Advanced Card Systems Ltd.
Card & Reader Technologies

ACR350
Secure Validator
with QR Code Scanner

User Manual V1.02

Version History

Date	Changes	Version
2021-03-16	• Initial	1.00.00
2022-04-20	• Modified against FW1.2.1	1.01.00
2022-04-27	• Review and Modified the content	1.02.00

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1.0. Introduction

The ACR350 Secure Validator is designed specifically for Automatic Fare Collection (AFC) systems to offer the convenience of cashless and secure payment in buses, ferries, trams, railways and other transportation modes.

The bus validator enables high-speed transaction processing and records collection through 13.56 MHz contactless (RFID) technology. It supports ISO 14443 Type A and B cards, MIFARE®, and FeliCa. Being certified with PCI PTS 5.1 with SRED, major payment standards such as PBOC Level 1 (Contactless) and EMV™ Levels 1 and 2 (Contactless) including MasterCard® Contactless and Visa PayWave® offers flexibility and security to adapt an open loop payment system. An embedded barcode scanner enables transactions through the use of print or mobile barcodes or other QR payment application.

It has advanced wireless connectivity options for data transfer such as GSM/GPRS, 3G/4G, and Wi-Fi. With an optional GNSS feature, it can also locate vehicles, manage fleets and set flexible distance-based fares. Protecting the bus validator from harsh environments is its IK08 rating for mechanical impact, IP65 rating for dust and water protection and the additional Military Standard MIL-STD-810 for Shock and Vibration.

2.0. ACR350 Hardware Overview

2.1. Parts of the Reader

Figure 1: ACR350 Parts

Part Number	Part Name
1a, 1b, 1c,1d	Programmable Button with Backlight (Blue)
2	Blue LED Indicator (For passenger)
3	Yellow LED Indicator (For passenger)
4	Green LED Indicator (For passenger)
5	Red LED Indicator (For passenger)
6	LCD Display with Touch Panel
7	Tapping Area
8	1D/2D Barcode Scanning Area
9	Speaker
10	Green LED Indicator (For Driver)
11	Red LED Indicator (For Driver)
12	Buzzer
13	Power Button
14	SIM and SD Card Cover
15	Back Cover

Table 1: ACR350 Parts Description

2.1.1. Connection Ports

Figure 2: ACR350 Connection Ports

Port Number	Port Name
1	Power Socket (With ignition pin)
2	RJ11 Serial Port (RS232, RS485)
3	USB Host
4	GPIO and CANBUS (12P socket MOLEX 5018761240, mate with 501646 plug)
5	Ethernet
6	Socket for External GPS Antenna
7	SAM Cover with 4 ISO7816 SAM Socket inside

Table 2: ACR350 Connection Ports Description

2.1.2. Input Power, RS232, RS485 Pin Assignment

Power Socket Type: Molex 43045-0400, Micro-Fit 3.0 Right Angle Header, 3.00mm Pitch, Dual Row, 4 Circuits. Refer to Section 2.5 for details about ignition sense.

RS232, RS485 Socket type: RJ11

Pin Assignment is shown as below:

Figure 3: ACR350 Input & Power

Pin Number	Pin Name
1	NC
2	RS232-TX
3	RS232-RX
4	RS485-A
5	RS485-B
6	GND

Table 3: ACR350 Input Power Pins Description

Note: Below is the application direct access device paths list:

- *RS232 - /dev/ttymxc1 (default setting: 115200 baud, 8 data bits, no parity, and 1 stop bit)*
- *RS485 - /dev/ttymxc2 (default setting: 115200 baud, 8 data bits, no parity, and 1 stop bit)*
- *USB disk - /media/udiskp1*

2.1.3. SAM Slot Arrangement

The SAM Slot Arrangement is shown in the image below.
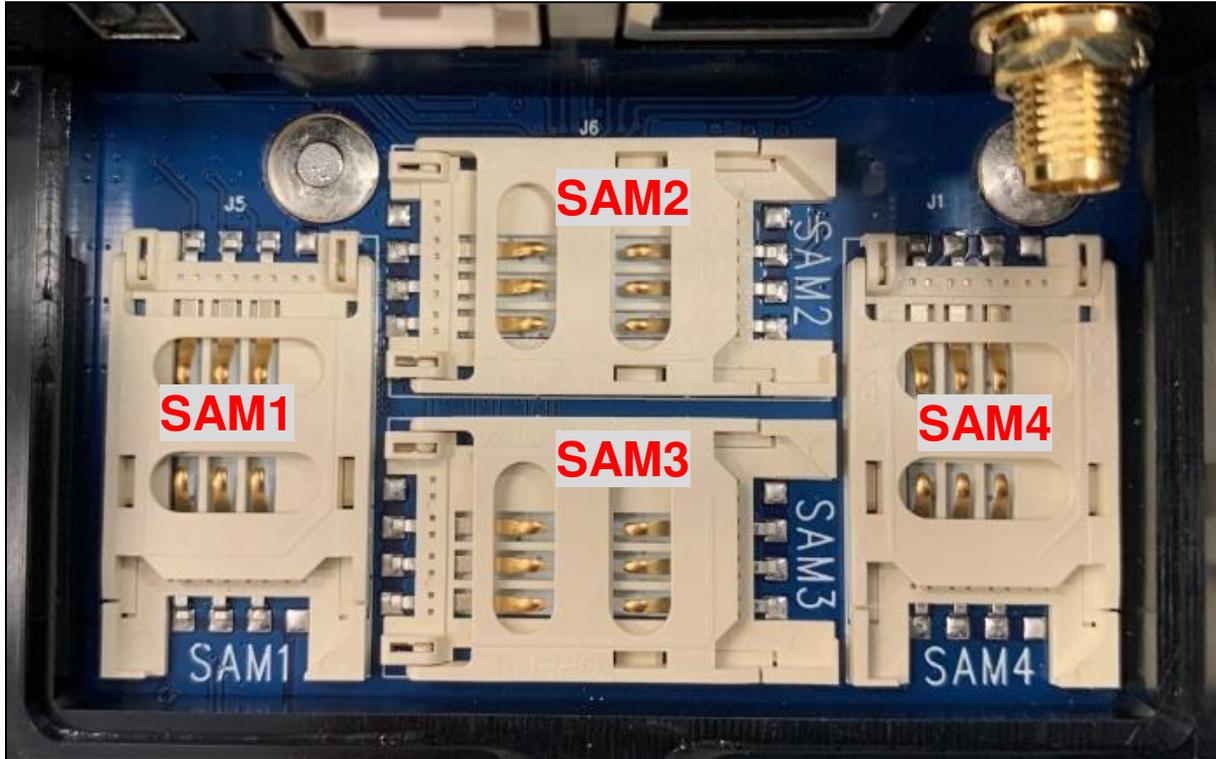
Figure 4: SAM Slot Arrangement

2.1.4. LTE Board Description
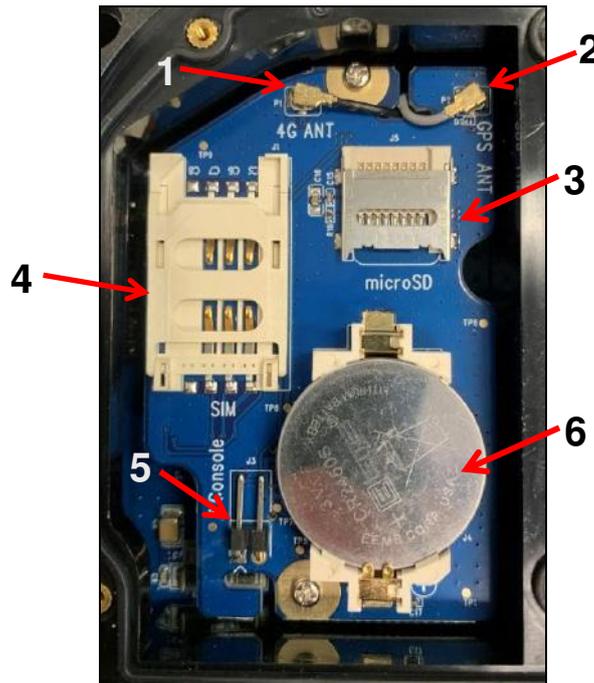
Figure 5: LTE Board Components

Part Number	Part Name
1	4G Antenna Socket
2	GPS Socket
3	SD Card Slot
4	SIM Card Slot
5	Console Jumper Port (Console mode is enabled through RS232 when jumper is plugged in. Speed: 115200 baud, 8 data bits, no parity, and 1 stop bit) *Note: Jumper is not included in standard product. May be purchased locally.*
6	Coin Cell Socket for CR2450 (3V)

Table 4: ACR350 LTE Board Description

Note: Below is the application direct access device paths list:

- *MicroSD - /media/sdcardp1*

2.2. ACR350 EVK Components
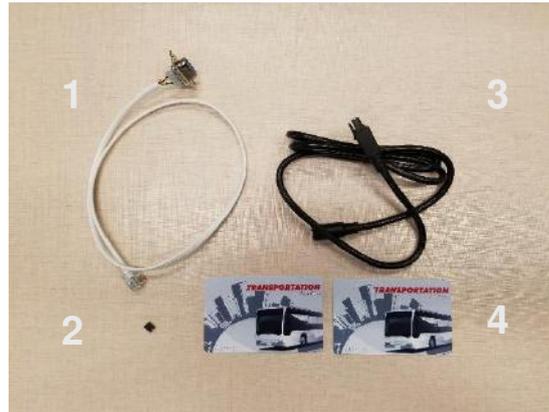
Figure 6: ACR350 EVK Components

The ACR350 EVK contains the following items:

1. Debug Cable

2. Console Jumper Port

3. 1m DC Power Jack to Molex Power Cord

    - The cable should comply with the required power rating.
      (example: 12V == 4A; 24V == 2A)

    - A DC jack adapter may be needed depending on the power supply used.

4. Demo Cards

    Purpose: To be used for the demo pre-installed on the reader

    - 2 pcs. Test Cards [Type: Mifare Desfire EV1]

    - There are QR Codes at the back of the cards to emulate both a valid and an expired card.

Note: *For more information about the demo, please check* **Section 3.3 -** **ACR350 Demo**

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2.3. Installing the Back Mount

2.3.1. Preparing the Components

Prior to installation, it is necessary to ensure that the components are complete and in good condition. Both the pole and the back-mount should be ready before the installation.

2.3.1.1. The Pole

To prepare the pole:

1. On the right side of the pole, check if the holes needed to secure the position of the ACR350 have been well-drilled. For reference, please refer to the illustration below.

   Note: The position of the holes can be adjusted depending on the requirement
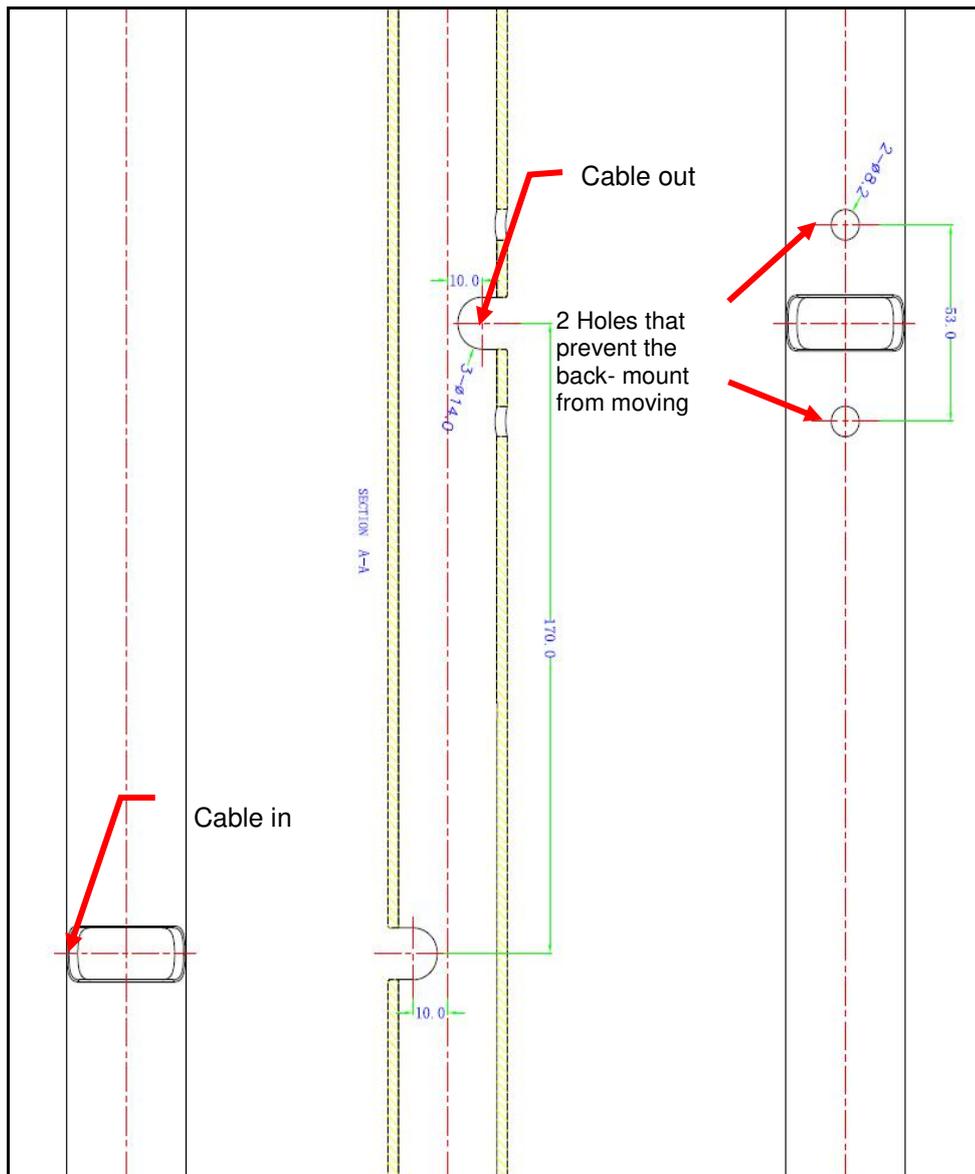
Figure 7: Pole Hole Position

2. Check if the required cables (e.g. power cords) have been properly passed through the poles, and that they can reach the position of the mounting with ample extra length.

3. Check the following details of the pole:

- Diameter (31/32mm or 35mm)

- Orientation (Vertical or Horizontal)

4. After checking the pole, proceed to check the back-mount.

2.3.1.2. The Back-mount

To prepare the back mount:

1. Unbox the tools. A **back-mount**, a **key**, and a **brown box** are included in the package.

2. Using the **key**, open the lock of the **back-mount**. The lock is located at the bottom part of the back-mount as shown on the image below:

3. Unlocking the back-mount will cause it to disassemble into three parts: **front cover**, **back cover**, and the **water-resistant part**. **Rubber adapters** are also included inside the back-mount.
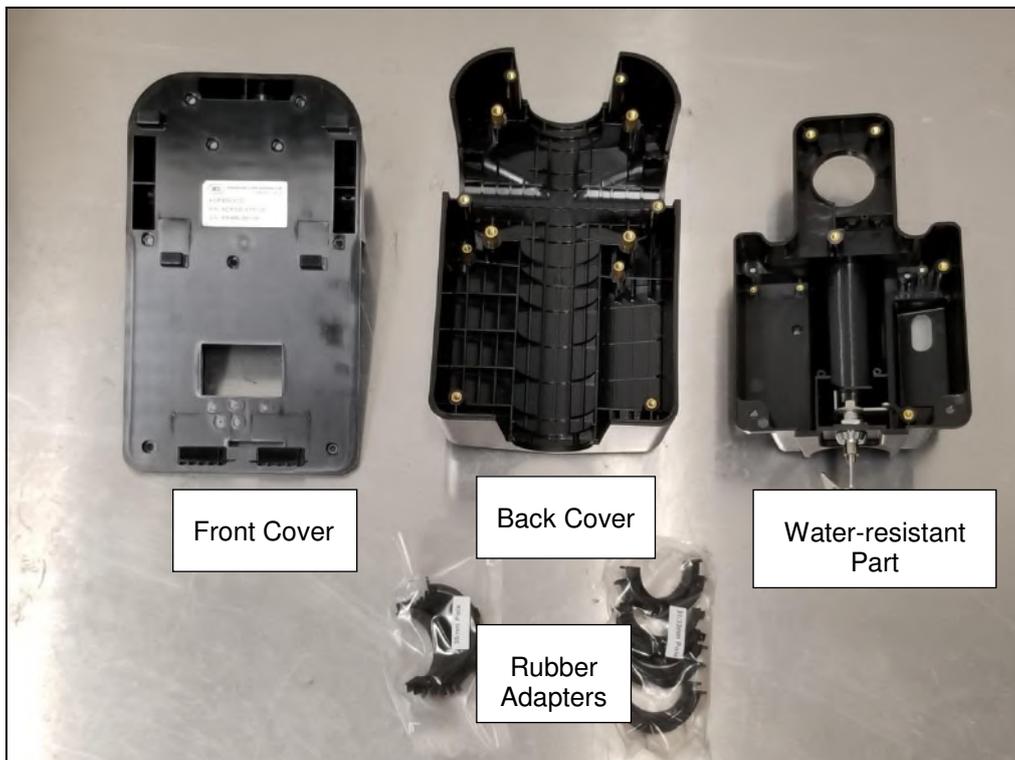
4. Using the codes on their inner side, select the **rubber adaptors** that match the pole's size and orientation, as shown in the table below:

For 35mm Pole   For 31/32mm Pole

Orientation of pole for mounting	Pole diameter	
	31/32mm	35mm
Horizontal (H)	HB-D31/32, HB-D31/32, HT-D31/32, HT-D31/32,	HB-D35, HB-D35, HT-D35, HT-D35,
Vertical (V)	VB-D31/32, VB-D31/32, VT-D31/32, VT-D31/32,	VB-D35, VB-D35, VT-D35, VT-D35,

Table 5: Rubber Adapter According to Pole Size and Orientation

5. Open the **brown box**. The following components should be inside the box:

Brown Box

Rubber Part

Metal Part 2

Metal Part 1

Screws
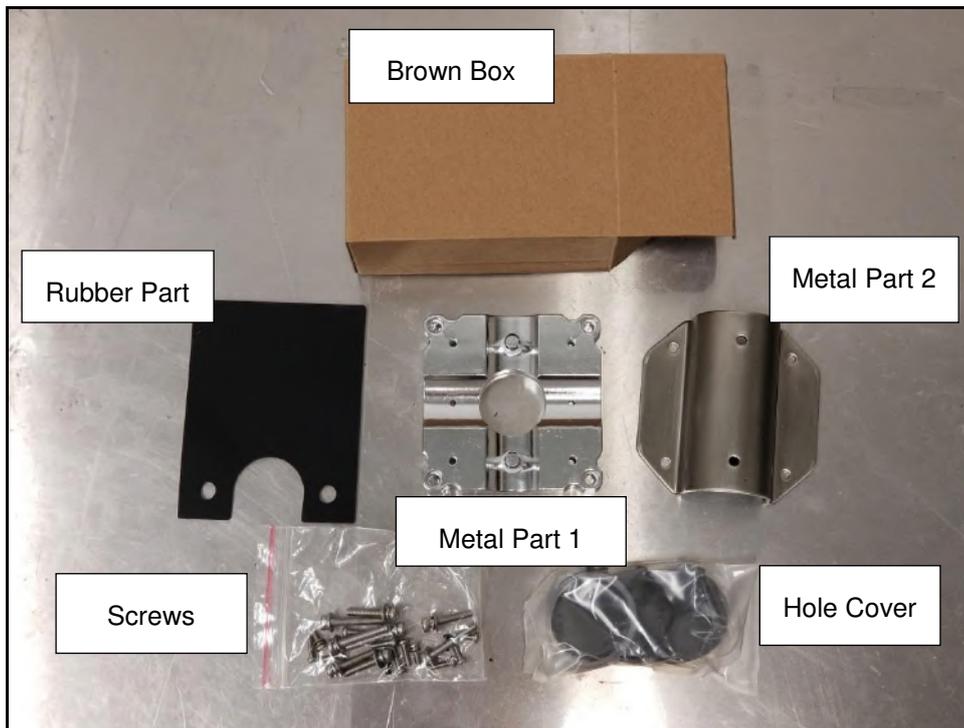
Hole Cover

6. Select the appropriate **hole cover** according to the orientation of the pole, as shown in the photo and in the table below:
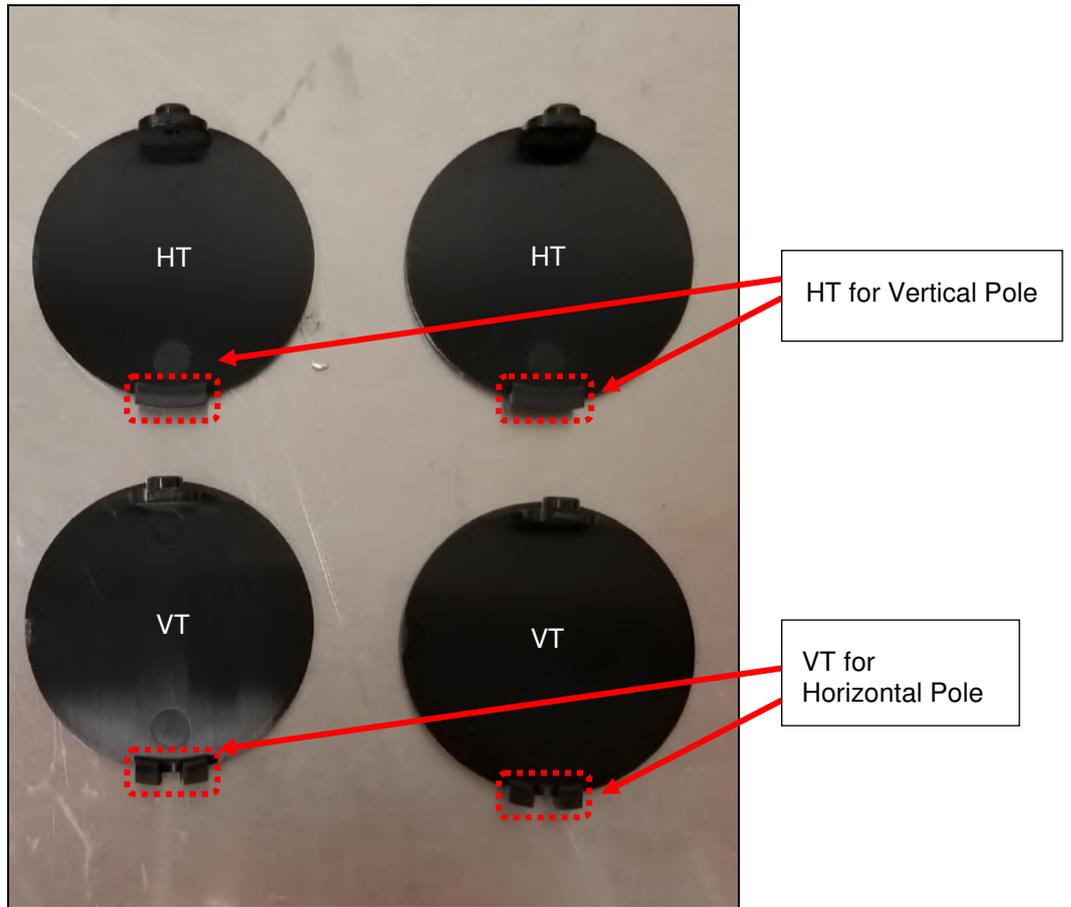
Orientation of pole for mounting	Pole diameter	
	31/32mm	35mm
Horizontal	**VT, VT**	**VT, VT**
Vertical	**HT, HT**	**HT, HT**

Table 6: Hole Cover According to Pole Size and Orientation

2.3.2. Installing ACR350 using a Vertical Pole

Note: Please ensure that the components are well prepared before starting the installation.

To install the ACR350 using a vertical pole:

1. Place the **rubber part** on top of the **metal part 1**.
   Note: This step is only applicable when using a 31/32mm pole. When using a 35mm pole, please skip this step.

2. Put **metal part 1** and **metal part 2** on top of the pole and screw them together using PM4*20 screws (4 pieces). The order of screwing is shown on the picture below:
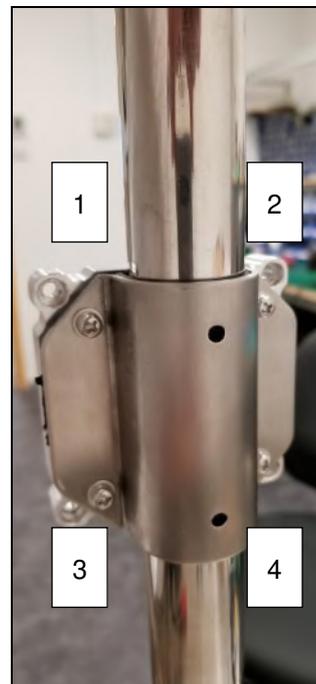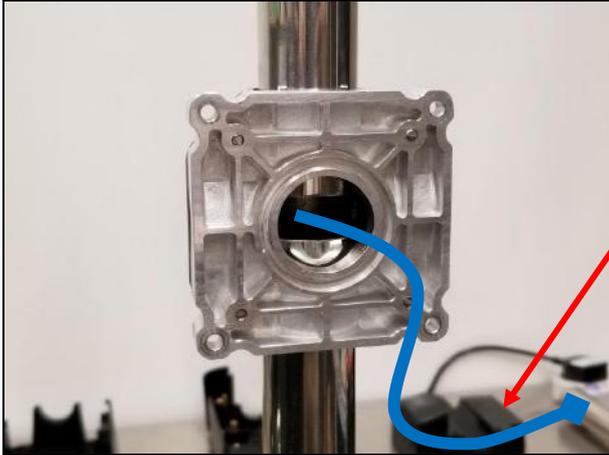
Note: *This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.*

Note: *The gap between the two metal parts is around 3mm for any size (31/32/35mm) of pole.), as shown in the picture below.*
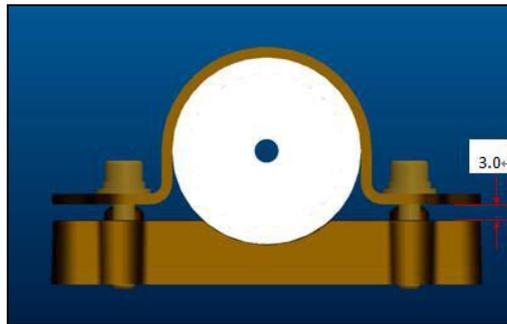
3. Screw the **rubber adapters** and **hole covers** using the PB2.0 screws (2 pieces). The exact position is shown on the photos below:

- For **31/32mm pole**:

- VT-D31/32 Rubber Adapter
- VB-D31/32 Rubber Adapter
- HT Hole Cover
- HT Hole Cover
- VB-D31/32 Rubber Adapter
- VT-D31/32 Rubber Adapter

- For **35mm pole**:

- VT-D35 Rubber Adapter
- VB-D35 Rubber Adapter
- HT Hole Cover
- HT Hole Cover
- VB-D35 Rubber Adapter
- VT-D35 Rubber Adapter

4. Screw the **back cover** to the metal parts using PM4*25 screws (4 pieces).

Note: This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.

5. Place the **O-ring** on top of the metal part. The exact position is shown on the photo below:

O-ring

Note: This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.

6. Screw the **water resistant part** using PM3*8 screws (2 pieces).

Note: *This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.*

7. Using the **key**, open the lock. The exact location is shown on the photo below:

8. Screw the **top cover** to the back cover using PM3.0*10 screws (9 pieces). The exact position and order is shown on the photo below:

Note: This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.

9. Connect the **cables** to the **ACR350**.
10. Mount the **ACR350** on the **back-mount**.

11. Using the **key**, lock the **back-mount**.

Lock

Locked

2.3.3. Installing the ACR350 using a Horizontal Pole

Note: *Please ensure that the components are well prepared before starting the installation.*

To install the ACR350 using a horizontal pole:

1. Place the **rubber part** on top of the **metal part 1**.
   Note: *This step is only applicable when using a 31/32mm pole. When using a 35mm pole, please skip this step.*


2. Put **metal part 1** and **metal part 2** on top of the pole and screw them together using PM4*20 screws (4 pieces). The order of screwing is shown on the picture below:
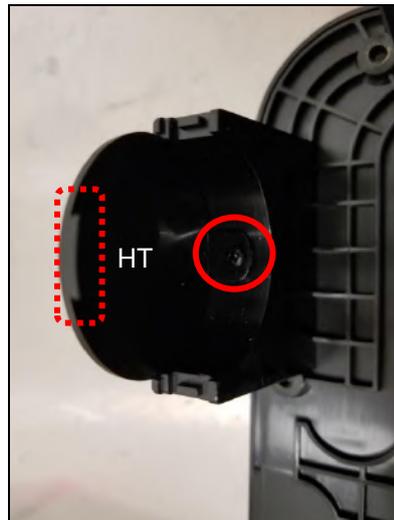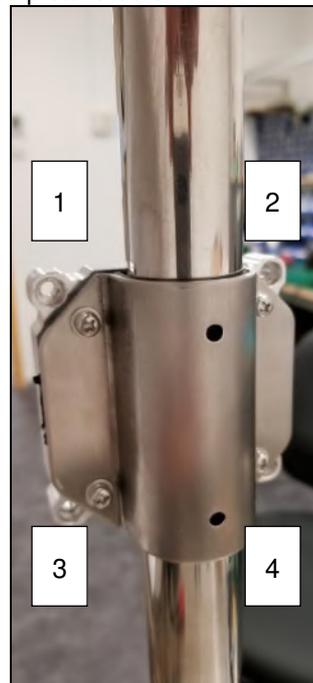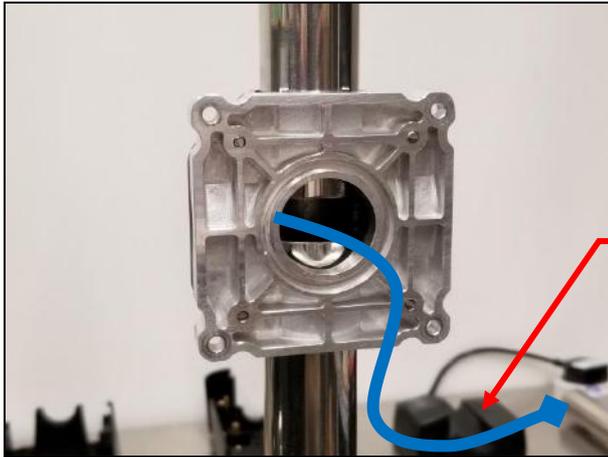
Note: *This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.*
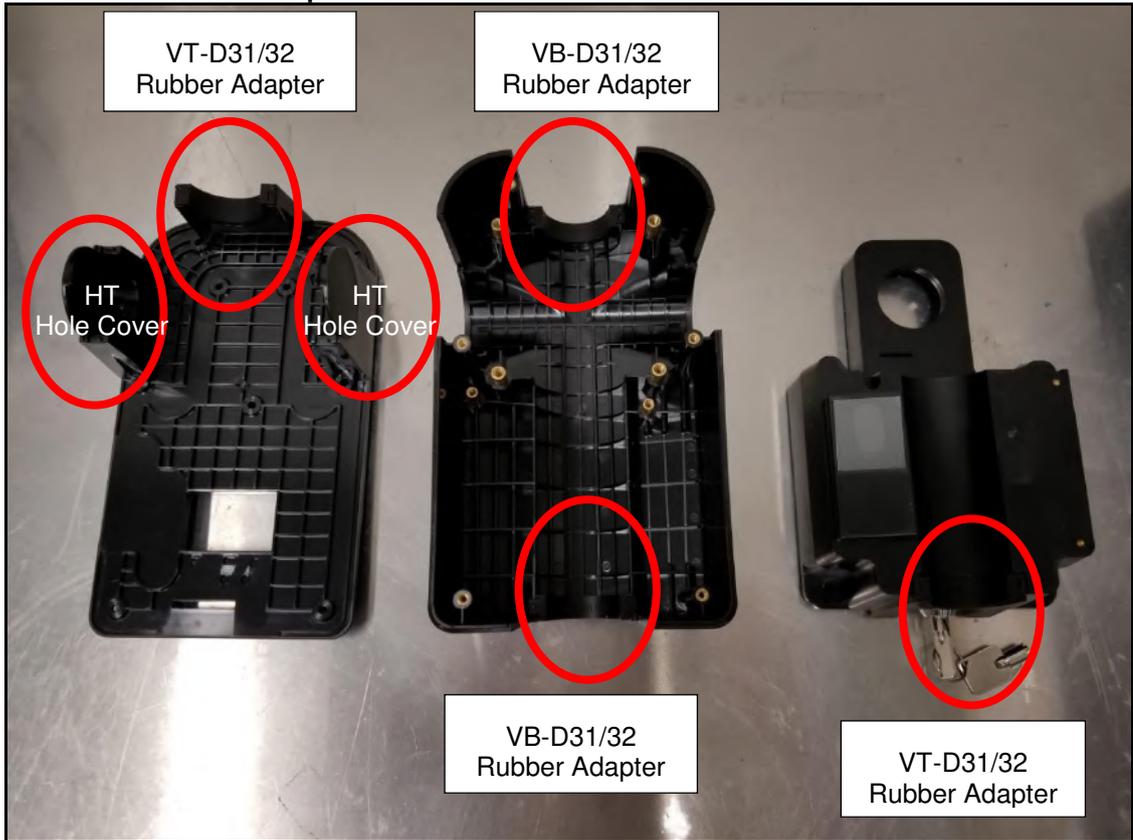
Note: *The gap between the two metal parts is around 3mm for any size (31/32/35mm) of pole.), as shown in the picture below.*
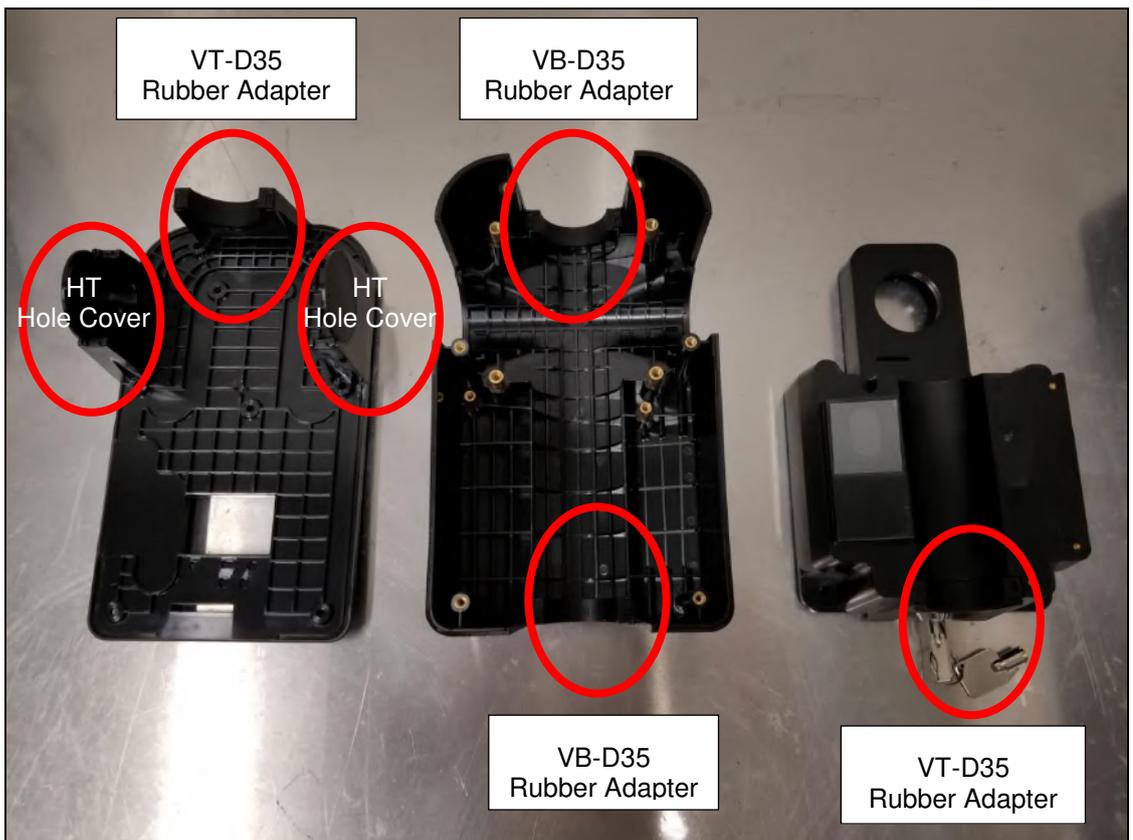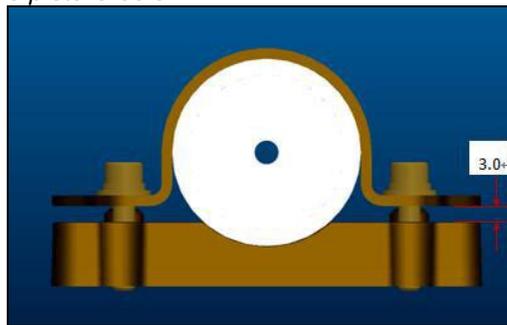

3. Screw the **rubber adapters** and **hole covers** using PB2.0 (2 pieces). The exact position is shown in the photos below:
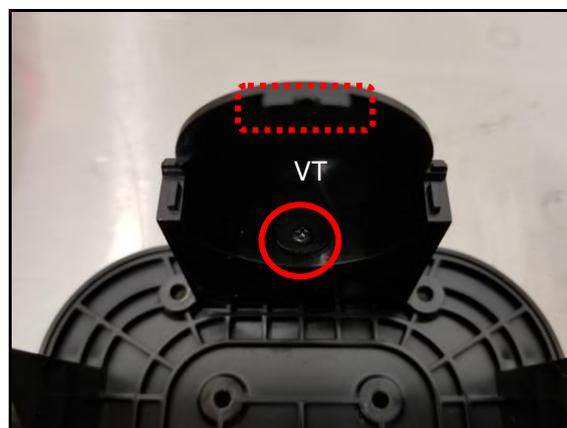
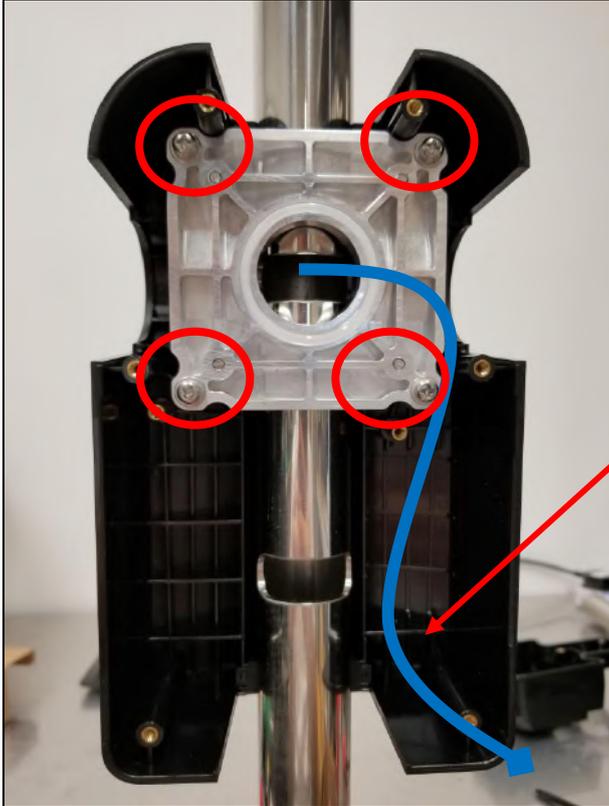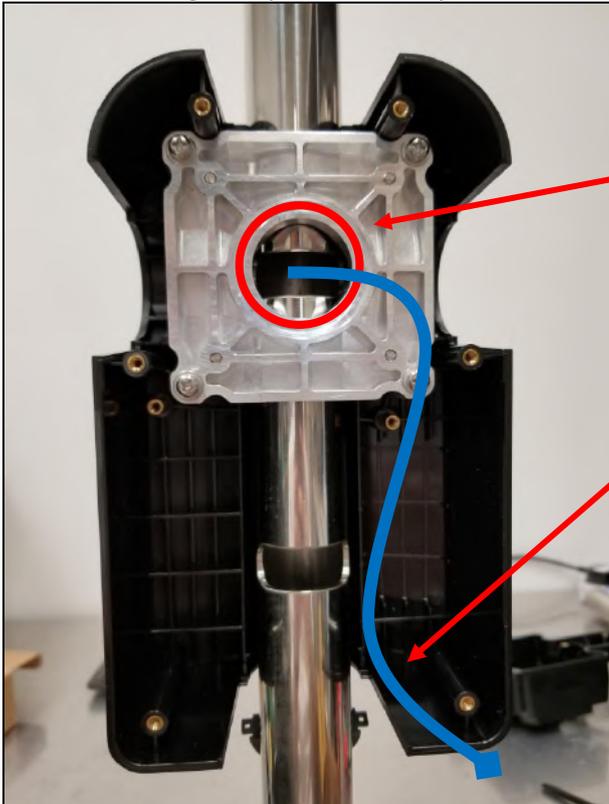- For **31/32mm pole**:
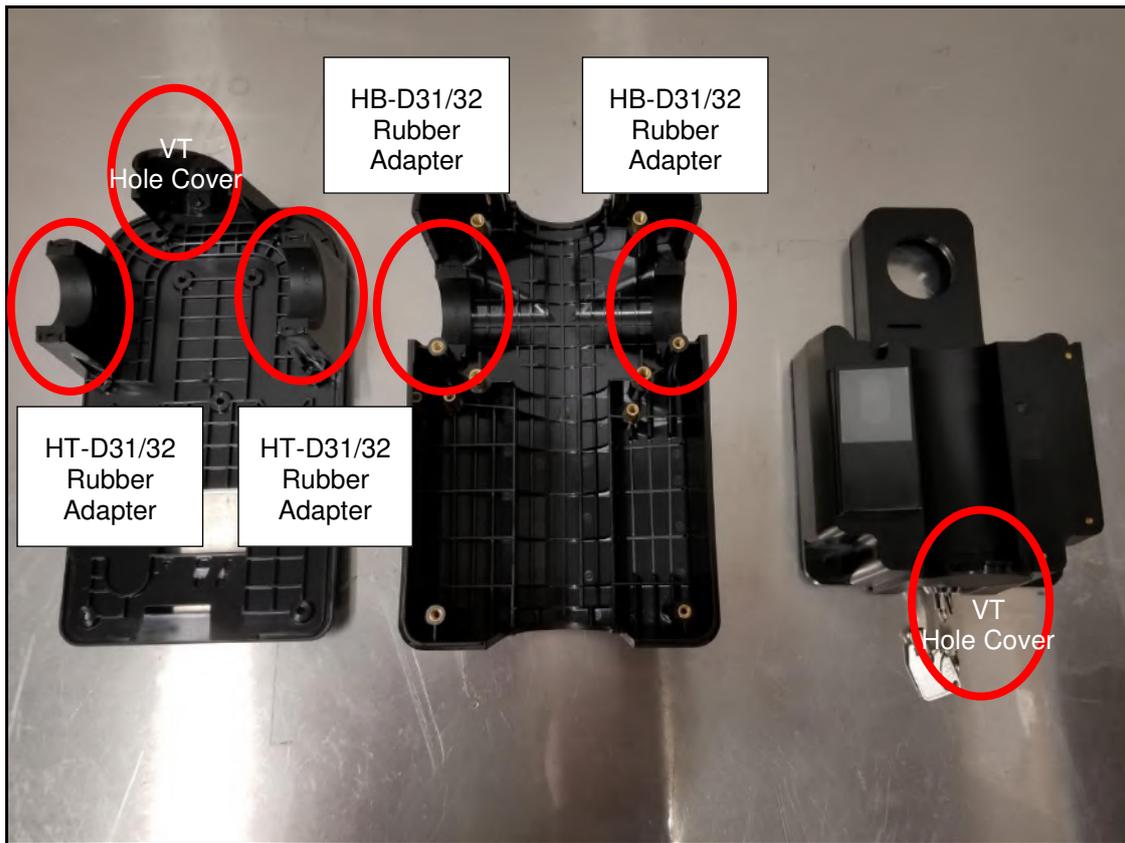
- For **35mm pole**:

4. Screw the **back cover** to the metal parts using PM4*25 screws (4 pieces).

Note: This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.

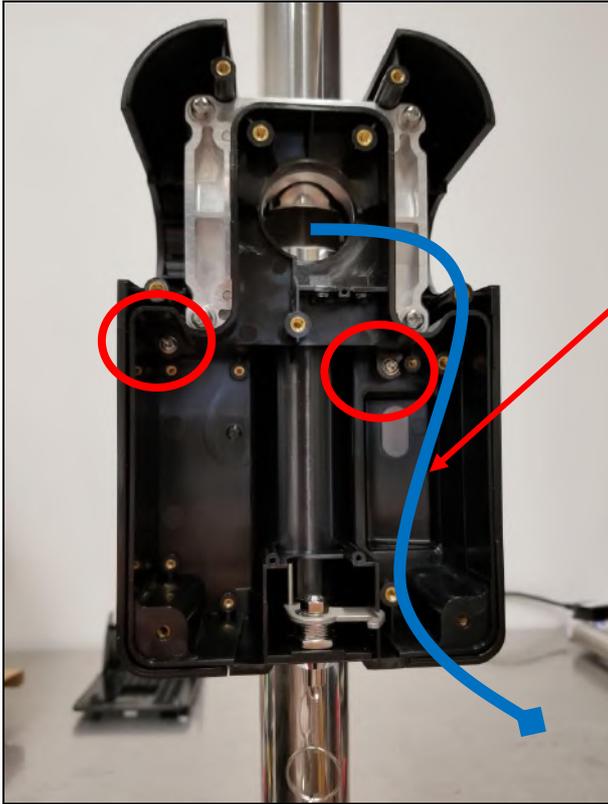5. Place the **O-ring** on top of the metal part. The exact position is shown in the photo below:

O-ring

Note: This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.

6. Screw the **water resistant part** using PM3*8 screws (2 pieces).
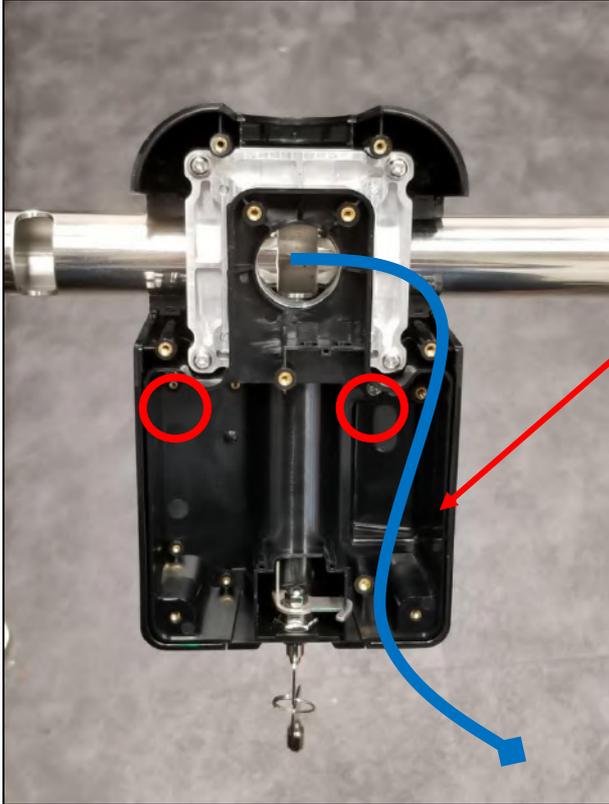
Note: This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.

7. Using the **key**, open the lock. The exact location is shown in the photo below:

8. Screw the **top cover** using PM3.0*10 screws (9 pieces). The exact position and order is shown in the photo below:
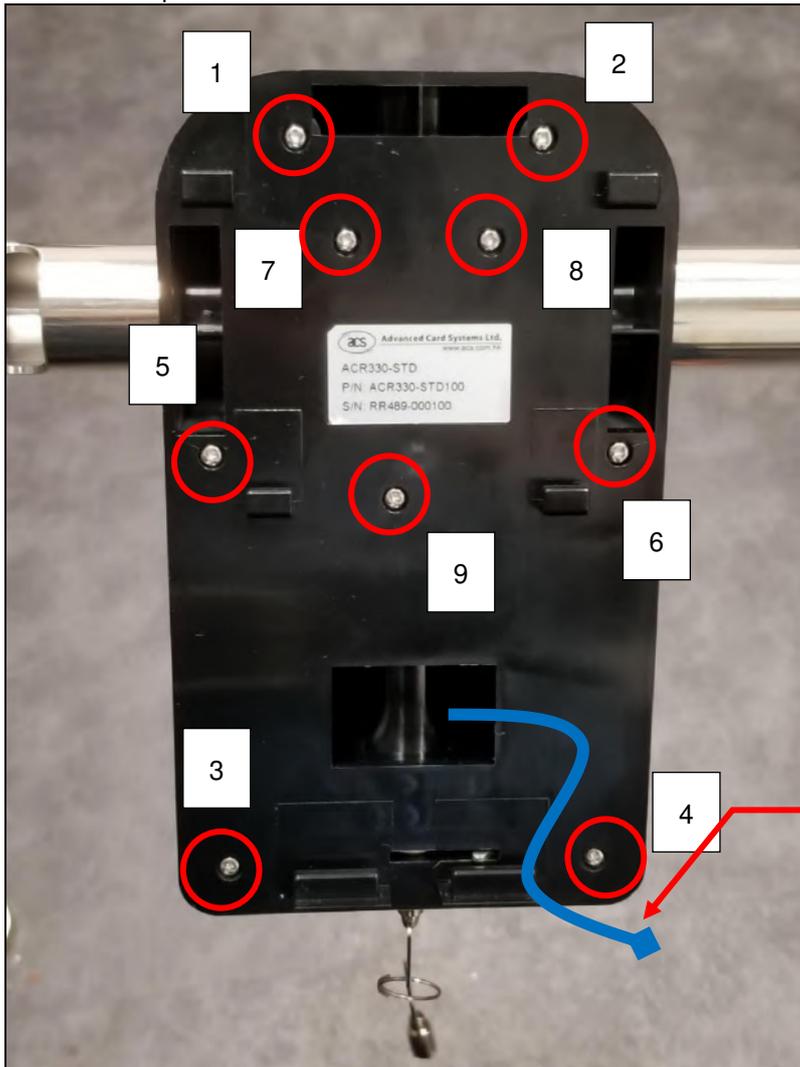
1 2 7 8 5 9 6 3 4
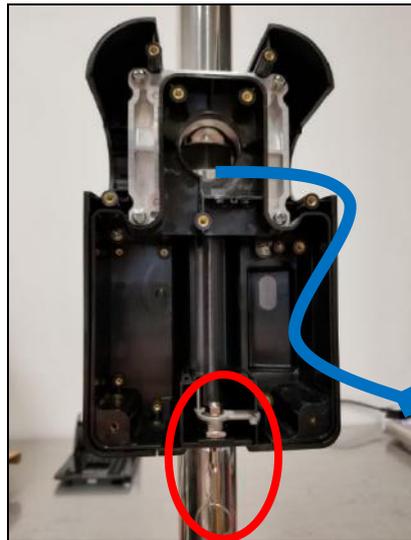
ACR330-STD
P/N: ACR330-STD100
S/N: RR489-000100

Note: *This is where the Connection Cable (ie, Power Cord) will go through. Make sure that the cables are out so that they may be easily connected to the ACR350 Validator later on.*

9. Connect the **cables** to the **ACR350**.
10. Mount the **ACR350** on the **back-mount**.

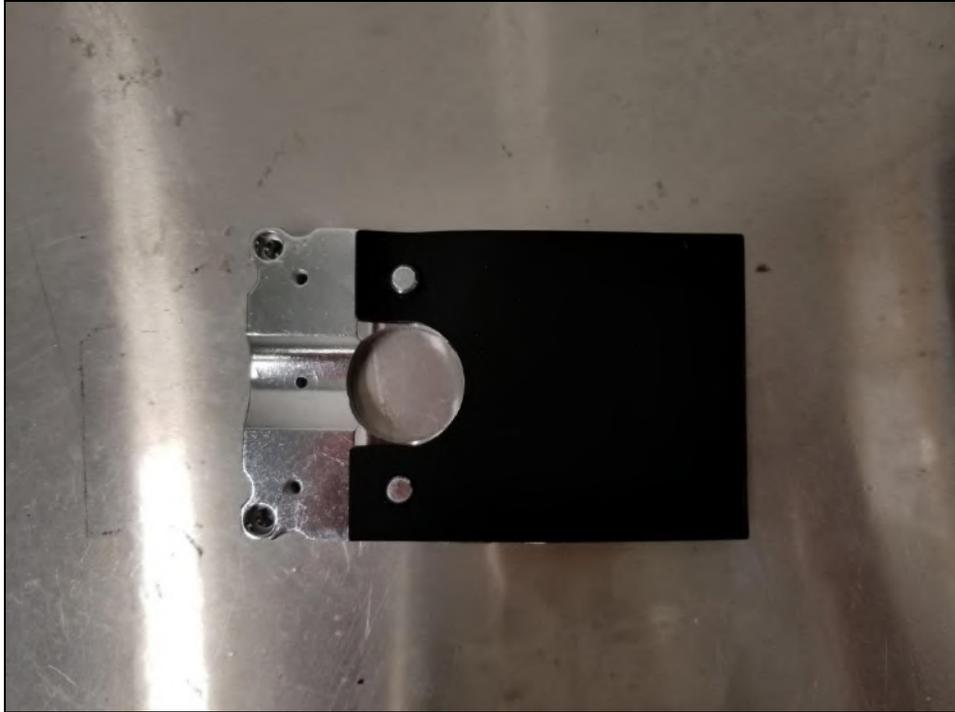

11. Using the **key**, lock the **back-mount**.

Lock

Locked
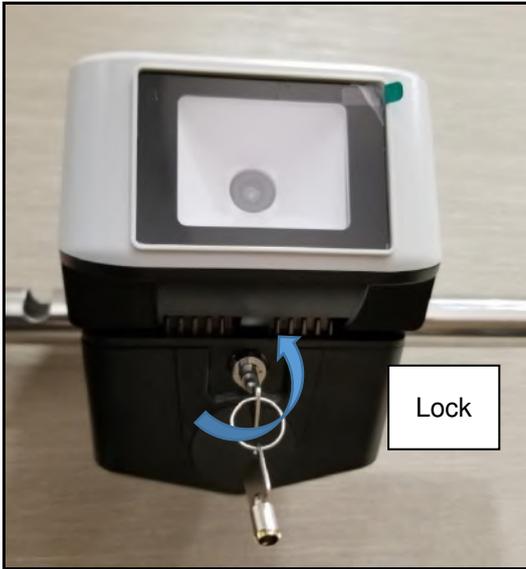
2.4. Turning the Device ON/OFF

2.4.1.   Turning on the Device

To turn the device on, plug the device's **power cable** to a **power source**. The validator will automatically turn on.

2.4.2.   Turning off the Device

To turn the device off, press the **power button** once.

To hard power off the device, press and hold the **power button** for few seconds.

*Note: press the **power button** once to turn on the device after a power off cycle. The power button is **at the back** of the device, as shown in the image below:*

Figure 8: Power Button

2.5. Ignition Sense

ACR350 has ignition sense function. It can detect the status of ignition signal and let application software to do further action, e.g. switch to maintenance mode for data transfer / data backup. The input of ignition pin is located at the 4-pin power connector as shown below.

Figure 9: Ignition Sense Pinout

The voltage level of ignition input is assumed to be same as input voltage, i.e. 9-36V. When ignition input is within this range, a 3.3V logic High signal sends to CPU.

There is opto-coupler in ACR350 to isolate CPU from high voltage ignition signal.

*Note: When the **Ignition pin** is not used, it **must be connected to input voltage pin VIN**. Otherwise ACR350 will not power up.*

Connection example of Ignition:
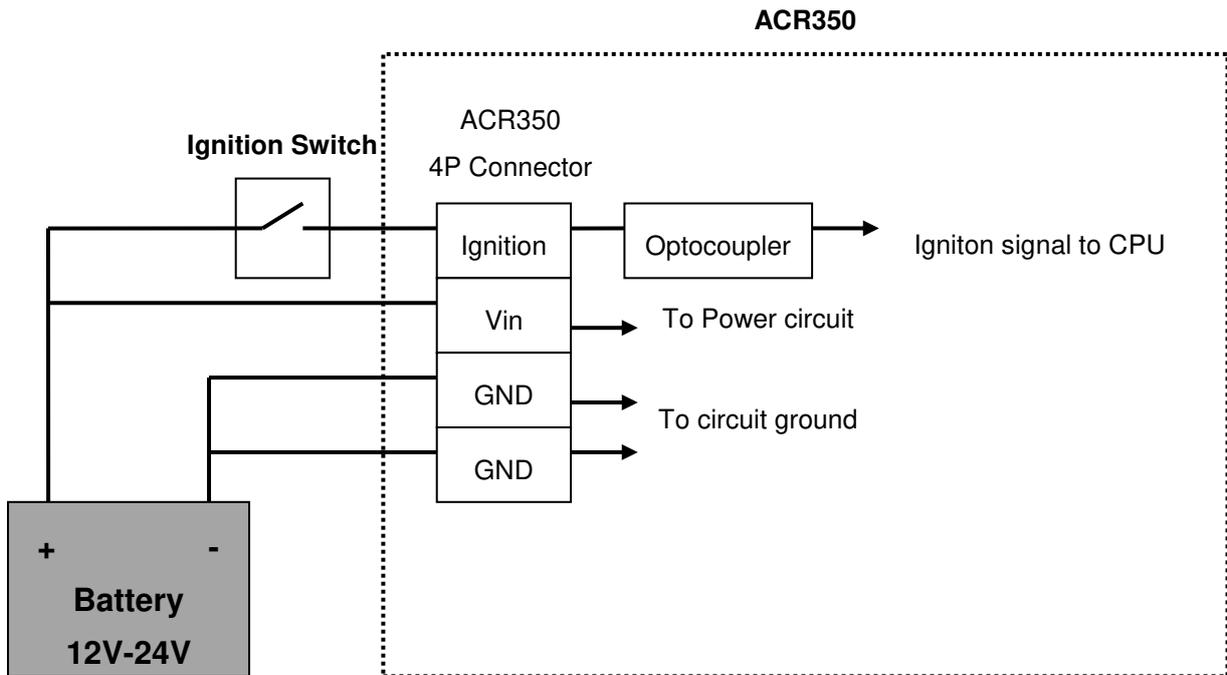
Figure 10: Ignition Sense Connection Example

2.6. Enabling Console Mode

Console mode can be enabled in ACR350 for development. To enable console mode:

Components needed:

- Jumper (to enable the console mode)

1. Open the 4G cover by unscrewing the 4 screws:

2. On the LTE board, plug in a jumper to enable console mode.

   Note: *A jumper is not included in the standard product. It may be purchased locally.*

Figure 11: Jumper Location

2.7. Accessing ACR350 with Telnet / SSH client

2.7.1. Connect Through RS232

1. Connect the ACR350 to the PC using the **RS232 debug console cable**. The exact location of the RJ11 serial port at the back of the ACR350 is shown in the image below.

   Note: *Connect the other end of the cable to the PC's serial port or use a USB-RS232 converter to connect it to the PC's USB port.*
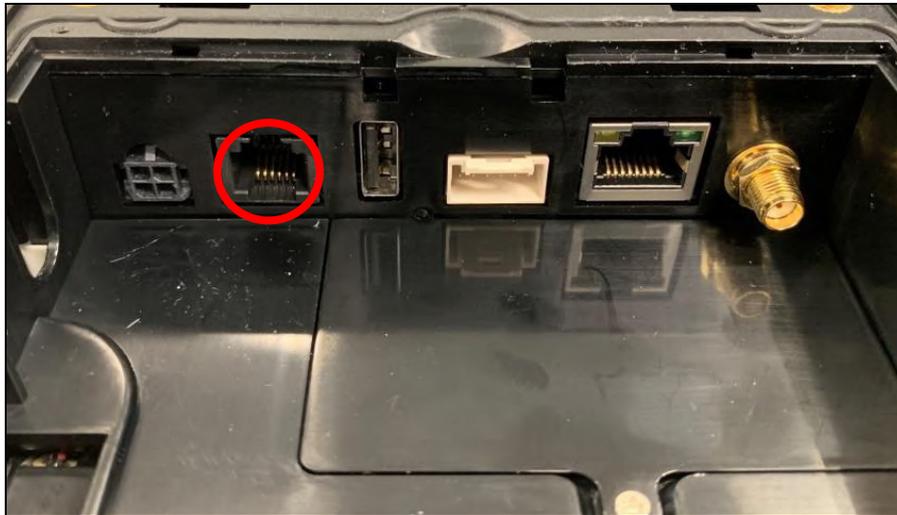
Figure 12: RJ11 Serial Port

2. Turn on the **ACR350**.

3. Run telnet client. Select the corresponding COM port and configure properly.

   - Example software:

     Bitvise SSH Client (Tunnelier) SFTP Application

     https://www.bitvise.com/ssh-client-download

     PuTTY

     https://www.putty.org/

4. Log in to the console.

   a. Login name: **root**

   b. Password: ACR350validator

   Note: *If **root@acr350:~#** is shown, it means login is successful.*

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Figure 13: Login Screen

2.7.2. Connect Through LAN

You may access the ACR350 through a PC using LAN. Below are the components needed and the instructions for accessing the ACR350 through LAN.

Components needed:

- Jumper (to enable the console mode)
- LAN cable

To access with LAN:

1. Connect to the ACR350 using a **LAN cable**. The exact location of the Ethernet port at the back of the ACR350 is shown in the image below:
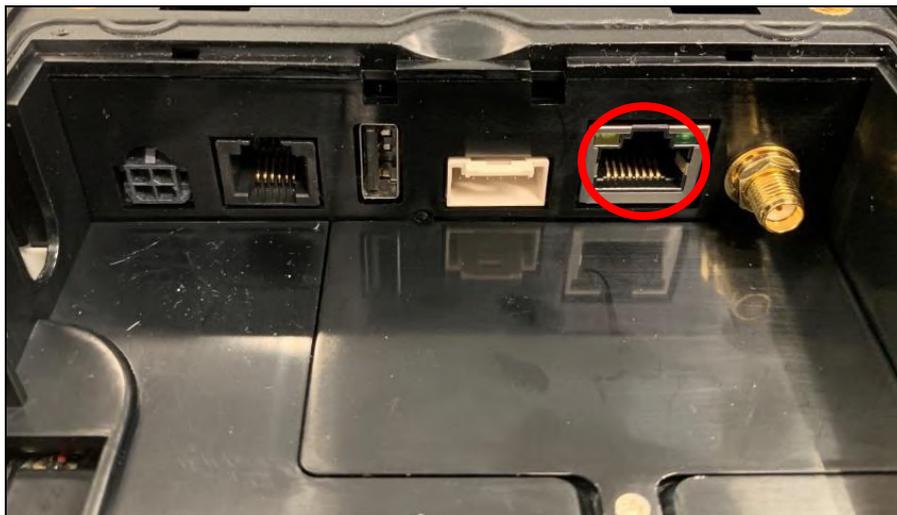
Figure 14: Ethernet Port

2. Open the telnet client on the PC.

3. Login with the IP address of ACR350 (Refer to Section 2.7.2.1).

   a. Login name: **root**

   b. Password: <mark>ACR350validator</mark>

4. The ACR350 may now be accessed on the PC.

   Note: For more information, please refer to ***ACR350 API.chm.***

2.7.2.1. IP Address of ACR350

Depending on the connection, IP Address of ACR350 can be distributed by DHCP or has to be set up manually.

2.7.2.1.1. Read IP Address from ACR350 Demo

IP Address can be read from Device Information page in the standard ACR350 Demo (Refer to Section 3.2.7.1)

2.7.2.1.2. Set IP Address Manually

Static IP address of ACR350 can be set manually by:

1. Enter console mode (Refer to Section 2.5).

2. Login to ACR350 console mode.

3. Edit **10-eth0.network** file in **/etc/systemd/network**. It should contain below content.

```
[Match]
Name=eth0

[Network]
DHCP=ipv4
Address=192.168.91.112/24

[DHCP]
#When CriticalConnection is applied to networkd, the IP address will not
# change after this service was reloaded. Just reboot the system.
CriticalConnection=true
```

Note: *192.168.91.112* is the IP address to be modified accordingly.

4. Save the file and reboot. The IP address will be set.

2.7.2.1.3. Restore IP Setting to DHCP

1. Enter console mode (Refer to Section 2.5).

2. Login to ACR350 console mode and run the command.

```
rm /etc/systemd/network/10-eth0.network
reboot
```

2.8. Replacing the Backup Battery

The backup power uses a CR2450 coin cell. This coin cell battery is shared between the RTC of main MCU and the ACM350-PCD PCI SRED module. The security features and secure memory of ACM350-PCD is powered by the CR2450.

To replace the CR2450 coin cell:

1. Open the 4G cover by unscrewing the 4 screws:

2. The CR2450 coin cell can be seen. Carefully remove the coin cell with tool and replace with new coin cell.

   Note: If ACM350-PCD security feature is enabled, the coin cell has to be replaced in short time, otherwise, tampering of ACM350-PCD will be triggered and all the keys will be erased.

3.0. ACR350 Software Overview

The ACR350 EVK includes C++ programming language.

3.1. C++ Software Block Diagram
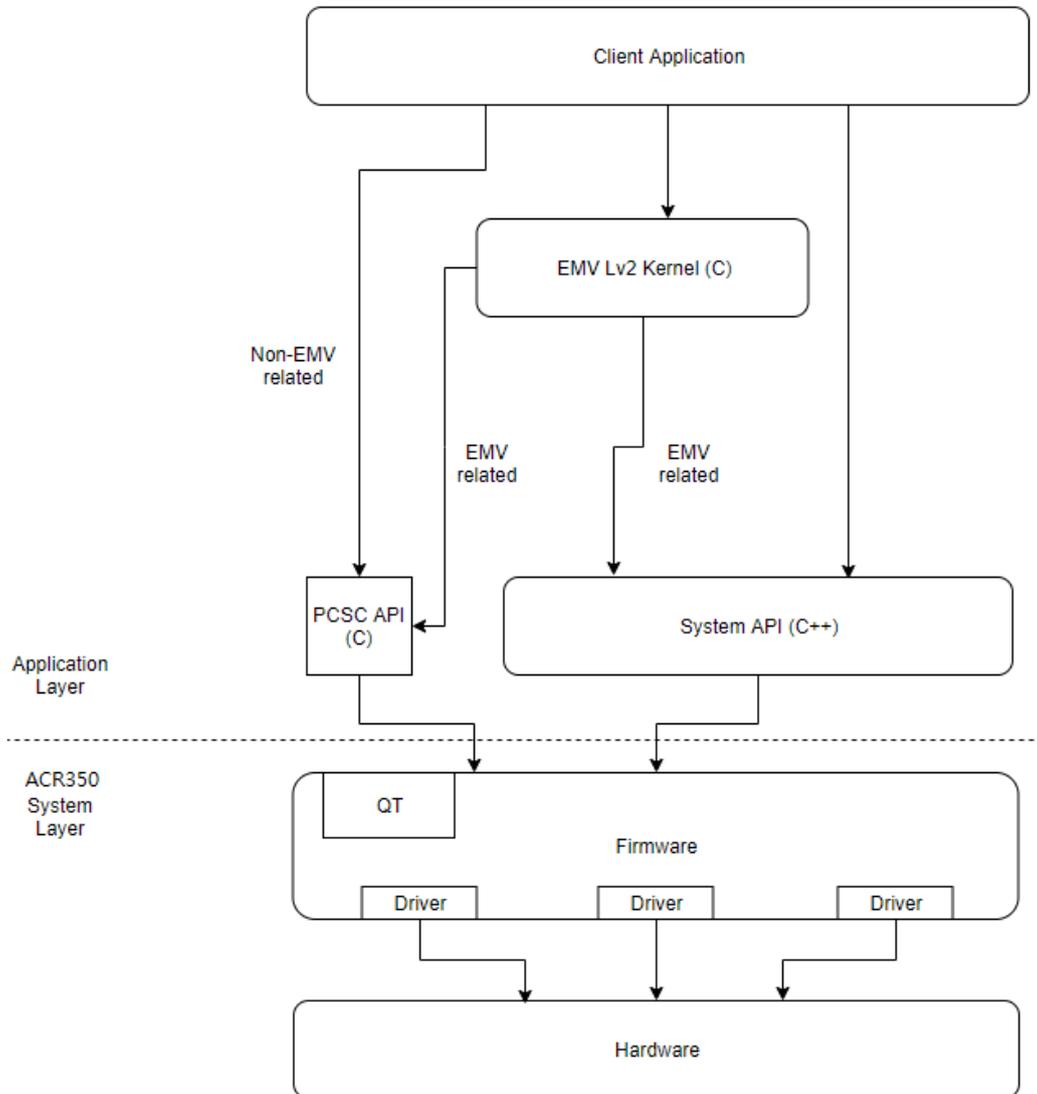
Figure 15: C++ Software Block Diagram

Note: *Additional Information below:*

- *Tool Chain version: phytec-acr350-glibc-x86_64-phytec-qt5demo-image-cortexa9t2hf-neon-toolchain-BSP-Yocto-i.MX6-PD20.1.0.sh*
- *QT version: 5.12.8*
- *For the **APPLICATION**, the file should be placed inside /**data**.*
- *For the **DATA**, the file should be placed inside /**data**.*

3.2. ACR350 Demo

The ACR350 demo showcases the functionalities of the validator and also serves as a troubleshooting tool. It has eight Modules: Contactless, Connectivity, Barcode, GPS, Card Slot, LED/Speaker, Settings, and Power Off. The details of each module are shown in the succeeding sub-sections.

Figure 16: ACR350 Demo Default Screen

3.2.1. Contactless Module

The Contactless module contains four interfaces, namely DESfire TOP-UP, DESfire PAY, DESfire CHECK BALANCE, and EMV Contactless Card.

Note: Follow **"USR-ACR350 TR34, EMV L2 Demo Guideline"** in order to enable this demo.
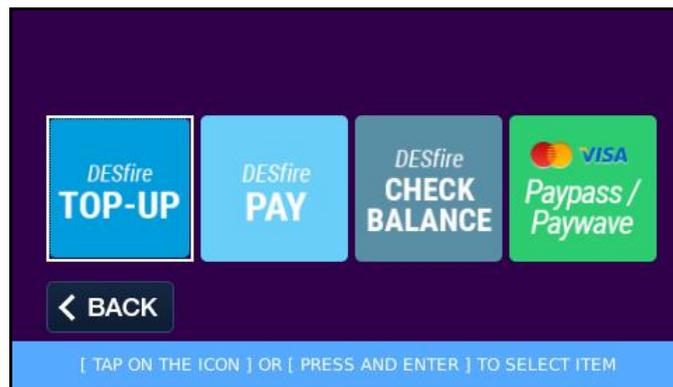
Figure 17: Contactless Module

3.2.1.1. DESfire TOP-UP

This function allows you to top-up an amount in your contactless card.

1. Select "Contactless".

2. Select "DESfire TOP-UP".

3. Select the value by adjusting the arrows.

   Note: *Successful and unsuccessful top-ups are shown at the bottom right*

5. a. After completing the top-up, a "SUCCESS" message will be shown together with card's updated balance

5. b. Otherwise, an "ERROR" message will be displayed.

4. Present the card on the tapping area

Figure 18: DESfire TOP-UP

3.2.1.2. DESfire PAY

This function allows you to pay the amount through your contactless card.

1. Select "Contactless".

2. Select "DESfire PAY".

3. Select the value by adjusting the arrows.

   Note: Successful and unsuccessful top-ups are shown at the bottom right

5. a. Once payment is completed, a "SUCCESS" message will be shown together with card's updated balance

5. b. Otherwise, an "ERROR" message will be displayed.

4. Present the card on the tapping area

Figure 19: DESfire PAY

3.2.1.3. DESfire CHECK BALANCE

This function allows you to check the current balance of your contactless card.

1. Select "Contactless".

2. Select "DESfire CHECK BALANCE".

3. The app waits for the card to be presented.

5. a. Once completed, a "SUCCESS" message will be shown together with card's current balance

5. b. Otherwise, an "ERROR" message will be displayed.

4. Present the card on the tapping area.
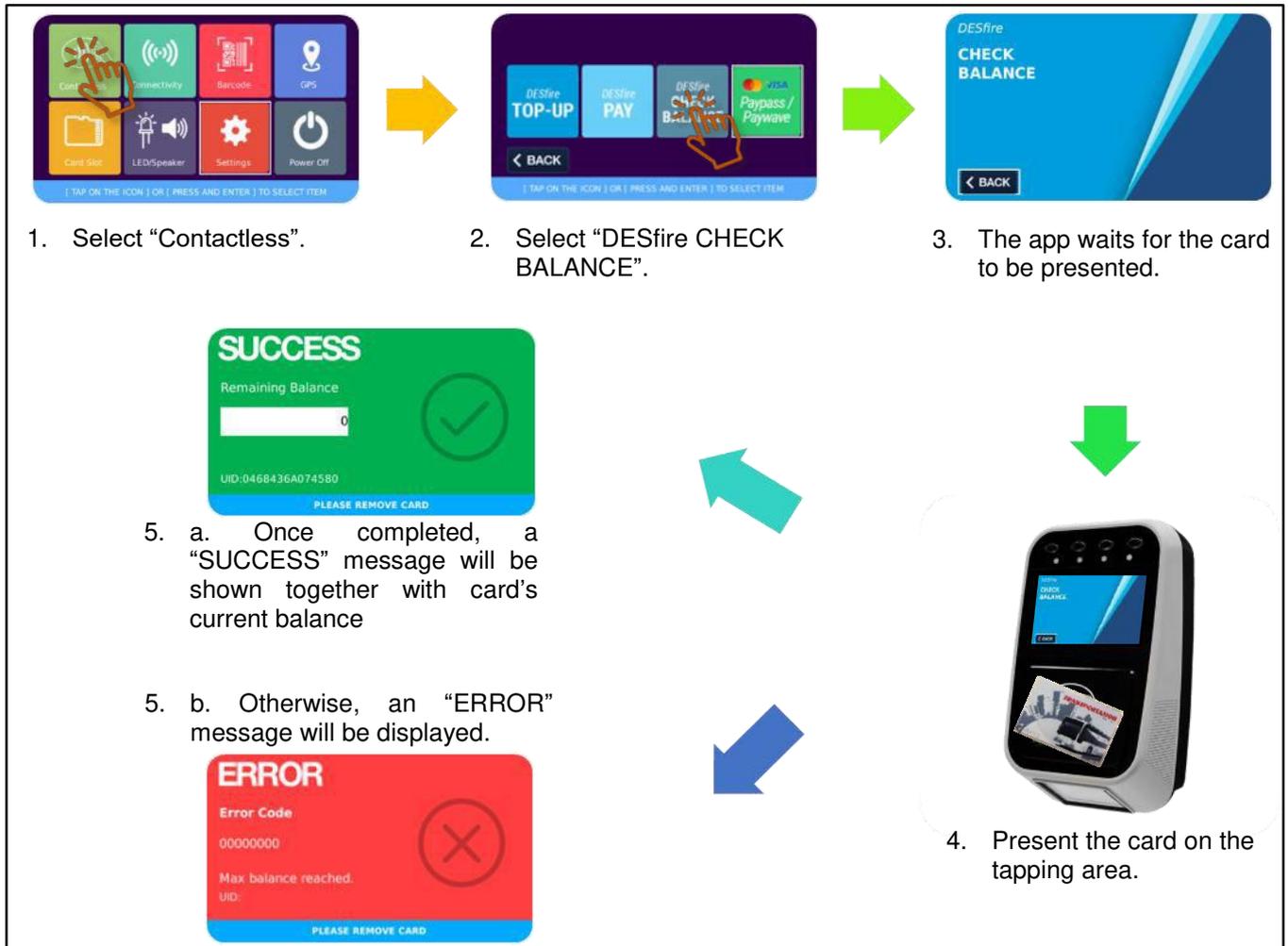
Figure 20: DESfire CHECK BALANCE

3.2.1.4. EMV Contactless Card

This function allows you to check whether the presented card is a valid EMV card implementing either Mastercard® Contactless or Visa payWave® payment scheme.

1. Select "Contactless".

2. Select "Paypass/Paywave".

3. The app waits for the card to be presented.

5. a. By tapping a valid Visa or Mastercard card, a "SUCCESS" message will be displayed.

5. b. Otherwise, an "ERROR" message will be displayed.

4. Present the card on the tapping area.
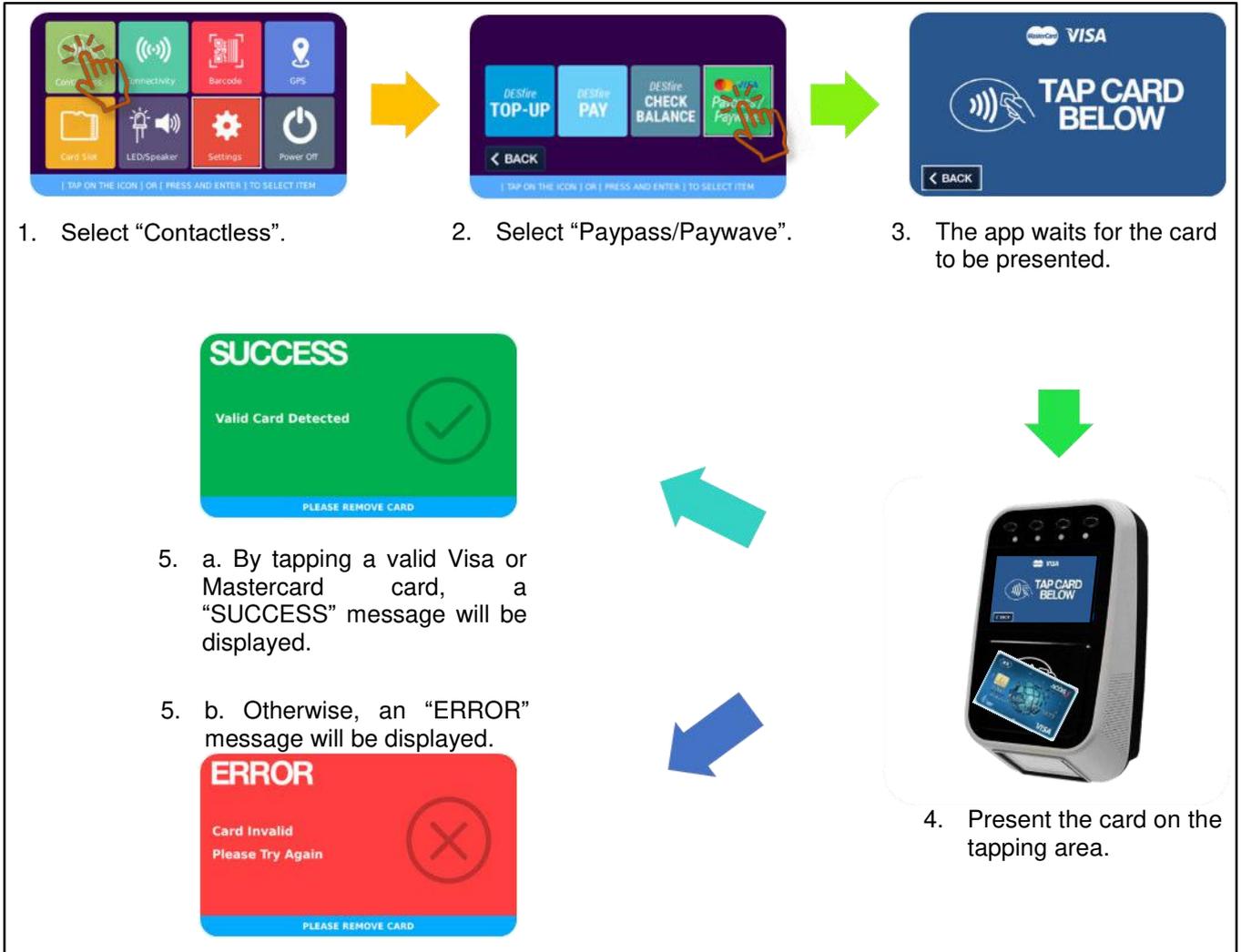
Figure 21: EMV Contactless Card

3.2.2. Connectivity Module

The Connectivity module contains three interfaces, namely Mobile Network, Wifi, and Bluetooth settings.

Figure 22: Connectivity Module

3.2.2.1. Mobile Network Settings

The Mobile Network settings contains three options, namely Connect, APN, and NTP date.

3.2.2.1.1. Connection and APN Settings

1. Select "Connectivity".

2. Select "Mobile Network", and then select "APN".

3. The APN can be set in this part

6. Select "Connect".

5. Select "SetAPN". Success message will be shown. Then select "BACK"

4. Select "OpenKeyBoard" and type the desired setting.

7. Select "Start".

8. Select "Connect".

9. The details of the network will be shown

11. Type the IP address, select "Ping". The ping message will be shown.

10. b. Select "BACK", and then select "APN".

10. a. End the connection by selecting "Disconnect" and "Stop".

Figure 23: Connection and APN Settings

3.2.2.1.2. NTP Settings

The NTP settings allow you to select different time zones.

1. Select "Connectivity".   2. Select "Mobile Network".   3. Select "NTP date".

5. Select "Sync", and the time will sync with the server.   4. Select the domain by adjusting the arrow.
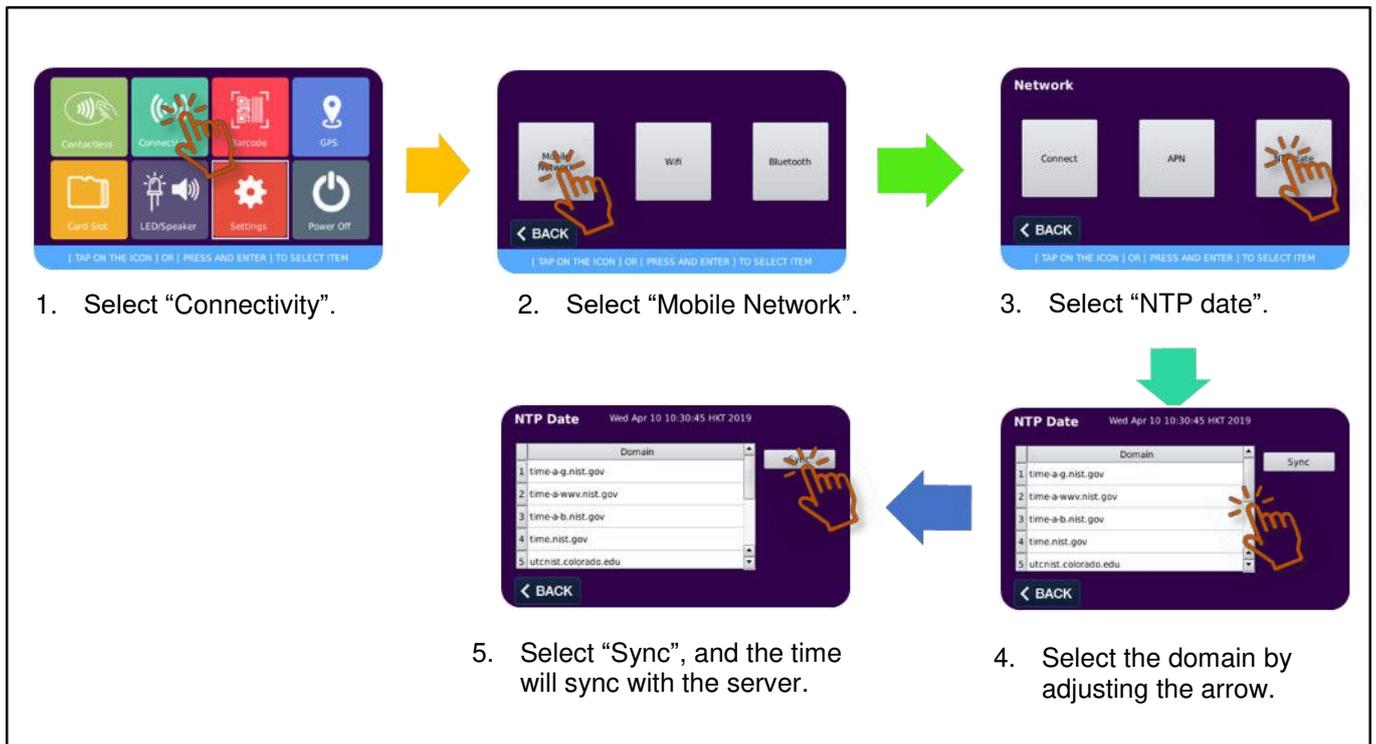
Figure 24: NTP Settings

3.2.2.2. Wi-Fi Settings

The Wi-Fi settings page allows you to connect to a Wi-Fi network.

1. Select "Connectivity".

2. Select "Wifi".

3. Select "Up".

6. Select the desired Wi-Fi network.

5. Select "Scan".

4. Select "Open".

7. Select "Connect".

8. Select "Open Keyboard".

9. Type in the password.

12. The details of the connected wi-fi network will be shown. Select "OK".

11. Select "Status".

10. Select "OK".

13. Select "Disconnect" then "Close".

14. Select "Down"

15. Wi-Fi will be disconnected

Figure 25: Wi-Fi Settings

3.2.2.3. Bluetooth

The Bluetooth settings page allows you to connect to a Bluetooth device.

1. Select "Connectivity".
2. Select "Bluetooth".
3. Select "Open".

6. Select the desired device.
5. Select "Scan off" if you want to stop searching and refreshing.
4. Select "Scan on".

7. Select "Pair".
8. Select "OK".
9. Select "Device info".

12. Bluetooth device will be disconnected.
11. Select "Remove".
10. The device information will be shown.
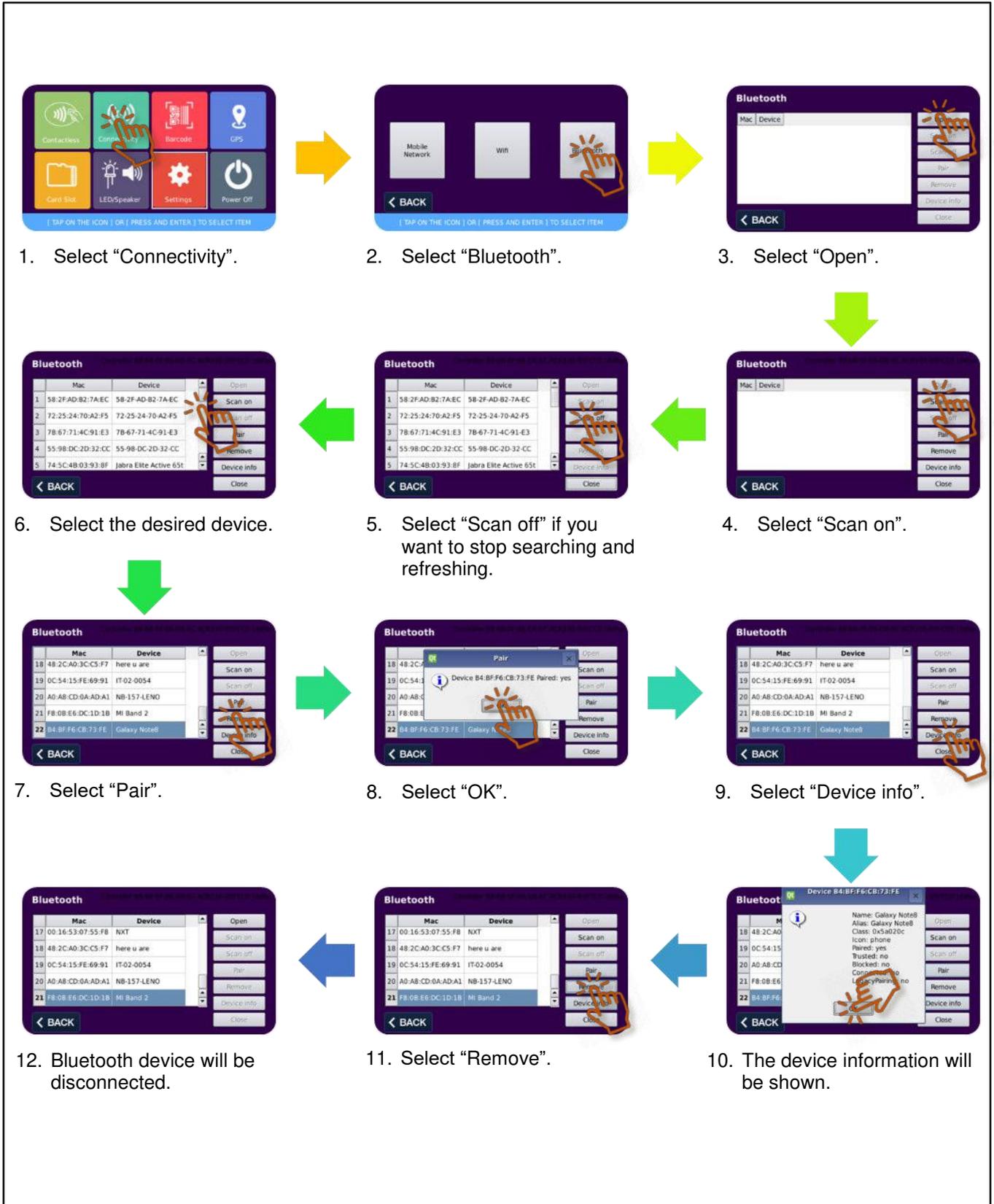
Figure 26: Bluetooth Settings

ACR350 Validator with QR Code Scanner – User Manual
Version 1.02
info@acs.com.hk
www.acs.com.hk

3.2.3. Barcode Module

The Barcode module can show the validity of the test cards thru QR code on Page 1 and display the details of any barcode or QR code on Page 2.

3.2.3.1. Barcode / QR code Validity Check

Page 1 shows the validity of the barcode on the test cards.

Note: test cards are included in the ACR350 EVK.

1. Select "Barcode".

2. The ACR350 will wait for the card to be presented.

3. Scan the card with the QR code facing the sensor.

4. a. If the QR code is valid, a "SUCCESS" message will be displayed.

4. b. Otherwise, an "ERROR" message will be displayed.
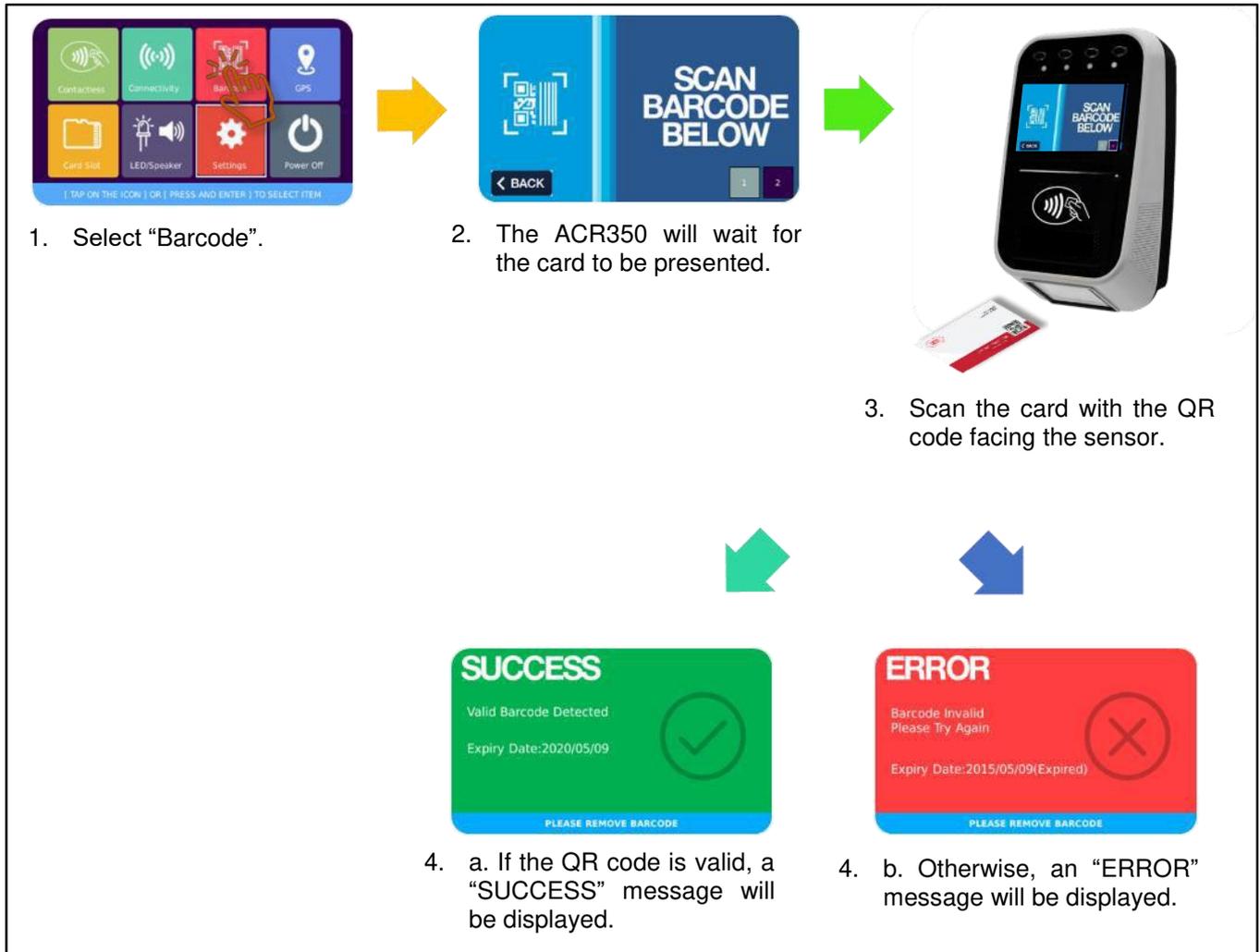
Figure 27: Barcode / QR code Validity Check

Note: The same QR code will not be accepted within 3 seconds to avoid duplicated transactions.

3.2.3.2. Barcode / QR code Information

Page 2 shows the details of any barcode or QR code scanned on the reader.
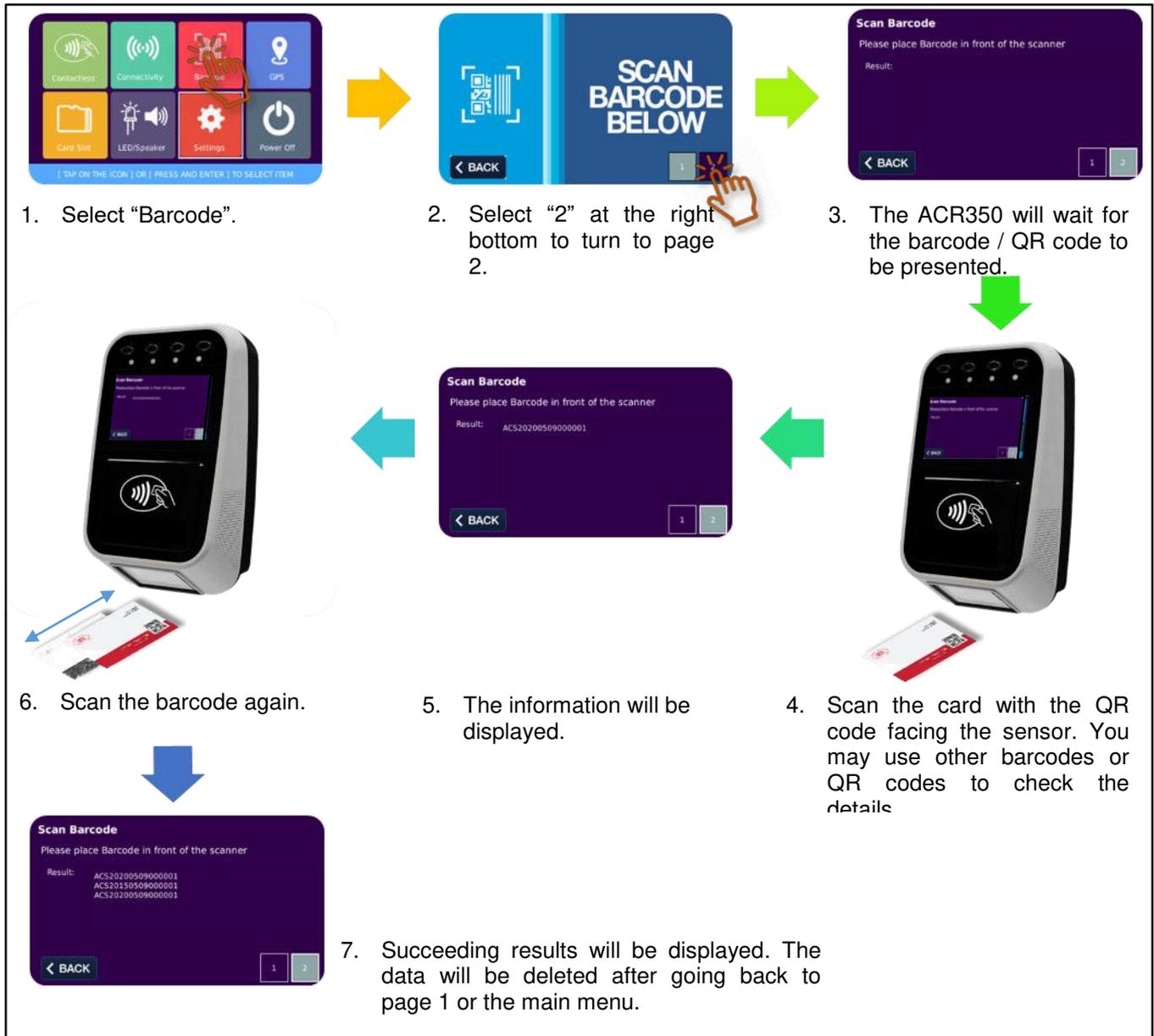
Figure 28: Barcode / QR code Information

3.2.4. GPS Module

The GPS module allows the configuration of the GPS settings.

1. Select "GPS".

2. Select "Setting".

3. Select "OpenKeyBoard".

6. Select "AGPS ON" or "GPS On". For AGPS, make sure the device is connected with 4G.

5. Select "HOTSTARTGPS" or "COLDSTARTGPS" from GPSType.

4. Type APN.

7. Select "BACK"

8. Select "Status"

9. Select "ReceiveData"

10. The information will be shown.
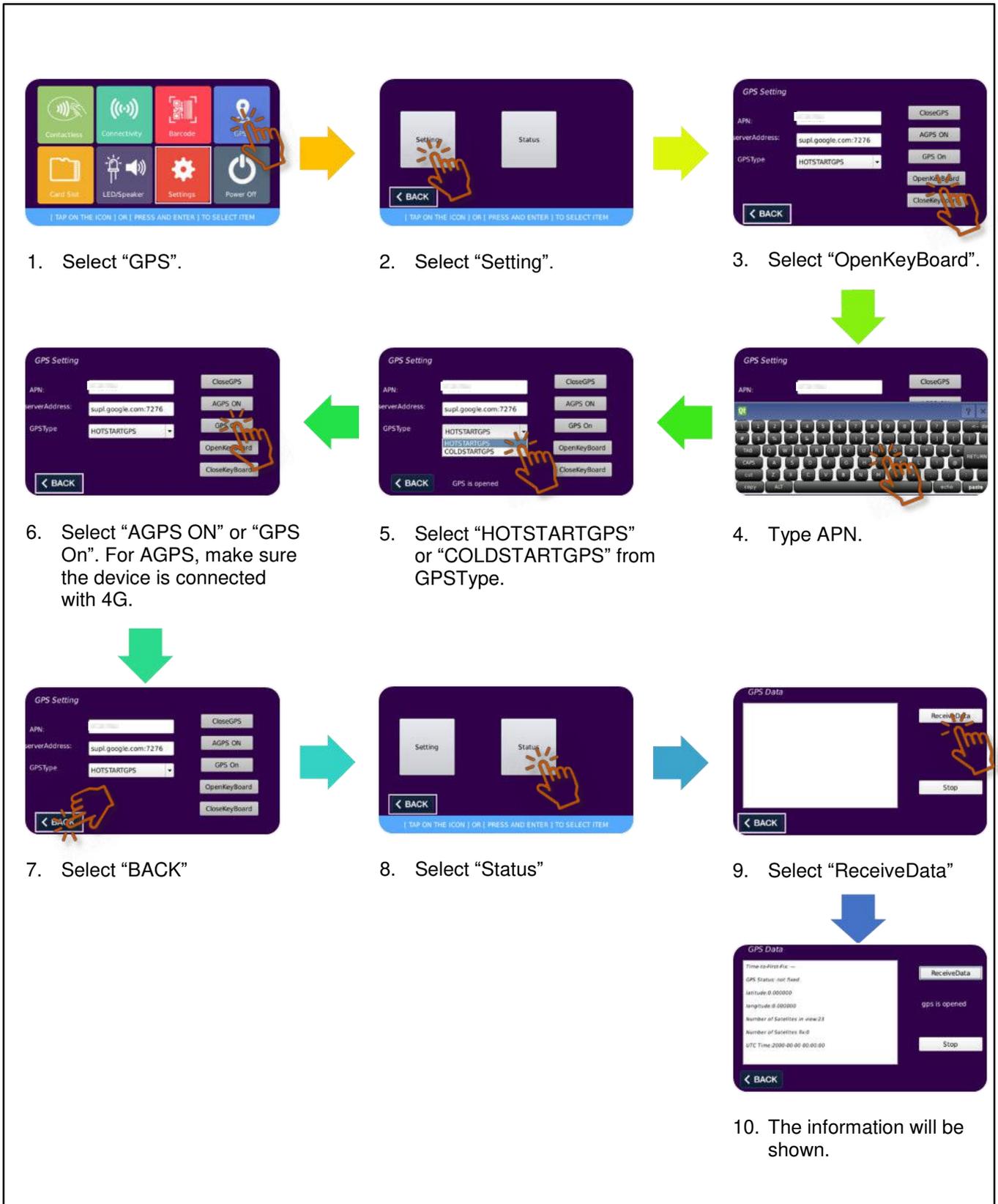
Figure 29: GPS Settings

3.2.5. Card Slot Module

The Card Slot module shows the status of the following slots/interfaces: PICC Interface, Four SAM Slots (SAM1, SAM2, SAM3, SAM4), and SD Card slot. The SD card slot shows if a card is inserted, while the other slots will also show the ATR of the card presented or inserted.

| 1. Select "Card Slot". | 2. The cards' details will be displayed. "Refreshing" status means that the reader is retrieving card information. | 3. Card details will be shown. |
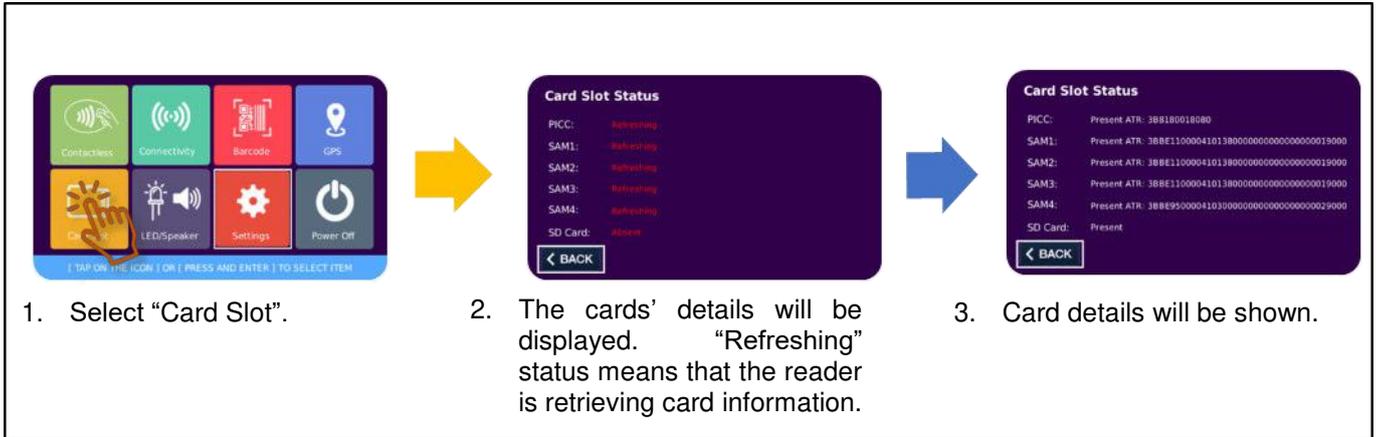
Figure 30: Card Slot Information

3.2.6. LED/Speaker Settings Module

The LED/Speaker module allows you to configure the LED Settings on Page 1 and Speaker Settings on Page 2.

3.2.6.1. LED Settings

Page 1 shows the configurable LED Settings.

1. Select "LED/Speaker".

2. User controllable settings for the Front LEDs will be shown.

    Note: When Cycle is selected, the LED will light up from left to right.

3. The tapping region's backlight changes when the CSC Reader LED setting is controlled.

    Note: When Cycle is selected, the backlight will change between the three colors simultaneously.

4. The Button's LED backlight will turn ON and OFF upon selection of the Button LED settings.

Figure 31: LED Settings

3.2.6.2. Speaker Settings

Page 2 shows the configurable Speaker Settings.

1. Select "LED/Speaker".

2. Select "2" on the bottom right to see the Speaker Settings.

3. The speaker's sound and volume, as well as the buzzer's sound can be selected or adjusted.

4. The reader will produce a sound depending on the selected setting.

Figure 32: Speaker Settings

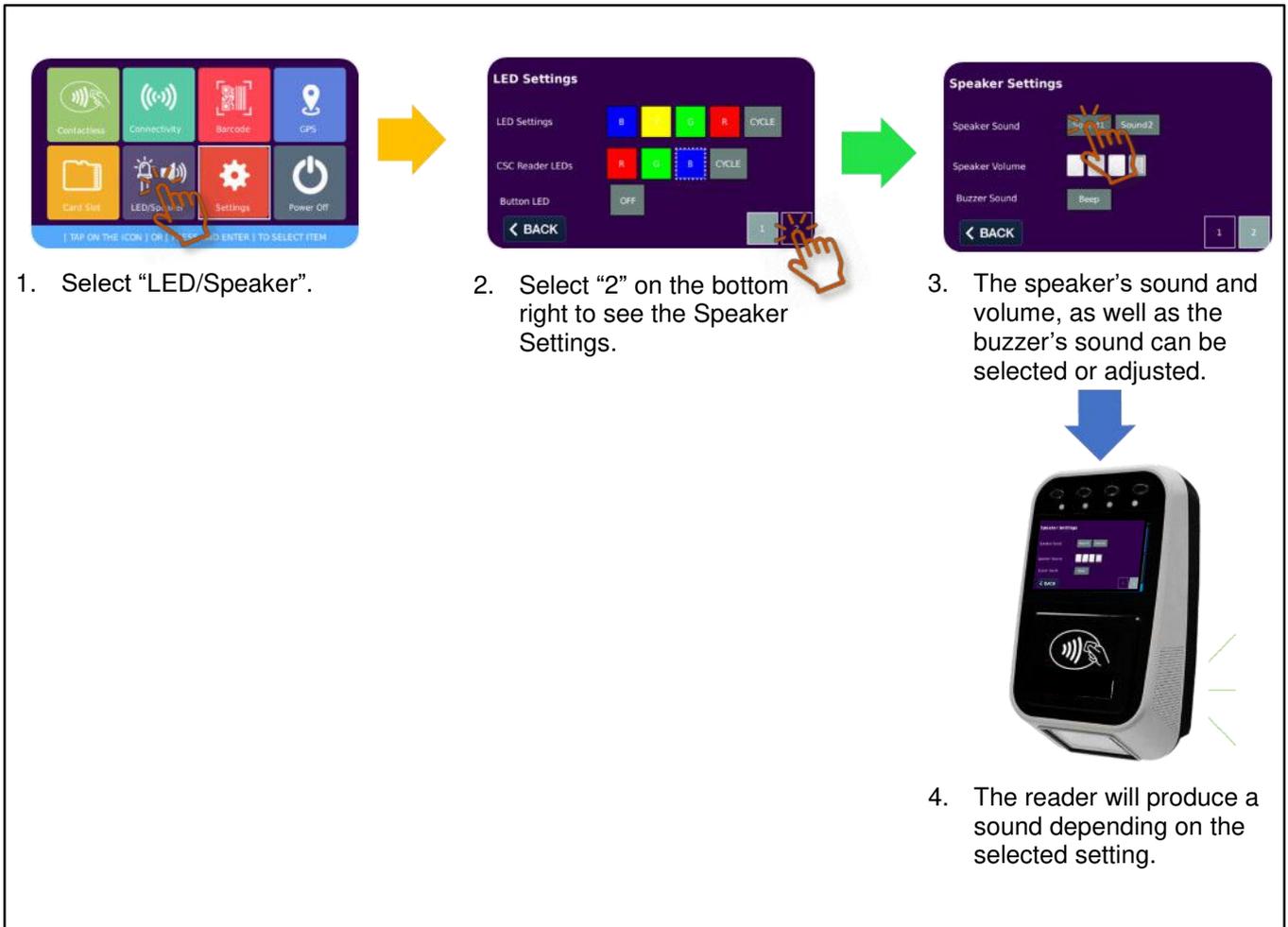### 3.2.7. Settings Module

The Settings module contains the Device Information on Page 1, Additional Settings on Page 2, and Auto Power Off settings on Page 3.

3.2.7.1. Device Information

Page 1 shows the device's hardware and software information.

1. Select "Settings".

2. Information including Model, firmware version, and Date/Time will be shown
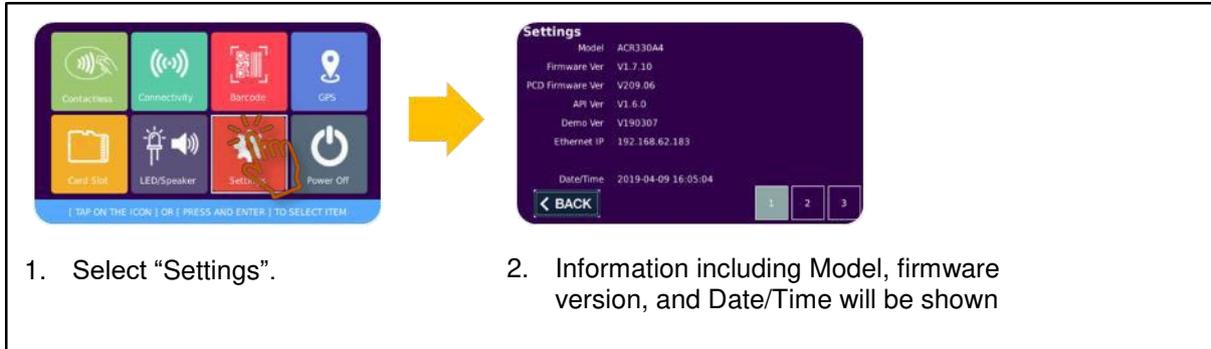
Figure 33: Device Information

3.2.7.2. Additional Settings

Page 2 contains the settings for Screen's brightness, Date and Time settings.

1. Select "Settings".

2. Select "2" on the bottom right to turn to page 2.

3. Screen's brightness, Date and Time can be set on this page.

Figure 34: Additional Settings

3.2.7.3. Auto Power Settings

Page 3 shows the option to enable Auto Power setting.

1. Select "Settings".

2. Select "3" on the bottom right to turn to page 3.

3. Select "Auto power off".

Figure 35: Auto Power Settings

3.2.7.4. Factory Reset --- Picture to be modified

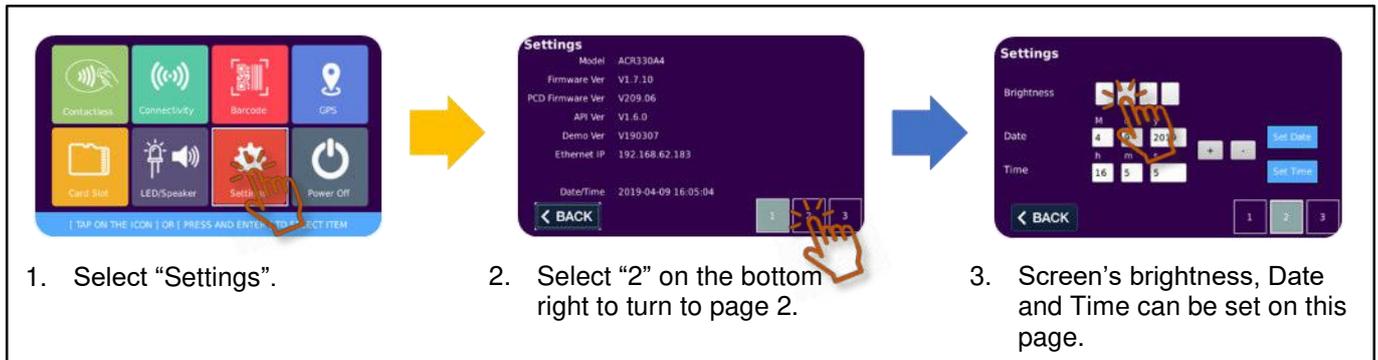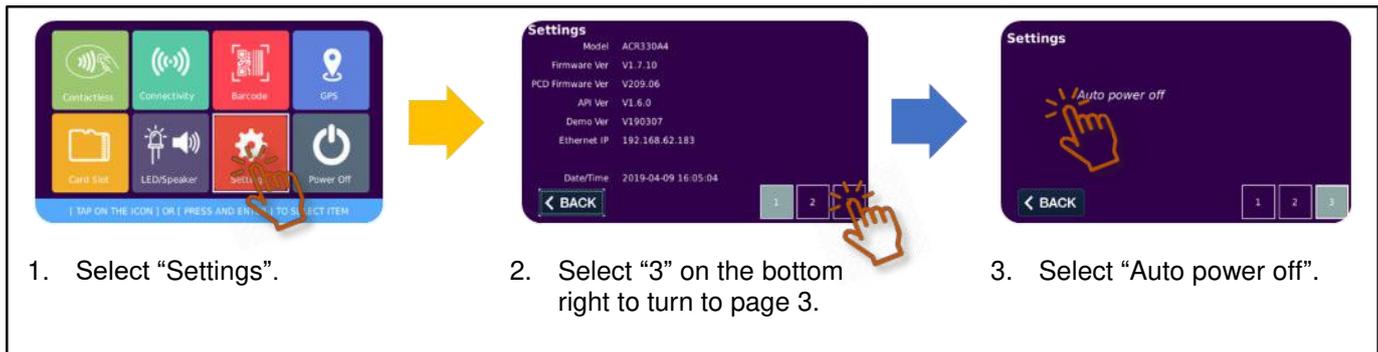Factory reset can be used to clear all data in ACR350 system. This does not clear any data in PCD.

2. Select "Settings".

3. Select "3" on the bottom right to turn to page 3.

4. Select "Factory Reset".
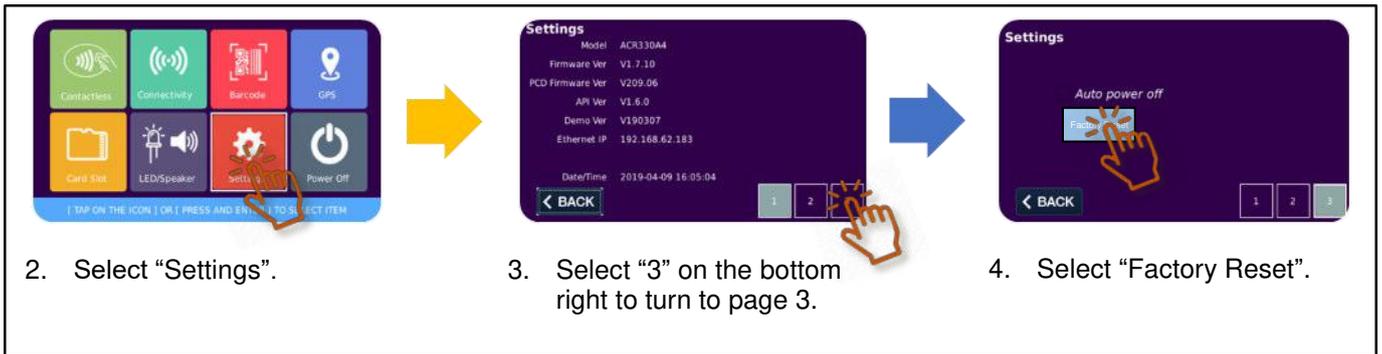
Figure 36: Factory Reset Settings

3.2.8. Power OFF Module

The Power Off module turns off the device.

1. Select "Power Off".

2. The device will turn off automatically.

Figure 37: Power OFF Module

3.2.9. Ignition Sense

Ignition sense function can be demonstrated in ACR350demo by connecting the power input according to Section 2.5.
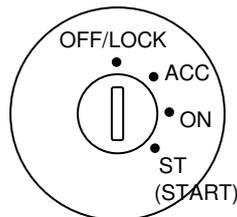

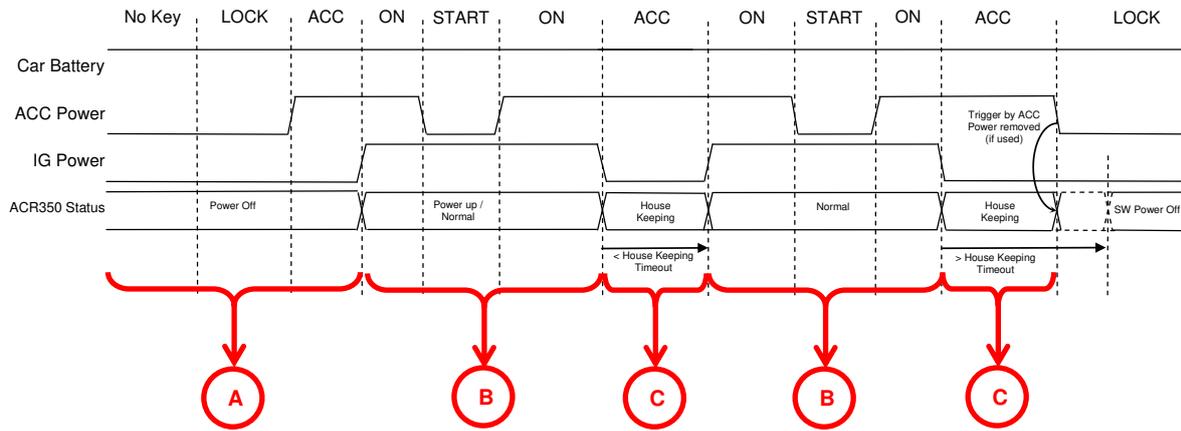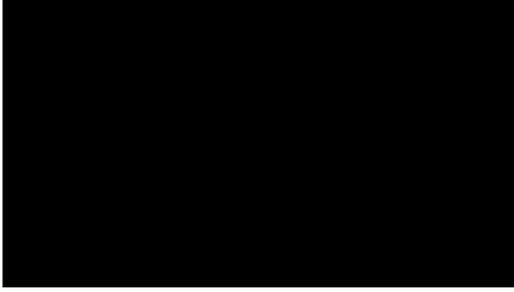**Figure 38**: Car Key Ignition Position

Figure 39: Example State Change and ACR350 Demo Screen according to Car Ignition (Refer to Table 7 for the Screen)

State	Screen	Description
A		Key is at **OFF/LOCK** position. ACR350 is powered off. Screen is blank.

State	Screen	Description
B	Loading............ Contactless Connectivity Barcode GPS / Card Slot LED/Speaker Settings Power Off / [TAP ON THE ICON] OR [PRESS AND ENTER] TO SELECT ITEM Power lost detected: System power off in 5 seconds / Power Off	Key is turned to **ON** position from **OFF**/**LOCK**. Power is provided to ACR350 and ACR350 is turned on. Loading screen can be seen on ACR350 and it will enter the default demo after loading. Key is turned to **START** from **ON**. ACR350 detects power lost and starts to count down to turn off device. Remark: **START** position is supposed to be kept in short time for starting the car engine.
C	In maintenance mode	Key is turned to **ACC** position from **ON**. ACR350 enters maintenance mode.

Table 7: Description and Screen Shown according to Figure 38

3.3. Using Application

This section shows how to launch an application and load a different application apart from the default demo. Please ensure that the application created for the ACR350 is compiled and built using the required tools. Otherwise, the device will reboot repeatedly.

If the application keeps on rebooting, place an empty **startup.x** file to the USB thumb drive to stop the application and have root access on the device to remove the initially copied files.

3.3.1.　　Launch an Application

To launch an application from drive such as USB thumb drive (udiskp1) or SD card (sdcardp1).

a. Create a "startup.x" script file. Below is an example of startup.x file:

```
#!/bin/bash
WORK_DIR= /media/<disk_folder>/<app_folder>
cd ${WORK_DIR}
/usr/bin/qtLauncher ./<user_app>
```

Note: <user_app> is the application
<disk_folder> is theUSB thumb drive or SD card mount folder. e.g. **sdcardp1**
<app_folder> is the application folder, e.g. **app** where the application files are stored

b. Put the startup.x in the USB thumb drive/SD card root folder. e.g. /**media**/**sdcardp1**

c. Plug in the drive to ACR350 and power up ACR350. The application should be launched.

3.3.2.　　Copy an Application to ACR350

3.3.2.1.　Copy Application in Console Mode

To copy the application to ACR350 from drive such as USB thumb drive or SD card.

a. Enter console mode (Refer to Section 2.5).

b. Login to ACR350 console mode.

c. Perform following commands

```
cp -rf /media/<disk_folder>/<app_folder> /data
cp /media/<disk_folder>/startup.x /data
chmod 755 startup.x
```

Note: <user_app> is the application
<disk_folder> is theUSB thumb drive or SD card mount folder. e.g. **sdcardp1**
<app_folder> is the application folder, e.g. **app** where the application files are stored

d. Power OFF the device and remove the media. Power ON ACR350 again. The application should be launched automatically after reboot.

3.3.2.2. Copy Application Automatically at Power Up with Startup Script

This method provides a way to copy application to multiple device using media like USB thumb drive or SD card.

    a.   Create a "startup.x" script file. It should contain the following:

```
#!/bin/bash
displayMessage()
{
    echo $1
    echo $1 > /dev/console
}
echo 1 > /sys/class/vtconsole/vtcon1/bind
displayMessage "Installing the Application"
cp -rf ./<app_folder>/data
mv /data/<app_folder>/startup.x /data
displayMessage "Installation Complete"
echo 0 > /sys/class/vtconsole/vtcon1/bind
sync
/data/startup.x &
```

Note: <app_folder> is the application folder, e.g. app where the application files are stored

    b.   Put the "startup.x" and the application in the media (such as USB thumb drive or SD card)

    c.   Insert the media into ACR350. Power ON ACR350.

    d.   The new application will run after successful installation.

    e.   Turn OFF the device and remove the media. Power ON to launch the new application by default.

3.3.3. Remove Installed Application

To remove the startup.x and the application:

    a.   Enter console mode (Refer to Section 2.5).

    b.   Login to ACR350 console mode.

    c.   Perform following commands

```
cd /data
rm startup.x
rm –rf /data/<app_folder>
reboot
```

Note:
<app_folder> is the application folder where the application files are stored

3.4. Re-flashing the Device

The ACR350 requires re-flashing when the firmware upgrade is interrupted or the loaded firmware fails to run some components. *To get the image file, please contact an ACS representative.*

   a. Plug in an SD card (4GB or above) to a PC.

   b. Open Win32 Disk Imager application.

   Note: *The Win32 Disk Imager application may be downloaded online for free.*
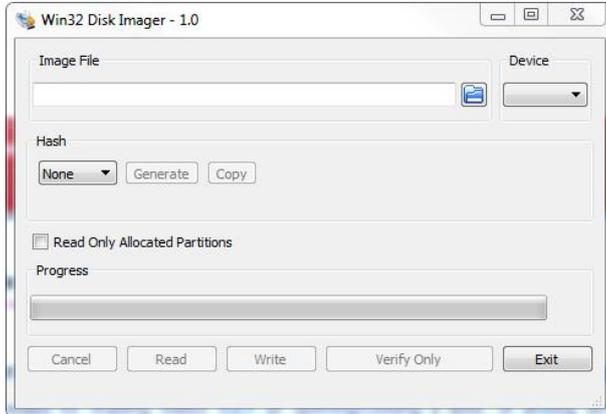
   c. Select the image file and locate the SD Card.

   d. Click Write and wait for the progress bar to be completed.

   e. Plug in the SD card into the SIM slot of the ACR350.

   f. Press and hold the second button (Button 1b), then turn on the ACR350.

   g. The ACR350 will be upgraded automatically. The LED will keep blinking until it turns off. This indicates that re-flashing is completed.

   h. Remove the SD Card and reboot the device for the changes to take effect.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

Note: 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 instructions, 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.

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.