AC908A
User's Manual

Published: 10/30/2023

Version 1.0.3

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Terminology

HF	High Frequency
RF	Radio frequency
RFID	Radio-frequency identification
AC908A	The wall-mount HF reader used for access control and payment system.
Tag ID	Tag-identification or Tag identifier, depending on context
Tag Data	The data stored in the tag memory.
Blacklist	A table defines a set of **Tag ID** that prohibit on using the reader.

Contents

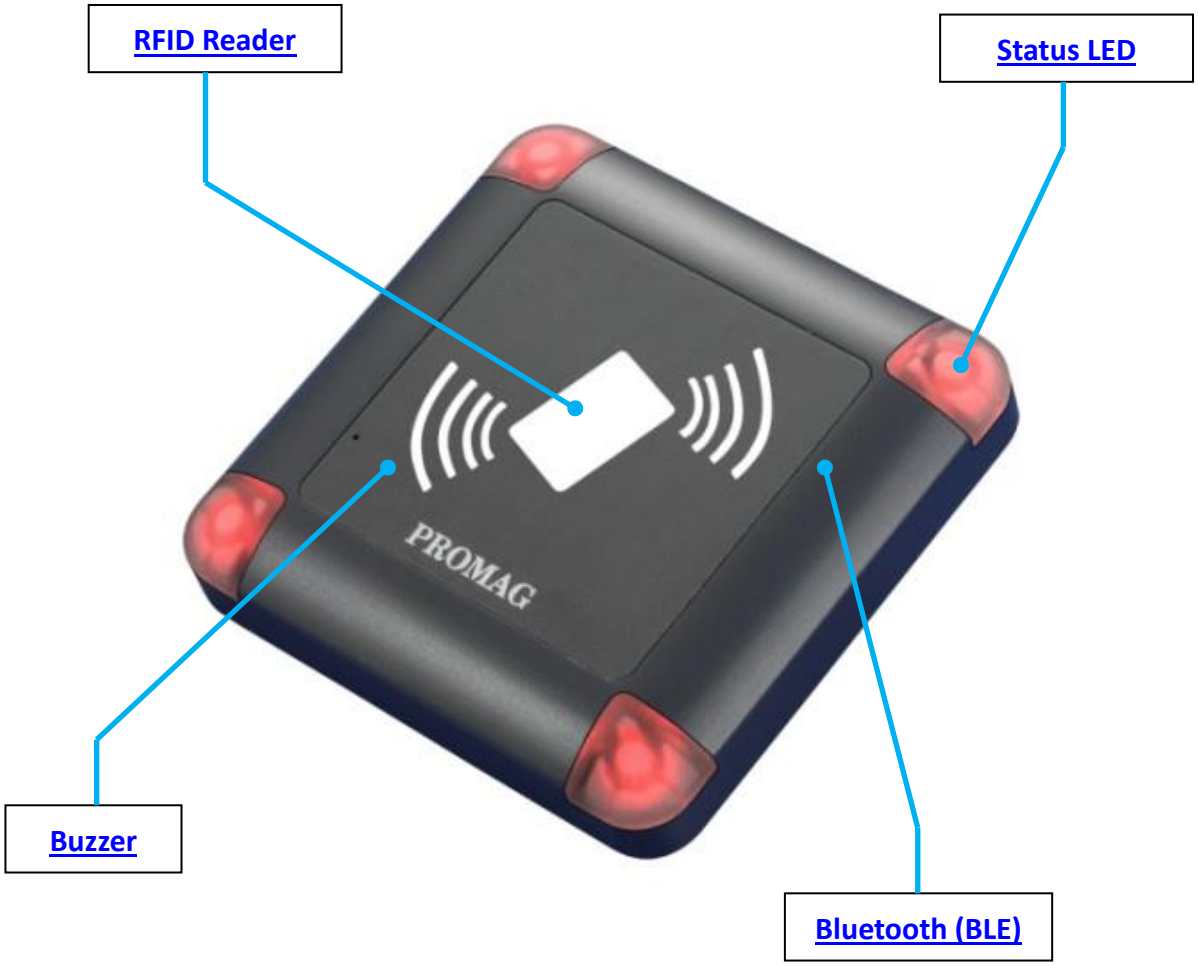
Introduction

The Cash Card Payment System is designed for the application of proximity cards of 13.56 MHz compliant with ISO 14443A. The idea is that consumers pay for all consumption by card instead of cash. First the proximity card needs to be programmed and stored with values or amounts by a Read/Write Device (RWD) PCR310U. Then consumers bring the programmed cash card with them to the Reader end, AC908A, for transaction. Whenever the cash card is read by AC908A, the preset decrement will be deducted from the card and the new value or amount will be rewritten to it.

This system can also be applied in Access Control purpose. Please refer to **Device Operations** topic for more details.

Hardware Features

Cable and Controls



RFID Reader

The RFID reader can read and write the on card memory with the card type of **Mifare** MF1 standard cards 1K/4K bytes for **ISO14443A**.
The reading distance is about 2 ~ 4 cm. The format of the card data must obey the definitions.
You can direct to present the card on this area to make **AC908A** to access.

Cable

The cable attached and fixed behind the **AC908A** device, includes the communicate data lines, I/O lines and power line.

Wire Assignment

Color	Symbol	I/O	Description
Red	VCC	IN	Power Input: DC 9V ~ 20V (Max. DC 20V)
Yellow	TXD	OUT	RS232 TXD (To host RXD)
Blue	RXD	IN	RS232 RXD (To Host TXD)
Green	REV	IN	Stop Deduction Operation
White	NO	-	Relay, Normal Open
Orange	COM	-	Relay, Common
Brown	NC	-	Relay, Normal Close
Black	GND	IN	Power Ground
Purple	T-	OUT	RS485 Diff. Signal (-)
Gray	T+	IN	RS485 Diff. Signal (+)

Relay Output Line

The **AC908A** device has one relay which outputs as lines in the cable. The relay is rated for 0.25A/240ACV or 1A/24DCV.

Line color	Function
White	Normal Open line
Orange	Common line
Brown	Normal Close line

RS232 Data Line

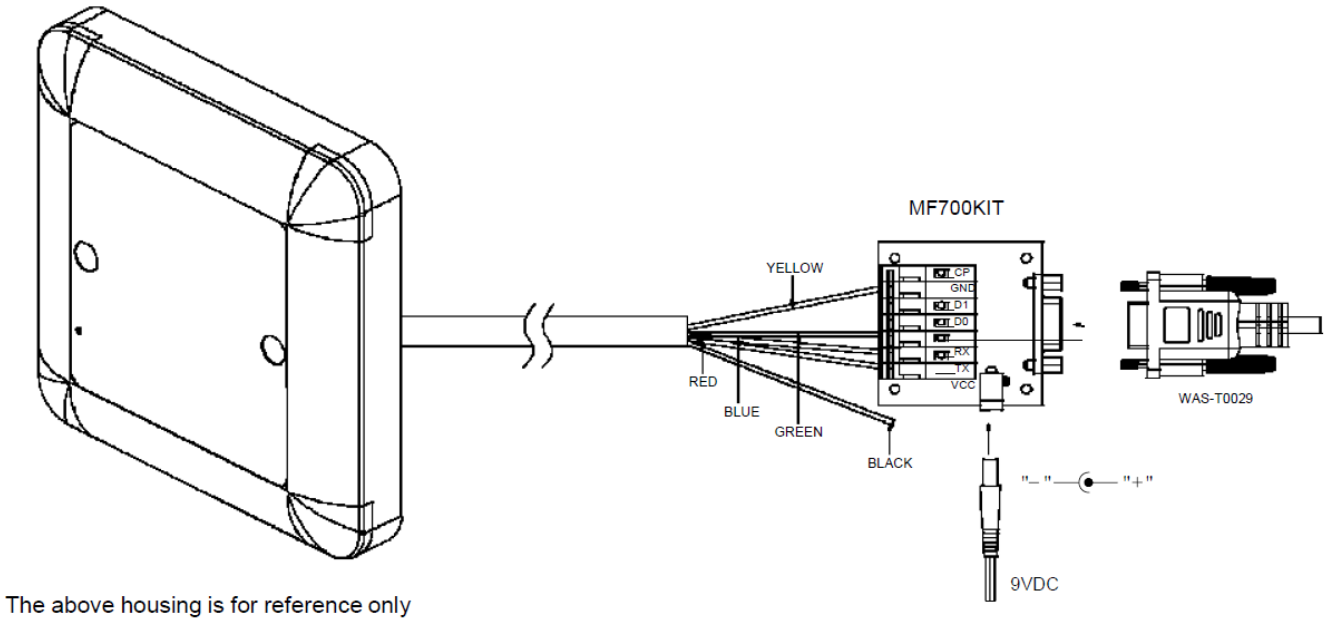
The **RS232** data lines are mainly used to 1) configure reader settings and 2) upload the firmware.

Data line color	Function
White	TXD data line
Gray	RXD data line

The handshaking for **RS232** data line:

- **Baud rate**: 19,200 bps
- **Parity check**: None
- **Data bits**: 8 bits
- **Stop bit**: 1 bit

You can connect RS232 data line to **MF700KIT**, then can connect reader to the computer.



The above housing is for reference only

RS485 Data Line

The RS485 data lines support a multi-device connected network.

Data line color	Function
Purple	RS485 '-' pin (inverting pin) data line
Gray	RS485 '+' pin (non-inverting pin) data line

The handshaking for **RS485** data line:

- **Baud rate**: 38,400 bps
- **Parity check**: None
- **Data bits**: 8 bits
- **Stop bit**: 1 bit

Status LED

The **Status LED** can light 2 colors – green and red, which is used to indicate **operation status or result**.

Buzzer

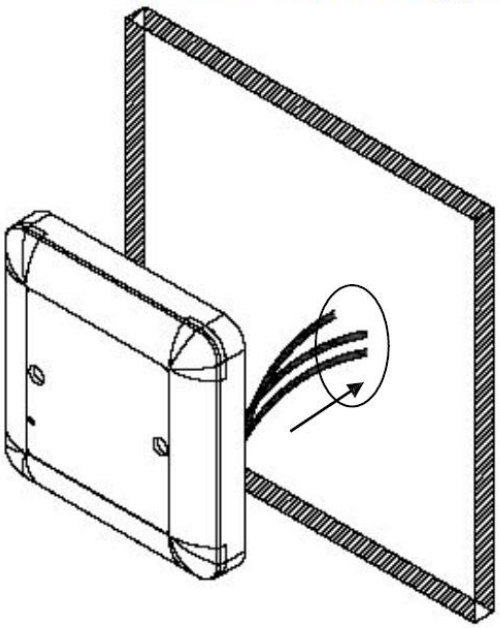
The buzzer is used to make beep sound to notify the user the **operation result**.

Bluetooth (BLE)

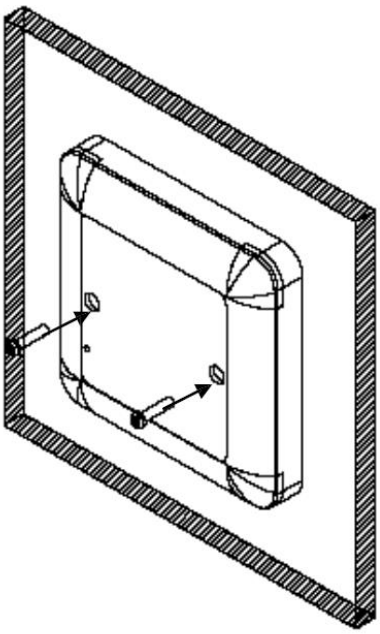
The Bluetooth module (BLE) provides wireless connectivity which makes **AC908A** can connect to BLE-enabled host, such as mobile device or laptop.

Hardware Installation

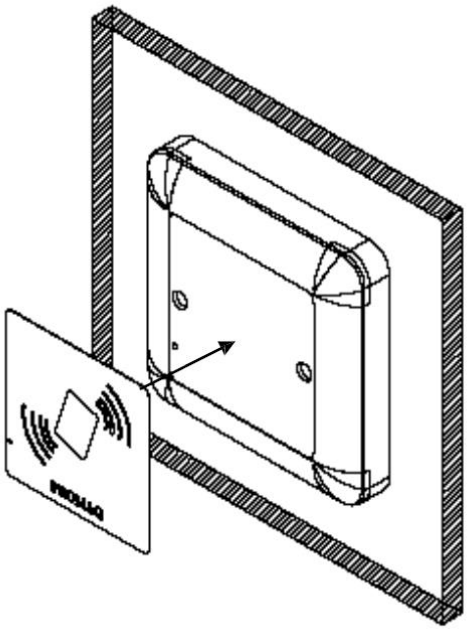
Step 1.Put all wires of AC908 through the hole of mounting place.



Step 2.Mount the AC908 by the screw.

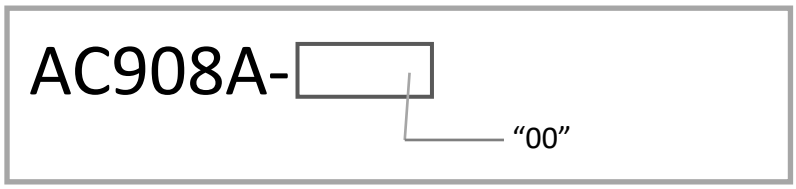


Step 3.Mount the PROMAG logo plate on AC908.



Part Numbers

Device numbering scheme is as follows:



Part Number	Description
AC908A-00	The standard version.

Specification

Features	
Card Type	Mifare MF1 standard cards 1K/4K bytes for ISO14443A
Read Range	2 ~ 4 cm
Number of Event Log	1,000
Number of Blacklist Card	1024
Status Indicator	4 RGB LEDs
Buzzer	1
Relay	1
RTC with backup battery	Yes (10 years)
Waterproof	Yes
Communication	
RS232 speed	19,200 bit/s
RS485 network speed	38,400 bit/s
Bluetooth	V4.0, Bluetooth Classic and Low Energy (BLE)
Electrical	
Voltage	9V~20V (Max. DC 20V) regulated DC / 1W (min)
RF Frequency	13.56 MHz
Relay - Rating Load	0.25A/240ACV 0.5A/125ACV 1A/24DCV
Environment	
Operating Temperature	0C ~ +50C
Storage Temperature	-10C ~ +60C
Humidity	10 ~ 90 relative
Dimensions	
Width	105 mm
Height	105 mm
Depth	20.74 mm

Model

When AC908A stays in idle state, it will keep scanning card, once a card presented and detected, it will do the **Card Verification**. If the verification is OK, then it will go to execute the **Command Operations**. AC908A will stop scanning card during the period of relay opened or alarm sounding.

Command Operations

The **Command Operations** is an action that is determined by the content of card memory. The **Command Operations** has 3 types, AC908A executes one of them according to the **Card Type** value that is reading from the card memory.

Command Operations contains following operation types:

- **Management Operation**
  - Application: Manage device parameter settings.
  - Card Type: **Settings Manage Card**, **Date/Time Manager Card**, **Blacklist Manager Card**, **Master Card**.
  - Function: Update device parameter settings.
- **Deduction Operation**
  - Application: Payment System.
  - Card Type: **User Card** (When AC908A's **Value** setting is larger than 0).
  - Function: Deduct the card's balance value, trigger relay, control I/O switch.
- **Access Control Operation**
  - Application: Access Control System
  - Card Type: **User Card** (When AC908A's **Value** setting is 0).
  - Function: Verify card UID (CSN), trigger relay control I/O switch.

Card Verification

When AC908A detects a card, it will start verifying this card. If the verification result is OK, then AC908A will go to execute **Command Operations**.

Following shows the **User Card** verification procedure:

1. Reads card UID and then check the card UID if is listed in the **Black List**. If so, AC908A will show an error beeps and LED light, then return to idle state.
2. Checks the AC908A's **anti-passback** setting. If is enabled, AC908A will check the last transaction time of this card by UID. If the elapsed time is over than defined anti-passback time, AC908A will show an error beeps and LED light, then return to idle state.

3. Reads card's **System Code** setting. If is not identical to AC908A's system code. AC908A will show an error beeps and LED light, then return to idle state.
4. Check the card's valid usage setting. If is expired or not yet take effect, AC908A will show an error beeps and LED light, then return to idle state.

Following shows the **Manager Card** verification procedure:

1. Reads card's **System Code** setting. If is not identical to AC908A's system code. AC908A will show an error beeps and LED light, then return to idle state.
2. Reads card's settings and search the sector setting's **FID** is identical to reader's **FID**. If is not found, AC908A will show an error beeps and LED light, then return to idle state. Step #2 is only for **Settings Manager Card**.

Manager Card contains:

- **Settings Manager Card**
- **Date/Time Manager Card**
- **Black List Card**
- **Master Manager Card**

Once the card verification result is OK, AC908A will execute the **Command Operations**.

Management Operation

The **Management Operation** is the process of updating the settings stored in the **Manager Card** to AC908A. If you want to change AC908A settings without connecting it to computer, then using **Manager Card** will be a solution.

Deduction Operation

When the AC908A's **Value** setting is larger than 0, then the application is used for payment system.
Before doing **Deduction Operation**, AC908A will confirm following conditions. If is OK, then it will deduct the **User Card**'s balance value, trigger the relay and control switch.
Following is the **Deduction Operation** procedure:

1. Reads card's log data. If the card memory is full and not allow overwrite the oldest log record, AC908A will show an error beeps and LED light, then return to idle state.
2. Checks card's balance is enough or not (compare to AC908A's **Value** setting). If card balance is not enough, then check AC908A's **Overdraft** the setting (a draft in excess of the credit balance).
3. If #1 and #2 meet the requirement, then AC908A will deduct card's balance by AC908A's **Value** setting.
4. Save the log **Record** to card memory.
5. Save the log **Record** to AC908's internal memory.

6. Trigger relay for defined **Period Time**. AC908A shows **success operation state** to notify user.
7. According to AC908A's **Pay Mode** to determine the method of deduction – By Count or By Time. If the **Pay Mode** is By Count, AC908A will send Halt command to card, which means the card needs to remove form AC908A then can go for next deduction.

Access Control Operation

When the AC908A's **Value** setting is equal or smaller than 0, then the application is used for access control system.
Before doing **Access Control Operation**, AC908A will confirm following conditions. If is OK, then it will trigger the relay to control the door lock or I/O switch.
Following is the **Access Control Operation** procedure:

1. Check the AC908A's MID if is listed in the card's **Door Access MID List** (this list can be set up by **Card Issue** program with using **PCR310U** card writer).
2. Check the card if is Mater Card.
3. Check the AC908A's MID and RTC if is meet the requirement of card's **DAID Usage Period** setting (this settings can be set up by **Card Issue** program with using **PCR310U** card writer).
4. If all of above #1, #2 and #3 condition is not meet the requirement, AC908A will show an error beeps and LED light, then return to idle state.
5. AC908A sends Halt command to card, which means the card needs to remove form AC908A then can go for next operation.
6. AC908A triggers relay for defined **Period Time**. AC908A shows **success operation state** to notify user.

Device Parameters

MID

Default: 0
Machine ID. This ID is AC908A identifier number. The MID value ranges from 1 to 255.

FID

Default: 0
This is mainly for on-site setting of the device properties by Manager Card. Readers of the same functioning group or decrement can have the same function ID. Manager Card is a reserved function for future. The FID (Function ID) ranges from 1 to
255.
FID is used to **Management Operation**.

Card Type (CT)

The type of card usage. AC908A reads this setting to determine how to parse on card data.

Value	Description
1	Settings Manager Card
2	Date/Time Manager Card
3	Black List Manager Card
5	User Card V3
6	Date/Time Manager Card V2
7	Master Manager Card

System Code

Default: 0
This code is to verify if the card and device are of the same system. If the system code of the card is different from that of device, the card cannot be accepted by device. The system code must be the same as that saved to programmer PCR310U.

Advance (Overdraft)

Default: Deny

Advance (Overdraft) Consumption is considered when the balance of the card is above zero but insufficient for a transaction. If it is allowed, device will accept the insufficient-valued card just once as last transaction.

Pay Mode

Default: By Count

There are 2 kinds of pay mode for option, one is *By Count* and the other is *By Time*.

- By Count: When a card is read by device, this card will be halted and the next transaction is not allowed until preset period time is up.
- By Time: When a card is read by device, it must stay with device during the period time to continue the next transaction in a row.

Value

Default: 0
Set the decrement value or amount required for using the device.
Set the value to 0 for access control application and no deduction will be made from the card.

Delay Time

Default: 0
Set the duration that a card needs to be presented to device to complete the transaction. This is to avoid accidental reading when a card is within the reading range yet not meant for transaction.

DO1: Period Time

Default: 0
Set the activation duration of the device connected with DO1 (relay). When the time is up, the device will be terminated accordingly. ◦

LED Status

Set the LED status of success. Set the green or red LED will be blink when the device has accepted a card.

Black List

Black List defines a list of card UID (CSN) that are stored in the AC908A internal memory. If the presented

card UID is in the **Black List**, then AC908A will reject to execute the **Command Operations**.

Card Information

The card is issued by **Card Issue** program by using the **PCR310U** card writer.

User Card (V3)

User Card stores the balance and a list of **MID** number. This card can be used for Payment or Access Control System.

Settings Manager Card

Settings Manager Card stores the AC908A settings. This card is used to update AC908A settings without connecting device to computer.

Data/Time Manager Card

Date/Time Manager Card stores the date/time parameters that are used to update the AC908A RTC value.

Data/Time Manager Card V2

Date/Time Manager Card stores the date/time parameters that are used to update the AC908A RTC value.

Black List Manager Card

Black List Manager Card stores the Black List data that is used to update the Black List setting of AC908A.

Master Manager Card

Master Manager Card stores access card key value that is used to update AC908A's card key value.

Device Operations

Operation Status for Status LED and Buzzer

Status	Buzzer	Status LED[1]
Power On/Idle	Long beep	Green light
Process OK	Long beep	Flash green light once
Read User Card Error	7 short beeps	Flash red light twice
Read Management Card Error	2 short beeps	Flash red light 7 times
Bluetooth Connected	3 very-short beeps	Quick-flash green light 3 times

Note:

1. The LED color can be configured by AC908A Utility program.

Transaction Log

When AC908A deduct User Card's balance value, AC908A will save the transaction log to User Card memory and its own memory. You can download the log stored in card by **Card Issue** program, and use **AC908A Utility** to download the log stored in AC908A.

The record count is determined by the card memory size. For 1K memory, the maximum record count is 42.

Record Format	
Bytes	**Description**
0	MID (Machine ID)
1	FID (Function ID)
2~7	Date & Time (BCD Format, YY/MM/DD HH:MM:SS)
8~11	Value 1 (+/- Value)
12~15	Value 2 (Balance)

Frequently Asked Questions

Q: Can I use mobile phone to update the AC908A firmware via the Bluetooth connectivity? If so, how much time will it take to update the firmware?

A**:** Yes, you can use the **Firmware Loader app** to update the firmware via the Bluetooth connectivity. The time to update the firmware is variant from the mobile OS you use. For Android, it will take about 4~5 minutes. For iOS, it will take about 10~11 minutes.

Update History

2023/10/30 v1.0.3

- Changed Card Writer model name from **PRW106** to **PCR310U**.

2021/6/9 v1.0.2

- Added **Frequently Asked Questions**.

2021/5/21 v1.0.1

- Corrected **Wire Assignment**.