CoreLocator User and Installation Manual (CHW-LOC4000)

Document Version 0.3

2025-06-06

PRELIMINARY PRODUCT INFORMATION

Applicable versions	
Hardware version:	1.0
Firmware version:	0.11

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2   Important Safety Information

In order to ensure the safe operation of the device and its users, please read and act in accordance with the following safety instructions.

1. The device is designed for indoor use only; do not place it outdoors.
2. Do not place the device in or near hot/humid places, such as a kitchen or bathroom.
3. Only a qualified service technician should install or service the device using the approved original CoreHW parts supplied in the sales package. Faulty installation or service may be dangerous and may void any warranty which may apply to the device.
4. End users should remember that the device contains complex technical equipment and requires installation using special tools and expert know-how.
5. Instructions given in this guide are general guidelines that apply to the installation of CoreHW devices. However, due to the wide variety of environments and mounting surfaces, this guide cannot consider the individual technical requirements relevant for any particular installation. Consult CoreHW if you are uncertain about installation in a specific environment.
6. Handle the device with care. Accidental damage will void the warranty of the device.
7. There are no user-serviceable parts inside the device. If you experience problems with the device, please contact CoreHW and ask for help.
8. The device is designed to operate either by using a standard Power over Ethernet (PoE) compatible network component connected at the Ethernet socket or by USB-C Connector.
9. For your safety, and to prevent any damage to the device, only use a compatible power supply. Contact CoreHW in case of any uncertainty regarding compatible power supplies. When using a PoE compatible network component as a power source, only use standard certified network components.
10. When installing the device, make sure that the installation surface can safely carry the weight of the equipment.
11. Your service technician or dealer may be able to provide you with information on alternative mounting solutions for different types of environments.
12. Do not smoke when installing the equipment. Make sure there is no source of fire or flame nearby.
13. Make sure to place cables so that they will not be subject to mechanical wear and tear. Do not pull any connected cable with force.

3   Introduction

CoreLocator is compatible with the CoreRTLS system. Other parts of the CoreRTLS are CoreTags and RTLS Core software. The CoreRTLS allows you to locate and track any objects equipped with CoreTags in an environment equipped with CoreLocators. The CoreLocator is designed for use in indoor environments.

Read this User Manual carefully before having the CoreLocator professionally installed. For the latest guides, additional information, and downloads related to your CoreRTLS product, contact CoreHW support.

NOTE:	This document contains information about the pre-production version of the CoreLocator. As such the information is subject to change without notice.

Contact CoreHW support for obtaining an updated version of the document.

4   CoreLocator Description

4.1   Locator Parts
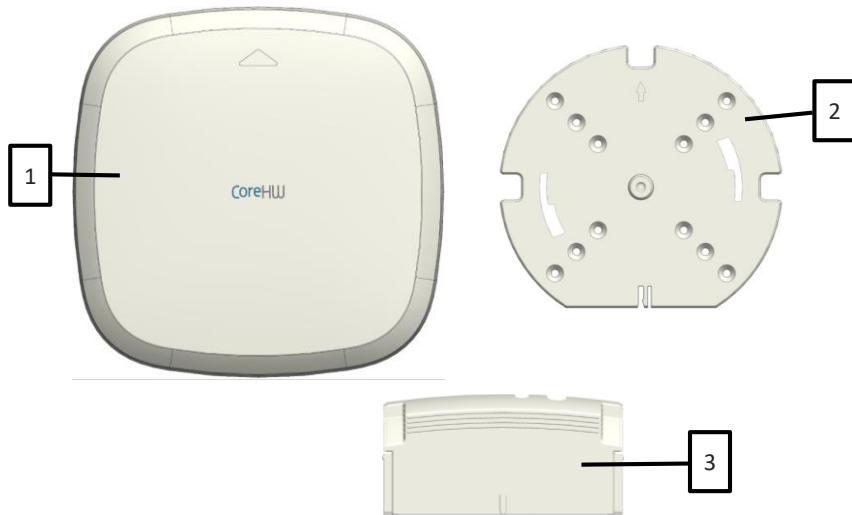
**Figure 1.** CoreLocator parts.

1. CoreLocator main unit
2. CoreLocator mounting plate
3. CoreLocator connector lid

4.1.1 CoreLocator Main Unit
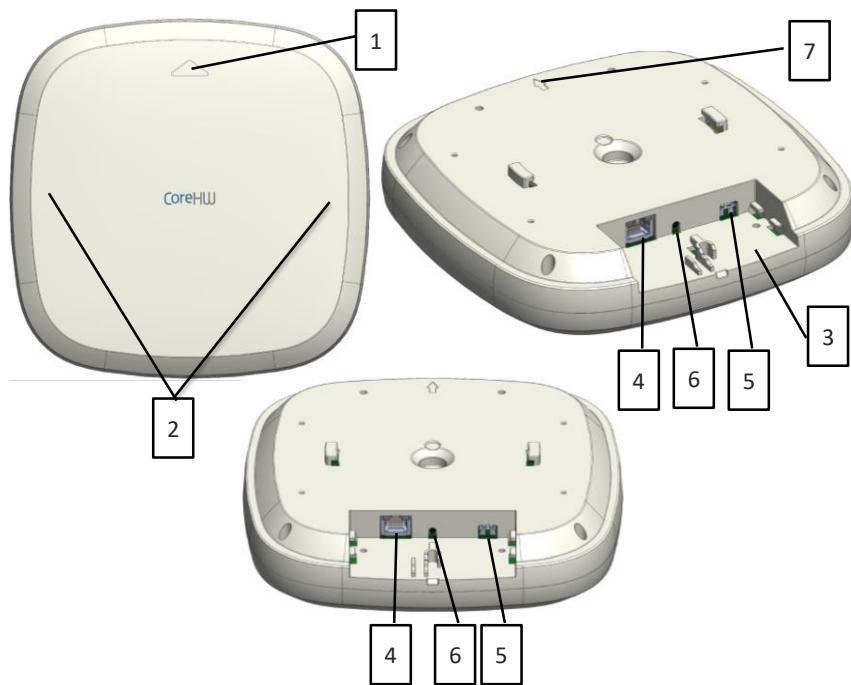
Figure 2. CoreLocator main unit.

1. Main LED indicator (RGB) and orientation indicator
2. Secondary LED indicators (2x red)
3. Type label
4. Ethernet connector
5. USB-C connector
6. Reset button
7. Back side mounting orientation guide

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4.1.2 CoreLocator Mounting Plate
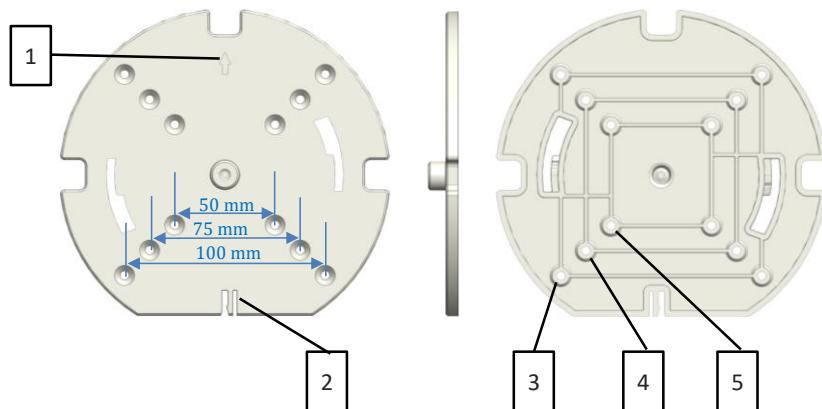
Figure 3. CoreLocator mounting plate.

1. Orientation guide
2. Locking mechanism
3. VESA standard 100mm x 100mm
4. VESA standard 75mm x 75mm
5. VESA standard 50mm x 50mm

4.1.3 CoreLocator Connector Lid
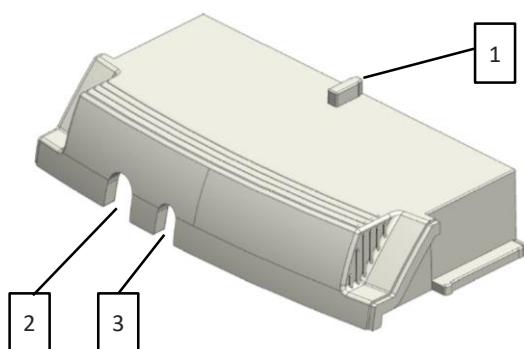
Figure 4. CoreLocator connector lid.

1. Locking mechanics
2. Ethernet cable passage
3. USB cable passage

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4.2 CoreLocator LED Indicators

The CoreLocator has three LEDs which indicate various operational modes. The main indicator is RGB, and the two secondary indicators are red.

### 4.2.1 Main Indicator States

The main indicator LED is located under the orientation arrow in the CoreLocator. The table below illustrates the different CoreLocator modes as indicated by the main indicator LED

Color sequence	Description
Static white (+ red LEDs on)	Device is starting, the locator manager has not been started yet.
Blinking blue	Appears when the reset button is pressed. It shows the user that if the button is released at this step the device will enter config mode.
Static blue	1. When the device starts: Indicates that the device is being initialized (usually lasts a very short amount of time) 2. After blinking blue when the button was held: It indicates that the device entered config mode.
Blinking red	Appears when holding the reset button longer. It indicates that once the button is released the device will perform the factory reset procedure.
Static red	Appears when there is a connection error. It indicates that the device tries to reconnect to MQTT/HTTP config server and that the Web UI is enabled for the user to change configuration if needed. Once the problem is solved the LED will change its state automatically.
Magenta blinking (+ red LEDs blinking)	This occurs for 10s when the "*Blink LED*" button is pressed in the Web UI. This can be used to see if the device is alive and to see which locator is controlled by the Web UI.
Blinking green	Appears when the device is operating normally.
Off	Device is powered off or device is in working/error state but has been configured to disable the LED within the settings (see Other Settings section in the Web UI).

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4.2.2 Secondary Indicator States

The secondary red LED states are controlled via the RTLS core software. They are on during the boot sequence, and turned off after the firmware starts to run. The secondary LEDs can be set to blink using the Web UI.

5 CoreLocator Installation

This chapter describes the CoreLocator installation procedures.

5.1 Physical Installation of the Locator

Typically, the CoreLocator is installed in the ceiling. The positions where the locators are installed in the site should be planned properly prior to the installation to ensure optimal positioning performance. Since the positioning accuracy will directly depend on the accuracy of the locator position and orientation data stored in the RTLS Core database, it is important that the actual position and orientation of the locators are measured and recorded accurately.

To ensure the best performance, the CoreLocator should be mounted away from any obstructions to the side or front of the enclosure.

The following sections describe the general steps of the installation in a typical setup.

5.1.1 Mounting Plate

The first step in the installation is to install the mounting plate. The mounting plate has three different VESA (Video Electronics Standard Association) standard sets (50, 75, 100) of countersunk mounting holes (Ø4.4mm) for the mounting screws. Use at least four screws to ensure stable installation.

The orientation guideline should be used to align the CoreLocator according to defined orientation in the site.

There are two different installation methods for the mounting plate:

1. Directly by screws e.g. to ceiling surface.
2. By attaching the mounting plate to VESA 50/75/100 compatible bracket. Several kinds of specific brackets are available on the market.

> **NOTE:** Be careful not to bend the mounting plate when fixing it to place. It might be impossible to mount the locator to the mounting plate if it has been bent.

Not following general safety regulations can cause injuries to people or damage to objects. Always use qualified personnel for carrying out the installation of CoreLocators.

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5.1.2   Mounting CoreLocator to the Mounting Plate

The locator is attached to the mounting plate by hassle-free twist lock mechanism. The installation steps (A, B, C) are described below.

NOTE: It is easier to connect the cables before attaching the locator to the mounting plate as the connectors are more visible and easier to access.

A) Center the locator on the mounting plate using the guide pin as an aid. Place the recess in the center of the locator to the boss at the center of the plate.
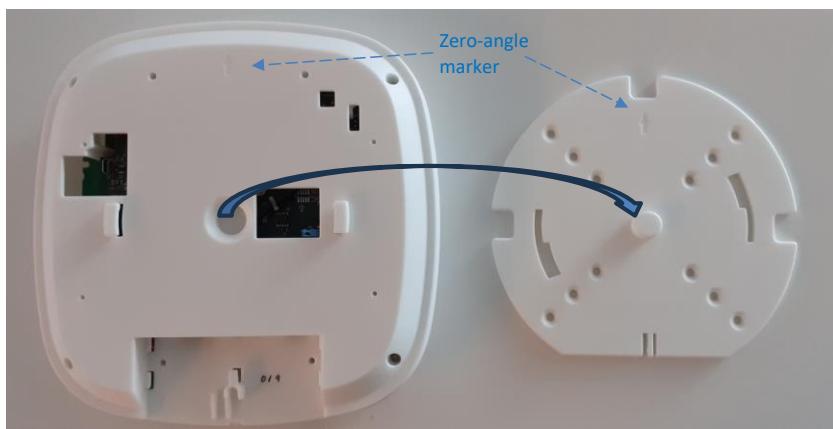

Figure 5. Inserting CoreLocator main unit to the mounting plate.

B) Rotate the locator until it is locked in place. There is a noticeable "click" when the locator is fully seated in the mounting plate.
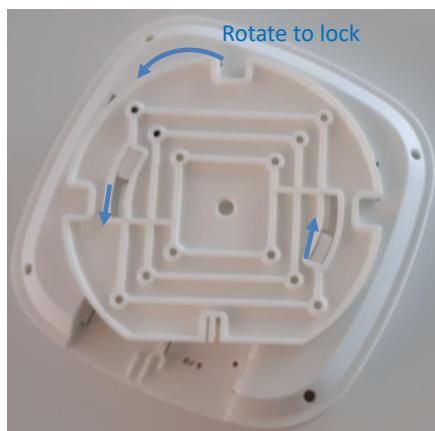
Figure 6. Locking CoreLocator main unit to the mounting plate.

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C) Installation is complete
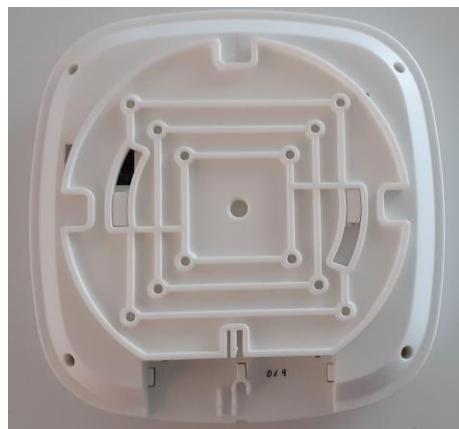
Figure 7. CoreLocator main unit correctly locked in the mounting plate.

5.1.3   CoreLocator Cable Interface

The CoreLocator cable interface contains an RJ45 connector for the Ethernet and a USB-C connector for the DC-power supply. Both connections are optional depending on how the locator is powered and connected to the network. See section *5.2 Locator Power Supply* below for options.
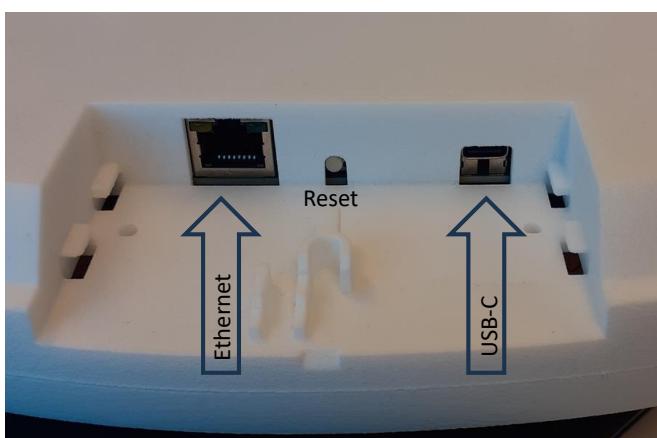
Figure 8. CoreLocator cable interface

The connector lid contains two openings for routing the cables. There is also a strain relief for the USB-cable to prevent the connector from disengaging, since the

connector itself does not have a locking mechanism. Figure 9 below shows how the cables should be routed inside the cable interface.
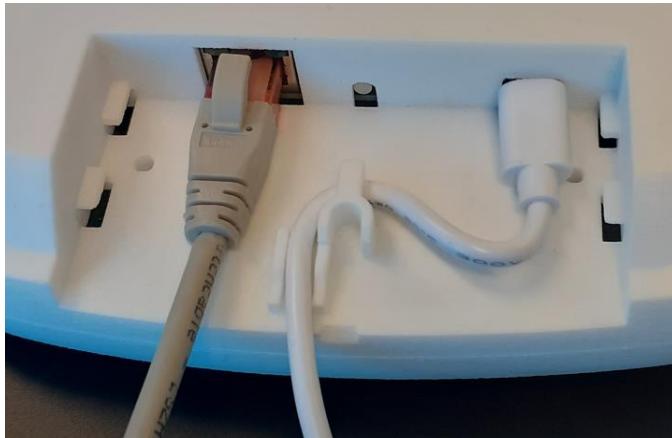
Figure 9. Routing cables inside the locator cable interface part.

After the cables are connected to the locator, the connector lid can be closed. This is done by sliding the cover in place. The connector lid acts also as a lock to lock the locator into the mounting plate, so it should be inserted only after the locator is attached to the mounting plate.
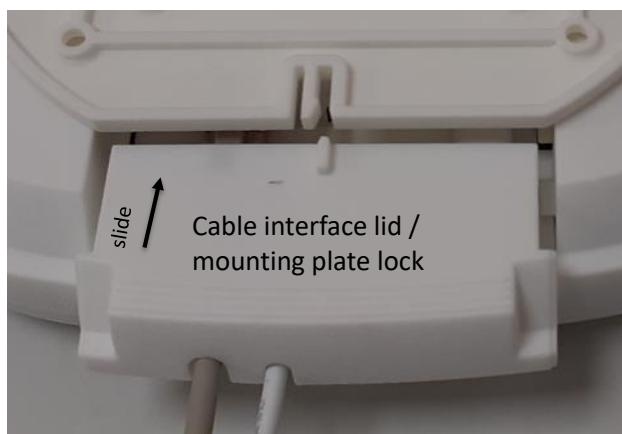
Figure 10. Inserting the connector lid.

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After the connector lid is fully pushed to its place, the connectors are shielded, and the locator is locked in place.

Figure 11. Connector lid in place and CoreLocator main unit locked to the mounting plate.

NOTE: Cable lid ensures that you have mounted the locator to the mounting plate correctly. Due to design symmetry 180-degree misorientation can inadvertently happen if the cable lid is not assembled. The connector cover cannot be inserted into its place if this is the case. See Figure 12 below for illustration of this problem.

Does not fit!

Figure 12. Incorrect CoreLocator main unit orientation.s

5.2   Locator Power Supply

The CoreLocator can be powered through the Ethernet using Power over Ethernet (PoE), or via the USB-C connector using a 5V DC supply. While not recommended it is safe to connect power through both sources at the same time.

When the power supply is connected, the CoreLocator automatically switches on. The main indicator is lit briefly in static white then static blue until the CoreLocator has started and is connected to the RTLS Core server.

5.2.1   Power Over Ethernet (PoE)

The CoreLocator can use a standard IEEE 802.3at Type 1 PoE switch or power injector as its power supply. Only use standard certified PoE devices. When using PoE, a separate DC power supply is not required.

5.2.2   Powering via USB-C

The CoreLocator can be powered via the USB-C connector from a 5V power supply. Only use standards compliant USB-C power supplies to power the CoreLocator. When using USB-C power, either non-powered Ethernet or WiFi can be used for data communication.

NOTE: Do not use legacy USB to USB-C converters or non-standard USB-C cabling in the power supply connection. The CoreLocator uses the USB-C connector CC-pins to verify that the power supply can provide enough current, and the CC pins must be connected properly for the CoreLocator to be powered via the USB-C connector.

5.3   Locator Network Connection

The CoreLocator must have a working network connection to the RTLS core server for proper operation. There are two interfaces available: Ethernet and WiFi.

5.3.1   CoreLocator Ethernet Connection

Connect the CoreLocator to a network with an Ethernet cable plugged in to the RJ-45 Ethernet socket. To ensure safety and prevent damage to the locator, always connect the CoreLocator only to standard certified network components.

The main indicator light starts blinking green when the CoreLocator operates normally and is connected to the RTLS core server.

5.3.2   CoreLocator WiFi Connection

The CoreLocator uses only the 5GHz WiFi band to avoid interfering with the BLE signals on the 2.4GHz band. Ensure that the WiFi infrastructure in the installation site supports the IEEE 802.11g/n for 5GHz operation. The WiFi operation requires that the WiFi interface in the locator is configured correctly. The locator is delivered

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with an empty WiFi configuration, and it must be configured before it can operate properly. There are several possible ways the configuration can be made:

1. Using the Web UI through the built-in access point. When the See section *6.3 CoreLocator Web UI Operation* for instructions on how to use the Web UI to configure the WiFi.
2. Connecting the locator to the network with wired Ethernet for fetching the configuration from the RTLS Core server. If the locator can connect to the public Internet via the Ethernet, it can fetch the assigned RTLS Core server address, and it can receive the correct WiFi configuration. After receiving the configuration, the Ethernet connection can be removed, and the locator can connect to the RTLS core server via WiFi.

The main indicator light starts blinking green when the CoreLocator operates normally and is connected to the RTLS core server. If the main indicator light is static red, the locator could not connect to the server, and it has started the Web UI for manual configuration.

5.4   Locator Factory Reset

It is possible to return the CoreLocator to the factory configuration corresponding to the state it was received. See section *6.1 Reset Button Operation* for instructions on how to manually perform a factory reset.

> **NOTE:**   After a factory reset, the locator must be configured and onboarded again to become operational.

5.5   Initial Configuration

After the physical installation and connecting the CoreLocator to the network, it must be configured to operate correctly with the RTLS Core server.

The locator can be fully configured via the RTLS Core server after it can reach the RTLS Core server over the network.

5.5.1   Configuring the RTLS Core Address

If the locator can reach the CoreHW Onboarding Server over the Internet, it can fetch the assigned RTLS Core Address automatically.

If the locator cannot access the CoreHW Onboarding Server, the RTLS Core Address must be manually configured using the Web UI. See the next section below for instructions on using the Web UI.

5.5.2   WiFi Access Point

The locator implements its own WiFi access point to connect to the Web UI. The access point is disabled during normal operation.

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To connect to the Wi-Fi access point, open the Wi-Fi connections scanner and look for the SSID named **`Locator_xxxxxx`**, where xxxxxx is the 3 least significant bytes of the locator ID in hexadecimal. The default password of the access point is **`corehw0000`**

5.5.3   Web UI

See section *6.3 CoreLocator Web UI Operation* for instructions on how to use the Web UI.

6   CoreLocator Operating Instructions

6.1   Reset Button Operation

The CoreLocator has a reset button that offers three functions. See section *4.1.1 CoreLocator* for its location inside the connector lid. Use a small pin to operate the button.

NOTE: Be careful not to touch the internal electronic components if the pin is very thin and conductive.

The three functions are:

1. **Reset the device:**

    By pressing the button shortly, the device will restart keeping its previous configuration and go into the default working state after the restart. During the restart, the main LED is white while the other two are red meaning that the locator manager hasn't started yet. After some time, the manager will power off the LED's and control them. When the device is working normally, the LED blinks green.

2. **Enable configuration mode:**

    Configuration mode enables the Web UI (See section *5.5.2 WiFi Access Point* above) and the Wi-Fi access point.

    To get into the configuration mode the button needs to be pressed and held until the device LED blinks in blue color (be careful to release the button at this step otherwise the LED will blink in red bringing device to the factory reset mode covered in the next part).

NOTE: The device will reset once pressed then the button needs to be held during startup until it reaches the state where the main indicator LED blinks in blue color. Right after reset, during the startup, the LED is white.

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3. **Trigger a factory reset:**

The factory reset will delete the current configuration data and restore the locator to its default state. To trigger the factory reset using the button it needs to be pressed and held until the main indicator LED starts blinking in red color. The factory reset will be performed after the LED is blinking red and the button is released.

NOTE:	The device will reset immediately when the button is pressed. The button needs to be held in the pressed state until it reaches the state where the main indicator LED blinks in red color. During the reset the main indicator LED will first be white, then it will blink in blue color, and after about 10 seconds it will start blinking red, indicating the factory reset.

WARNING:	All the modifications done to the device will be lost including the network information. However, if the device is able to connect to the RTLS core it will fetch its configuration from the server.

6.2 Configuration

The CoreLocator is configured through the RTLS Core server. The RTLS Core server instructions cover the available locator configuration settings.

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6.3   CoreLocator Web UI Operation

The CoreLocator implements a local configuration interface that can be accessed using a Web browser. The Web UI will be activated if:

1. The locator has not been configured, and it cannot access CoreHW Onboarding Server.
2. The locator cannot access the network for an extended time.
3. The user requests starting the Web UI using the reset button (see section *6.1 Reset Button Operation* for instructions)

Once connected to the CoreLocator WiFi access point, the Web UI address is **http://192.168.8.1:8080/**

Alternatively, Web UI can be reached using the device IP address at port **8080**.

6.3.1   Web UI Login

At startup the interface will request to login with a password, depending on the configuration the password may vary but the default one is **chwloc.**
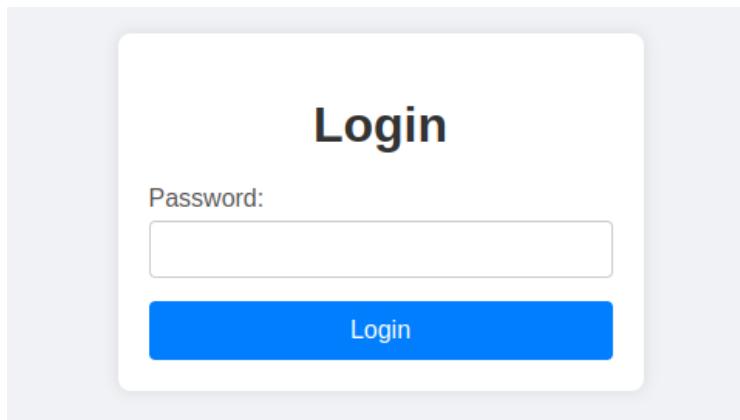

Figure 13. Locator Web UI login

6.3.2 Home / Status Screen

Once connected the status window is opened by default.
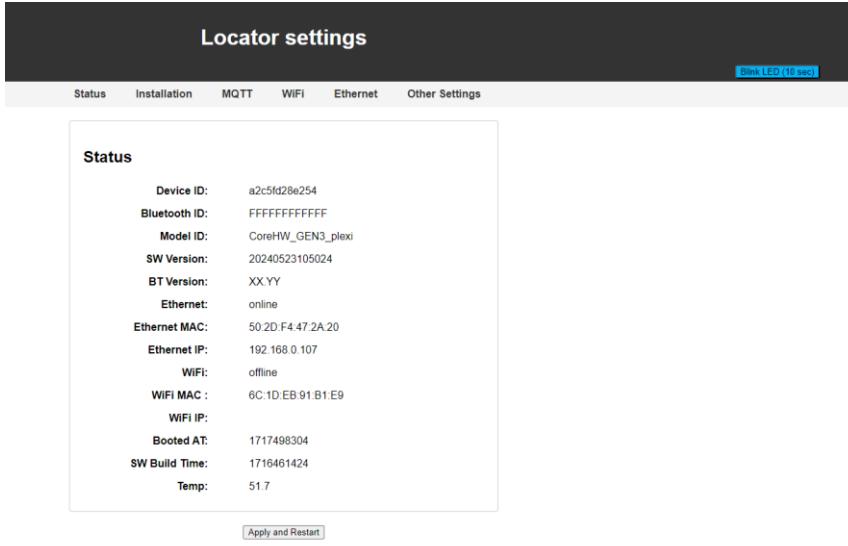
Figure 14. Locator Web UI status

At the top right there is a button called Blink LED which can be used to blink the LED a few times to know which device is being configured in case of multiple locators connected.

- **Status / Home screen:** Shows locator status information
- **Installation Settings screen:** Locator position and identification settings
- **Server Settings screen:** URI server setting and MQTT broker information
- **WiFi Settings screen:** WiFi connection configuration
- **Ethernet Settings screen:** Ethernet connection configuration
- **Others screen:** Factory reset, LED, and password settings

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6.3.3   Installation Settings Screen

The position and area identification related settings can be changed here. Also, a friendly name can be given to the locator.

Figure 15. Locator Web UI installation

6.3.4 Server Settings Screen

The information needed about the MQTT broker can be found there as well as the possibility to set the configuration server URI.

Server Settings

Config server URI:	https://chw-onboard.iotlab.fi
MQTT Broker URI:	emqx.iotlab.fi
MQTT Broker Port:	1883
MQTT Broker Username:	test_position_engine
MQTT Broker Password:	test_position_engine

Apply and Restart

Figure 16. Locator Web UI Server

6.3.5 WiFi Settings Screen

The Wi-Fi connection of the locator can be enabled/disabled and configured here. By default, the selected method is WPA which allows the locator to connect to Wi-Fi using SSID and password. The other method is EAP-TLS, which will use certificate-based authentication.

Additionally, there is the possibility to switch from DHCP to manual IP address and set up the IP Address, Subnet Mask and Gateway under it.

NOTE: At bootup the device will connect accordingly to the selected method under *Authentication Method* selection no matter the saved WiFi access points.

The WiFi screen will look different based on which authentication method is selected.

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6.3.5.1   WPA Settings

Multiple SSID's and passwords can be saved and removed, they will appear on the table below.

Figure 17. Locator Web UI Wi-Fi WPA

6.3.5.2 EAP-TLS Settings

Only one connection can be saved, adding another one will replace and overwrite the one in place. The DCHP and IP address settings are identical to the WPA case (not shown in the figure below).

Figure 18. Locator Web UI Wi-Fi EAP-TLS

6.3.6   Ethernet Settings Screen

The Ethernet connection of the locator can be enabled/disabled and configured here.

Figure 19. Locator Web UI ethernet

6.3.7 Others Screen

Other actions can be taken here such as:

- Triggering the factory reset functionality
- Disable/enable the LED (only during normal working state)
- Changing device password: It will change the Web UI password as well as the root user password.

Figure 20. Locator Web UI others

7   Care and Maintenance

The CoreLocator is a sensitive and high-performance part of an accurate indoor positioning system and should be treated with care.

- Do not attempt to open the device.
- Keep the CoreLocator dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store CoreLocator in dusty and/or dirty areas. Its connectors and electronic components can be damaged.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the device. Only use soft, clean and dry cloth to clean the surface of the device.
- Do not paint the device.
- Keep the device out of the reach of small children.

Commented [AK3]: Ehkä tässäkin voisi mainita, että pystyasennossa asennus liittimet alaspäin

Commented [VE4R3]: Ehkä ei tässä kohtaa, mutta fyysistä asennusta käsittelevässä kohdassa voisi mainita / kuvata tuetut (ta suositellut) asennot

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8   Specifications

These preliminary specifications are subject to change until the device is released to mass production.

Item	Description
Bluetooth specifications	
Bluetooth standards	Bluetooth LE 5.1
Carrier frequencies	2.402 – 2.480 GHz
Maximum RF power	+10 dBm
Modulation	GFSK
WiFi specifications	
WiFi standards	IEEE 802.11a/n
Carrier frequencies	4.900 – 5.825 GHz
Maximum RF power	+18 dBm[1]
Modulation	OFDM
Supported data rates	6, 9, 12, 18, 24, 36, 48, 54 Mbps (802.1a) 150 Mbps (802.11n)
Supported channel bandwidth	20 MHz, 40 MHz
Security	WPA3, WPA2, WPA2 and WPA mixed mode
Electrical specifications	
Power Supply	PoE (802.3at, class 0), 5V DC (USB-C)
Typical power consumption	2.5W
Physical specifications	
Dimensions	206x206x47mm
Weight	<700g
Mounting	VESA 50/75/100 using provided mounting bracket

Commented [AK5]: Pitäisikö tännekin tulla se +10dBm maksimi EIRP:ksi

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[1] The maximum RF power will vary by channel and according to individual country regulations.

Item	Description
Environmental specifications	
IP protection class	IP 44
Operating temperature	-30 to 60°C
Storage temperature	-40 to 85°C
Physical interfaces	
Ethernet (PoE)	10/100Mbps (RJ45)
Power supply	USB-C
LED	1 x RGB, 2 x Red
Reset button	1 (Reset/Config/Factory)
Certifications	
Regulatory	Pending: CE, FCC, IC, Japan
Industry	Pending: Bluetooth SIG

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FCC Statement

1. 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.

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

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate

the equipment.

NOTE:

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.

To comply with RF exposure requirements, a minimum separation distance of 20mm must be maintained between the user's body and

the handset, including the antenna.

IC WARNING:
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
ADVERTENCIA IC
Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS)d'Innovation,
Sciences et Développement économique Canada. Le fonctionnement est soumis auxdeux conditions suivantes :
(1) Cet appareil ne doit pas causer d'interférences.
(2) Cet appareil doit accepter toutes les interférences, y compris celles susceptibles deprovoquer un fonctionnement indésirable de l'appareil.