

Aperio® Online System Description

Document No: ST-002326-C, Issue date: 30 March 2016



Table of Contents

| | |
|--|-----------|
| 1 Introduction | 4 |
| Purpose..... | 4 |
| Scope..... | 4 |
| Applicable products..... | 4 |
| Product availability..... | 4 |
| Aperio support in the EAC system | 4 |
| References | 4 |
| 2 System Overview | 5 |
| The Aperio Online System | 5 |
| The Aperio Online concept | 5 |
| Installation and Configuration Tool..... | 5 |
| 3 Aperio Online Functional Support | 6 |
| System components | 6 |
| Main system features | 6 |
| <i>Remote unlock</i> | <i>6</i> |
| <i>Communication hub functions.....</i> | <i>6</i> |
| <i>Lock functions</i> | <i>6</i> |
| <i>AS100 Door Sensor functions</i> | <i>6</i> |
| <i>Alarm/event handling to EAC.....</i> | <i>6</i> |
| <i>Audit trail.....</i> | <i>6</i> |
| <i>Override credentials</i> | <i>7</i> |
| <i>Maintenance functions.....</i> | <i>7</i> |
| <i>Security</i> | <i>7</i> |
| <i>Communication protocols towards EAC.....</i> | <i>7</i> |
| <i>Software tool - Programming Application</i> | <i>7</i> |
| 4 Detailed feature descriptions..... | 8 |
| Credential technologies | 8 |
| Locks | 8 |
| <i>Unlock times.....</i> | <i>8</i> |
| <i>Keypad support.....</i> | <i>8</i> |
| <i>Battery supervision.....</i> | <i>8</i> |
| <i>Battery replacement.....</i> | <i>8</i> |
| <i>RTC time drift.....</i> | <i>8</i> |
| <i>Status report interval.....</i> | <i>8</i> |
| Communication hubs..... | 9 |
| EAC addressing features (RS-485) | 9 |
| <i>Addressing alternatives.....</i> | <i>9</i> |
| <i>Different EAC addressing modes</i> | <i>9</i> |
| Remote Unlock use cases | 10 |
| <i>Office Mode/First Man In.....</i> | <i>10</i> |
| <i>Scheduled relock.....</i> | <i>10</i> |
| <i>Remote unlock</i> | <i>10</i> |
| <i>Remote unlock configuration.....</i> | <i>10</i> |
| Audit trails | 10 |

1 Introduction

Purpose

The main purpose of this manual is to provide necessary information to plan and perform the mechanical installation of Aperio communication hubs. The manual is intended for project managers and other people with access system design responsibilities.

Scope

This manual includes a complete description of an Aperio Online system and its integration to surrounding systems.

For a description of Aperio Online system components refer to ref [1], Aperio Online Mechanical Installation Manual and ref [2], Aperio Programming Application Manual.

Applicable products

This manual can be used for the latest version of the Aperio online hardware.

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 communication hub used and the level of integration. Please contact your OEM for details.

Abbreviations and definitions

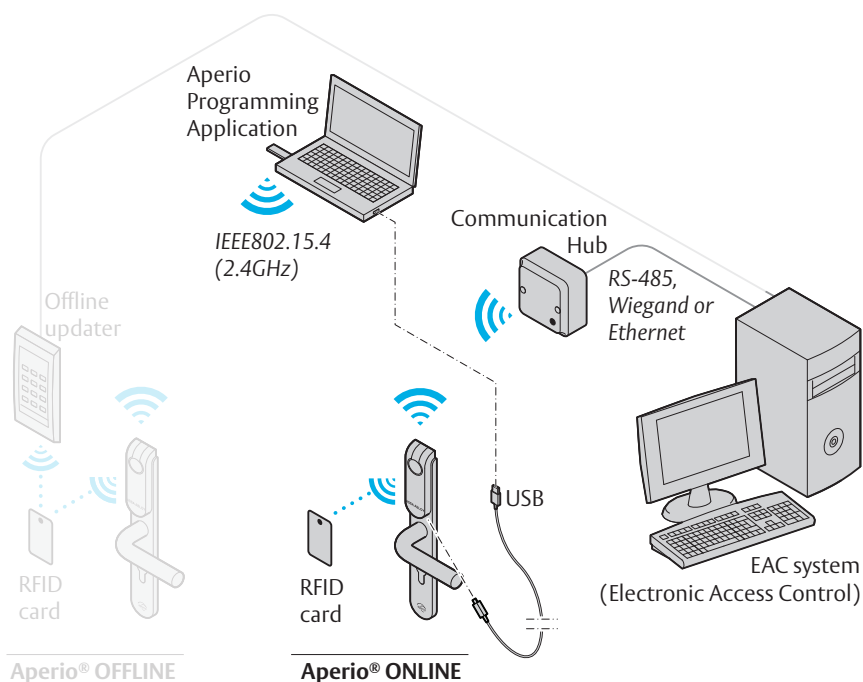
| Abbreviation | Definition |
|--------------|--|
| EAC | Electronic Access Control. The system controlling access decisions. |
| DIP | Dual in-line Package. A manual electric switch used for settings on the communication hub. |
| RFID | Radio Frequency Identification. The credential technology used. |
| TLS | Transport Layer Security. Cryptographic protocol that provides secure communication over TCP/IP connections. |
| OEM | Original Equipment Manufacturer, the company that integrates the Aperio support in their EAC system. |
| RTC | Real time clock. Aperio hardware use this to maintain date and time for aperio hardware. |

References

| | |
|------------|--|
| [1] | ST-001323-Aperio Online Mechanical Installation Manual |
| [3] | ST-001321-Aperio Programming Application Manual |
| [2] | ST-001322-Aperio Online Quick Installation Guide |

2 System Overview

Figure 1.
Aperio technology
overview



The Aperio Online System

Aperio Online is a technology that enables mechanical locks to be connected wirelessly to an existing access control system in a convenient and cost effective manner.

The main feature is the use of a wireless short distance communication protocol for communication with locks and a wired connection to an online access control system.

Aperio is easy to integrate with most devices and systems, regardless of manufacturer, as it has a large integrated base.

Different mechanical standards and RFID technologies are supported to provide a solution for most markets.

The Aperio Online concept

The Aperio system is used in the following way: The user holds an *RFID card* in front of an online lock and/or enters a PIN.

The lock sends credentials or PIN 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.

Installation and Configuration Tool

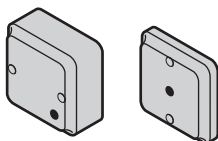
The *Aperio Programming Application* is a software tool used for installation and configuration. It connects to the communication hub wirelessly with a USB radio dongle. The software can also connect directly to locks using a standard USB cable.

3 Aperio Online Functional Support

System components

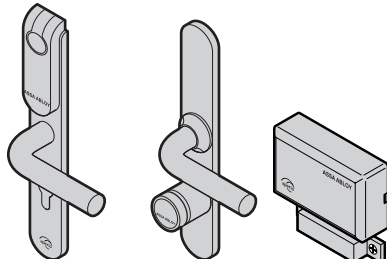
• Communication hub:

Wireless connection point (IEEE 802.15.4) connected to overlaying EAC (RS-485, Wiegand or TCP/IP). It communicates with Aperio online locks with a range of up to 25 m/80 ft depending on the radio environment.



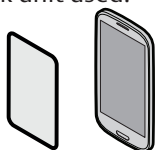
• Lock Unit/Door Sensor:

Supports all Aperio Online variants. Equipped with an RFID card reader, UHF transceiver and keypad (option). Door sensor AS100 is also supported.



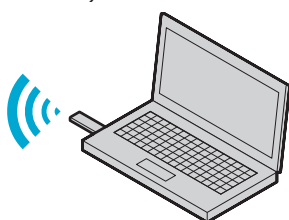
• Card formats for different RFID technologies:

Aperio Online supports MIFARE Classic/Plus/DESFire EV1, Legic, iCLASS, Low Frequency (EM/HID Prox), Seos and HID SE credentials, depending on lock unit used.



• Aperio Programming Application:

Installation and maintenance tool that connects wirelessly to the communication hubs (and further on to locks) via a USB radio dongle.



Main system features

Remote unlock

- Several options to keep the door unlocked for a longer period of time, either user activated or remotely from the EAC system.
- Available for RS-485, Wiegand and TCP/IP.

Communication hub functions

- Supports RS-485, Wiegand and TCP/IP.
- Connect up to 8 locks per AH30/40 (V2) communication hub and 16 locks for AH40 (V3).
- Different modes of device addressing (RS-485) towards the EAC (product specific).
- Digital/manual setting of EAC address.
- Automatic/manual pairing with locks/sensors.

Lock functions

- Configurable LED & buzzer handling for card read indication.
- Configurable lock open/close handling and timeouts (product specific).
- Emergency opening (product specific).
- Escape and return, configurable (product specific).
- Privacy mode (V3 locks), allows user to mechanically inhibit access on locks equipped with privacy mode switch.
- Battery supervision.
- Configurable RFID search priority (V2 SE and V3 locks only).
- Keypad support, configurable.
- The lock is equipped with a LED supporting three colors, that indicate lock status, access decisions, alarms and EAC and communication hub status.
- Battery life up to 40000 openings depending on product, use and configuration.
- Lock sensor support such as door position, handle, bolt etc (product specific)
- Polling interval (V3 locks), allows automatic status update to communication hub.

AS100 Door Sensor functions

- Magnetic/mechanical circuit breaker for applications such as door position sensor or glass break sensor.

Alarm/event handling to EAC

- Communication hub and/or lock offline
- Communication hub and lock tamper (product specific)

- Lock battery low, battery flat
- Lock jammed
- Communication hub reset
- Door sensor events

Audit trail

- Audit trail with 200 entries stored in case of lost contact to EAC system.
- Audit trails can be extracted with the software tool, Aperio Programming Application.

Override credentials

- 10 positions for override/emergency cards or PIN when the lock/Hub is offline from the EAC.

Maintenance functions

- Up to 200 entries in event log.
- Firmware upgrade.
- Use of 3 radio channels that can be configurable.

Security

Encryption key

The communication between lock and communication hub is encrypted using 128 bit AES encryption key, owned by the customer. The customer key is activated during installation and also ensure secure communication between Aperio hardware and the Aperio Programming Application.

Communication protocols towards EAC

Wiegand

- Security as per the Wiegand standard.

RS-485

- No encryption on the interface.
- AADP-RS485 which is proprietary and open under NDA.
- OEM protocols HID VertX and Mercury are proprietary and closed.

Ethernet

- AADP-IP with is proprietary and open under NDA.
- Security over the TCP/IP interface is implemented using TLS.

Software tool - Aperio Programming Application

- Installation and configuration of Aperio hardware are done with an Windows installation tool (Aperio Programming Application).
- USB radio dongle: UHF transceiver used by the programming application to communicate with communication hubs.
- USB cable: Used to directly connect and configure V3 locks equipped with USB connection.
- Installation data is entered manually in the tool, and can be saved for reuse purposes, also exported/imported.

4 Detailed feature descriptions

Credential technologies

The following credential types are supported by Aperio Online:

| Credential |
|----------------------------|
| MIFARE Classic |
| MIFARE Classic UID |
| MIFARE Classic Sector |
| MIFARE Plus UID |
| MIFARE Plus Sector |
| MIFARE DESFire UID |
| MIFARE DESFire Application |
| MIFARE Ultralight CSN |
| Low Frequency: HID Prox |
| Low Frequency: EM PROX |
| iCLASS |
| Legic UID |
| Legic UID with data |
| Seos |
| HID SE credentials |
| PIN (via Keypad) |

Note: All credentials are not supported by all products. All card credential can be combined with a pin code.

Locks

Unlock times

The unlock time for an Aperio lock can be controlled in several ways. There is a configurable default time in the lock. The unlock time can be controlled from the EAC per access decision and through the different "Remote Unlock" type of use cases.

In addition a normal unlock time can be extended by double-badging the lock thus extending the open time by the same time used for the particular operation

Keypad support

This keypad function is product specific and supports two reading modes, PIN with configurable length or use of end character that also can be set.

The Aperio keypad function does not send character per character, but a whole PIN to EAC, in order to save battery life.

Battery supervision

This function is product specific and is performed in the following two ways:

- **Energy counter:** Typically used on products that use lithium batteries of type CR123 and CR2. Battery life is calculated from measured energy consumption for each lock operation such as lock, unlock etc. It is therefore

important to always use fully charged batteries during battery replacement to guarantee correct battery life measurement. At battery low, this type of product performs a minimum of 1000 lock operations before reaching battery flat.

- **Battery measurement:** Used on other products. Battery measurement is normally made at every lock operation and every time a status report is sent to the EAC (default every 60 minutes). Battery life is product and battery specific.

The battery check interval can be set using the Aperio Programming Application.

Battery replacement

In Aperio readers there is a RTC maintaining the date and time. The time is typically set via the Aperio Programming Application or from the EAC if that system has the "SetTime" functionality implemented. When replacing the battery in an Aperio V2 device, the RTC may lose time and date. The time for how long the RTC can maintain correct time when the batteries are out varies between the Aperio products. When replacing battery in an Aperio V3 device the RTC time is "frozen" and there will therefore be a time skew for the time it takes to replace the batteries. Therefore it is recommended to use the Aperio Programming Application to set time and after battery change. For Aperio Online the time and date is used for time stamp in audit trail and event logs.

RTC time drift

In Aperio V2 devices the RTC time drift is +/- 16 minutes/year on average and in in Aperio V3 devices the RTC time drift is +/- 13 minutes/year on average. This should be considered in regards to battery replacement schemes and the requirement for accuracy in the audit trail time stamps.

Status report interval

This function enables configuration of how often the lock sends status report to the communication hub and EAC. At the time of a status report, updates from the EAC are also downloaded to the lock. This setting is as default set to 60 minutes. Short time intervals will have

a negative effect on battery life. However, when using remote unlock, this value is normally set to 5 -15 minutes.

Communication hubs

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

| Functional support | Communication hub version | | | | |
|--|--|--|------------------|---|---------------|
| | AH15 | AH20 | AH30 | AH40 | |
| Wireless technology | IEEE 802.15.4 based | | | | |
| EAC Interface | Wiegand/RS-485* (AADP protocol Mercury) | Advanced Wiegand | Standard Wiegand | RS-485 (AADP protocol HID VertX Mercury) | IP (Ethernet) |
| Maximum number of locks/sensors | 1 | 1 | 1 | 8 | 16 |
| Encryption: | lock to hub | Encryption key (Customer key) 128 bit AES encryption | | | |
| | hub to EAC | None | None | None | TLS |
| EAC address limit (DIP/w PAP tool) | 31/63 | - | - | 15 (one-to-several) 16-31/63 (single device mode) | - |
| Typical range | 5 m | 25 m | 25 m | 25 m | 25 m |
| External antenna (option for alternate coverage pattern) | No | Yes | Yes | Yes | Yes |
| Lock Keypad support | Yes | Yes | Yes | Yes | Yes |
| Wiegand support | Byte order | | | | |
| | Addition of parity bit | | | | |
| | Red LED signal | | | | |
| Relays for lock notification | No | Yes | No | - | - |

* The firmware type loaded into the communication hub controls what interface is enabled.

EAC addressing options (RS-485)

This applies for AH15 and AH30 communication hubs.

Addressing alternatives

The communication hubs can use up to 63 addresses depending on usage:

- **Address 1-15:** Applicable for all types of installations where one or several locks are paired to the communication hub. (one-to-several installation). Address is selected by the DIP-switch or the Aperio Programming Application.
- **Address 16-31:** For communication hubs with only one lock paired. Address is selected by DIP-switch or the Programming Application.
- **Address 32-63:** For communication hubs with only one lock paired (single device mode). Address can only be selected using the Programming Application.

For details, refer to the Aperio Programming application Manual, ref [2].

Different EAC addressing modes

Communication hubs can be set to address the locks in two different ways, normal and legacy mode.

Legacy address offset is used when the EAC has a low limit for handling addresses. Normal address offset mode is used when the EAC can handle addresses without limit.

Remote Unlock use cases

Aperio support three options for setting a door unlocked.

- Office Mode/First Man In
- Scheduled relock
- Remote unlock

The time the unlock command is valid can furthermore be configured in the communication hub through the Time to live-setting when using the Remote Unlock function.

During these use cases there is a possibility to disable sensor events from the lock. This will conserve battery life and also keep the traffic down when used in high traffic doors.

Office Mode/First Man In

The EAC manages which users have the right to set a door unlocked.

Example: The lock is set unlocked by the first card holder that enters the office in the morning.

Scheduled relock

This mode is suitable when longer unlock periods are used and ensures that the lock is locked at a certain time. The unlock command from the EAC is sent to the communication hub. First when the Aperio lock performs a status update or a user presents a credential at the lock the unlock command is sent to the lock. The waiting time in the communication hub is deducted from the total remote unlock time to ensure that the relock occurs at the correct time.

For V3 locks using the polling interval function, the waiting time will be limited to the polling interval time setting, which is by default short. However, the polling interval time should not be longer than the time-to-live function.

Example: The EAC sends an unlock command of to a communication hub to unlock a certain lock for 3 hours (between 5 pm and 8 pm). The command waits in the communication hub for 30 minutes until the lock connects. The waiting time is in this case deducted and the lock will be relocked after 2.5 hours (8 pm).

Remote unlock

This function is similar to the Scheduled relock function with the difference that the unlock time period is left unchanged. This mode is suitable for shorter unlock periods of for example a few minutes.

For V3 locks using the polling interval function, the waiting time will be limited to the polling interval time setting, which is by default short. However, the polling interval time should not be longer than the time-to-live function.

Example: The EAC sends an unlock command of 10 minutes to a communication hub valid for a certain lock. The waiting time in the communication hub is 5 minutes until lock connects and gets the unlock command. The total unlock time will in this case still be 10 minutes.

Remote unlock configuration

The time period the unlock command stays active in the communication hub can be set. This is the Time to live-setting.

It is important to synchronize this setting with the Status report interval setting in the lock. The Time to live-setting must be shorter than the status report interval time to ensure that EAC commands are sent to the lock.

For V3 locks that do not use the remote unlock function, it is also recommended to also deactivate the polling interval function.

Audit trails

The audit trail log in the lock units keeps track of the access attempts made on each particular door when the lock is offline from the communication hub and/or EAC.

There are 200 entries in the log which means that it will be full after 200 access attempts. When a card is presented and the log is full, the oldest entry will be replaced with the result from the new access attempt.

Each entry consists:

- Time stamp
- Credential UID/Data/PIN
- Access decision, granted/denied.

The audit trail log can be read out with the Aperio Programming Application.

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

ASSA ABLOY

Contact

www.assaabloy.com/aperio

