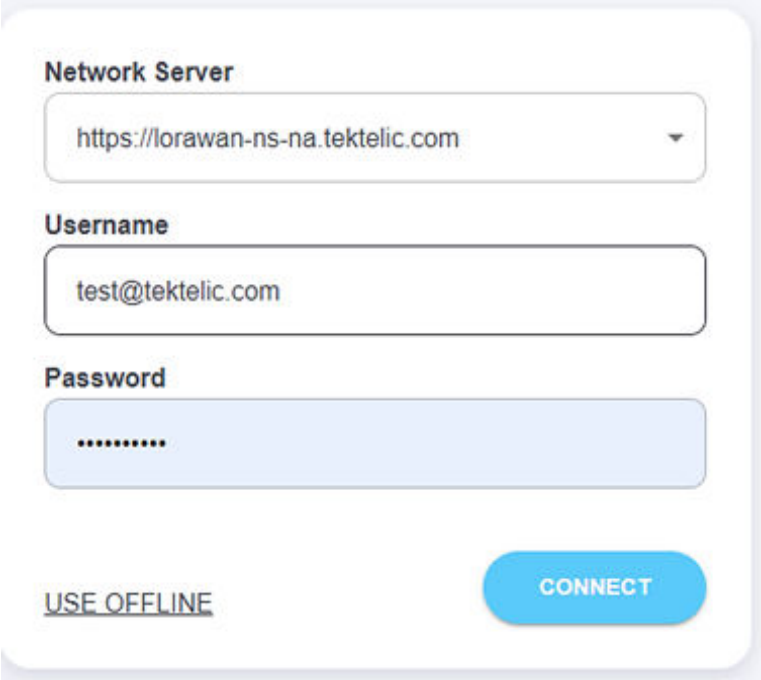

Figure 5-3: Login with Network Server Credentials

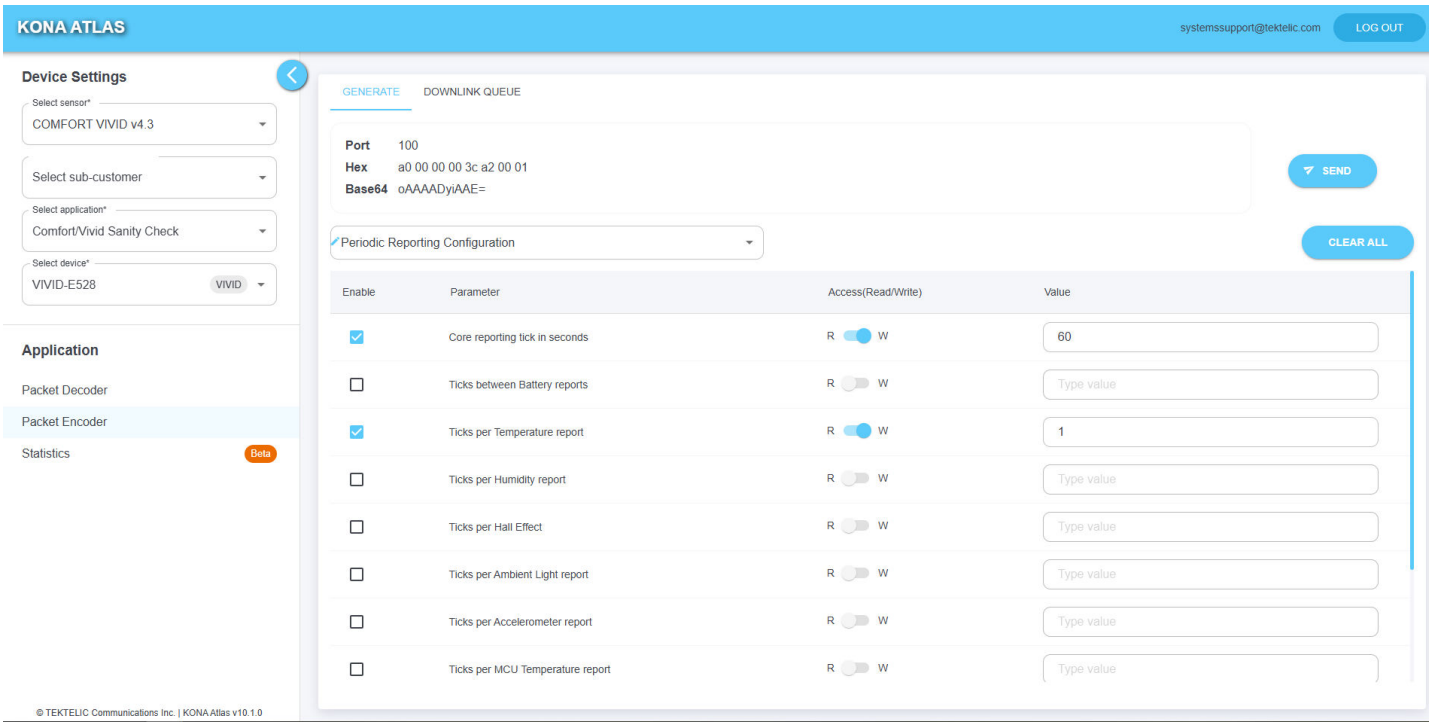

Figure 5-4: Select Decoder, Application, and the Device

For more information follow this link: TEKTELIC at www.tektelic.com.

6 Basic Downlinks

VIVID v3 use a "tick" system for reporting data. Generally, the sensor will report most important data every tick. A tick can be measured in seconds.

There are two sets of settings that must be configured in conjunction - "Core reporting tick in seconds" and "Ticks per [data/report]".

"Core reporting tick in seconds" will determine the interval between ticks. For example, you may set it to 30 seconds or 180 seconds (3 minutes) for each tick.

"Ticks per [data/report]" determines how many ticks it will take before the sensor reports any data. For example, if you set "Ticks per Battery report" to 2, it will take 2 ticks before the sensor reports battery data.

To Change the Core Report to Every Minute

With LeapX application (you can get it on Google Play or App Store): write 1 number in the field minutes between reports, then click on saved changes.

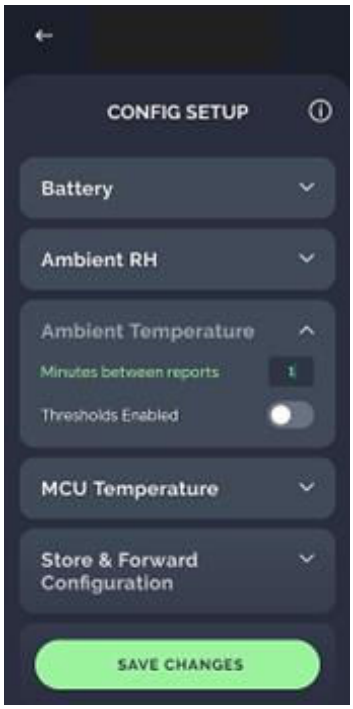

Figure 6-1: LeapX Application

With ATLAS: check the box for Core report tick in seconds and ticks between ambient temperature reports. Write the values shown in the Figure 6-2 and click send.

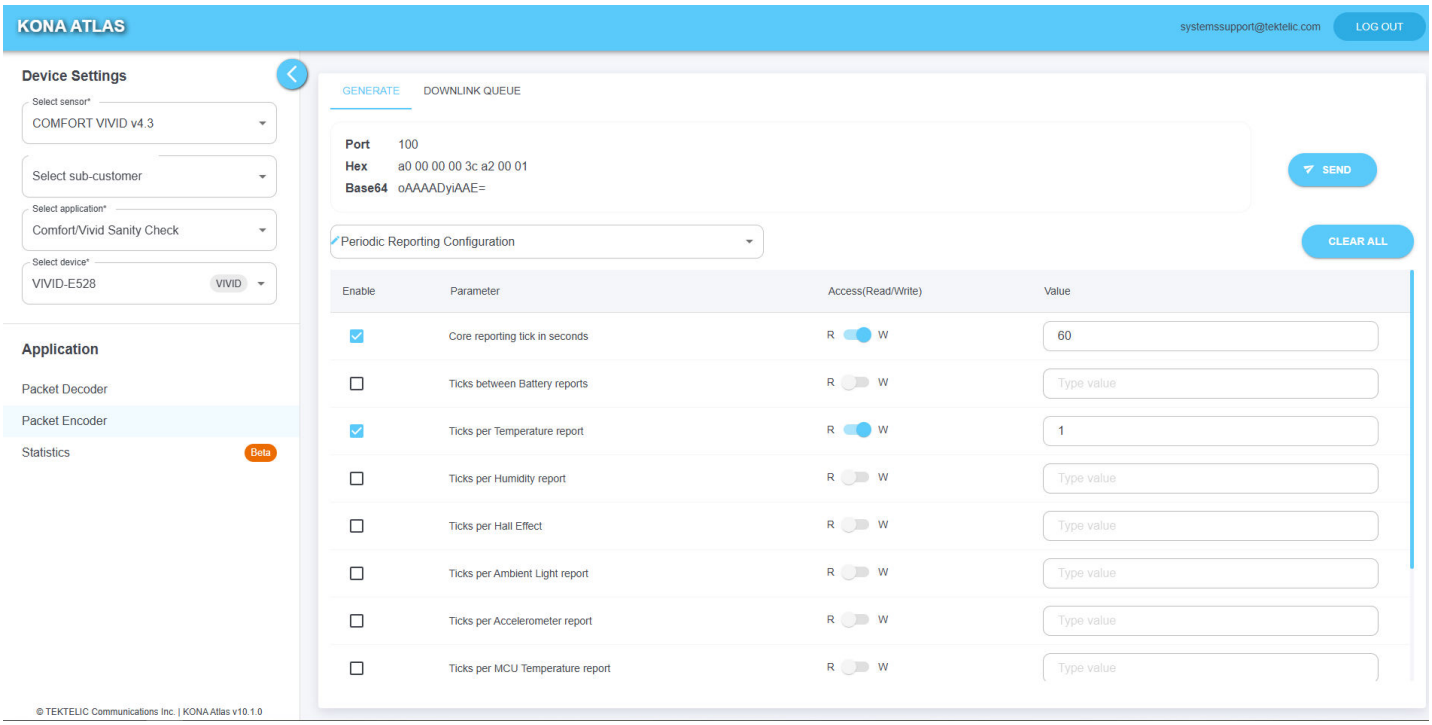

Figure 6-2: ATLAS Application

Example of an Uplink

"data": {

"raw": "03 67 00 F2 04 68 1A 00 BA 0B BA",

"fPort": 10,

"ambient_temperature": "24.2",

"relative_humidity": "13.0",

"battery_voltage": "3.002"

},

"errors": [],

"warnings": []

7 Data converters

Please follow this link: https://github.com/TektelicCommunications/data-converters/tree/master for the data converters that are to be used on TEKTELIC & other Network Server for TEKTELIC Sensors. These data converters can be used as a reference for other platforms.

TEKTELIC's data converters conform to the LoRa Alliance Payload Codec Specification and can be used with any 3rd party Network Server / Application Server that supports this specification.

https://resources.lora-alliance.org/technical-specifications/ts013-1-0-0-payload-codec-api

8 Safety Precautions

The following safety precautions should be observed:

- The VIVID v3 is intended for indoor use.
- The VIVID v3 Sensor contains a lithium coin cell battery.

Do not ingest battery, Chemical Burn Hazard.

If a battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death.

Keep new and used batteries away from children.

If the battery compartment does not close securely, stop using the product and keep it away from children.

If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

Caution – Risk of fire or explosion if the battery is replaced by an incorrect type.

Caution – This product contains a coin / button cell battery. If the coin / button cell battery is swallowed, it can cause severe internal burns in just 2 hours and can lead to death.

- To reduce risk of fire, explosion or chemical burns: replace only with approved 3 V CR2477 coin batteries; DO NOT recharge, disassemble, heat above 100°C (212°F) or incinerate battery.
- The VIVID v3 Sensor requires an external magnet for use with the internal magnetic switch.
- Keep magnets away from all children. Small magnets can pose a serious choking hazard. If multiple magnets are swallowed, immediately seek medical attention.

9 Compliance Statements

Federal Communications Commission:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

To comply with FCC exposure limits for general population / uncontrolled exposure, this device should be installed at a distance of 20 cm from all persons and must not be co-located or operating in conjunction with any other transmitter.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Innovation, Science and Economic Development Canada:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

(2) This device must accept any interference, including interference that may cause undesired operation of the device.

This device should be installed and operated with minimum distance 0.2 m from human body.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) L'appareil ne doit pas produire de brouillage.

(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil doit être installé et utilise à une distance minimale de 0.2 m du corps humain.

California Proposition 65:

⚠ **WARNING:** This product can expose you to chemicals including lead, nickel & carbon black, which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov.

Revision History

Revision	Date	Editor	Position	Comments
0.1	May 29, 2024	A. A.	Systems Engineer	Initial Draft based on COMFORT/VIVID v1 UG
1.0	June 03, 2024	A. A.	Systems Engineer	Released after technical review
2.0	June 14, 2024	A. A.	Systems Engineer	• Removed technical section on external connections • Updated document T-code to T0009096 • Released after document format update
2.1	Nov 13, 2024	E. T.	Systems Engineer	• Updated COMFORT/VIVID T-codes to match updated ones: (T0009125, T0009156, T0009157, T0009126, T0009158, T0009159) • Updated External Connector section to reflect Connect B supporting analog mode • Updated PIR section to reflect VIVID v2 implementation • Updated figures
2.2	Jan 16, 2025	E. T.	Systems Engineer	• Updated specifications to indoor-only • Corrected external output rating to 300 mA
2.3	June 25, 2025	M. Y. & E. T.	Business Analyst & Systems Engineer	Remove motion and FoV temperature
2.4	November 27, 2025	J. H.	Systems Engineering Intern	Separated COMFORT and VIVID UG documents
3.0	January 7, 2026	E. T.	Systems Engineer	Reviewed separated Vivid v3 UG and updated figures as needed.
3.1	May 6, 2026	E. T. & A.K.	Systems Engineer & Business Analyst	• Added Table 1-2 with Order codes. • Updated document T-code • Updated Tx power Updated hyperlinks