



Vital Sensor

ZH-500-v1

Instruction Manual

1 Introduction

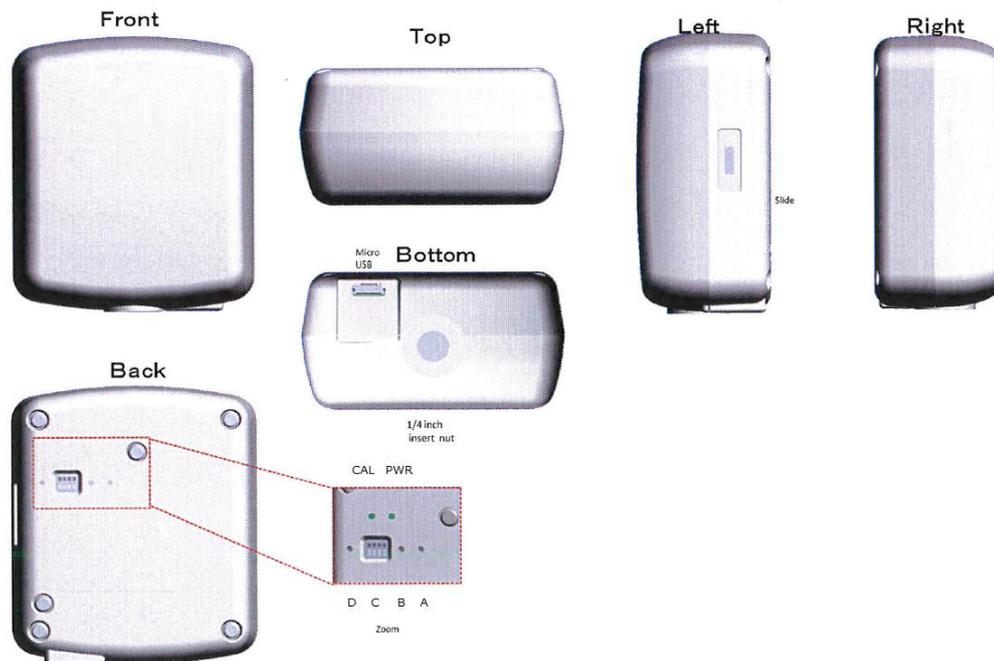
This Vital Sensor is a Z-Wave multi sensor to detect heart rate, and respiratory rate for a person. This sensor sends heart rate and respiratory rate data with the user-specified interval and reports an alarm when detecting activity change using Z-Wave signal.

2 Specifications

- Protocol: Z-Wave
- Frequency: CH0 922.5MHz
CH1 923.9MHz
CH2 926.3MHz
- Power Supply: AC100V, DC-5V, 50/60 Hz
- Operating Range: Up to 30 m line of sight
- Operational Temperature: 0°C - 40°C
- Storage Temperature: -10°C - 50°C
- Sensor Detecting Range: Up to 3 m

3 Package Contents

- 1pc Vital Sensor
- 1pc AC adapter



4 Hardware Buttons

1. Button A (Add/Remove/Reset): For adding the sensor to the network, removing the sensor from the network, and system reset.
2. Button B (CAL): For calibration.
3. Button C (DIP): Not used. Do not change this switch.
4. Button D: Not used.
5. Slide: Not used. Do not change this slide switch.

5 LED Notifications

- Power ON
 - When powering on the sensor, LED[PWR] and LED[CAL] will blink alternately for 2 seconds then LED[CAL] will be off and LED[PWR] will blink in the following manner.
 - When the sensor has not been added to a network yet, LED[PWR] will blink every second.
 - When the sensor has been added to a network, LED[PWR] will be off if the configuration parameter 1 is set to 0 or on if the configuration parameter 1 is set to 1.

- When an error happens on the sensor at power up, one of the LEDs will blink quickly. If this happens, please power off and on again.
- Calibration
 - LED[CAL] will turn on for 60 seconds after the calibration starts. Otherwise, it remains off.

6 Z-Wave Specifications

- Device type and Role type:
 - Device type: Sensor (Notification)
 - Role type: Always On Slave (AOS)

- Supported command classes:

○ COMMAND_CLASS_ZWAVEPLUS_INFO	V2
○ COMMAND_CLASS_CONFIGURATION	V1
○ COMMAND_CLASS_DEVICE_RESET_LOCALLY	V1
○ COMMAND_CLASS_MANUFACTURER_SPECIFIC	V2
○ COMMAND_CLASS_POWER_LEVEL	V1
○ COMMAND_CLASS_ASSOCIATION	V2
○ COMMAND_CLASS_ASSOCIATION_GRP_INFO	V2
○ COMMAND_CLASS_VERSION	V2
○ COMMAND_CLASS_NOTIFICATION	V7
○ COMMAND_CLASS_SENSOR_MULTILEVEL	V10

- Association Groups:
 - Group ID: 1 – Lifeline
 - COMMAND_CLASS_SENSOR_MULTILEVEL
 - COMMAND_CLASS_NOTIFICATION
 - COMMAND_CLASS_DEVICE_RESET_LOCALLY
 - Maximum number of devices that can be added to the group: 5
 - All triggering multilevel sensor reports and notification reports will be sent to the all associated nodes of the group.
 - This product can be included and operated in any Z-Wave network with other Z-Wave certified devices from other manufacturers and/or other applications. All non-battery operated nodes within the network will act as repeaters regardless of vendor to increase reliability of the network.

- Configuration:

- Power LED Control

Parameter Number	Value	Size	Default
1	0: LED Off 1: LED On	1	1 (On)

- Time Interval for Auto Report

Parameter Number	Value	Size	Default
2	Time interval for auto report Heart Rate 0: Off 6 ~ 120: Time interval (x5 seconds)	1	6 (30 sec)
3	Time interval for auto report Respiratory Rate 0: Off 6 ~ 120: Time interval (x5 seconds)	1	6 (30 sec)

- Time interval is calculated as follows

Time interval = configuration value x 5 (seconds)

- Averaging Window Size for Notification Report

Parameter Number	Value	Size	Default
4	Averaging window size for notification report 1 ~ 8 (x5 seconds)	1	3 (15 sec)

- Window size is calculated as follows

Window size = configuration value x 5 (seconds)

- Threshold for Heart Rate

Parameter Number	Value	Size	Default
6	High-threshold: 1 ~ 200 (bpm) (0: Threshold deactivated)	2	100
7	Low-threshold: 1 ~ 200 (bpm) (0: Threshold deactivated)	2	60

- Value of Parameter 6 must be higher than value of Parameter 7.

○ Threshold for Respiratory Rate

Parameter Number	Value	Size	Default
8	High-threshold: 1 ~ 120 (bpm) (0: Threshold deactivated)	1	20
9	Low-threshold: 1 ~ 120 (bpm) (0: Threshold deactivated)	1	10

- Value of Parameter 8 must be higher than value of Parameter 9.

○ Sensor Setting

Parameter Number	Value	Size	Default
10	Sensor Sensitivity: 0 - high, 1 - low	1	1
11	Calibration mode: 0- manual, 1- calibration	1	0
12	Heart rate type: 0 - av. Over 70, 1 - av. Below 70	1	0
13	Heart Rate/Respiratory Rate sensitivity: 0 - high, 1 - low	1	1

- Parameter 10) If parameter 10 is set to 0 (high sensitivity mode), the sensor becomes more vulnerable to environmental noise.
- Parameter 11) If parameter 11 is set to 0 (manual mode), the sensor will use preset values as thresholds for detecting Heart Rate / Respiratory Rate. If set to 1 (calibration mode), the sensor will use the calibrated values instead.
- Parameter 12) Set this to 0 when the target person's average heart rate is over 70. Set it to 1 when it's below 70.
- Parameter 13) If parameter 13 is set to 0, it becomes more vulnerable to environmental noise so it becomes more likely that the sensor reports fictitious non-zero Heart Rate and/or Respiratory Rate even if the target person is absent.

- Calibration

Parameter Number	Value	Size	Default
14	1: Start calibration	1	-
15	Calibration Status 0: Not calibrated 1: Calibration in progress 2: Calibration done 3: Error in calibration	1	-

- Parameter 14) When this parameter is set to 1, the calibration will be started. No response for CONFIGURATION_GET command for this parameter.
- Parameter 15) This can be used to get the calibration status by CONFIGURATION_GET command. Cannot set this parameter value.

When power on the sensor, the status becomes “0: Not calibrated”. Once calibration starts, the status becomes “1: Calibration in progress” and changes to “2: Calibration done” when the calibration finishes.

If the status becomes “3: Error in calibration”, you need to start calibration again.

- Multilevel Sensor Report:

This sensor will report Heart Rate and Respiratory Rate with Multilevel Sensor Command Class in the time interval (configured with parameters 2 and 3). The report value is an average value of the time interval (configured with parameters 2 and 3).

And the sensor will also report the value when the averaging value of the window size (configured with parameter 4) goes below the corresponding low threshold or goes over the corresponding high threshold (configured with parameters 6 to 9) and when receiving the SENSOR_MULTILEVEL_GET command.

- Heart Rate

Sensor Type	Scale	Size	Precision
0x2C	0x00 (Bpm)	2	0

- Respiratory Rate

Sensor Type	Scale	Size	Precision
0x3C	0x00 (Bpm)	1	0

- Notification Report:

V1 Alarm Type	V1 Alarm Level	Notification Type	Event
0x00	0x00	0x0D (Home Health)	0x00 (Event inactive) 0x01 (Leaving bed) 0x03 (Lying on bed) 0x04 (Posture changed)

7 Add Vital Sensor to Your Z-Wave Network (Inclusion)

1. Put your Z-Wave gateway to “Inclusion” mode.
2. Push A (Add/Remove/Reset) button once.
3. When “Inclusion” finishes successfully, LED [PWR] stops blinking.

8 Remove Vital Sensor from Your Z-Wave Network (Exclusion)

1. Put your Z-Wave gateway to “Exclusion” mode.
2. Push A (Add/Remove/Reset) button once.
3. When “Exclusion” finishes successfully, LED [PWR] starts to blink.

9 Calibration

To increase the accuracy of the sensor, you can perform calibration.

Push B (Calibration) button once or send CONFIGURATION_SET command with Parameter 14 from the network controller to start calibration. The LED [CAL] turns on during calibration. The calibration starts 20 seconds after the push of the button or setting parameter 14 and it takes about 60 seconds. While calibrating, the room is recommended to be empty (no target persons). Do not start calibration again while calibration is in progress.

10 Sending the Device Information

To send the device information (NIF), push the A (Add/Rmv/Reset) button once. The “NIF” of this product will be sent via broadcast to all devices.

11 Reset the Z-Wave Chip

Press A (Add/Remove/Reset) button for at least 10 seconds and release. The Vital Sensor will send the “Device Reset Locally” command and reset all settings to the factory default. Reset cannot be aborted.

Please use this procedure only when the network primary controller is missing or otherwise inoperable.

12 Preferred Gateway

This Vital Sensor allows users to add any Z-Wave network controllers by any vendors.

This Vital Sensor was tested with the following vendors:

- Z-WORKS

13 Test Mode

This Vital Sensor has a manufacturing test mode used in the factory to check the hardware buttons and LEDs are correctly wired. To enter the manufacturing test mode, set DIPSW to ON(SW1) / OFF(SW2) / ON(SW3) / OFF(SW4) and power up the sensor while pressing A button. Z-Wave related functionality is not available in the manufacturing test mode. To back to the normal mode, set DIPSW to OFF / OFF / OFF / OFF then power up the sensor.