

Intrinsically Safe WiFi/BLE Cordless Cap Lamp User Manual

Model: KH4E-WB

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Acronyms/Key Phrases

Acronym/Key Phrases	Explanation
BLE	Bluetooth Low Energy
RFID	Radio-Frequency Identification
Wi-Fi	Wireless Fidelity
NFC	Near Field Communication
RloTC	Roobuck Internet of Things Configurator
Short Press	Press the PUSH button and release immediately
Long Press	Press and hold the PUSH button for at least 5 sec* and release

*Configurable from the Roobuck Internet of Things Configurator (RIOTC- only accessible by authorised personnel from the control centre). Refer to Chapter 3: Configuring Devices in the “Roobuck Internet of Things Console User Guide”.

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Overview

1.1 Scope

This manual covers functional, operational, and technical specifications of a basic Roobuck WiFi/BLE Cordless Cap Lamp.

1.2 Technology

A basic WiFi/BLE Cordless Cap Lamp supports the following technologies:

- Wireless Fidelity (Wi-Fi) for communication and asset tracking
- Bluetooth Low Energy (BLE) for network configuration and asset tracking
- UHF 860 - 960 MHz with longer range than NFC can be integrated into tracking & entry control systems
- 13.56 MHz NFC for use with your access control Kiosk and Tag Board

Inventory solutions in addition to these technologies, some models may support one or more of the following functions:

- Dedicated Short-Range Communications (DSRC)
- Ultra-Wide-Band (UWB)
- Long-Term Evolution (LTE)
- Long-Range (LoRa)
- Radio-Frequency Identification (RFID)

Functions and Features

2.1 Features

The Roobuck WiFi/BLE Cordless Cap Lamp has a number of features:

- LED lights with adjustable brightness.
- Two-way communication between Cap Lamp users and control centre.
- LED flashing patterns to indicate emergency alerts, pages, or acknowledgements.
- Can be assigned into a PPE Kiosk solution or to fixed or mobile assets.
- Simple one button operations.
- Dual indicators: Charging Indicator and Network Activity Indicator.
- Reboot and factory reset functionality
- Firmware can be updated via Over-the-Air (OTA)

2.2 Parts Indications



1. Main LED
2. Auxiliary LEDs
3. Charging Indicator (Red)
4. Network Activity Indicator (Green)
5. Lens reflector

6. Cap lamp Helmet clip
7. Charging electrodes
8. PUSH button (Yellow)
9. Lanyard/Strap hole

2.2.1 LED Lights

The Cap Lamp has three LEDs:

- Main LED: Used for Main Mode and High Beam Mode illumination. The beam is focused.
- Two auxiliary LEDs: They are less bright than the main LED and consume less power. The beams not focused.

A constant light is used for normal illumination. A flashing LED light is used for various signals, alerts, and acknowledgements. Users should familiarize themselves with the different types of flashes and their meanings. These are explained in detail in *Section 2.2.4: Illumination Modes*.

2.2.2 PUSH Button

The PUSH button is the only button on the Cap Lamp. It can be used for:

- Switching between different illuminations modes.
- Sending emergency alerts to control centre.
- Acknowledging emergency alerts and pages sent by control centre.
- Activating a device reset.

Details on performing each of the above functions are explained in *Section 3: Operations*.

2.2.3 Indicators

There are two indicators – Red and Green. The red Charging Indicator shows whether the Cap Lamp is currently charging its battery.

- When charging, the red indicator is constantly ON.
- When in use, the red indicator is always off.

The green Indicator has different meanings depending on whether the Cap Lamp is currently in use or charging:

- Once the Cap Lamp has been put on a charging dock, the green indicator turns off after a few seconds, indicating the device is in light sleep and no network activity.
- While charging, if the device is fully charged, the green indicator will turn on constantly.
- Right after being taken off the charging dock, the green indicator blinks to indicate the battery level as follows.
 - 1 blink – Battery level < 50%
 - 2 blinks – Battery level > 50% but <80%
 - 3 blinks - Battery level >80 %

- When in use, the green indicator shows the network connectivity:
 - Constantly ON: The Cap Lamp has network connection.
 - Constantly OFF: The Cap Lamp has no network connection.

2.2.4 Illumination Modes

The Cap Lamp has three illumination mode levels:

- **Main Mode (5000Lux):** For normal working operations. This mode uses the main LED only.
- **High Beam Mode(8000 Lux):** This mode projects a strong, focused light beam for long distance projection, spotting, etc. This mode uses both the main LED and the auxiliary LEDs.
- **Power Saving Mode:** For conserving battery and providing extended operating hours with low-level illumination. This mode uses the auxiliary LEDs only.
- **OFF:** Both main LED and auxiliary LEDs are turned off.



High Beam Mode should only be used for short periods as this mode is battery intensive. If the Cap Lamp is kept in High Beam Mode for 20 minutes(configurable), it will automatically revert to Main Mode to conserve battery. The user can switch to High Beam Mode again to continue use for a further 20 minutes.



Both blinks and flashes involve the LEDs / indicators turning ON and OFF. The difference is that for flashes, the light remains OFF for a shorter period of time, while for blinks, the light remains OFF for a longer period of time. We strongly recommend users familiarize themselves with flashes and blinks before using Cap Lamps under working conditions.



Cap Lamp configuration options can be configured by the control center using the Roobuck Internet of Things Configurator (RIoTC) or Roobuck Mobile App. Users cannot change them from the Cap Lamp.



Roobuck Internet of Things Configurator is the management software platform which the control center uses to manage Cap Lamps.

Operations

3.1 Basic Operations

3.1.1 Changing Illumination Modes

During normal operation, short press the PUSH button to cycle through Main Mode, High Beam Mode, Power Saving Mode and OFF.

3.1.2 Sending Emergency Alerts

To send an emergency alert to the control centre, long press the PUSH button until the LEDs start fast flashing. Short press the PUSH button to return the LEDs to normal mode. Once the emergency alert has been acknowledged by the control centre, the LEDs will blink again temporarily to indicate the control centre has received and acknowledged the user's emergency alert.

The User can repeat this call if a flashing acknowledgement is not received in a few minutes.

3.1.3 Receiving Emergency Alerts

The control centre can send an emergency alert to all Cap Lamp users. Upon receiving the alert, Cap Lamps will continuously fast flash. Short press the PUSH button to acknowledge the alert and return the LEDs to Main Mode. Immediately proceed to the closest evacuation point.



An emergency alert will not be signaled while the Cap Lamp is being charged. It will only be signaled on the Cap Lamps that are being used.



The user **MUST** acknowledge the emergency alert. Otherwise, control center will assume the user did not see the alert and may send help to contact the user.

3.1.4 Receiving Pages

A page is similar to a "missed call". The control center can page a single user or group of users to request a call back. Upon receiving the page, the Cap Lamp will flash in short bursts. Short press the PUSH button to acknowledge the page and return the LEDs to Main Mode. Immediately contact the control centre to clarify the nature of the call.

If an acknowledgement is not received from any targeted cap lamp User for a long period of time, the Control Centre may send another message to this User. Retries will be attempted several times if required.



A page will not be signaled while the Cap Lamp is in a charger. It will only be signaled once the Cap Lamp is removed from the charger.

3.1.5 Personnel Tracking and Real-Time Monitoring

A cap lamp is tracked from the Control Centre constantly. There is no way for the User to stop the tracking. There is no User operation associated to the tracking function.

Every cap lamp is constantly monitored in real-time and key information of the cap lamp is displayed and recorded in the Control Centre. Monitored cap lamp statuses include:

- Location: Location of the cap lamp as provided by the locating system
- Battery Level: Remaining capacity of the battery
- Charging Status: The cap lamp is in a state of charge

Maintenance and Troubleshooting

When the Cap Lamp is placed in a charger, the PUSH button can be used to reboot the Cap Lamp or carry out a factory reset. These operations require the Cap Lamp to remain in the charger for the duration of the operation.



Emergency alerts cannot be activated while the device is in a charging state. Hence, if the device user accidentally holds down the button for 5 seconds, this will not trigger an emergency alert.

4.1 Rebooting to Resolve Wi-Fi Connectivity Issues

If the Cap Lamp fails to connect to the Wi-Fi network, the user can try rebooting to resolve the problem by following these steps:

1. Put the Cap Lamp on a charging dock.
2. Press and hold the PUSH button for 5 seconds until the LEDs flash slowly, then release.
3. Short press the PUSH button.
4. The LEDs will stop flashing.
5. Wait about 10 seconds until the reboot process is complete.

4.2 Updating Firmware

Device firmware can be updated over-the-air (OTA). The device must be put on a charging dock and made sure it can connect to the network in order to allow the control center to update the firmware remotely via the Roobuck RIoT Software. Please refer to RIoT User Guide for more details.

4.3 Updating Configurations

There are two methods to update configurations on the device.

1. Update via Wi-Fi:

The device must be connected to the network, and this will allow the control center to update configurations remotely via the Roobuck RIoT Software. Please refer to RIoT User Guide for more details.

2. Update via BLE:

The device can be configured using a Bluetooth capable mobile phone. Please refer to the BLE Configuration Guide for more details.

4.4 Factory Reset

To reset a Cap Lamp with its factory settings, the user can follow these steps:

1. Put the Cap Lamp on a charging dock.
2. Press and hold the PUSH button for 5 seconds until the LEDs flash slowly, then release.
3. Press and hold the PUSH button again for another 5 seconds until the LEDs stop flashing, then release.
4. Wait about 10 seconds until the reboot process is complete.

4.5 Self-Recovery

Self-recovery is an important feature of this product. Comprehensive protection methods are implemented to safeguard the product including processor supervisor, watchdog, TVS protection, both software & hardware resets, user warning and chassis banding. Self-recovery, as a key protection, can bring the product back to normal operation in various unexpected adverse events such as current-surge, large electrical static discharge, overheat, extreme networking conditions and mechanical impact.

Technical Specifications

General Specifications

- Operating time: 14 hours (Main Mode)
- Luminous intensity: 5000 lux (Main Mode)
- Charging time: 9 hours
- Battery: 4AH, 3.7 VDC.
- Battery lifetime: 80% after 500 full charging cycles.
- LED Lifetime: 50,000 Hours
- Weight: 180 g
- Operating temperature: -20°C to +40°C
- Ingress Protection rating: IP67
- Warranty: 1- Year Repair or Replacement

Wireless Protocols

- IEEE 802.11b/g/n
- Frequency: 2.4GHz for WiFi/BLE
- RFID –UHF 915-921MHZ (Receiver only)
- NFC – 13.56 MHZ (Receiver only)
- Programmability: (OTA) Over-The-Air Firmware upgradable.

Intrinsically Safe Certificate

- Ex code: Ex ia op is IIA T3 Ga or Ex ia op is IIB T3 Gb

Certificate #: IECEx TSA 19.0008

FCC Regulations

- 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.
- 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 or more 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.
- Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Contact

For further technical support, please contact Roobuck.

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