



Sound Level Sensor

Reference Manual

TBSL100-915
TBSL100-868

Model Name: TBSL100

Table of Contents

1. Description	1
2. Specifications	3
2.1 Mechanical	3
2.1.1 Sensor	3
2.2 Environmental	3
2.3 Radio	3
2.4 Certifications and Conformity	3
2.5 Power	3
2.6 User Interface	3
2.7 Additional Features	3
3. Operation	4
3.1 Transport Mode	4
3.2 Default Operation	4
4. Messages	4
4.1 Status	4
4.1.1 Triggers	4
4.1.2 Payload	4
4.1.2 Payload	5
5. Battery	6
5.1 Replacement	6
5.2 Cautions	6
6. Label format information	7
6.1 Round label	7
6.1.1 All QR code	7
6.1.2 JoinEUI	7
6.1.3 DevEUI	7
6.1.4 Model number	7
6.1.5 Factory check code	8
6.1.6 Model Name	8
6.2 PE Bag & Back Label Label Barcode	8
7. Important Product & Safety Instructions	9
8. Warnings	10
9. Notices	11
10. Cautions	11
11. Regulatory	12
11.1 Federal Communication Commission Interference Statement	12
11.2 Industry Canada statement:	13
Appendix. Configuration Downlink Command	14
Appx. 1 Payload	14
Appx. 2 Response Content	15
Appx. 3 Frame Count 0 Content	15

1. Description

The Sound Level Sensor utilizes LoRaWAN connectivity to provide to easily measure and investigate sound levels in decibels (dBA) in a variety of building environments.

2. Specifications

2.1 Mechanical



2.1.1 Sensor

Length x Width x Height	50mm x 20mm x 50mm
Weight	30g without battery 40g with battery
Sensor	<ul style="list-style-type: none">• MEMS microphone• Measuring range: 40~100dB(A)• Frequency Response: 100~10,000 Hz• Resolution: 1 dB

2.2 Environmental

Temperature	0°C to +50°C
IP Rating	IP 40 equivalent

2.3 Radio

Frequency	<ul style="list-style-type: none">• 863–870MHz for EU• 902–928MHz for North America
Tx Power	US: +19dBm EU: +17dBm
Rx Sensitivity	-135dBm
Antenna Gain	-2dBi Peak, -5dBi Avg

2.4 Certifications and Conformity

FCC ID: pending
IC:
CE
ROHS REACH

2.5 Power

Source	3.6V 1/2 AA Li-SOCl2 1200mAh battery
Maximum Voltage	3.6V
Minimum Voltage	3.1V
Current	135mA maximum/ 100uA minimum

2.6 User Interface

LEDs	One blue LED
------	--------------

2.7 Additional Features

PCB Temperature
Battery Monitoring

3. Operation

3.1 Transport Mode

They are shipped with a plastic battery isolation tab that must be removed to enable operation.

3.2 Default Operation

While in default operation the device will send a join request message after booting. After joining successfully, the device will detect the decibel value every 5 minutes. If the decibel value over the threshold, the sensor will send a status message.

4. Messages

LoRaWAN Packets for this device use port 105.

4.1 Status

4.1.1 Triggers

Packet Triggers: detect decibel value per 5 minutes or the decibel value is more than the threshold.

4.1.2 Payload

Port	105
Payload Length	4 bytes

Bytes	0	1	2	3
Field	Status	Battery	Temp	Decibel

4.1.2 Payload

Status	Sensors status
	Bit [0] 0 -> keep alive, 1 -> trigger threshold event. Bit [7:1] RFU
Battery	Battery level
	Bits [3:0] unsigned value v, range 1 – 14; battery voltage in V = $(25 + v) \div 10$. Bits [7:4] RFU
Temp	Temperature as measured by on-board NTC
	Bits [6:0] unsigned value τ , range 0 – 127; temperature in °C = $\tau - 32$. Bit [7] RFU measurement range -32 to 95°C
Decibel	Decibel value
	Bits [7:0] unsigned value τ , range 40 ~ 100 (dBA). 255(0xFF) => Sensor could not measure decibel value.

5. Battery

5.1 Replacement

Use ER14250 or equivalent.

Remove the upper cap and replace the battery.



5.2 Cautions

CAUTION: Disposal of a battery (or battery pack) into a fire or a hot oven, or mechanically crushing or cutting of a battery (or battery pack) can result in an EXPLOSION!

Leaving a battery (or battery pack) in an extremely high temperature surrounding environment that can result in an EXPLOSION or leakage of flammable liquid or gas.

A battery (or battery pack) subjected to extremely low air pressure may also result in an EXPLOSION or leakage of flammable liquid or gas.

Discard used batteries according to the manufacturer's instructions.

CAUTION: The unit is provided with a battery-powered circuit.

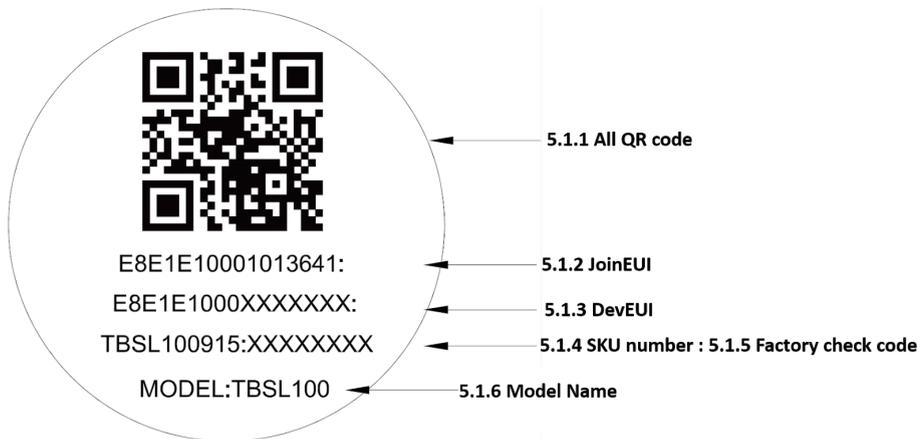
There is a danger of explosion if the battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Risk of Explosion if Battery is replaced by an Incorrect Type. Dispose of Used Batteries According to the Instructions.

6. Label format information

6.1 Round label



6.1.1 All QR code

[URN:LWDP:E8E1E10001013641:E8E1E1000XXXXXXX:TBSL100915:XXXXXXX.](#)

The total maximum resulting character sentence is 72 alphanumeric characters long.

6.1.2 JoinEUI

900MHz: [E8E1E10001013641. \(US/AU/AS923/BR\)](#)

800MHz: [E8E1E10001013642. \(EU/IN/RU\)](#)

Uses a hexadecimal representation resulting in 16 characters.

6.1.3 DevEUI

[E8E1E1000XXXXXXX.](#)

Uses a hexadecimal representation resulting in 16 characters

6.1.4 Model number

TBSL100915

Sensor's model name

915 for US/AU/AS923/BR
868 for EU/IN/RU

Non-reserved characters(except ":" and space) with a maximum length of 20 characters.

6.1.5 Factory check code

XXXXXXXX.

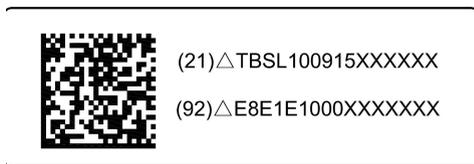
Checksum of the factory production line.

6.1.6 Model Name

MODEL:TBSL100.

Fixed code, not including in QR code.

6.2 PE Bag & Back Label Label Barcode



PE Bag Label



Back Label

Definition of Back Label and PE Bag Barcode Label:

GS1 DataMatrix

- The GS1 Application Identifier (21) indicates that the GS1 Application Identifier data field contains a serial number.
- The GS1 Application Identifier (92) assigned to the company's internal information is DevEUI.

 : Caution! For more information please refer to chapter 5.2 and chapter 10.

7. Important Product & Safety Instructions

For the most current and more detailed information about Tabs features and settings as well as safety instructions, please download the user manual for the products online at www.browan.com before the use of any Tabs products or services.

Certain sensors contain magnets. **Keep away from ALL Children!** Do not put in nose or mouth. Swallowed magnets can stick to intestines causing serious injury or death. Seek immediate medical attention if magnets are swallowed.

These products are not toys and contain small parts that can be dangerous to children under 3 years old. Do not allow children or pets to play with products.

Observe proper precautions when handling batteries. Batteries may leak or explode if improperly handled.

Observe the following precautions to avoid a sensor explosion or fire:

- Do not drop, disassemble, open, crush, bend, deform, puncture, shred, microwave, incinerate or paint the sensors, Hub or other hardware.
- Do not insert foreign objects into any opening on the sensors or Hub, such as the USB port.
- Do not use the hardware if it has been damaged—for example, if cracked, punctured or harmed by water. Disassembling or puncturing the battery (whether integrated or removable) can cause an explosion or fire.
- Do not dry the sensors or battery with an external heat source such as a microwave oven or hairdryer.

8. Warnings

- Do not place naked flame sources, such as lighted candles, on or near the equipment.
- The battery shall not be exposed to excessive heat such as sunshine, fire or the like.
- Do not dismantle, open or shred battery pack or cells.
- Do not expose batteries to heat or fire. Avoid storage in direct sunlight.
- Do not short-circuit the battery. Do not store batteries in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects.
- Do not remove a battery from its original packaging until required for use.
- Do not subject batteries to mechanical shock.
- In the event of a battery leaking, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts of water and seek medical advice.
- Do not use any charger other than that specifically provided for use with the equipment.
- Observe the plus (+) and minus (-) marks on the battery and equipment and ensure correct use.
- Do not use any which is not designed for use with the product.
- Do not mix cells of different manufacture, capacity, size or type within a device.
- Keep batteries out of the reach of children.
- Seek medical advice immediately if a battery has been swallowed.
- Always purchase the correct battery for the equipment.
- Keep batteries clean and dry.
- Wipe the battery terminals with a clean dry cloth if they become dirty.

9. Notices

- Avoid exposing your sensors or batteries to very cold or very hot temperatures. Low or high temperature conditions may temporarily shorten the battery life or cause the sensors to temporarily stop working.
- Take care in setting up the Hub Gateway and other hardware. Follow all installation instructions in the User Guide. Failure to do so may result in injury.
- Do not install hardware equipment while standing in water or with wet hands. Failure to do so can result in electric shock or death. Use caution when setting up all electronic equipment.
- When charging the sensors, do not handle the sensors with wet hands. Failure to observe this precaution could result in electric shock.
- PROP 65 WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm
- Cleaning Tabs Products: Use a clean dry cloth or wipe to clean Tabs products. Do not use detergent or abrasive materials to clean the Tabs products, as this may damage the sensors.

10. Cautions

CAUTION: Disposal of a battery (or battery pack) into a fire or a hot oven, or mechanically crushing or cutting of a battery (or battery pack) can result in an **EXPLOSION!**

Leaving a battery (or battery pack) in an extremely high temperature surrounding environment that can result in an **EXPLOSION** or leakage of flammable liquid or gas.

A battery (or battery pack) subjected to extremely low air pressure may also result in an **EXPLOSION** or leakage of flammable liquid or gas.

Discard used batteries according to the manufacturer's instructions.

CAUTION: The unit is provided with a battery-powered circuit.

There is a danger of **EXPLOSION** if the battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Risk of **EXPLOSION** if Battery is replaced by an Incorrect Type. Dispose of Used Batteries According to the Instructions.

11. Regulatory

	<p>Hereby, Browan Communications Inc. declares that the radio equipment for Tabs products is in compliance with Directive 2014/53/EU.</p> <p>This device complies with Part 15 of the FCC Rules and RSS Standards of Industry Canada. 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.</p>
	<p>This symbol means that according to local laws and regulations your product should be disposed of separately from household waste. When this product reaches its end of life, take it to a collection point designated by local authorities. Some collection points accept products for free. The separate collection and recycling of your product at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.</p>

11.1 Federal Communication Commission Interference Statement

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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

IMPORTANT NOTE:

Radiation Exposure Statement:

The product complies with the US portable RF exposure limit set forth for an uncontrolled environment and is safe for intended operation as described in this manual. The further RF exposure reduction can be

achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such a function is available.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

11.2 Industry Canada statement:

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-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

Cet appareil contient des émetteurs / récepteurs exempts de licence qui sont conformes au (x) RSS (s) exemptés de licence d'Innovation, Sciences et Développement économique Canada. L'opération est soumise aux deux conditions suivantes :

- (1) Cet appareil ne doit pas causer d'interférences
- (2) Cet appareil doit accepter toute interférence, y compris les interférences pouvant provoquer un fonctionnement indésirable de l'appareil

The product complies with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such a function is available.

This equipment should be installed and operated with minimum distance 0cm between the radiator & your body.

Déclaration d'exposition aux radiations :

Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé. Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

Cet équipement doit être installé et utilisé avec un minimum de 0 cm de distance entre le radiateur et votre corps.

Appendix. Configuration Downlink Command

Port	204
------	-----

Appx. 1 Payload

Bytes	0	1~4
Field	Cmd	Config

Cmd	Command	1 byte															
	Bit [7:0]	<p>0x00 – Set keep-alive interval. default value : => 300 sec value range : 15~65535</p> <p>0x01 – Set sensor detection interval. default value : 300 (sec) value range : 0 or 15~65535</p> <p>0x02 – Set sensor’s decibel threshold to trigger events. default value : 80 (dBA) value range: 40~100</p> <p>Note: The keep-alive interval should be greater than or equal to the detection interval.</p>															
Config	Configuration	0~2 bytes															
	See the table as follows:																
	<table border="1"> <thead> <tr> <th>Cmd</th> <th>Command Description</th> <th>Config Length</th> </tr> </thead> <tbody> <tr> <td>0x00</td> <td>Get Sensor Configuration (Only for unconfirmed downlink)</td> <td>0 bytes</td> </tr> <tr> <td>0x00</td> <td>Set keep-alive interval *Note: little-endian format.</td> <td>2 bytes</td> </tr> <tr> <td>0x01</td> <td>Set sensor detection interval *Note: little-endian format.</td> <td>2 bytes</td> </tr> <tr> <td>0x02</td> <td>Set sensor’s decibel threshold to trigger event</td> <td>1 byte</td> </tr> </tbody> </table>		Cmd	Command Description	Config Length	0x00	Get Sensor Configuration (Only for unconfirmed downlink)	0 bytes	0x00	Set keep-alive interval *Note: little-endian format.	2 bytes	0x01	Set sensor detection interval *Note: little-endian format.	2 bytes	0x02	Set sensor’s decibel threshold to trigger event	1 byte
Cmd	Command Description	Config Length															
0x00	Get Sensor Configuration (Only for unconfirmed downlink)	0 bytes															
0x00	Set keep-alive interval *Note: little-endian format.	2 bytes															
0x01	Set sensor detection interval *Note: little-endian format.	2 bytes															
0x02	Set sensor’s decibel threshold to trigger event	1 byte															

Payload Content	Command content Ex: 00100E 011E00 023C 00 100E => Set keep alive interval : 0x0E10 -> 3600 sec 01 1E00 => Set sensor detection interval : 0x001E -> 30 sec 02 3C => Set sensor's decibel threshold to trigger event : 0x3C -> 60
------------------------	--

Appx. 2 Response Content

(Only for unconfirmed downlink)

Port	204
Payload Length	8 bytes
Payload Content	Response content Ex: 00100E011E00023C 00 100E => Keep-alive interval : 0x0E10 -> 3600 sec 01 1E00 => Sensor detection interval : 0x001E -> 30 sec 02 3C => Sensor's decibel threshold to trigger event : 0x3C -> 60

Appx. 3 Frame Count 0 Content

Payload Length	17 bytes
Payload Content	Frame count 0 content Ex: 010600000001600007ff1f102e2d4f6ee 01 => command ID 06000000 => bootloader version : 0x00000006 (little-endian format) 00160000 => HW ID : 0x00001600 (little-endian format) 7ff1f102 => FW CRC : 0x02f1f17f (little-endian format) e2d4f6ee => PubKey ID : 0xeef6d4e2 (little-endian format)