BioEntry™ Installation Guide

BioEntry™ Smart / Pass

Ver. 1.1

SUPREMA

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About the BioEntry™ Series

BioEntry™ is an advanced biometric access reader equipped with award winning fingerprint recognition engine and standard Wiegand interface. BioEntry™ can practically replace legacy and simple readers and be instantly added onto existing access control systems as well as new installations.

BioEntry™ Smart is a fingerprint smart card reader that seamlessly integrates fingerprint and smart card reader into one device. BioEntry™ Smart is designed to replace existing access readers like proximity or magnetic readers without additional wiring. Fingerprint template is stored in each user's smart card and there is no need to store fingerprint data in a reader itself. This eliminates the burden of template management and networking readers.

BioEntry™ Pass is a fingerprint access reader equipped with fast one to many fingerprint identification engine. Enrolled with more than hundreds of users, identification can be done in less than one second.

Following the unique feature of Suprema's famous UniFinger™ fingerprint identification modules, BioEntry™ also provides customers with multiple choices of fingerprint sensors including optical, capacitive and thermal sensors.

About Suprema Inc

Suprema is a leading biometric company offering core fingerprint technologies for embedded and PC applications. Suprema's fingerprint products include low cost standalone OEM modules, access control readers, USB fingerprint scanners and fingerprint algorithm SDK. Suprema's fingerprint recognition algorithm was proved to be world top level by ranking first in the 3rd international Fingerprint Verification Competition (FVC2004) with the lowest error rate in light category. Suprema's fingerprint products have been sold to more than 50 different countries and are being used in various applications. For more information on Suprema's technologies and products, please visit Suprema's website (http://www.supremainc.com) or contact by e-mail (sales@supremainc.com).

About This Guide

This is an introduction to the installation of BioEntry™ Smart and Pass. This guide describes how to install, examples for BioEntry™ and technical specifications. The purpose of this guide is to provide instructions on using BioEntry™ Smart and Pass and troubleshooting minor problems.

Contents

Figures

Revision History

Version	Date	Description
V1.0	2005.9.27	Created.
V1.1	2005.12.2	ABA Track II wiring is added to Chapter 2.1 Connection wires.

1. Before you start with BioEntry™

1.1. Included items

- BioEntry Smart/Pass unit
- Stereo plug to DB-9 cable
- Star wrench
- 2 ferrite cores
- Quick Start Guide
- Mounting Template

1.2. Required items

- A DC power supply rated at 9~24V @ 500mA
- An access control panel with Wiegand input port or Data/Clock input port

1.3. Optional items

- A reader with Wiegand output port

2. Installing BioEntry™

2.1. Connecting wires

The BioEntry is connected to other devices of the security system through the pigtail cable at the rear side.

See Table 1 for wire colors and signals.

Wire color	Signal	Description
Shield (naked wire)	EARTH GND	Ground Earth
Blue with yellow tracer		Reserved
Black with white tracer	IN0	TTL IN 0
Black	IN1	TTL IN 1
Brown with white tracer	OUT0	TTL OUT 0
Brown	OUT1	TTL OUT 1
Red with white tracer	IO_GND	GND, for IO signals
Red	DCO_STRB	Data/Clock Output, Strobe
Orange with white tracer	WO_GND	Wiegand Output, GND
Orange	WO_VREF	Wiegand Output, VREF
Yellow with red tracer	WO_D0	Wiegand Output, Data 0 or Data/Clock Output, Card Present
Yellow	WO_D1	Wiegand Output, Data 1 or Data/Clock Output, Data
Green with white tracer	WI_D0	Wiegand Input, Data 0
Green	WI_D1	Wiegand Input, Data 1
Blue with white tracer	COM_GND	Comm. GND (for RS-232C)
Blue	WI_GND	Wiegand Input GND
Violet with white tracer	RX2	Receive data, RS-232C level
Violet	TX2	Transmit data, RS-232C level
Gray with red tracer	RX+	RX+, RS-485 level
Gray	RX-	RX-, RS-485 level
White with red tracer	TX+	TX+, RS-485 level
White	TX-	TX-, RS-485 level
Green with yellow tracer	POW_GND	Power GND
Red with yellow tracer	POW+	Power Input

Table 1> BioEntry wire colors

Warning: Care should be taken identifying the wires. Improper wiring may render permanent damage to the device or personal injury.

2.2. Power connection

Use 'POW+' and 'POW_GND' wires to connect BioEntry to a DC supply, rated at 9~24V, 500mA. The power cable should be as short as possible to minimize wire resistance and emissions.

For optimum ESD resistance and safety, please make proper connection of 'Earth GND'.

For compliance with FCC and CE regulations, a good connection of earth ground should be made, and an additional ferrite core should be installed to supply lines. The installation of this ferrite core is mandatory for FCC and CE under R&TTE directive. Refer to Figure 1 for installation details.

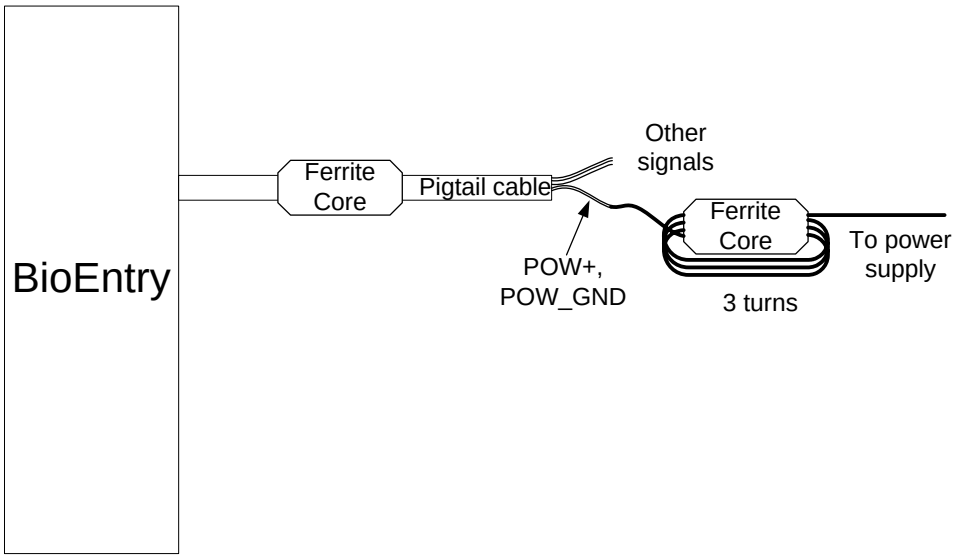

Figure 1> Power connection

2.3. Connecting to a Wiegand compatible reader

The BioEntry supports Wiegand compatible readers of various formats, including 26bit standard.

Connect 'WI_D0', 'WI_D1' and 'WI_GND' wires to 'Data 0', 'Data 1' signals and signal ground of the Wiegand reader, respectively. The input signals can tolerate voltages up to 12V dc.

2.4. Connecting to a Wiegand compatible access controller

The BioEntry supports a flexible Wiegand output interface for most access controllers with Wiegand input ports.

Connect 'WO_D0', 'WO_D1' and 'WO_GND' wires to 'Data 0', 'Data 1' signals and signal ground of the access controller, respectively. If the access controller's input signal level exceeds 5.0V, apply required voltage to 'WO_VREF' to obtain higher voltage output signals. Be cautious not to connect 'WO_VREF' directly to a power supply, especially when the source is below 5Vdc. Use a diode and a current limit resistor of a few hundred ohms in series to prevent excessive currents and damages of the device.

However, 'WO_VREF' signal can be safely left unconnected as most access controllers accept 5V Wiegand signals.

2.5. Connecting to a Data/Clock compatible access controller

The BioEntry supports a Data/Clock output interface for access controllers with Data/Clock input ports. The output format is ABA track II. Refer to the operation manual for configuration and format details.

The Data/Clock interface shares signals with Wiegand Output port. If the port is configured as Data/Clock interface, 'WO_D0' acts as card present signal, and 'WO_D1' outputs data synchronized with additional 'DCO_STRB' signal, which is the data strobe. Connect 'WO_D0', 'WO_D1', 'DCO_STRB' and 'WO_GND' wires to 'Card Present', 'Data', 'Strobe' signals and signal ground of the access controller, respectively.

2.6. Connecting to the host PC

The BioEntry provides various means to connect to the host PC such as: being a part of the RS-485 network, direct connection with RS-232C interface, and an auxiliary port for laptops. These interfaces are internally multiplexed, so only one interface should be connected. It is not supported using two or more interfaces simultaneously.

2.6.1. Connecting via RS-232C interface

Connect 'RX2', 'TX2' and 'COM_GND' wires to 'TX', 'RX' and signal ground of PC's serial port.

2.6.2. Connecting via RS-485 interface for a full duplex BioEntry network system

Use 'RX+', 'RX-', 'TX+', and 'TX-' signals to join a full duplex BioEntry network.

For a full duplex network, two pairs of twisted wires in a shielded cable is needed.

Each signal in all BioEntry devices of the BioEntry network system should be

connected forming a multipoint network. As the PC is the master of the network system, connect 'TX+' and 'TX-' signals of the computer to 'RX+' and 'RX-' of BioEntry signals, and vice versa(See Figure 2).

At each end of the network, termination resistors of 120ohms should be connected between '+' and '-' signals for proper impedance matching.

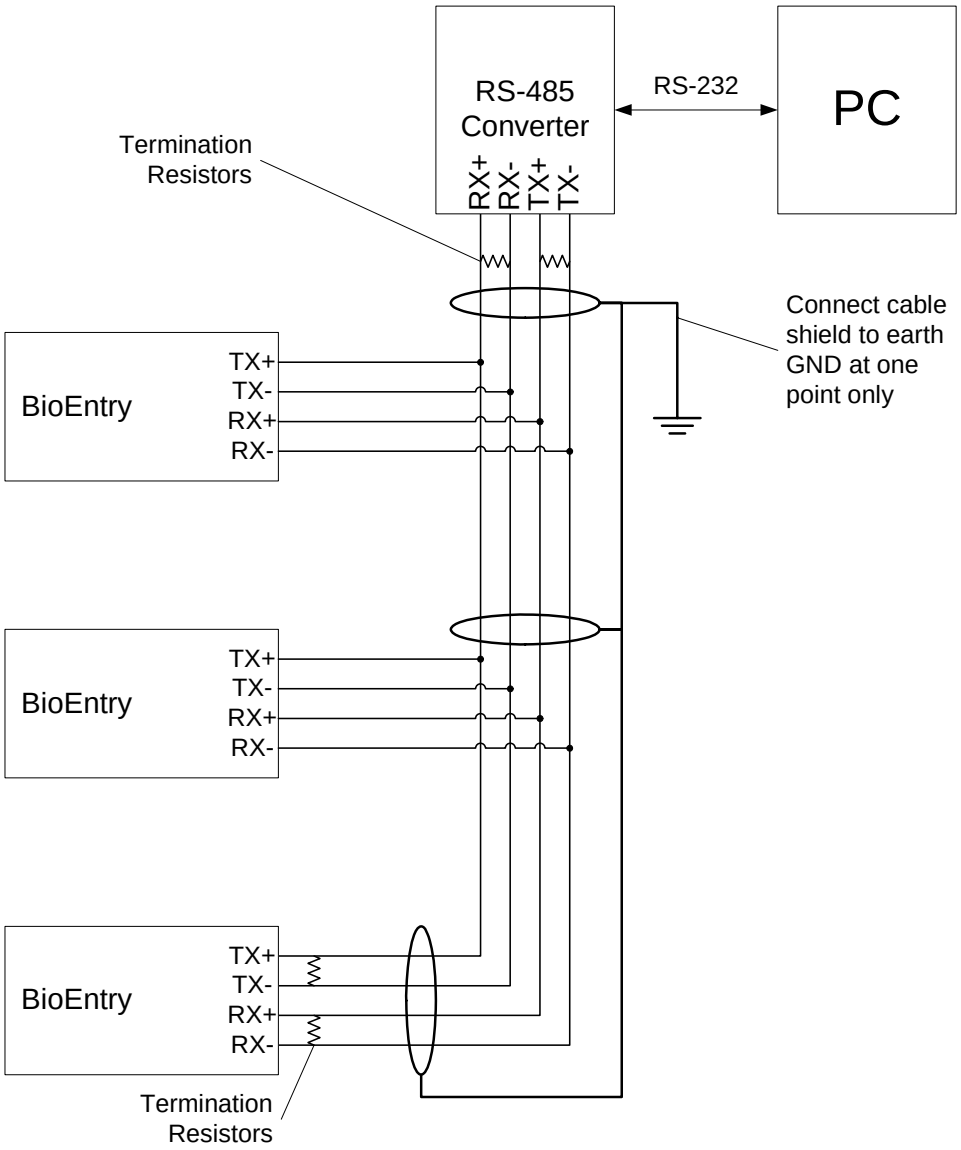

Figure 2> A full duplex BioEntry network

Warning: To prevent ground loops and avoid communication problems, connect cable shield to earth GND at only one point.

2.6.3. Connecting via RS-485 interface for a half duplex BioEntry network system

For a half duplex network, a pair of twisted wires in a shielded cable is needed. For every devices in the half duplex network, tie 'TX+' with 'RX+' and 'TX-' with 'RX-' locally before connecting to the network(See Figure 3).

At each end of the network, termination resistors of 120ohms should be connected between '+' and '-' signals for proper impedance matching.

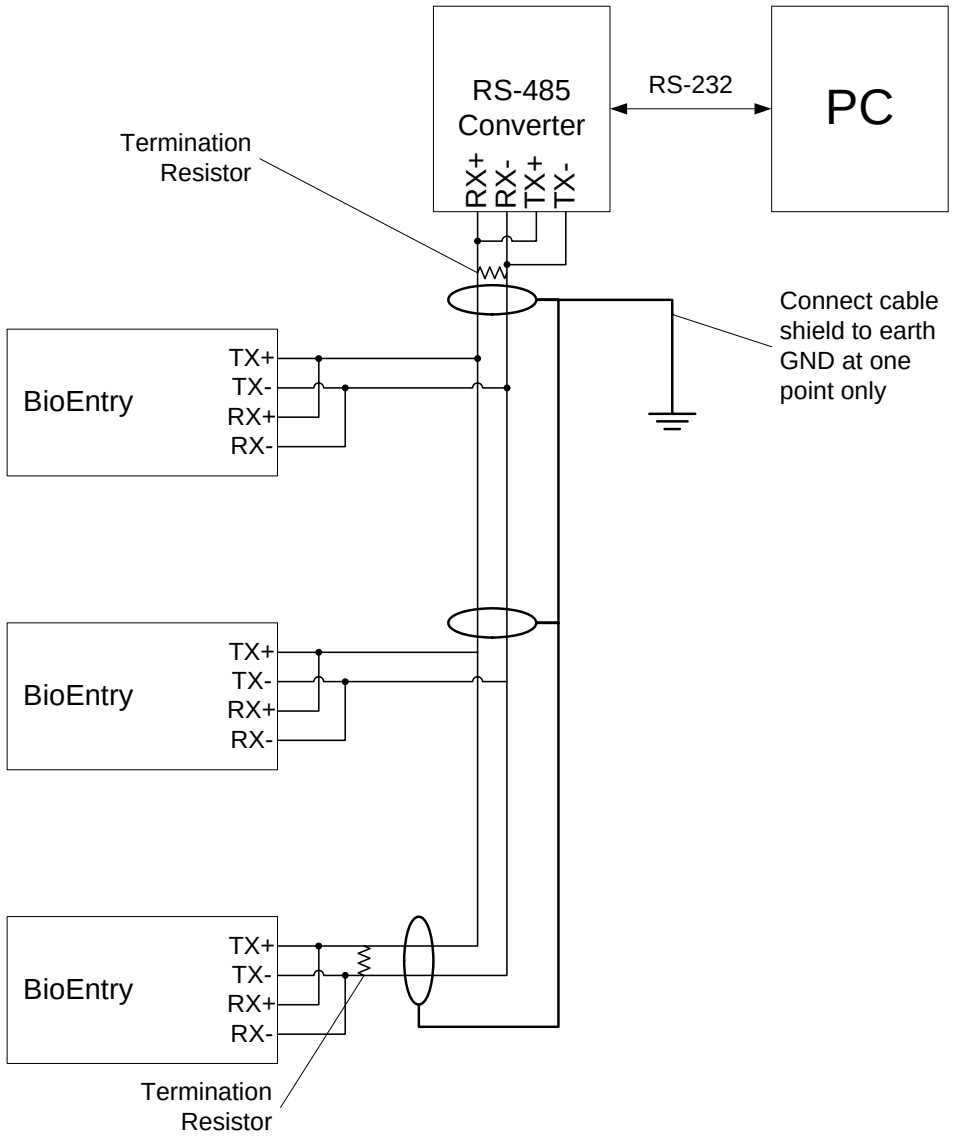

Figure 3> A half duplex BioEntry network

Warning: To prevent ground loops and avoid communication problems, connect cable shield to earth GND at only one point.

2.6.4. Connecting via auxiliary interface

BioEntry™ series provide an auxiliary port to support connection to laptops, even if the device is not networked during installation. The user can access and manage the device with standard RS-232C port.

This port is internally multiplexed with RX2 and TX2 signals in the pigtail cable, and can be disabled for improved security.

Figure 4> Connecting stereo plug to DB-9 cable

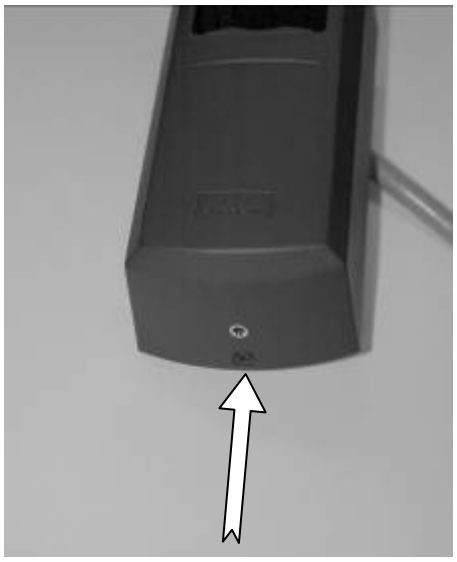

Figure 5> Auxiliary port

As shown on the Figure 6, to control the auxiliary port functionality for security

reasons, the BioEntry provides a slide switch to isolate the port electrically. By default, this switch is in down position to enable the port. To disable the port, slide up the switch with a small screw driver or a pen.

If the stereo plug is plugged into this port while the switch is enabled, the RX2 and TX2 signals in the pigtail cable are disconnected from the system. This feature is implemented to avoid signal conflicts between two interfaces. However, if the switch is disabled, the RX2 and TX2 signals remain connected regardless of the auxiliary port status.

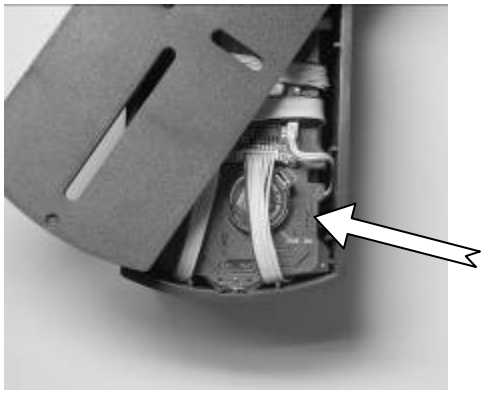

Figure 6> Aux. enable switch

2.7. Disassembling

Remove screw at bottom of the BioEntry.

Figure 7> Removing the screw

Lift bottom of the housing, slide up and carefully remove it.

Figure 8> Separating the case

2.8. Mounting back plate

Install back plate to wall surface.

Figure 9> Installing back plate to the wall

2.9. Reassembling the BioEntry

Figure 10> Reassembling the case

2.10. Installing the BioEntry™ Admin software

Carefully read the Operation Manual.

3. Examples for BioEntry™ installation

BioEntry™ Smart/Pass offers various interfaces such as Wiegand input/output, general purpose I/O signals and communication ports that can be easily implemented to a security system, improving the security level.

3.1. Building a new system

BioEntry™ Smart/Pass is compatible with most access controllers with Wiegand interface. Building a new access control system with BioEntry is as simple and easy as with conventional Wiegand readers. In this section, the system with a BioEntry only configuration is explained. The minimal configuration for BioEntry installation is illustrated in Figure 11.

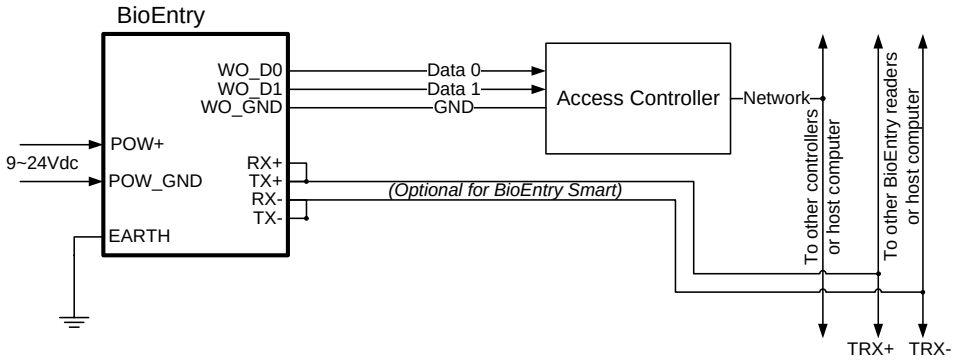

Figure 11> BioEntry connection diagram

3.1.1. Installing BioEntry Pass

BioEntry™ Pass series operates in 1:N matching mode, and stores up to 9000 fingerprint template data into internal flash memory, which is more than enough for most applications. The access control system is secured with Suprema's fast and reliable 1:N matching algorithm.

The user enrollment process is performed in the administrator's computer, and the biometric data is distributed to each reader over the BioEntry Network.

3.1.2. Installing BioEntry Smart

BioEntry™ Smart series stores user's fingerprint data in smartcards, easing user management and simplifying installation issues.

The user enrollment process is performed in the administrator's computer. The biometric data is stored in the smartcard which every user holds, instead of

distributing it to each reader over the network. This simple architecture greatly simplifies user management process and improves overall security, as the biometric data are physically isolated from the BioEntry, protecting them against possible vandalism. Moreover, as the user management process does not rely on network installation, total cost for installation is minimized.

3.2. Adding BioEntry to existing access control system

Access control systems using Wiegand readers for user identification can be upgraded by adding BioEntry Pass between Wiegand reader and access controller for improved security over a legacy proximity card based identification system. The BioEntry Pass is configured to work in 1:1 matching mode.

In this mode, user identification is performed in the following order:

- The user places the proximity card on the Wiegand reader to initiate the identification process.
- The Wiegand reader passes the user's ID to the BioEntry Pass through Wiegand port.
- The BioEntry Pass captures the user's fingerprint, and performs 1:1 matching with the user's fingerprint template data stored in the flash memory.
- If the captured fingerprint and the one stored in the flash memory match, the BioEntry Pass sends the user's ID to the access controller as if it were a Wiegand reader.
- The access controller process the user ID for further authentication.

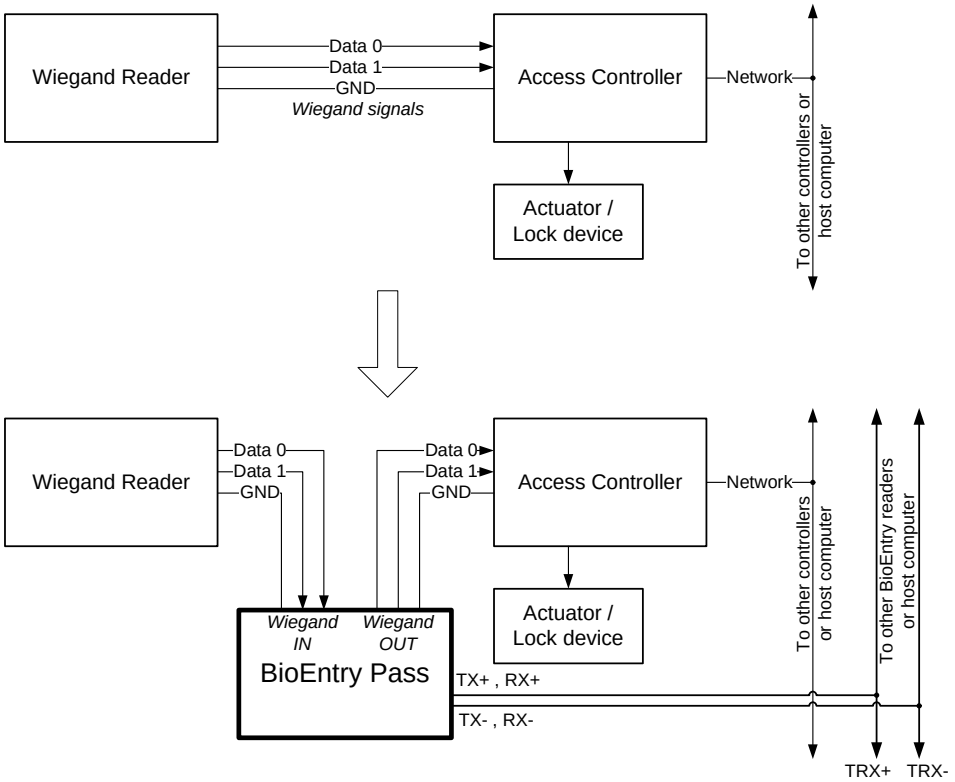

Figure 12> Adding BioEntry Pass to existing system

4. Specifications

4.1. Fingerprint authentication specifications

4.1.1. Fingerprint authentication performance

EER*	<0.1%
Enrollment time	<1 sec
Verification time	<1 sec

*EER is dependent on specific database

4.1.2. Fingerprint sensor specifications

Model	**BioEntry OP**	**BioEntry TC**	**BioEntry FC**
Device Name	Suprema Optical sensor I	UPEK TouchChip TCS1CD	Atmel Fingerchip AT77C101B-CB02
Sensor technology	Optical	Capacitive	Thermal
Capture method	Touch	Touch	Swipe
Sensing area	16.0mm x 19.0mm	12.8mm x 18.0mm	14.0mm x 0.4mm
Image size(pixels)	272x320	256x360	360 x 500
Image resolution	500 dpi	508 dpi	500 dpi

4.1.3. Data storage

Template capacity	9,000 at 4M Flash (19,000 at 8M)
LOG capacity	12,800 event

4.2. Mechanical specifications

4.2.1. Operating range

Parameter	**Symbol**	**Min**	**Max**	**Units**
Supply voltage	V_{IN}	9	24	V
Operating temperature (TC,OP)	T_{OP}	0	70	°C
Operating temperature (FC)	T_{OP}	-20	70	°C
Humidity (non-condensing)			85	%

4.2.2. Absolute maximum ratings

Parameter	**Symbol**	**Min.**	**Max.**	**Units**
Power supply voltage	V_{DD}	-0.3	28	V

Input voltage on Wiegand Input pins	V_{IN}	-0.3	14	V

4.2.3. Electrical DC characteristics

Parameter	**Symbol**	**Min**	**Typ.**	**Max**	**Units**
Supply current	I_{DD}		200	500	mA
Wiegand Input Port	**Symbol**	**Min**	**Typ.**	**Max**	**Units**
High level input voltage	V_{WIH}	3.3		12	V
Low level input voltage	V_{WIL}	-0.3		2.0	V
Wiegand Output Port	**Symbol**	**Min**	**Typ.**	**Max**	**Units**
High level output voltage	V_{WOH}		5.0	12	V
Low level output voltage	V_{WOL}		0.0		V
Current source/drain	I_{WO}		-1/20		mA
TTL Input Port	**Symbol**	**Min**	**Typ.**	**Max**	**Units**
High level input voltage	V_{IH}	2.0		5.5	V
Low level input voltage	V_{IL}	-0.3		0.8	V
TTL Output Port	**Symbol**	**Min**	**Typ.**	**Max**	**Units**
High level output voltage	V_{OH}		5.0		V
Low level output voltage	V_{OL}		0.0		V

4.3. Smart card specifications

Parameter	**Value**
Antenna type	PCB loop antenna (60mm x 57mm)
Connection with transceiver	Permanent
Manufacturer / Model	Dual I, DE-KTFMI
Operating Frequency Range	13.553 ~ 13.567MHz
Duty cycle	100%

4.4. Material information

Component	**Material / Model**	**Manufacturer**
PCB	FR-4,	Doosan Electronics
Enclosure	ABS, HF-380	LG Chem, Ltd.
Battery	CR2032	Hitachi Maxell, Ltd.

4.5. RTC battery specification

Parameter	**Value**

Model	CR2032
Manufacturer	Hitachi Maxell, Ltd.
Nominal Voltage	3 V
Nominal Capacity	210mAh
UL Recognition	MH12568(N)
Temp. range	-20 ~ +85°C

5. Certification information

5.1. CE

The BioEntry devices are compliant with CE under the R&TTE Directive.

The user should install proper earth ground wiring and ferrite core as stated in Section 2.2 to meet this directive.

5.2. FCC

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 instruction manual, 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

The user should install proper earth ground wiring and ferrite core as stated in Section 2.2 to meet the rules.

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