ESAP-UPLYNX-004

SenLog/SenLog Pro Device User Guide

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Important Notice

Revision History

Rev	Date	Description of Change	Approved
0.1	7/12/2021	Document First Version	

Table of Contents

1 *Description*

This user guide describes the usages of the SenLog/SenLog Pro devices. There will be descriptions of basic operations, device behaviors and payload format. This document introduces you to everything you need to know about how to use the devices.

2 *Features*

◆ Sigfox RC1234567 Compliant

◆ Uplink class 0u for all zones

◆ Temperature detecting accuracy of ± 0.5℃ (SenLog Pro) and ± 1℃ (SenLog)

◆ Battery Life: 30 days (max)

◆ Geolocation Tracking through Sigfox Atlas

◆ Configurable temperature threshold

◆ Temperature logger

◆ Data log reading via micro USB connector*****

◆ Firmware customization service

◆ LEDs : Green for device activation ; Red for abnormal temperature

◆ Dimension : 75mm X 37mm X 17mm

◆ Operating Temperature : -10℃ ~ 60℃

◆ High Performance PCB antenna

* Function requires customized control board and specialized USB cables

3   *Product Appearance and Dimensions*
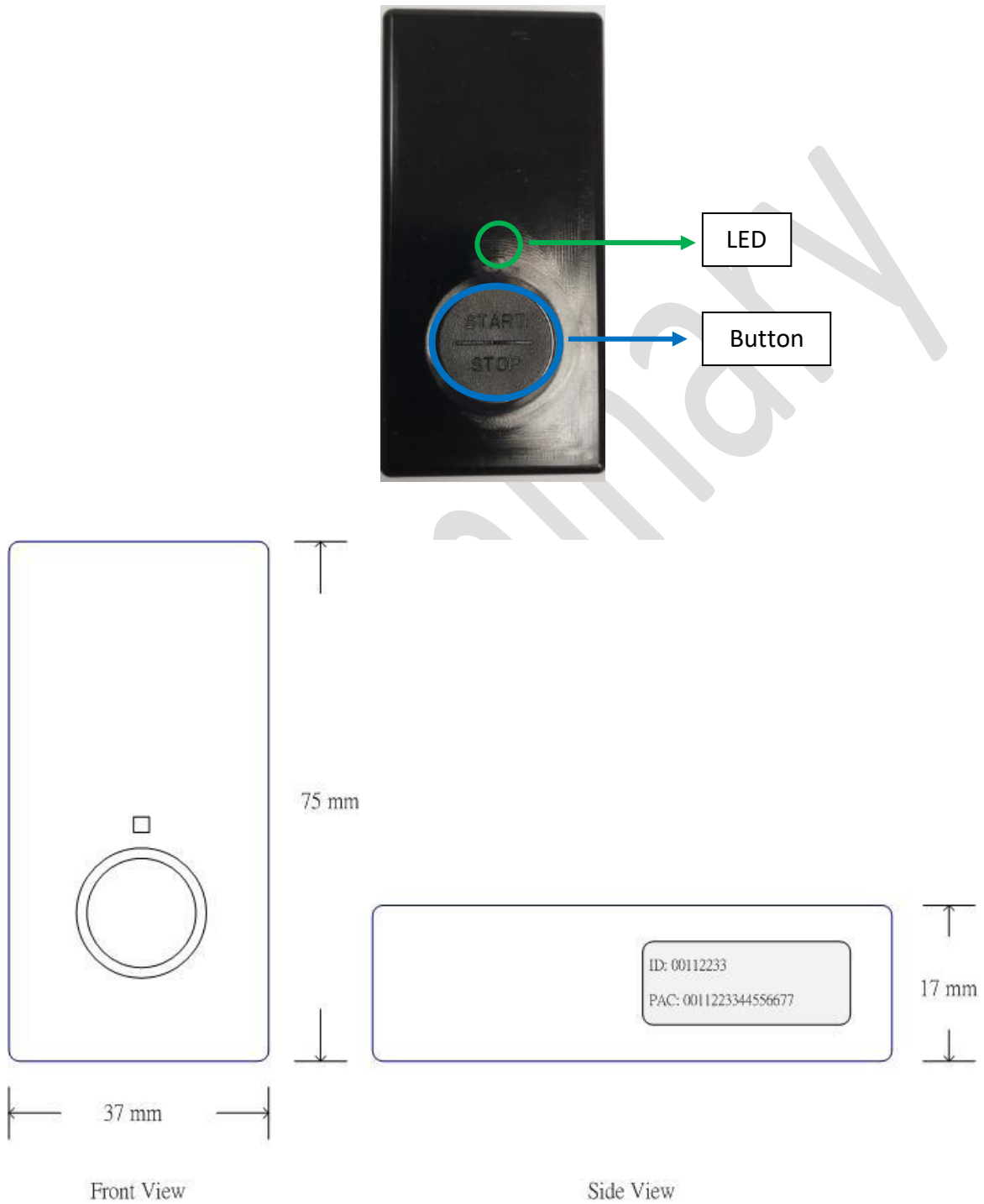
4   *Basic Operation*

The device is operated by a single button. Its behavior is quite simple:

User Operation	LED Indicator	Status
Install battery	Green LED lights up for 2 seconds	Device powers up and then goes into **Sleep Mode**.
Press the button	Green LED flashes 3 times	Device goes into **Normal Operation Mode**. Device will start transmitting data via Sigfox. Data content and format explained in the payload section.
Press the button again	Red LED flashes 3 times	Device goes into **Data Logger Mode**. Device halts Sigfox transmission but keeps on logging temperature data in the internal flash.

NOTE: Before the device's batteries are depleted, you can toggle between the Normal Operation Mode and Data Logger Mode by pressing the button.

5   *LED Indicator*

Event	LED Behavior
Power on (insert batteries)	Green LED light up for 2s
Press button to start Normal Operation	Green LED flashes 3 times with 0.3s cycle*
Press button to go into Data Logger Mode	Red LED flashes 3 times with 0.3s cycle
Battery Low**	Both Green LED & Red LED flashes 4 times, with 1 0.5s cycle followed by 3 with 0.1s cycle
Abnormal Temperature (SenLog Pro only)**	Red LED flash 3 times with 0.1s cycle every 30s
Reset (press and hold the button > 3s)	Red LED light up for 2s

*When LED lights up and then goes off it's considered a cycle. So a 0.3s cycle is when the LED lights up for 0.3s and then goes off for 0.3s

** These behaviors are seen every transmission interval, which is 10 minutes by default.

6   *Basic Device Settings*

Basic settings that determines the device's basic behaviors and their default values:

Transmission Interval: 10 minutes

Sample Rate: 2.5 minutes (SenLog Pro)/5 minutes (SenLog)

Temperature Threshold: 30℃ *

Time Threshold: 30 minutes

*Some older devices might have this set at 5℃

Transmission Interval is the time gap between two periodic Sigfox transmissions. This is set at 10 minutes by default.

Sample Rate determines how often the device takes a reading from the sensor(s). For example, SenLog Pro device takes a temperature reading every 2.5 minutes.

Temperature Threshold: The upper limit of the "normal temperature" range. Temperature above this value is considered abnormal.

Time Threshold: Combining Temperature Threshold to determine whether the controlled temperature condition has been breached. i.e. If the temperature has been over the temperature threshold for longer than the duration specified by this time threshold, then the condition is breached.

7 Payload format

SenLog

B0		B1	B2		B3	B4	B5		B6		B7
Temperature #1 - T1 (@ t = 10)			Temperature #2 - T2 (@ t = 10 + 5 min.)			Temperature Threshold	(Optional) Temperature Alarm for Customer		(Optional) Temperature Alarm for Driver		Battery Capacity (%)
T1_Integer	T1_Float		T2_Integer	T2_Float			Flag_C1	Flag_C2	Flag_D1	Flag_D2	
19	38		19	25		8A	0 *2	0 *3	0 *4	0 *5	00
25.56℃			25.37℃			-10℃	0	0	0	0	0

NOTE: Optional bytes are NOT available by default.

SenLog Pro

B0	B1	B2	B3	B4	B5	B6	B7	B8	B9		B10		B11
Temperature #1 - T1 (@ t = X)		Temperature #2 - T2 (@ t = X + X/4 min.) *1		Temperature #3 - T3 (@ t = X + X/2 min.) *1		Temperature #4 - T4 (@ t = X + 3X/4 min.) *1		Temperature Threshold	Temperature Alarm for Customer		Temperature Alarm for Driver		Battery Capacity (%)
T1_Integer	T1_Float	T2_Integer	T2_Float	T3_Integer	T3_Float	T4_Integer	T4_Float		Flag_C1	Flag_C2	Flag_D1	Flag_D2	
19	38	19	25	19	38	19	25	8A	0 *2	0 *3	0 *4	0 *5	50
25.56℃		25.37℃		25.56℃		25.37℃		-10℃	0	0	0	0	80

Note :

1. During each transmission interval, which is **10 min** by default, the device takes temperature readings either **2** (SenLog) or **4** (SenLog Pro) times. Those data points will be carried in the payload in the next Sigfox transmission.

2. Flag_C1: permanent failure alert that shows temperature had risen over the threshold for longer than the allowed time threshold. For example, if temperature threshold is set at **X**℃ and time threshold is set at **Y** minutes, flag C1 will be raised if the temperature has been above **X**℃ **and** for longer than **Y** minutes. This event also triggers the Red LED to flash 3 times every 30s as a visual alert.

3. Flag_C2: warning flag that indicates a higher-than-threshold temperature has been detected. This flag could go back down when temperature falls back below the threshold.

4. Flag_D1: warning flag that indicates a **Z** degree higher-than-threshold temperature has been detected, where **Z** is configurable. For example, if the temperature threshold is set at 10 ℃ and **Z** is set to 5, then flash D1 will be raised if the temperature goes above 15 ℃.

5. Flag_D2 : same as Flag_C2.

Appendix A: Raw temperature data conversion

When converting raw temperature to actual temperature value, please keep in mind that:

1. The Integer byte is a signed int and the floating byte is unsigned. The floating value is calculated by floating_byte * 10-2

2. When the integer byte is negative, to compute the right value please do -(integer_byte + floating_byte).

To determine whether the temperature is positive or negative:

 If((integer_byte & 0x80) == 0x80)

> **Negative number; // (MSB = 1), MSB: most significant bit**

else

> **positive number;// (MSB = 0)**

 To convert floating_byte to actual temperature value: **temperature value = floating_byte*10-2**

 So if the number is negative: **-(integer_byte + (floating_byte*10-2))**

Otherwise it's positive: **integer_byte + (floating_byte*10-2)**

Example 1:

Temperature raw data : 0x88 0x09

(0x88 & 0x80) == 0x80 //negative number (MSB = 1)

Integer byte : 0x88   value is 8 (7 bitwise)

Floating byte: 0x09   9, value is 9*10-2

Temperature is : -(8 + (9/100)) = -8.09

Example 2:

Temperature raw data : 0x19 0x03
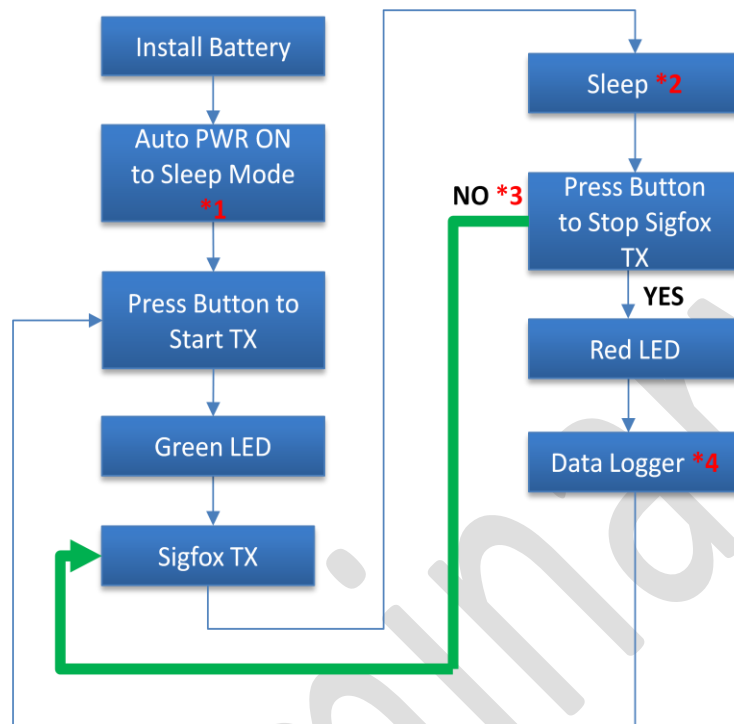
(0x19 & 0x80) = 0x00 //It is positive number (MSB = 0)

Integer byte : 0x19   value is 25 (7 bitwise)

Floating byte: 0x03   3, value is 3*10-2

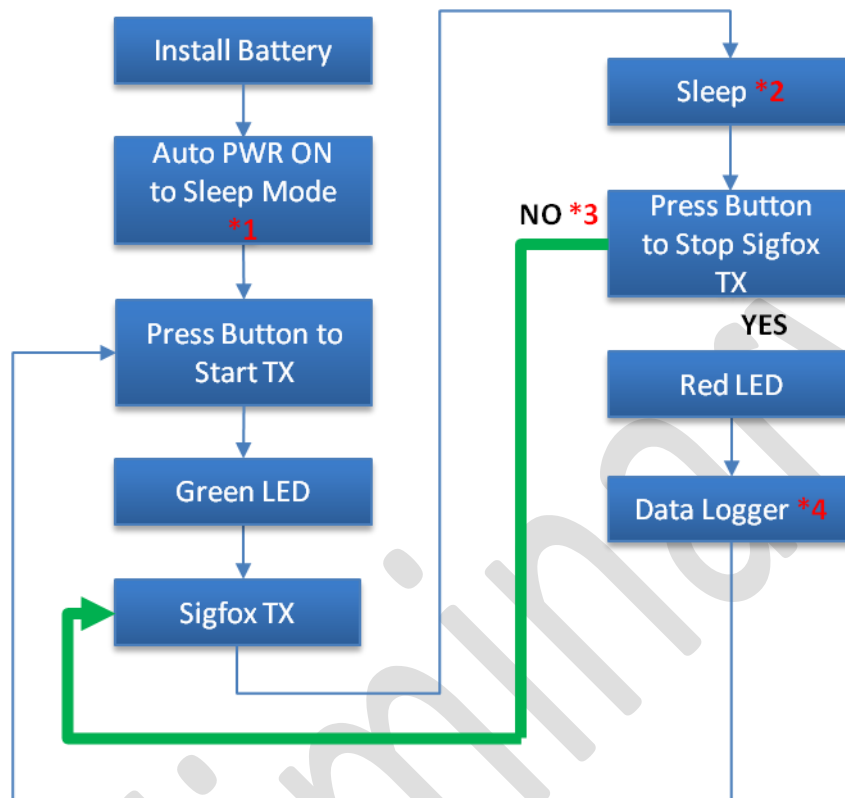Temperature is : 25 + (3/100) = 25.03

Appendix B: SenLog Pro Operation Flow Chart

Note :

1. Insert batteries (AAA, 2) to power on the device. Device goes into Sleep Mode automatically after boot up. The device would not wake up until the button is pressed.

2. Once the button is pressed, device will periodically wake up from sleep, detect and log current temperature with a customizable interval. This is indicated by 3 Green LED flashes.

3. Device also transmits the logged temp. data via Sigfox periodically with a customizable interval.

4. When the button is pressed the 2nd time, it will stop Sigfox TX but will still wake up to log temp. (Data Logger Mode) Indicated by 3 Red LED flashes.

5. If the button is pressed again, data transmission via Sigfox will resume. Again, 3 Green LED flashes.

6. Remove the batteries to cease all operations and reset the entire operation flow.

Appendix C: SenLog Operation Flow Chart

Note :

1. Insert batteries (AAA, 2) to power on the device. Device goes into Sleep Mode automatically after boot up. The device would not wake up until the button is pressed.

2. Once the button is pressed, device will periodically wake up from sleep, detect and log current temperature with a customizable interval. This is indicated by 3 Green LED flashes.

3. Device also transmits the logged temp. data via Sigfox periodically with a customizable interval.

4. When the button is pressed the 2nd time, it will stop Sigfox TX but will still wake up to log temp. (Data Logger Mode) Indicated by 3 Red LED flashes.

5. If the button is pressed again, data transmission via Sigfox will resume. Again, 3 Green LED flashes.

6. Remove the batteries to cease all operations and reset the entire operation flow.

Appendix D: Device Behavior Flow

SenLog Pro: TX interval = 10 min, Sensor sampling rate = 2.5min (1/4 of TX interval)
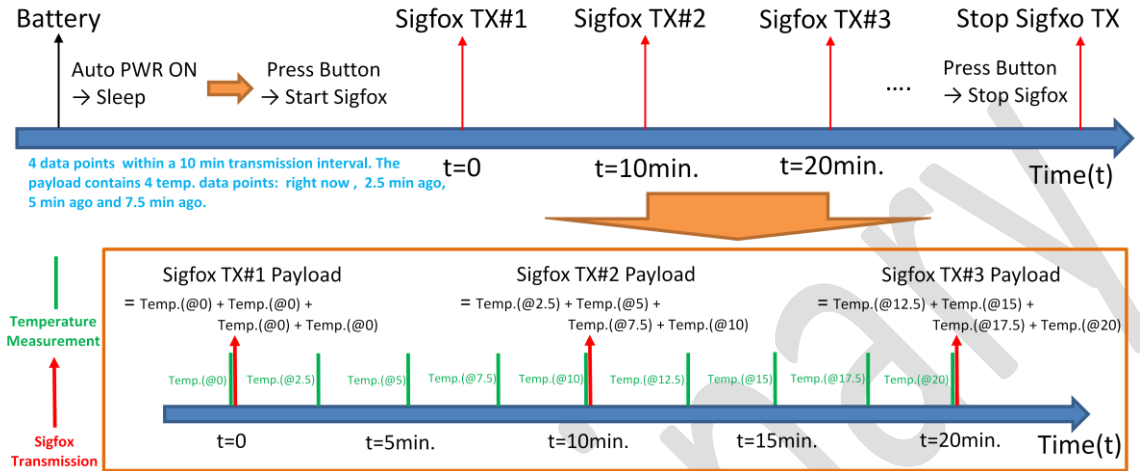
SenLog: TX interval = 10 min, Sensor sampling rate = 5 min (1/2 of TX interval)