

# Aperio® Offline Quick Installation Guide

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# 1 Introduction

## Purpose

The main purpose of this manual is to provide necessary information for a quick installation of Aperio Offline 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 offline system.

For a complete description of all functionality and possible settings in an Aperio Offline installation, refer to the Aperio Programming Application Manual, ref [1].

This manual is applicable to version 2.6.6 of the Aperio Programming Application.

## Applicable Products

This manual can be used for all Aperio Offline locks.

## Product availability

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

## Aperio support in the EAC system

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

## Abbreviations and Definitions

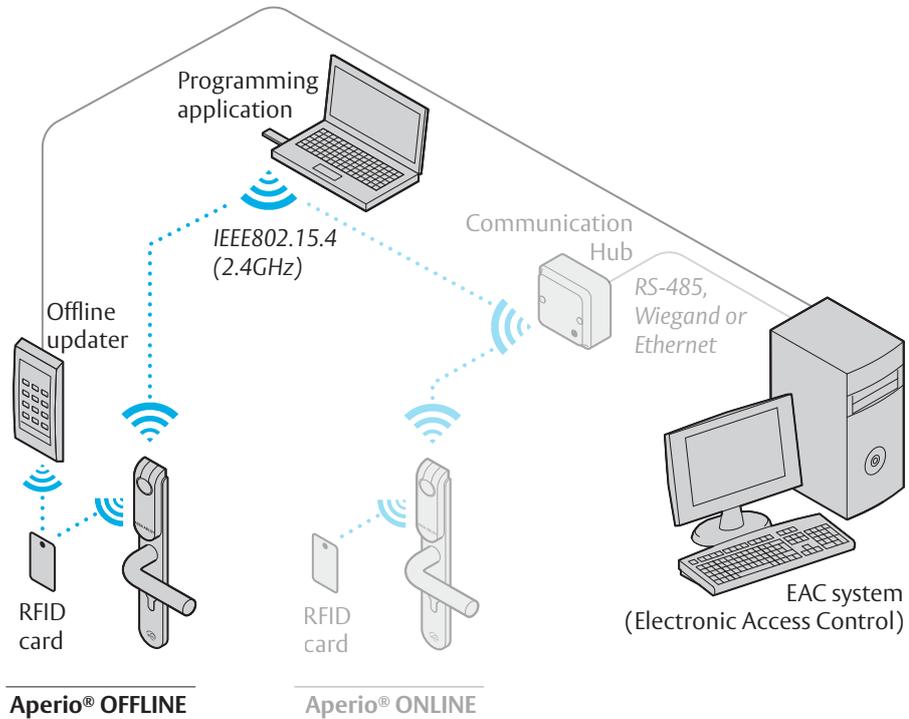
Abbreviation	Definition
<b>EAC</b>	Electronic Access Control. The system controlling the access rules which is then conveyed to user cards through the Offline Updater.
<b>RFID</b>	Radio Frequency Identification. The credential technology used.

## References

[1]	ST-001321-Aperio Programming Application Manual
[2]	Aperio Offline System Description

## 2 System Overview

Figure 1.  
Aperio technology  
overview



### The Aperio system

The Aperio system is used in the following way: The user holds an RFID card in front of an offline lock. Access decision is taken locally by lock. Result of decision depends on access rights stored on the card and also on lock configuration received from the EAC through offline updaters with setup- or user cards.

Aperio online locks communicate to the EAC through communication hubs, for more information refer to the Programming Application manual, ref [1].

### The Aperio Programming Application

The 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 USB radio dongle enables the programming application to connect to an offline lock.

### Regulatory and security information

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

## 3 Quick Installation of Aperio offline locks

After the hardware installation of the locks, the Aperio Programming application is used to configure the locks for use in an access control system. Optionally a lock setup card might be used as a first step to make a fast but limited configuration before the configuration with the Aperio Programming application is done.

This chapter will guide installation personnel to configure Aperio Offline locks using the Programming Application, with default settings for an offline access control system: RFID user card (setting of RFID Key and configuration), scheduled open and secure communication. Perform all instruction steps in this chapter to complete an installation. All advanced settings are described in the Aperio Programming Application manual, ref [1].

### Information of encryption key

To obtain secure communication between the Programming Application and locks 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 any copy should be erased from the hard drive or e-mail. It is however recommended that a copy of the encryption key is stored in safe.

The encryption key file is delivered from your local ASSA ABLOY company and should be requested on a customer/site basis.



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

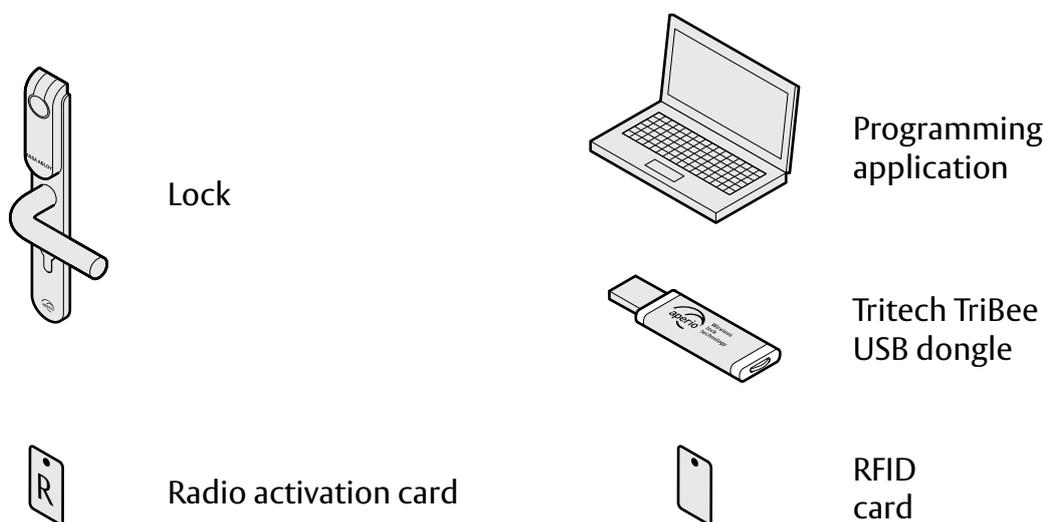
It is absolutely necessary to use the customer encryption key by setting all locks in Customer mode to ensure a secure and encrypted communication with the lock.

## Checklist for quick installation of offline locks

To communicate with, and configure locks you need the following:

- Aperio Programming application
- USB Radio dongle
- Radio activation card
- RFID (MIFARE Classic/DESFire) user card for testing
- Encryption key (from your local ASSA ABLOY company)

Figure 2.  
Equipment needed



A complete quick installation includes the following steps:

- **Preparation:** Installation of software and powering the Aperio hardware.
- **Step 1:** creating a new installation
- **Step 2:** connecting to an offline lock
- **Step 3:** configuring locks Wizard: RFID configuration, scheduled open, setting security mode
- **Step 4:** adding lock identification data: lock id and lock group
- **Step 5:** apply saved configuration to several locks
- **Step 6:** testing after configuration

For some configurations a number of additional advanced settings can be necessary, such as advanced lock settings and configuration of the radio communication.

These and other settings are described in the Aperio Programming Application manual, ref [1].



The quick installation process does NOT require that the Aperio hardware is configured in the EAC, nor mechanically installed.

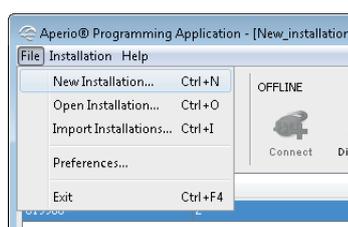
## Preparation before quick installation

- Install the Programming Application on your laptop. Refer to ref [1], Aperio Programming Application manual for instructions. The software and encryption key file is delivered from your local ASSA ABLOY company. (The encryption key file is provided via encrypted e-mail or on a USB memory stick.)
- Make sure that batteries are installed in the lock.

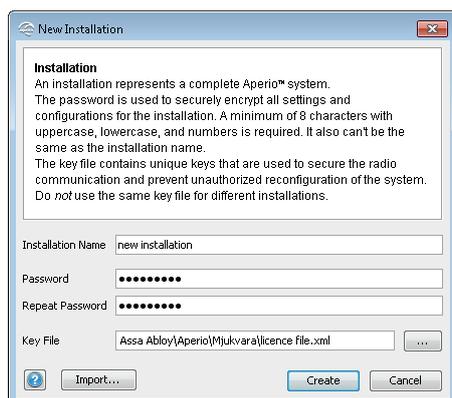
### Step 1 - Creating a new installation

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.

- 1) Insert the USB Radio dongle and start the Aperio Programming Application.
- 2) Select *File–New Installation...* in the Aperio Programming Application.



- 3) Enter a name for the installation, a password matching the requirements and finally click the button in the *Key file* field to add the Encryption key.



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

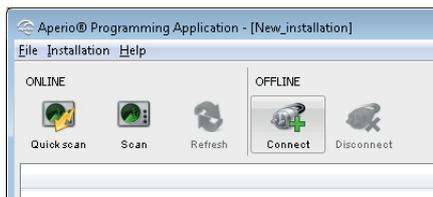
It is absolutely necessary to use the customer encryption key by setting all communication hubs and locks/sensors in Customer mode to ensure a secure and encrypted communication with the lock/sensor.

- 4) Select the key file and click *Select*. (The xml-file (key file) containing the encryption keys.)
- 5) Click *Create*.

## Step 2 - Connecting to an offline lock

Follow these steps to connect to an offline lock:

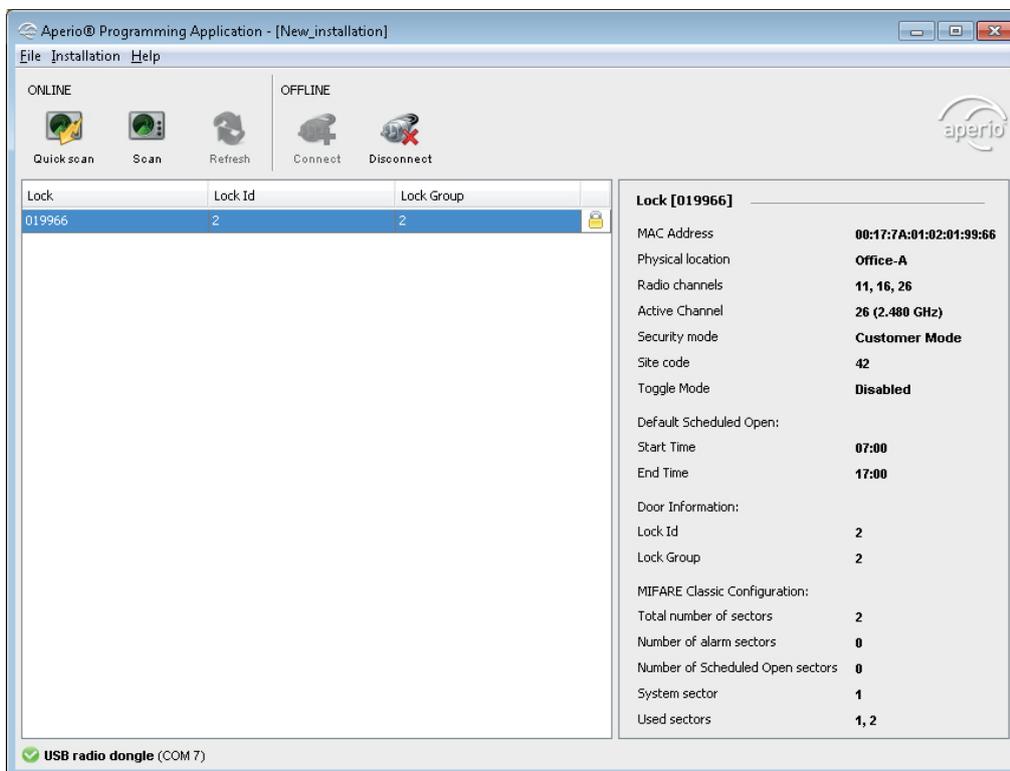
- 1) Click *Connect* in the Offline section of the menu bar.



- 2) Hold the radio card at the lock (or remove and reinsert battery).



**Result:** Detailed information is downloaded and the Programming application connects to the lock.



### Step 3 - Configuring locks Wizard

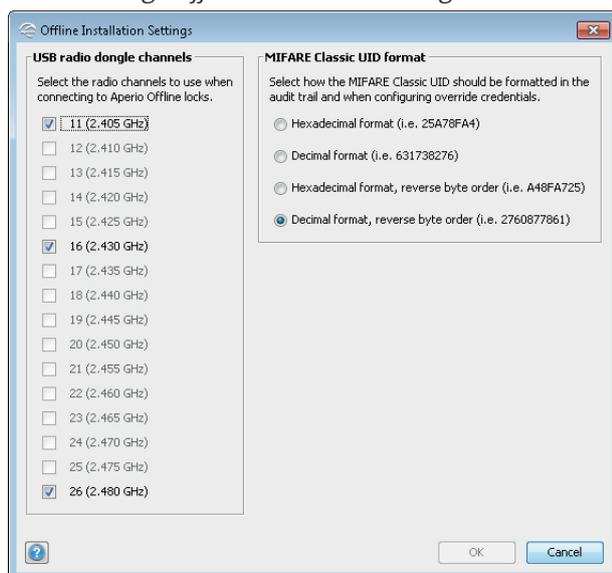
This instruction describes a default configuration of a lock and includes the following settings:

- RFID user card (setting of RFID Key and configuration) - *RFID configuration* dialog.
- Site code and time zone - *General settings* dialog.
- Scheduled open - *Configure Schedule open settings & schedules* dialog
- Secure communication - *Security Mode Settings* dialog.

 Everything is skipped (without changes) in this workflow by clicking *Next* except *Time zone-Daylight saving time data* and *Time and date (UTC)*

For other settings other than mentioned here, refer to the Aperio Programming Application manual, ref [1].

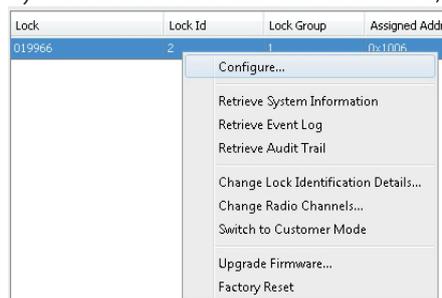
- Before configuration, check that default radio channels are used (11, 16 and 26). On the menu bar, click *Settings-Offline Installation settings* to enter this dialog.



Follow the steps below to perform a default configuration of locks:

 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.

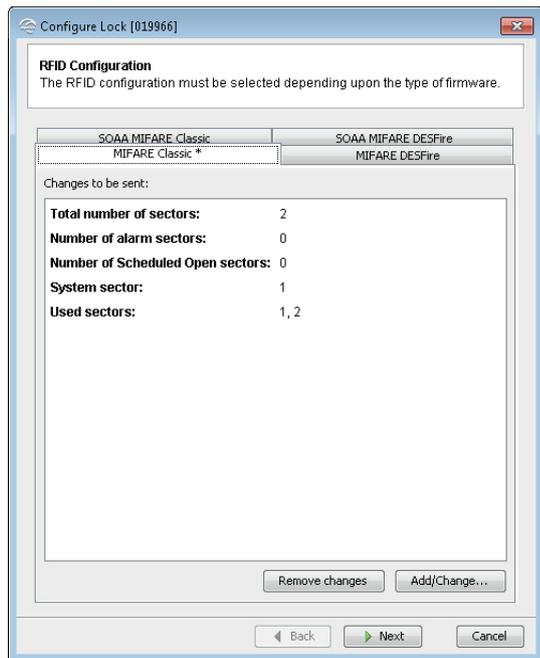
1) Select the lock in the scan result table, right-click and select *Configure...*



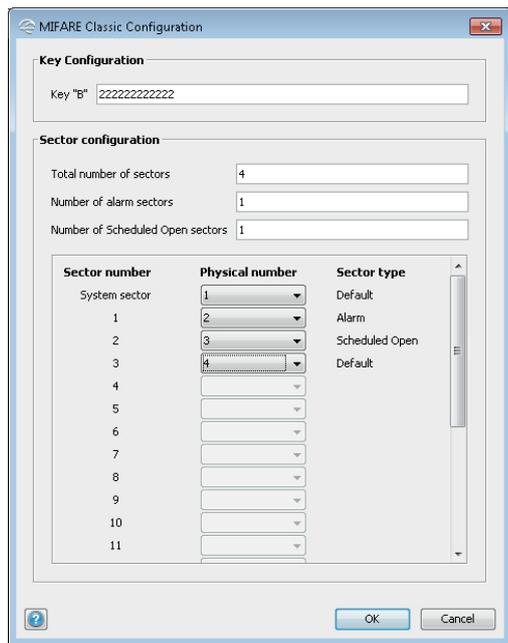
2) Click **Next** after completion of each dialog in the Configuration Wizard.

### RFID configuration

Select the tab depending upon the lock type. Only one type of configuration can be sent to the Lock. Click **Add/Change...** to enter the settings for each card format.



### MIFARE Classic configuration



MIFARE Classic configurations is a part of the lock setup information that describes the sector layout of access cards used on the site. This configuration screen allows the user to specify a MIFARE 'B' key and configure the MIFARE-sector usage (alarm sectors and schedule open sectors).



If MIFARE Classic RFID configuration is done wrong, the lock may become inoperable.

#### Key configuration:

- **MIFARE Key B:** Enter the 6 byte long hexadecimal MIFARE Classic Key B that applies for the user cards in your installation. Example: AABBC112233.

#### Sector configuration:

- **Total number of sectors:** Enter the total number of sectors to be used on the card.
- **Number of alarm sectors:** Enter the number of alarm sectors reserved on access cards used on the particular site.
- **Number of scheduled open sectors:** Enter number of scheduled open sectors reserved on access cards used on the particular site.

After adding the number of sector used, click the *Physical number* drop down menu to select/change a physical number for each sector.

Physical numbers not used are free to be used by other applications.

#### System limitation



The sector configuration settings affect the number of lock groups that can be used (see section "Step 4 - Adding Lock Identification Details" on page 17).

Plan your sector configuration with the following limitations in mind:

	MIFARE Classic 1K	MIFARE Classic 4K
Max lock units	65536	65536
Max lock groups	1344	5088
Max alarms	84	420

Having max lock groups means no alarms and vice versa since they share the same storage space on the credential.

It is up to the system owner to ensure that the appropriate number of sectors needed to represent all doors are reserved on all user credentials in the system.

It is recommended to add extra sectors not reserved for alarms/schedules, in order to obtain space for lock group addressing. Each free sector allows 96 lock groups (MIFARE Classic 1K card).

## DESFire Configurations

- **Application ID:** Identification number for the Programming application on the MIFARE DESFire cards used in the system. A MIFARE DESFire card can have up to 32 applications. Application ID:s range from 0 to 16777215.
- **File Data Protection Level:** Security level for the communication between lock and card. Choose one of the two options (Data Authenticity by MAC, Full Encryption) depending on how the cards used in the system are configured.
- **Number of alarm slots:** Numeric value representing number of alarm slots on access cards used in the system.
- **Number of scheduled open slots:** Numeric value representing number of scheduled open slots on access cards used in the system.
- **Number of lock groups:** Numeric value representing maximum number of allowed lock groups on access cards used in the system.
- **Key Type:** Choose one of the three options (2K3DES, 3K3DES, AES-128) depending on the cryptographic algorithm used to read/write data from/to the card. Type the key value in hexadecimal. 2K3DES and AES-128 are 16 byte keys. 3K3DES is a 24 byte key.
- **Key:** MIFARE DESFire key that applies for the user cards in your installation in HEX format. Example:00112233445566778899aabbccddeeff
- **Key Number:** Each application can use up to 14 keys. Key 0 is always the Application's Master Key. Type here which key number that is used for the Programming application on the MIFARE DESFire cards. Key numbers range from 0 to 13.

### System limitation

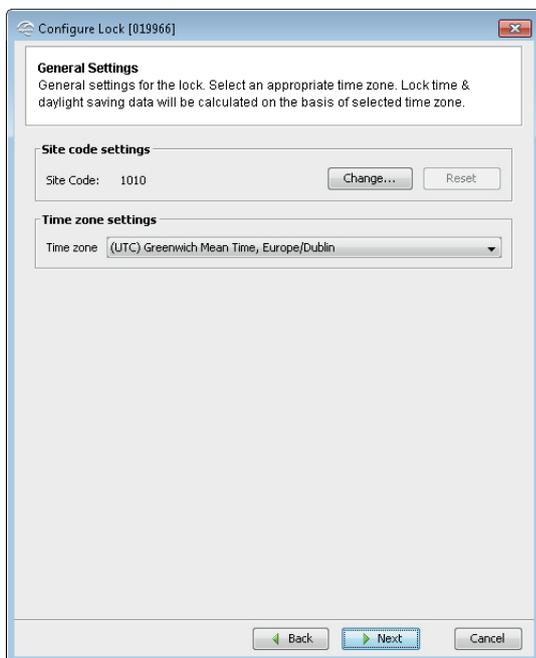
It is up to the system owner to assure that there is space enough on the access cards used for the actual system configuration. Possible configurations are dependent on the size of the MIFARE DESFire EV1 cards used in the system and if they are used for other applications than Aperio Offline.

Plan your sector configuration with the following limitations in mind:

	MIFARE DESFire 2K	MIFARE DESFire 4K	MIFARE DESFire 8K
Max lock groups	4000	8096	16288
Max alarm slots	250	506	1018
Max scheduled open slots	500	1012	2036

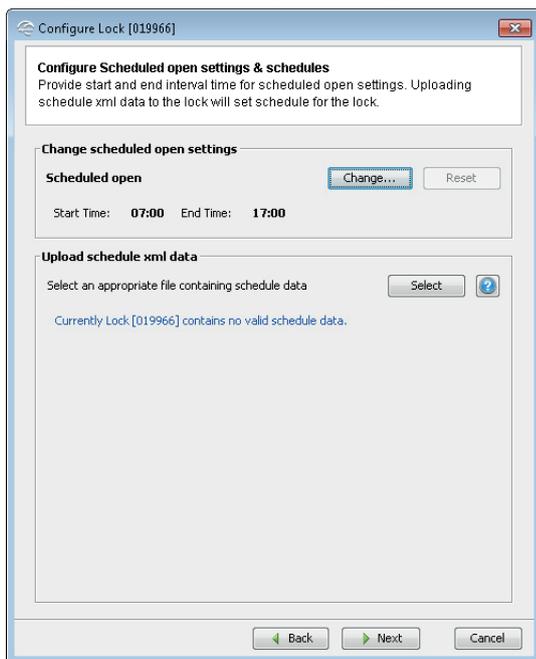
Having max lock groups means no alarms and vice versa since they share the same storage space on the credential.

## General settings

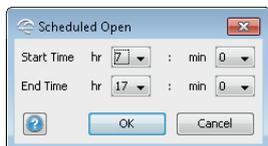


- **Site code settings:** Each site has a unique code that all credentials within the system share. It is a mandatory field on the screen where the user is allowed to enter up to 4 bytes (9-10 digits) .
- **Time zone settings:** Select the time zone where the access system is located.

## Configure Scheduled Open settings & schedules



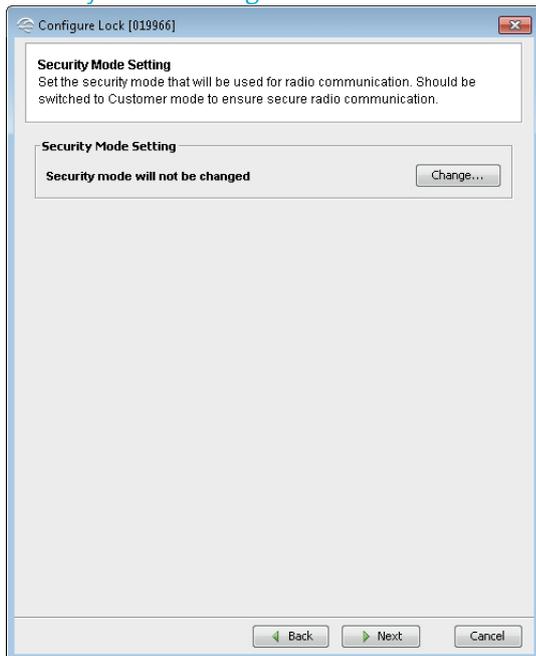
### Change Scheduled open settings



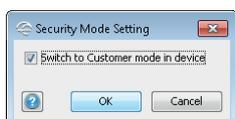
- **Start time:** Start time for when the lock can be activated for scheduled open (For when access cards with scheduled open functionality can set the lock to be open).
- **End time:** End time for when the lock responds to scheduled open attempts. It is also the time when the lock goes back to locked state after being scheduled open unlocked.

The schedule open function has several options, please refer to the Aperio Offline System Description manual for more details.

### Security Mode Settings



- 1) Click *Change* in the Security Mode Setting area if you want to change the security mode, or click *Next*.
- 2) To change to customer mode, click the check box and click *OK*.

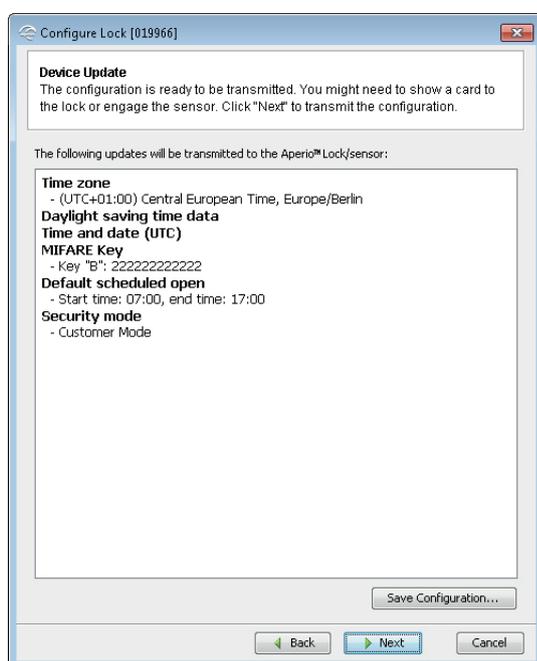




The default mode is Manufacturer mode, but you should always change it to Customer mode. If you change to Manufacturer mode the lock will no longer be using secure radio communication.

### Device update page – Saving Configuration

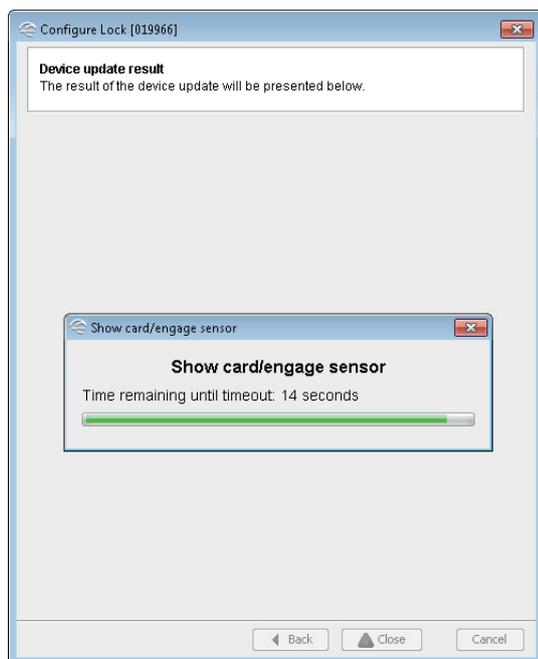
The Device Update dialog box shows a summary of the configuration tasks that will be downloaded to the lock. The configuration may be saved to facilitate configuration of additional devices with the same information.



- 1) Click *Save configuration*.
- 2) Enter a unique and suitable name for this configuration in the *Configuration name* field. Choose this name carefully, to make it clear what settings are changed in the lock/sensor or communication hub. You could, for instance, name it according to the different configuration tasks or, if applicable, use a name that reflects the specific door type.



- 3) Exclude configurations settings by clicking the check boxes. Only save settings that are general for all locks in your installation. A recommendation is:
    - a) RFID configuration
    - b) Change security mode
    - c) Device time update
    - d) And optionally some advanced features like Battery Alarm, Status configuration and Locking parameters
  - 4) Click *OK*.
- Result:** The configuration is saved in the local storage, and you are back in the Configuration Wizard. Choosing *Cancel* on the Device Update page does not affect the locally stored configuration.
- 5) Click *Next* to download the configuration to the lock.
  - 6) Hold the radio card at the lock (or remove and reinsert battery).

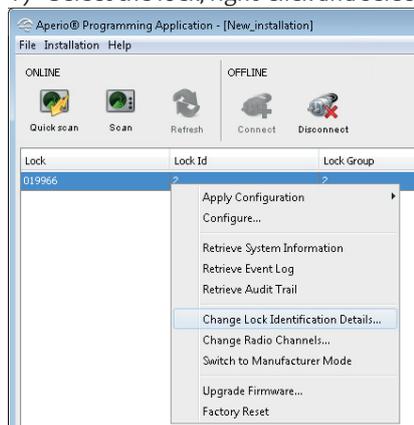


7) Click *Close* to exit the wizard.



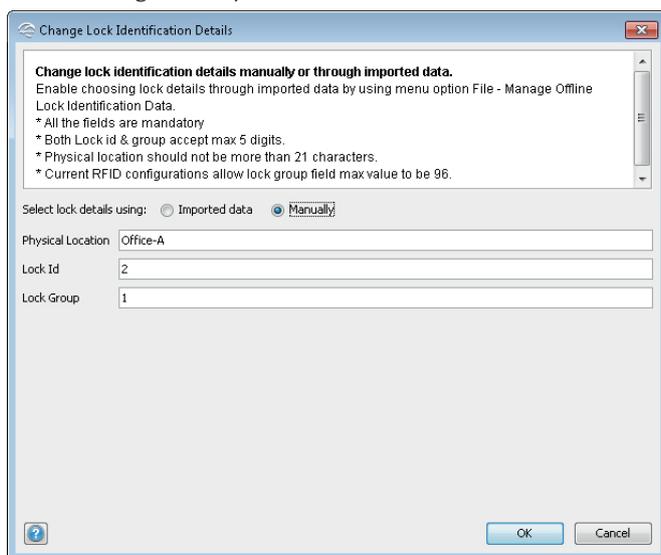
## Step 4 - Adding Lock Identification Details

1) Select the lock, right-click and select *Change lock identification details*.

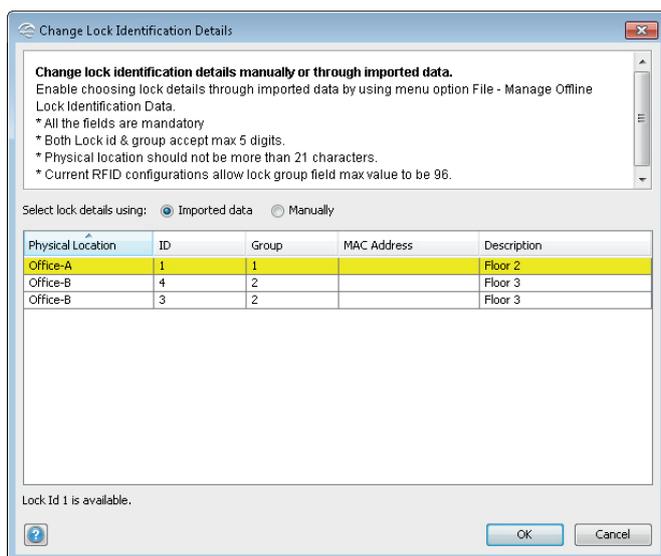


2) Enter the lock identification details either *Manually* or through *Imported data* by selecting one of the radio buttons.

a) **Manually:** Enter *Physical Location* (max 21 alpha numeric characters), *Lock Id* (max 5 numeric characters, 2 bytes: 0-65535), *Lock Group* (max 5 numeric characters, 2 bytes: 0-65535, & max value decided by RFID configurations)

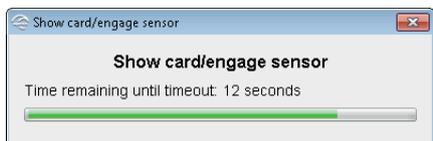


b) **Imported data:** This is an advanced option where imported door data (XML format) can be used to configure locks, see ref [1] ST-001321-Aperio Programming Application manual.



3) Click OK.

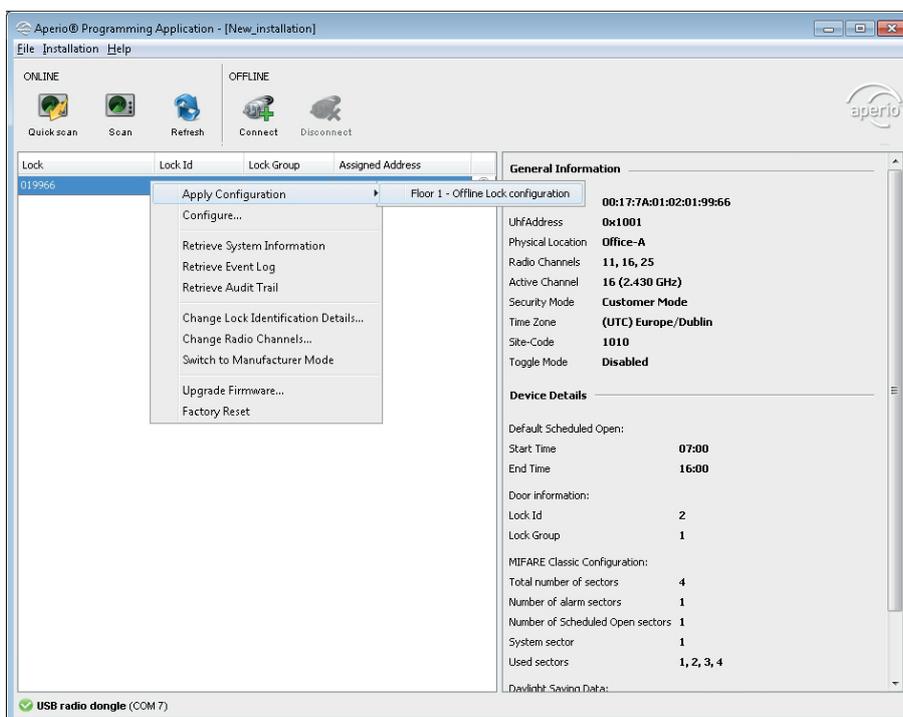
- 4) Hold the radio card at the lock (or remove and reinsert battery) to download the Physical location data.



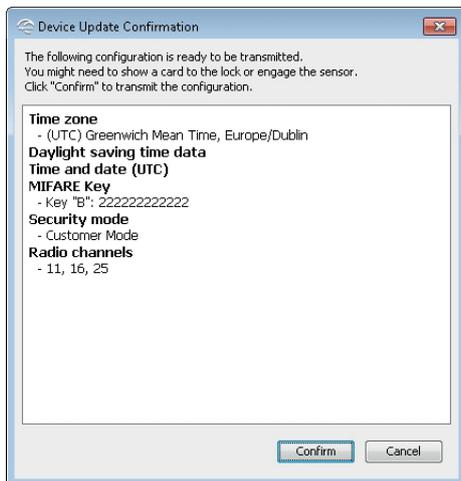
## Step 5 - Applying a stored configuration to a lock

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.

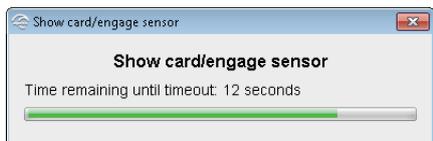
- 1) Connect to another lock that you want to apply a saved configuration on. In the Installation view, right-click the new lock and select *Apply configuration* and choose an earlier stored configuration.



2) Click *Confirm* to start the transfer.



3) Hold the radio card at the lock (or remove and reinsert battery) to download the configuration.



4) After download, the result is shown. The settings that could not be downloaded to the specific hardware are ignored. Click *OK* to finish.



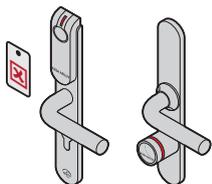
5) Add *Physical location*, *Lock id* and *Lock Group* according to section "Step 4 - Adding Lock Identification Details" on page 17.

6) Repeat all the steps from the beginning of this section for every lock you want to configure with a saved configuration.

### Step 6 - Testing after configuration

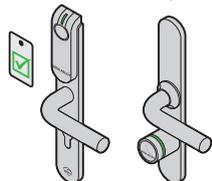
Follow these steps to test that the configuration of each lock has been performed correctly and that the hardware is working:

- 1) 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  One red flash (1 second)

- 2) 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.



Access granted  One green flash (1 second)

See section "4 LED Indications" on page 22 for details on the different LED indications.

## 4 LED Indications

### Offline Lock LED Indication

The Aperio Offline lock has a single LED that supports an optical scheme with red, green and yellow. The indication scheme differs depending on the credential type presented at the lock:

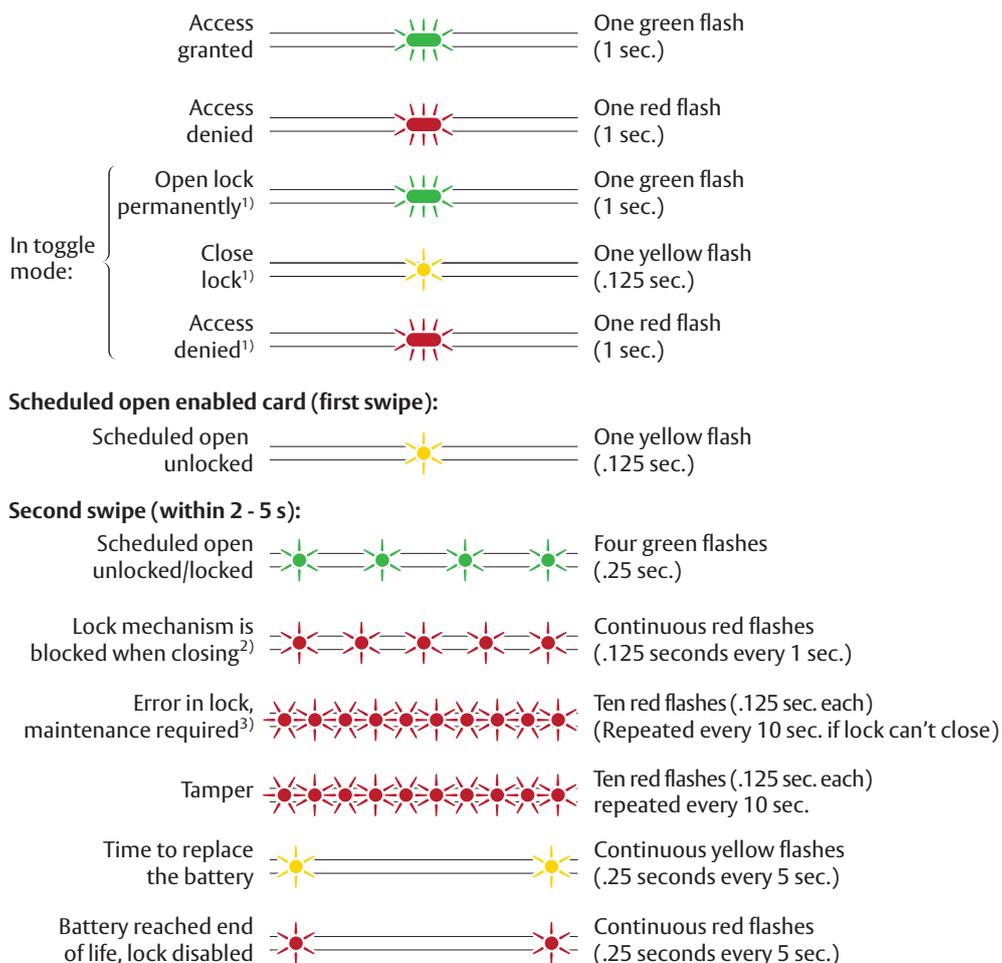


Figure 3. Offline lock LED indication - Access cards

-  1) If LED or LED/Buzzer is configured as card read indication, an extra yellow indication will be shown compared to description above.
-  2) When the lock mechanism is blocked (lock jammed) the knob must be turned to release it.
-  3) 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.

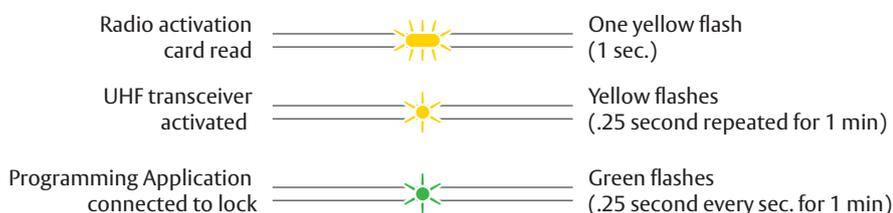


Figure 4. Offline lock LED indication - Radio activation card

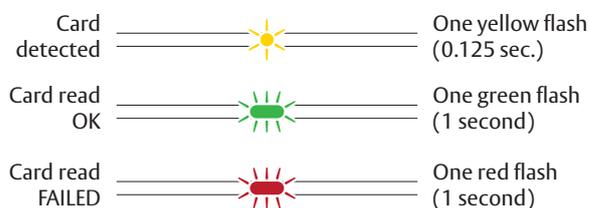


Figure 5. Offline lock LED indication - Void list card

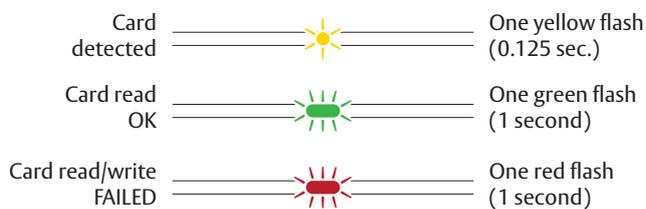


Figure 6. Offline lock LED indication - Audit Trail card

### Lock Maintenance LED Indication

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



## Lock self test LED indication

After replacing the battery, a Power on Self Test (POST) is performed. The result is indicated using a series of red and green LED flashes as is described by the figure below:

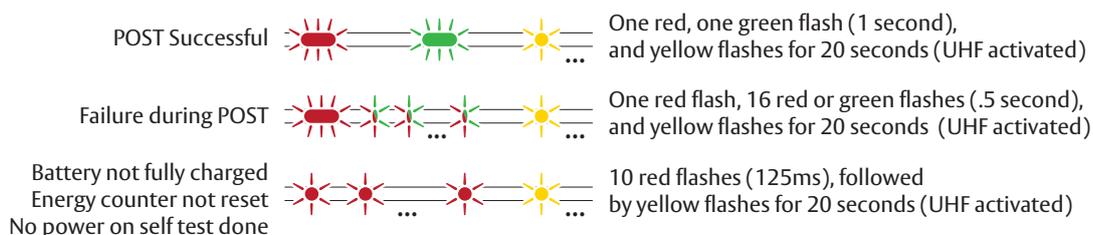


Figure 7. Lock POST LED indication



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

The first flash is always red. If the POST fail, 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	-
2	Main board firmware corrupt	0x0001
3	Reserved for future use	0x0002
4	Production data corrupt	0x0004
5	Production data corrupt	0x0008
6	Configuration data corrupt	0x0010
7	Load circuit corrupt	0x0020
8	Configuration data corrupt	0x0040
9	Secure area key error	0x0080
10	Secure area motor error	0x0100
11	Secure area communication error	0x0200
12	Secure area memory error	0x0400
13	Secure area motor sensor error	0x0800
14	Radio modem communication error	0x1000
15	Radio modem memory corrupt	0x2000
16	Radio modem EEPROM corrupt	0x4000
17	Radio modem RF error	0x8000

## 5 Troubleshooting

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

### When connecting to a lock

Problem indication	Cause	Action
The lock is not found when trying to connect = no connection between the programming application/ laptop and the lock.	<ul style="list-style-type: none"> <li>• All radio channels are busy.</li> <li>• The programming application and the lock have different radio channels.</li> <li>• The lock is not working.</li> <li>• The lock is not powered.</li> <li>• The lock is out of range of the USB dongle.</li> </ul>	<ol style="list-style-type: none"> <li>1. Click Connect again.</li> <li>2. Change the radio channels. See the Programming Application manual.</li> </ol>
Unstable communication between lock and Radio dongle even though the MAC address is displayed after connecting to lock.	<ul style="list-style-type: none"> <li>• A probable cause is bad radio conditions or limited radio range.</li> </ul>	<ul style="list-style-type: none"> <li>• Try moving the USB radio closer to the lock. Either by moving the laptop or by using an A-A USB extension cable to distance the USB radio from the PC.</li> </ul>
The device update fails	Radio not activated in lock	Perform device update again and show the radio activation card to the lock.

### During normal operation

Problem indication	Cause	Action
The lock LED is flashing red.	<ul style="list-style-type: none"> <li>• The battery of the lock/sensor has run out.</li> <li>• Hardware failure/Lock jammed</li> </ul>	<ul style="list-style-type: none"> <li>• Change the battery of the lock. See the Programming Application manual.</li> <li>• Service the lock.</li> </ul>





ASSA ABLOY is the  
global leader in door  
opening solutions,  
dedicated to satisfying  
end-user needs for  
security, safety and  
convenience

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