ASSA ABLOY

Aperio® Online Quick Installation Guide

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Table of Contents

1 Introduction

Purpose

The main purpose of this manual is to provide necessary information for a quick installation of Aperio based products using the Aperio programming application.

The manual is intended for installation personnel, project managers and people with similar responsibilities.

Scope

This Quick Installation Guide covers a standard installation of a complete Aperio online system including communication hubs and locks/sensors. For a complete description of all functionality and possible settings in an Aperio online installation, refer to the Aperio Programming Application Manual, ref [1].

This manual is applicable to version 14.0 of the Aperio programming application.

Definitions and abbreviations

Expression	Description
EAC	Electronic Access Control. The system controlling access decisions.
DIP	Dual in-line Package. A manual electric switch used for settings on the communication hub.
RFID	Radio Frequency Identification. The credential technology used.
ACU	Access Control Unit. The device within the EAC system that communicates with the communication hub.
TLS	Transport Layer Security. Cryptographic protocol that provides secure communication over TCP/IP connections

References

[1]	ST-001321-Aperio programming application manual
[2]	ST-001323-Aperio Online Mechanical installation manual

Product availability

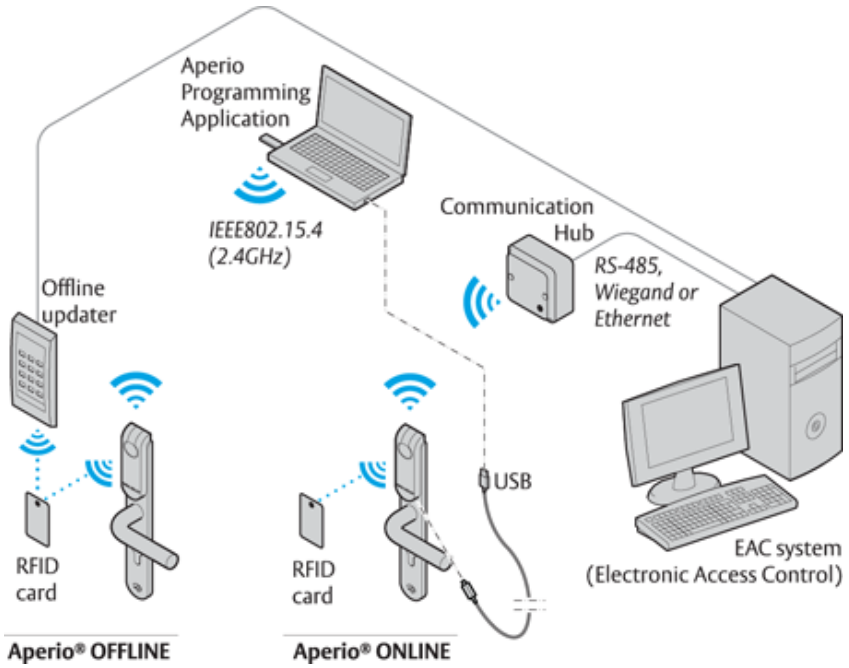
The products included in this manual may not be available on all markets. Please check with your local Assa Abloy company for details.

Aperio Support in the EAC system

Note that the Aperio support may vary depending on the Aperio communication hub used and the level of integration. Please contact your OEM for details.

2 Aperio System Overview

Figure 1: Aperio technology overview



The Aperio System

The Aperio system is used in the following way: The user holds an RFID credential in front of an online or offline lock.

- Aperio Online: An online lock sends card credentials wirelessly to the communication hub which in turn communicates with an EAC (Electronic Access Control) system (wired through RS-485, Wiegand or TCP/IP). The EAC system makes the access decision. The decision is sent via the communication hub to the lock and access is granted or denied.
- Aperio Offline: Access decision is made locally by the lock. Result of decision depends on access rights stored on the card and also on lock configuration transferred from the EAC through offline updaters with setup- or user cards.

The Aperio programming application

The Aperio programming application is used for the configuration of a door installation. It is normally installed on a laptop and is used with an Aperio USB radio dongle connected to one of the USB ports. The Aperio programming application uses the USB radio dongle to connect to a communication hub and an online lock (via the communication hub) or directly to an offline lock. V3 locks can also be connected to using a USB cable.

Regulatory and security information

Refer to the Aperio programming application manual, ref [1] for regulatory and security information.

Communication Hub Versions and EAC interface

There are four communication hub types according to the table below:

Version	Interface	Maximum number of locks/ sensors
AH15	Wiegand/RS 485 [1]	1
AH20	Wiegand (Adv., Std.)	1
AH30	RS-485	8
AH40	IP (Ethernet)	8/16[2]

[1] The firmware type loaded into the communication hub controls what interface is enabled.
[2] Applicable for release 3.0.0 and onwards.

3 Quick installation of Aperio lock and communication hub

This chapter describes a quick installation, applicable for most EAC system using a standard configuration.

A quick installation of Aperio lock and communication hub starts with pairing the hardware. In some cases lock/communication hub are pre-paired from the factory. If not pairing can be done in two ways:

- Automatic pairing – The communication hub automatically pairs with nearby Aperio lock/sensor.
- Pairing with the Aperio programming application – This is the recommended method, where detailed settings and encrypted communication are set.

Automatic pairing

Automatic pairing is obtained by setting the DIP Switch in Pairing mode for AH15/20/30 communication hubs (RS485 - DIP 1-5 OFF, Wiegand – DIP 5 ON). For AH40 communication hub, set the pairing mode jumper in the left position.

Automatic pairing will only be made with unpaired locks.

Communication hub and locks may be sold pre-paired from factory. If this is the case, the following pairing procedure is not necessary . However, configuration using the Aperio programming application is still needed.

To perform pairing with communication hubs set in Pairing mode , do the following:

1. Power cycle the communication hub if necessary and check that the LED is constant yellow.

2. Hold the credential in front of the lock to activate it, or engage the magnet for the sensor (Not necessary for V3 locks with polling activated.).
   Result: Communication hub pairs with lock and indicates with one green flash.

3. After successful paring, power off the Communication hub.
4. Deactivate paring mode and set the desired EAC address:
   - AH15/30 RS485: Set the DIP switch 1-5 to desired address: 1-15/16-31 (1-s / 1-1).
   - AH15/20 Wiegand: Set the DIP switch 5 to OFF.
   - AH40 Ethernet: Move the pairing mode jumper to the right position or remove it.
5. Power the communication hub to start up for normal operation.

Locks/sensors and communication hubs that are paired with Pairing mode will communicate in Manufacturer mode, and not in Customer mode that offers encrypted communication. It is required to activate Customer mode by using the programming application, according to next section.

Paring with the Aperio programming application

The Aperio programming application enables connection between communication hubs and locks/sensors by pairing the devices. The communication is encrypted with a customer key, obtained from your ASSA ABLOY supplier.

To communicate with communication hubs and locks/sensors through the Aperio Programming Application, you need a USB Radio dongle. For installation of the Aperio Programming Application, the USB Radio dongle and information of advanced settings, refer to the Aperio Programming Application manual, ref [1].

Information of encryption key

To obtain secure communication between communication hubs and locks/sensors an Encryption key is used. This Encryption Key should be handled with the same care as the Master Key in a traditional Master Key System. A person with access to the Encryption key can gain unauthorized access to any Aperio door in the system. Once loaded into the Programming Application, it will be stored encrypted in a local database and should be erased from the hard drive.

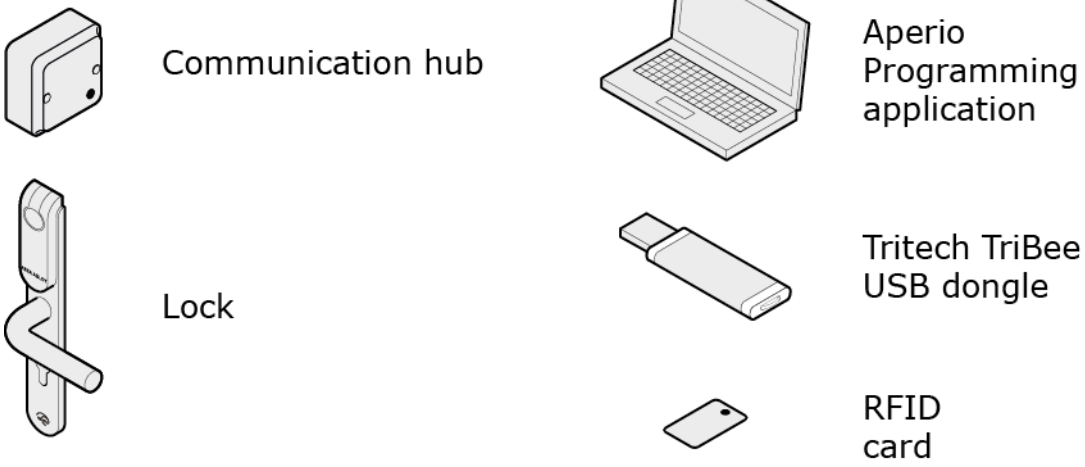
The encryption key file is delivered from your local ASSA ABLOY company and should be stored safely.

Proper handling of encryption keys is essential to lock/sensor security!

It is absolutely necessary to use the customer encryption key by setting all communication hubs and locks/sensors in Customer mode to ensure a secure and encrypted communication with the lock/sensor.

Checklist for pairing locks/sensors and communication hubs

Equipment needed:



A complete configuration includes the following steps:

- Preparation: Installation of software and powering the Aperio hardware.
- Step 1: Creating a new installation
- Step 2: Scanning for Communication hubs
- Step 3: Pairing locks/sensors with communication hub

- Step 4: Configuring locks and communication hubs: setting security mode, addressing mode, override credentials etc.
- Step 5: Apply saved configuration on several locks
- Step 6: Testing after configuration

For some configurations a number of additional advanced settings can be necessary, such as:

- configuration of status and alarm messages.
- configuration of the radio communication.

These and a number of other advanced settings are described in the Aperio programming application manual, ref [1].

The quick installation process does NOT require that the EAC is connected to the Aperio hardware. Quick installation can be performed on hardware not yet mechanically installed.

Preparation before quick installation

- Install the Aperio programming application and USB Radio dongle drivers on your laptop. Refer to the Aperio programming application manual for instructions. The software and encryption key file is delivered from your local Assa Abloy company.
- Make sure the communication hub is powered (8-24V) and that batteries are installed in the lock.

Step 1 - Creating a new installation

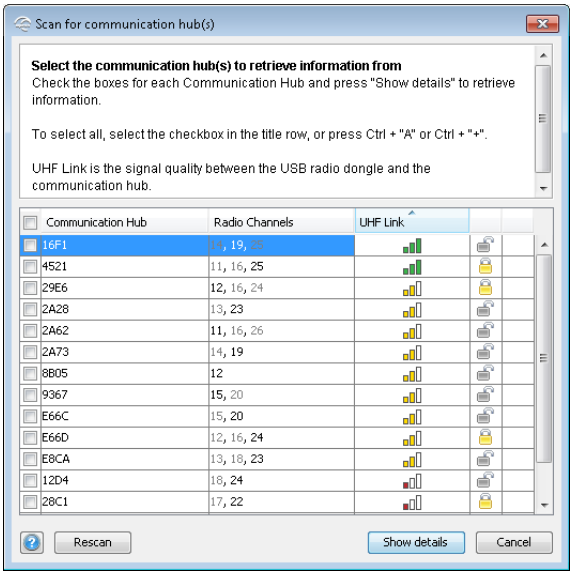
The first step is to create a new installation, which is a password protected set of settings you need to communicate with a lock. The installation is linked to the encryption file that is needed in order for the communication to work.

Content-Reference to:

Step 2 - Scanning for Communication hubs

Follow these steps to scan for doors:

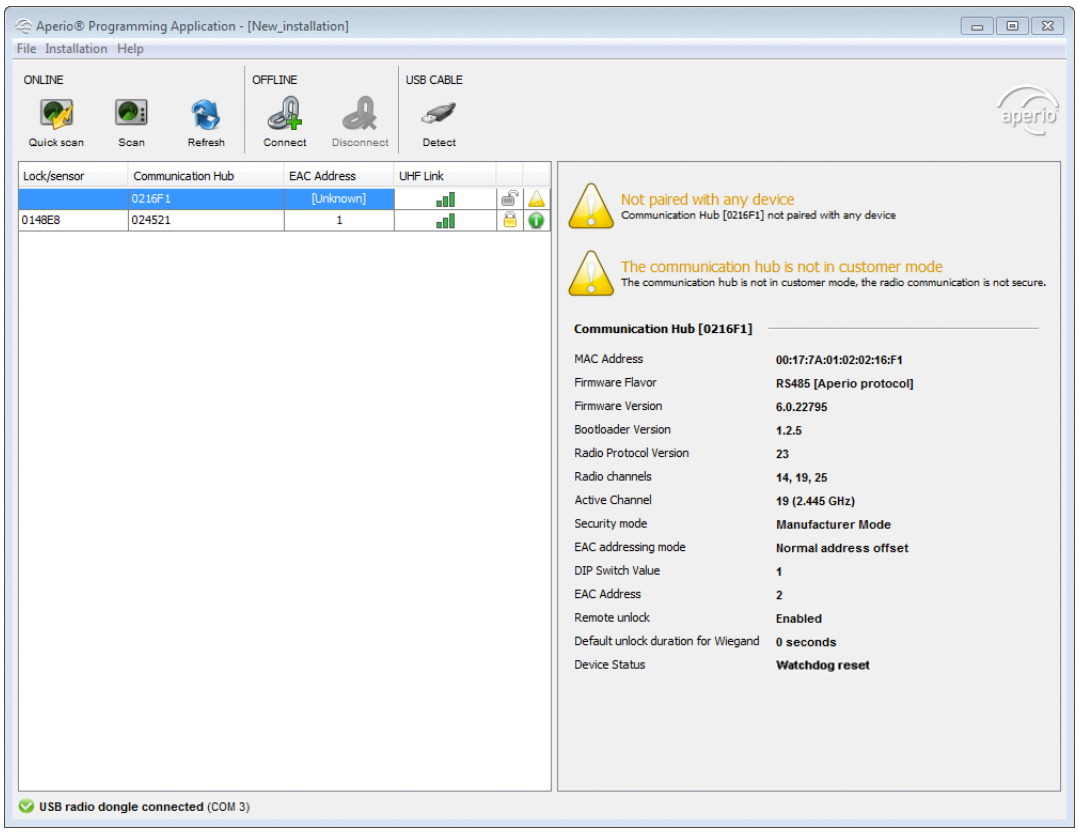
1. Select Scan-Quick scan to find communication hubs. (Or open a earlier created installation)
   Result: All communication hubs within reach of the USB Radio dongle of your computer are displayed in the scan result table.



2. Locate a communication hub by the last four characters of the communication hub MAC address (ex. 01CF) in the scan result table. The same characters should be on a label on the cover of the

communication hub. Click Rescan if the communication hubs that you want to configure are not shown in the list.

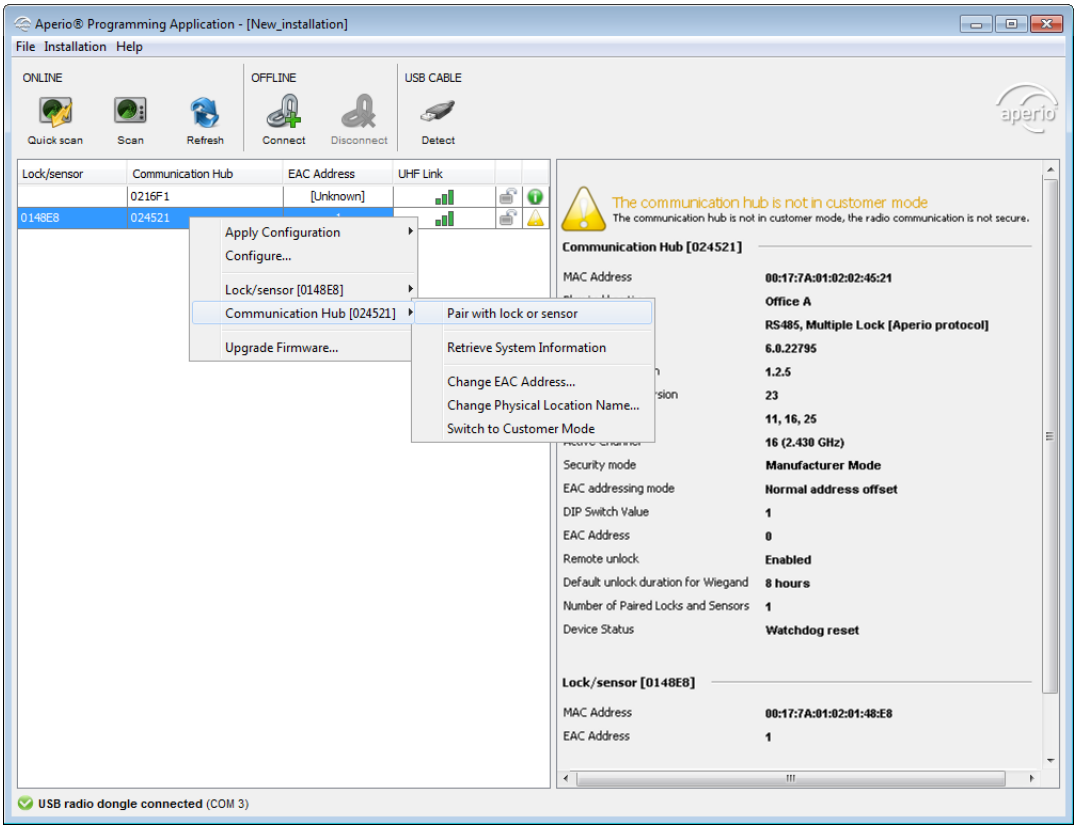
3. Select the communication hub(s) that you want to include in your installation. Click Show details to view detailed information in the installation view.



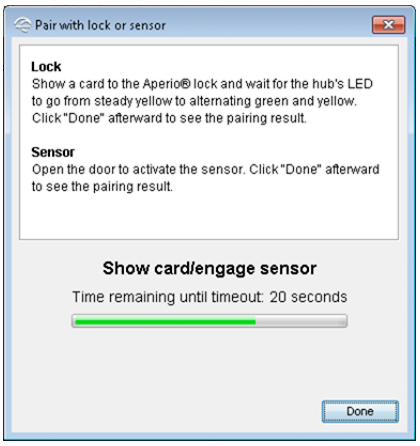
Step 3 - Pairing locks/sensors with communication hub

AH30 version of the communication hub can be paired with a combination of up to 8 locks/sensors. AH40 can manage 16 locks/sensors. AH15/AH20 can manage one lock/sensor.

1. Right-click and select Communication hub Pair with lock or sensor .

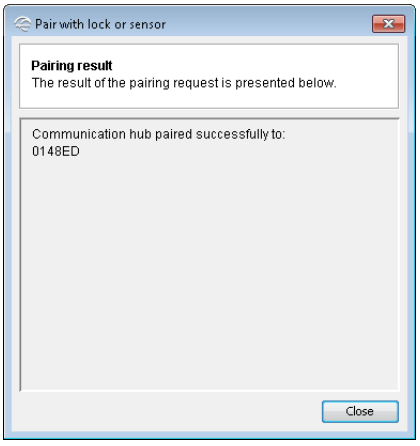


2. The pairing process starts. Hold the credential at the lock, or engage the magnet for the sensor.



Result: The communication hub pairs with the lock and indicates with one green flash.

3. When the lock has flashed green you can click Done to see the pairing result. (The communication hub LED is constant yellow and indicates successful pairing with a green flash.)
Result: The result is displayed.



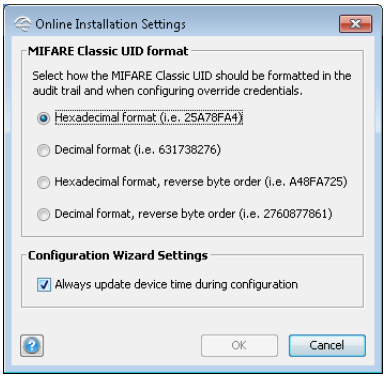
4. Repeat the pairing for all communication hubs and locks/sensors within reach of the USB Radio Dongle.

Step 4 - Configuring locks and communication hubs

This procedure describes a configuration example of locks and communication hubs using: MIFARE Classic UID user credential, override credential card (MIFARE Classic UID), secure communication and DIP Switch addressing mode.

For other settings and addressing modes, refer to Aperio programming application manual, ref [1].

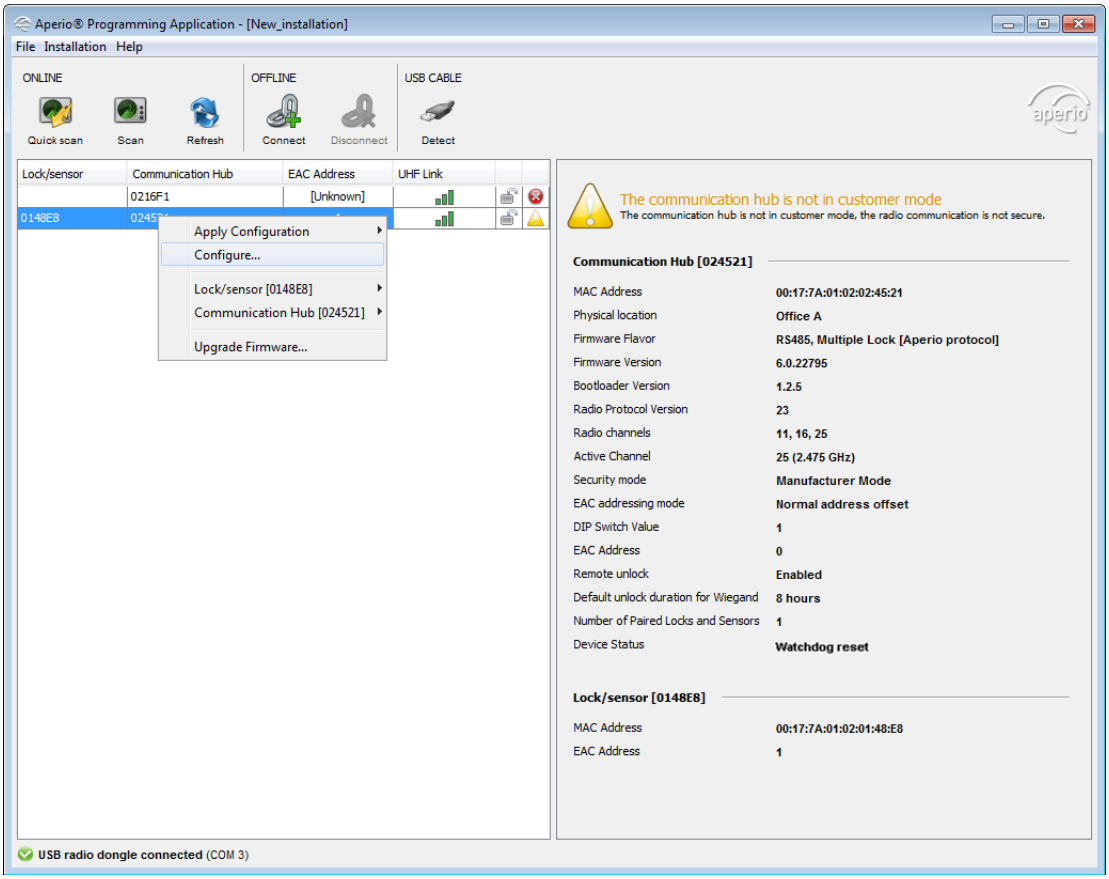
- Before configuration, check that Update device time during door configuration is activated. In the menu bar select Installation Online Settings...



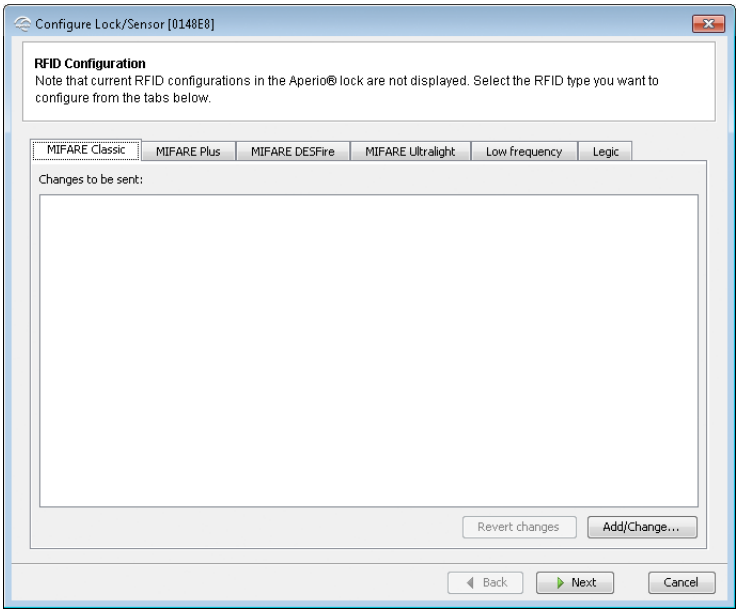
Follow the steps below to perform a default configuration of locks/sensors and communication hubs:

The changes you make during the update of the door configuration are not carried out until you perform the device update on the last page in the wizard.

1. Select a lock in the scan result table, right-click and select Configure... (or Lock/sensor Configure if several locks are paired).

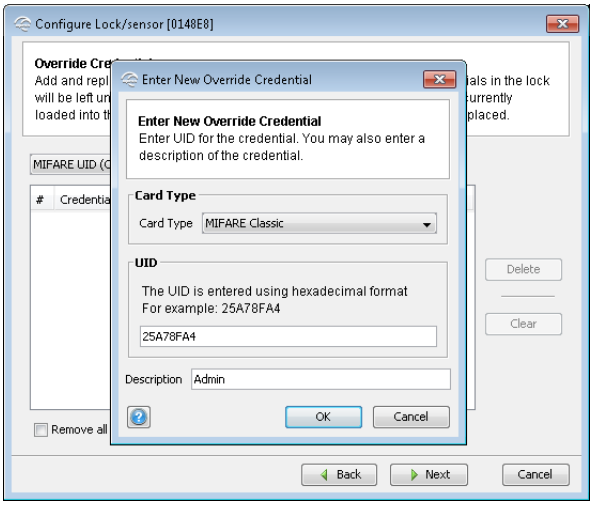


2. On the RFID Configuration page, click Next without any changes.

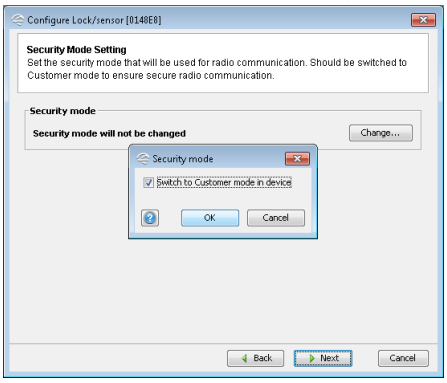


iClass RFID format is also supported by the Aperio programming application. However, no settings are necessary.

3. If advanced mode is activated (File Preferences... where the option Show advanced settings is selected), the Keypad configuration page will appear. Leave without changes by clicking Next.
4. On the Override Credential page it is recommended to add a credential. Select the credential type in the drop down list and click Add and enter credential information (in this case MIFARE Classic UID). This credential can for example be used to gain access through all doors during installation and when the EAC is offline.

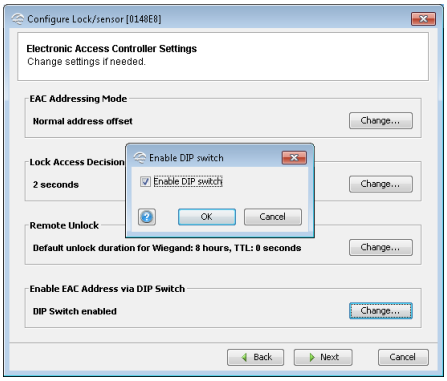


5. Click OK followed by Next in the Wizard main window.
6. On the Security mode Setting page, click Change to switch to Customer mode in the lock.

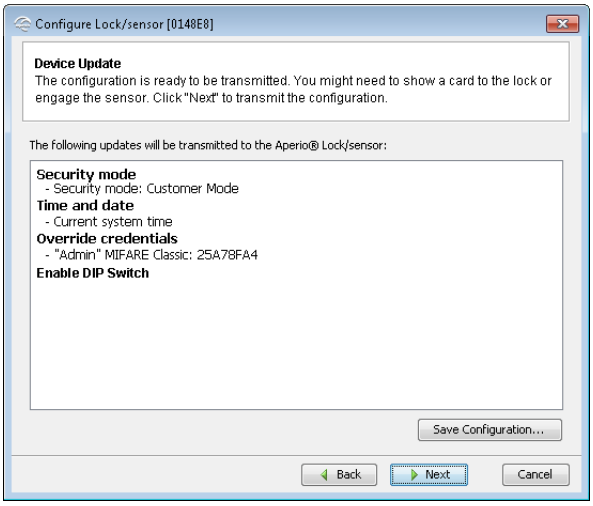


If the installation and first configuration is not performed correctly by setting all locks in customer mode, the radio communication will not be secure and the locks will therefore be vulnerable to intrusion attempts.

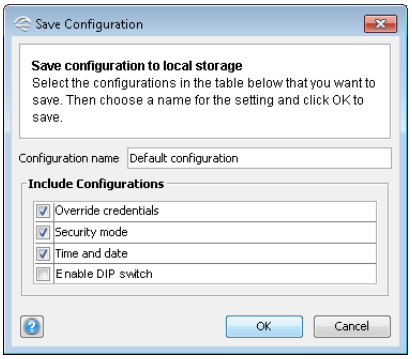
7. Select Switch to customer mode in device, click OK and then Next in the wizard main window.
8. On the Electronic Access Controller Setting page, in the Enable EAC Address via Dip Switch field, click Change and select Enable Dip Switch.



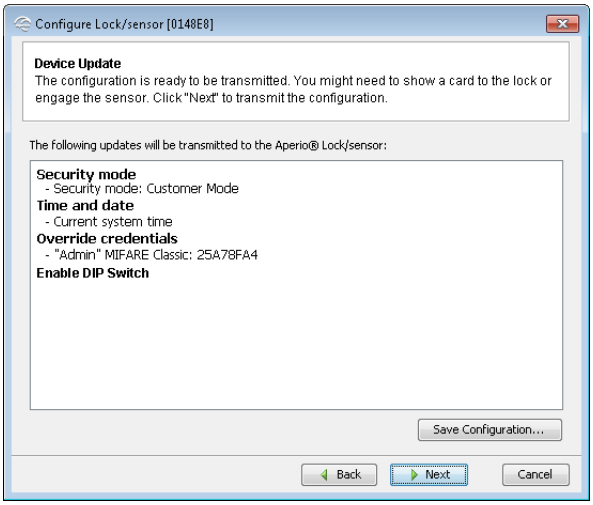
9. Click OK followed by Next in the wizard main window.
10. If advanced mode is activated the Advanced Settings and Advanced Lock/Sensor Settings will appear. Leave both pages without changes by clicking Next.
11. On the Device Update page, check that the summary of the configuration tasks that will be sent to the lock is correct.



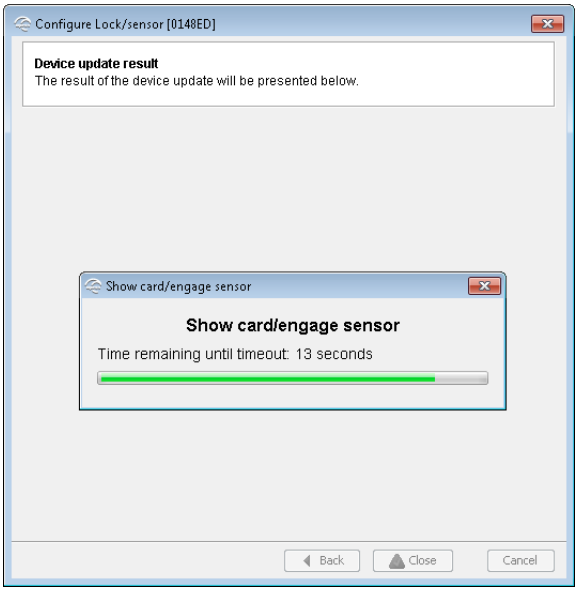
12. Click Save configuration... to facilitate further lock configurations (for other hubs/locks) using the same communication hub. Enter a configuration name and click OK.



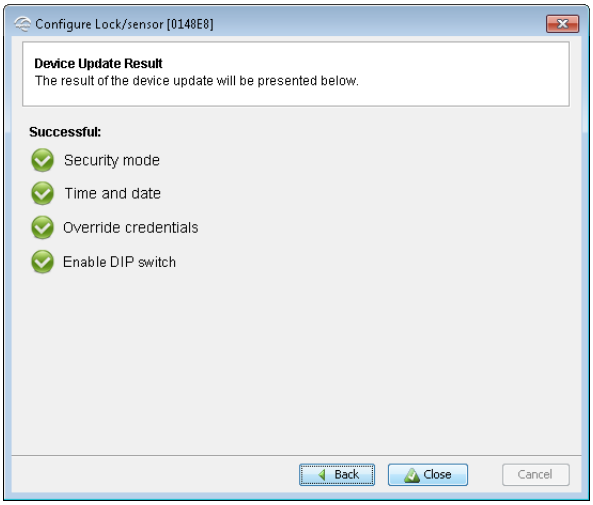
13. Click Next in the wizard main window to download the configuration to the lock.



14. If necessary hold the credential in front of the lock to activate the radio.



15. After successful update, click Close.

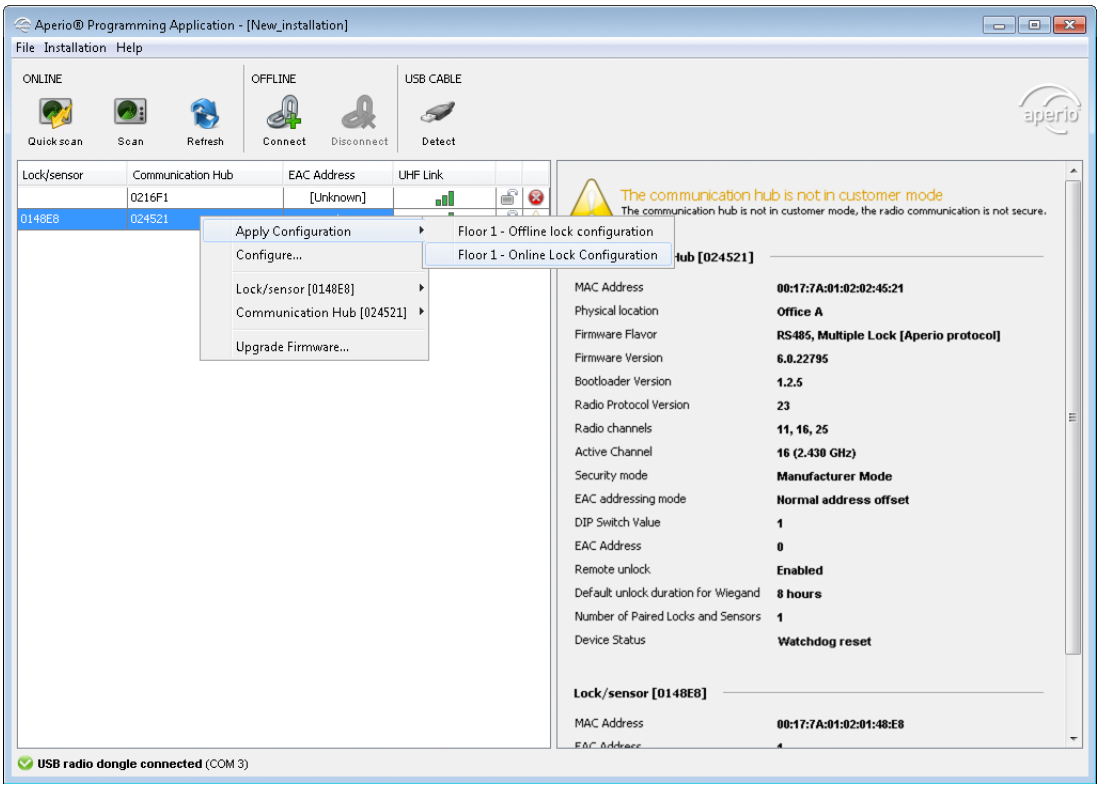


Using the wizard for a communication hub with only one lock paired, customer mode is set both for the lock and communication hub. For communication hubs with several locks paired a security conflict will appear.

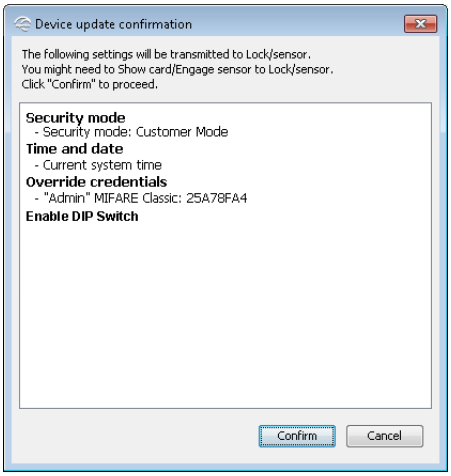
Step 5 - Apply saved configuration on several locks

If you have more than one lock that will use the same configuration you can apply the previously saved configuration on any lock in your installation.

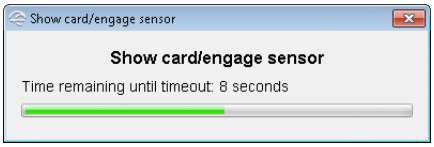
1. In the Installation view, right-click the desired lock/sensor and select Apply configuration and an earlier stored configuration.



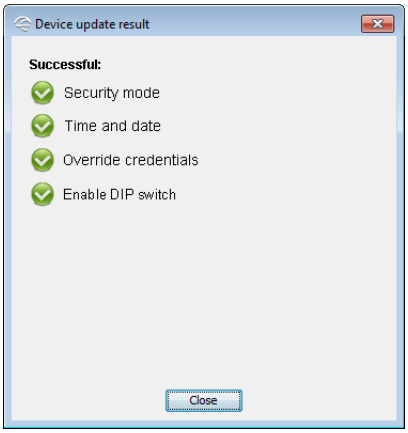
2. Confirm the update by clicking Confirm.



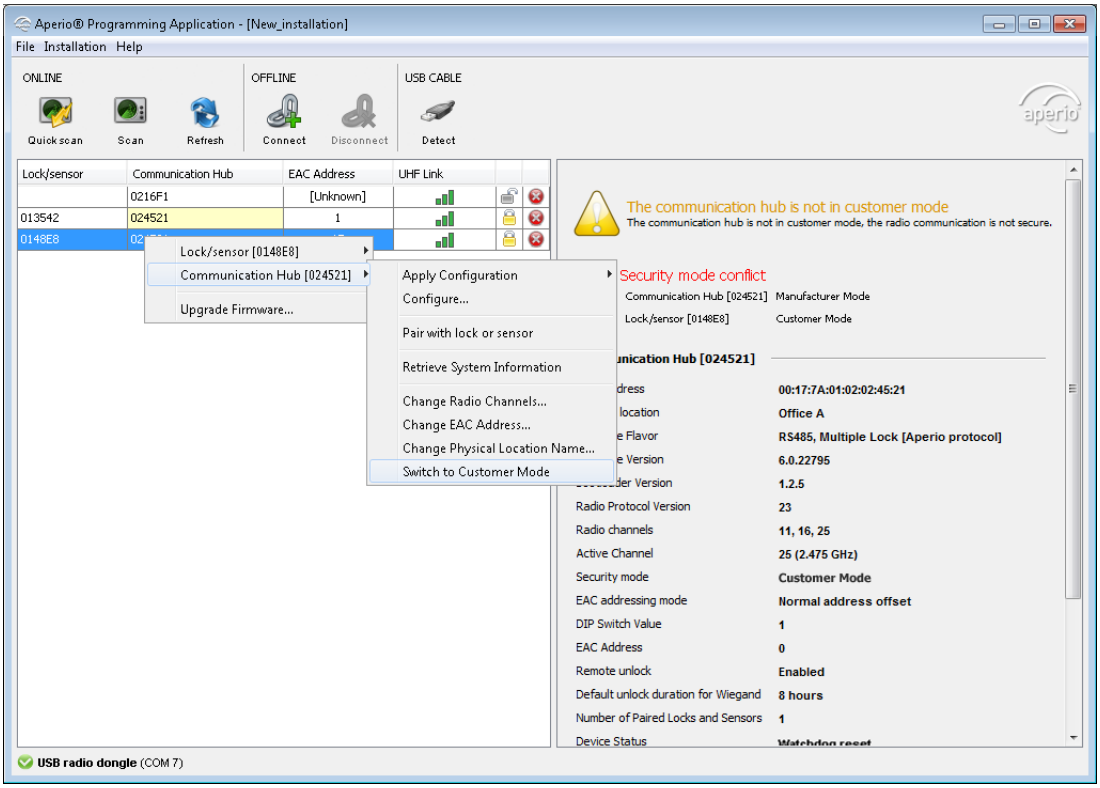
3. Hold the credential in front of the lock/sensor to download the configuration.



4. After successful update, click Close.



5. Repeat the configuration for all locks paired to the communication hub.
6. Finally activate customer mode for the communication hub on the right-click menu, Communication Hub Switch to customer Mode .

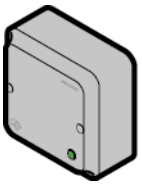


Step 6 - Testing after configuration

Follow these steps to test that the installation and first configuration of each communication hub and lock/sensor has been performed correctly and that the hardware is working:

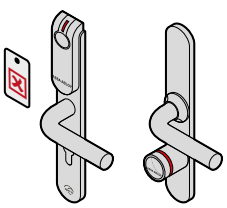
This step requires that the EAC is connected and the communication hub is online.

1. Check that the communication hub LED has a steady green light. This indicates that the installation and configuration have been performed correctly



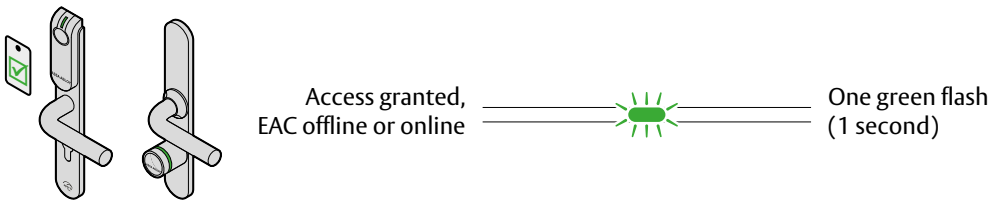
Online — Green

2. Hold a credential that is invalid in the EAC system in front of the lock. Result: Access is denied and the lock LED flashes red once.



Access denied, EAC online — One red flash (1 second)

3. Hold a credential that is valid in the EAC system in front of the lock. Result: Access is granted and the lock LED flashes green once.

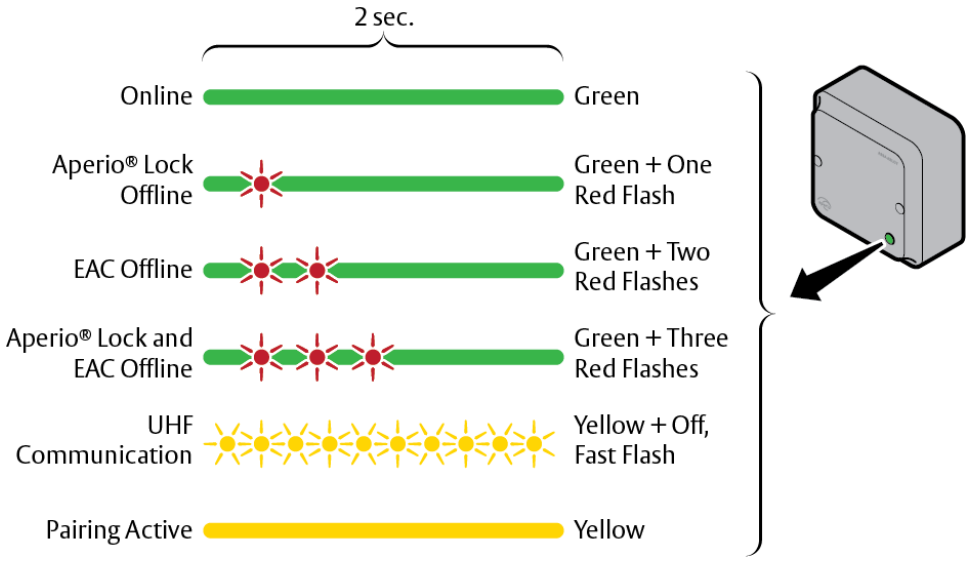


See *LED Indications* on page 19 for details on the different LED indications.

4 LED Indications

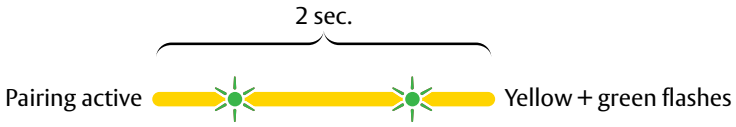
Communication Hub

The communication hub has a single LED. It supports an optical scheme with red, green and yellow. The indication scheme is described by the two figures below:



Figur 2. Communication hub normal operation LED indication

Some special LED indication schemes are used during lock maintenance actions:



Figur 3. Communication hub maintenance LED indication

Communication Hub Ethernet

The LED on the back of the AH40 communication hub indicates both the status of the Ethernet link level and ethernet communication:

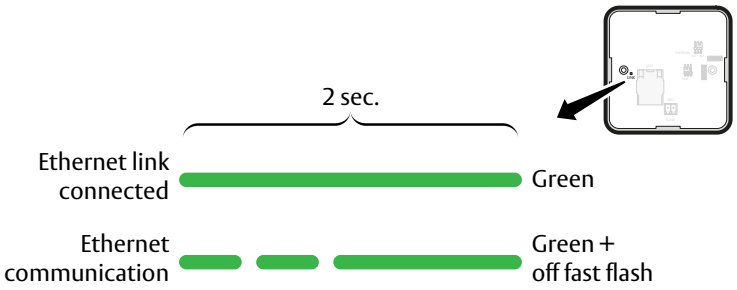


Figure 4: Ethernet LED indication

Lock, normal operation

The lock has three LEDs. They support an optical scheme with red, yellow and green. The indication scheme is described by the figures below:

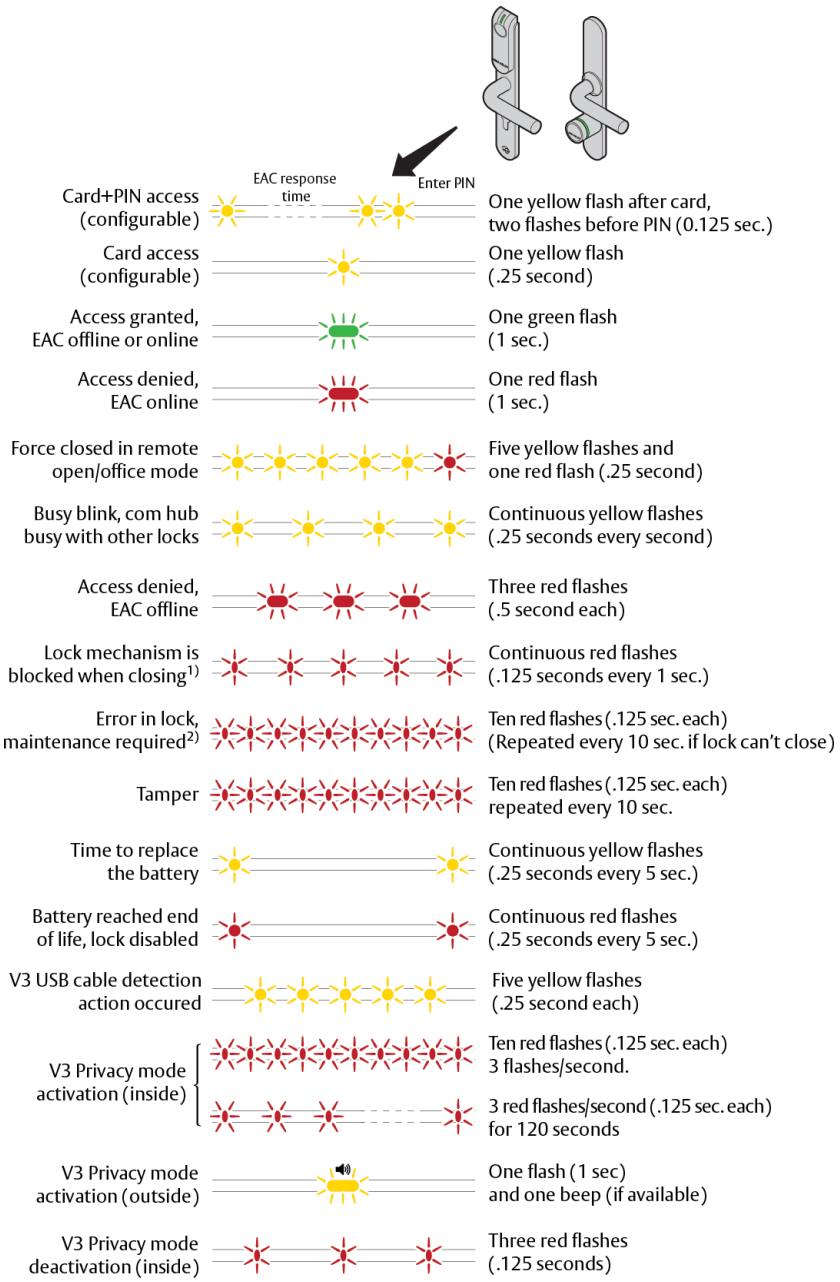


Figure 5: Lock normal operation LED indication

1) When the lock mechanism is blocked (lock jammed) the knob must be turned to release it (Product dependent).

2) The "Error in lock" indication is also shown instead of the POST flashes if the battery is not accepted as new after a power-on-reset.

Lock, maintenance

Some special LED indication schemes are used during lock maintenance actions:

Lock Self Test LED Indication (V2 locks)

After replacing the battery or a power up, a Power on Self Test (POST) is performed.

If the battery is not accepted as new after a power on reset, no POST is performed, instead 10 quick red flashes is used to indicate "Error in lock".

The result is indicated using a series of red and green LED flashes as is described by the figure below:

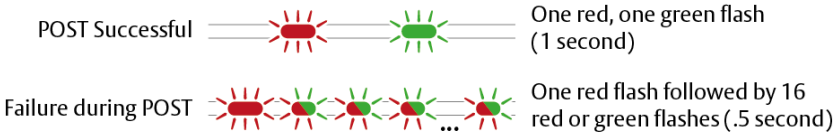


Figure 6: Lock POST LED indication

The first flash is always red. If the POST fails, the color of the 16 trailing flashes indicate the status of each individual test as described by the following table:

Blink	Meaning if red	Code in event log
1	POST initiation flash, always red	-
2	Main board firmware corrupt	0x0001
3	Override list corrupt	0x0002
4	Production data corrupt	0x0004
5	Security data corrupt	0x0008
6	Configuration data corrupt	0x0010
7	Load Circuit Error	0x0020
8	Configuration data corrupt 2	0x0040
9	Secure Area Encryption Key error	0x0080
10	Secure Area Motor error	0x0100
11	Secure area communication error	0x0200
12	Secure area memory corrupt	0x0400
13	Secure area sensor or motor error	0x0800
14	Radio modem communication error	0x1000
15	Radio modem memory corrupt	0x2000
16	Radio modem configuration error	0x4000
17	Radio modem RF circuit error	0x8000

Lock Self Test LED Indication (V3 locks)

After replacing the battery or a power up, a Power on Self Test (POST) is performed.

If the battery is not accepted as new after a power on reset, no POST is performed, instead 10 quick red flashes is used to indicate "Error in lock".

Battery not fully charged, energy counter not reset, no Power on self-test done.  Ten red flashes (.125 sec. each)

The result is indicated using a series of red and green LED flashes as is described by the figure below:

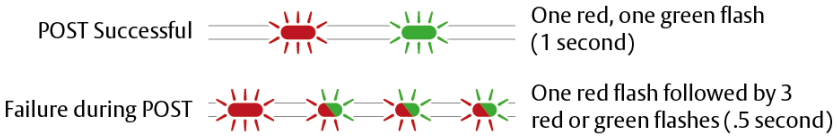


Figure 7: Lock POST LED indication

The first flash is always red. If the POST fail, the color of the 3 trailing flashes indicate the status of each individual test as described by the following table:

Blink	Indication group	Description	Purpose
1	POST initiation flash	Always red	-
2	Fatal error	Tests core functionality. MCUs, memory's and internal communication, etc.	This is a problem that can not be solved on the field.
3	Electrical interconnection error	Tests communication between the different parts in the system, i.e. different boards connected with a wire. Will be different test cases depending on the specific partitioning of a product.	Check that all physical parts are connected together in the right way. If the test fails it is likely a cable/connection problem between the modules. This is a problem that could be solved in the field.
4	Mechanical error	Test related to moving parts of the lock.	If the test fails it is likely due to a mechanical problem. This is a problem that could be solved in the field.

5 Troubleshooting

The tables below shows possible problems when using the Aperio technology, and how to solve them:

During Door Installation and Update

Problem indication	Cause	Action
Not possible to pair communication hub and lock/sensor	· You are using a credential configured as an override credential. · The lock/sensor and the hub are on different radio channels.	· Use a credential that is not on the override credentials list. · Check the radio channel settings for the lock/sensor and the hub so that they match.
Not possible to use override credentials	No default override credentials are configured for the installation.	Add the credentials one by one in the lock configuration wizard.
The device update fails	· You have not shown the credential to the lock within 30 seconds. · The lock and hub might be in different security modes, then communication problems can easily occur.	· Perform device update again and show the credential to the lock within 30 seconds. · Change security mode in the hub and perform device update again. .

During Scanning

Problem indication	Cause	Action
None or only some of the communication hubs are found when scanning	· All channels are busy or too many communication hubs are using the same channel.. · The communication hub(s) are not working. · The communication hub(s) are out of range. · The communication hub(s) are not powered.	· Repeat the scanning process by selecting Scan /Scan all · Restart the hub. · Temporary reduce the number of powered up Hubs within radio range during configuration. (After configuration, make sure that this communication hub have stable radio communication with paired locks/ sensors.)
Communication error is displayed and no configuration can be done to the communication hub.	· The communication hub belongs to another installation and has another encryption key.	1. Switch installation or create a new installation with the correct encryption key. 2. Repeat the scanning and pairing process.
Unstable communication between communication hub and lock/sensor even though the MAC address is displayed at scan.	· A probable cause is bad radio conditions or limited radio range.	· Try moving the USB radio closer to the communication hub. Either by moving the laptop or by using an A-A USB extension cable to distance the USB radio from the PC.

The Aperio Communication hubs are by default configured to select the best channel out of three possible. If the selected channel is disturbed, a new channel is selected automatically. Communication hubs in an Aperio system normally distribute themselves on different channels but a synchronized power up of all hubs may cause them to initially choose the same channel.

Note that this problem does not affect performance of already installed and paired lock/ cylinders/sensors and communication hubs, only the Aperio programming application scan functionality is affected.

During Configuration

Problem indication	Cause	Action
The program application reports an update failure. The device does not support the desired configuration.	· The firmware on the device is outdated. · You are trying to configure something that the device does not support	· Check the current firmware on the device and perform an upgrade if needed. Also check the intended new configuration .
The AH40 communication hub LED is flashing red twice = no connection between the EAC system and the communication hub	· The hub is not properly connected to the IP network. · The hub network parameters are not correctly configured. · The ACU address, port or TLS settings are not properly configured in the communication hub. · The ACU is not properly configured. · The certificate used by the ACU is not supported.	· Check that the Ethernet LED is green. If not, check Ethernet cable and network equipment. · Configure the hub network parameters. · Configure the hub EAC connection. · Make sure that the communication settings in the EAC matches the hub EAC connection settings. · Make sure that a valid certificate type is used.

During Normal Operation

Problem indication	Cause	Action
The communication hub LED is flashing red once = no connection between the lock/sensor and the communication hub	· The lock/sensor and communication hub are not paired. · The lock/sensor and the communication hub have different channel masks. · The battery of the lock/sensor has run out. · The status message intervals differ between the hub and the lock	· Repeat the scanning process by selecting Scan /Scan all. · Pair the lock/sensor and communication hub in the Configure lock wizard of the Aperio programming application. · Change the radio channel. See the Aperio programming application manual, ref [2]. · Replace the battery of the lock/sensor. See the Aperio programming application manual, ref .[1] · Make sure that the lock has the same or a shorter status message interval than the hub
The communication hub LED is flashing red twice = no connection between the EAC system and the communication hub	· The EAC address is not properly configured in the communication hub. · The EAC system is not properly configured.	Configure the EAC address. Refer to the Aperio mechanical installation manual.
Unstable radio communication between lock/sensor and communication hub	· Poor radio link quality. · The lock/sensor and the communication hub have different channel masks.	· Change the radio channel. See the Aperio programming application manual, ref .[1]
The V3 lock LED is flashing red.	· The battery has run out.	· Connect the USB cable to provide emergency power, and show credential to open the door. · Replace the battery. See lock installation instructions.

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