# PAX A8900
# Security Policy

[V1.23]

PAX Computer Technology（Shenzhen）Co., Ltd.

# Contents

# 1 Purpose

This document is to provide guidance for users to use the device in a secure manner, including information on key-management responsibilities, administrative responsibilities, device functionality, identification and environmental requirements.

The use of any method not listed in this security policy will invalidate the PCI PTS POI v6.2 approval of the device.

# 2 General Description

## 2.1 Product Name and Appearance

Figure 1 shows the appearance of PAX A8900(A8900K4, A8900K5, A8900T5).

The product name is visible both on the front view of the device and on the label at the back side. The product name shall not be covered by a sticker or modified by merchant.


PAX
A8900
1
2
3
CANCEL
4
5
6
CLEAR
7
8
9
ENTER
0


A8900-0AW-RD6-00AU S/N: 3210000298


PAX
A8900
1
2
3
4
5
6
7
8
9
0


Figure 1 PAX A8900 View


Figure 2 PAX A8900 Model Name

## 2.2 Product Type

The device is approved as a handheld PED product under PCI PTS POI v6.2 requirement, and designed to process online and offline financial transactions in an attended environment.

It provides LCD display, physical keypad, touchscreen, Contact IC card reader, MSR, Contactless card reader, camera, printer, SIM card slot, eSIM moule, SAM card slot, SD card slot, Wi-Fi, Bluetooth, GPS, USB, speaker and power interface.

The use of the device in an unapproved method will violate the PCI PTS approval of the device.

## 2.3 Product Identification

### 2.3.1 Hardware Version

**Hardware Version:**

A8900-0xx-Rx6-0xxx

A8900-0xx-Rx6-Axxx

A8900-0xx-Rx6-1xxx

A8900-0xx-Rx6-2xxx

A8900-0xx-Rx6-Bxxx

A8900-0xx-Rx6-3xxx

A8900-0xx-Rx6-4xxx

A8900-0xx-Rx6-5xxx

A8900-0xx-Rx6-6xxx

A8900-0xx-Rx6-Cxxx

A8900-1xx-Rx6-3xxx

A8900-1xx-Rx6-4xxx

A8900-2xx-Rx6-7xxx

A8900-1xx-Rx6-Cxxx

The “x” is non-security related variables.

Position "8","9" indicate the communication method supported.

Position "12" represents memory capacity.

Position "16","17","18" represents packaging option, customer logo, etc. (non-security related).

Position "15" represents the different configurations.

The value "0" means no keymesh+4 inch LCD;

The value "A" means with keymesh+4 inch LCD.

The value "1" means 5.5 inch LCD;

The value "2" means no keymesh+5 inch LCD.

The value "B" means with keymesh+5 inch LCD;

The value "3" means no keymesh+4 inch LCD;

The value "4" means 5.5 inch LCD;

The value "5" means no keymesh+5 inch LCD;

The value "6" means no keymesh+4 inch LCD;

The value "7" means 5.5 inch LCD;

The value "C" means with keymesh+5 inch LCD;

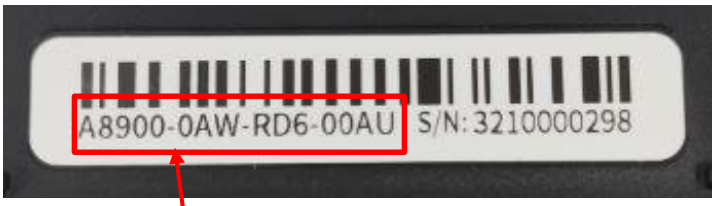
Position "7" represents the platform and OS version.

The value "0" means platform1+android12.

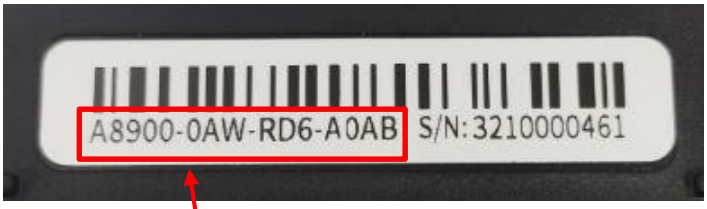
The value "1" means platform1+android14.

The value "2" means platform2+android14.

1) The product hardware version is visible on the label at the back side of the device (see Figure 3).
2) The label shall not be taken off, altered or covered in any way.

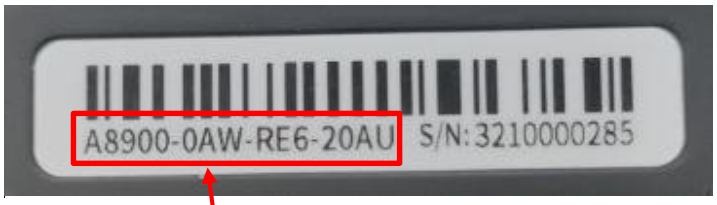



Hardware Version1



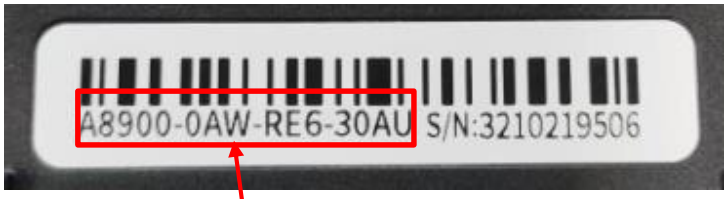

Hardware Version2


Hardware Version3




Hardware Version4


Hardware Version5




Hardware Version6

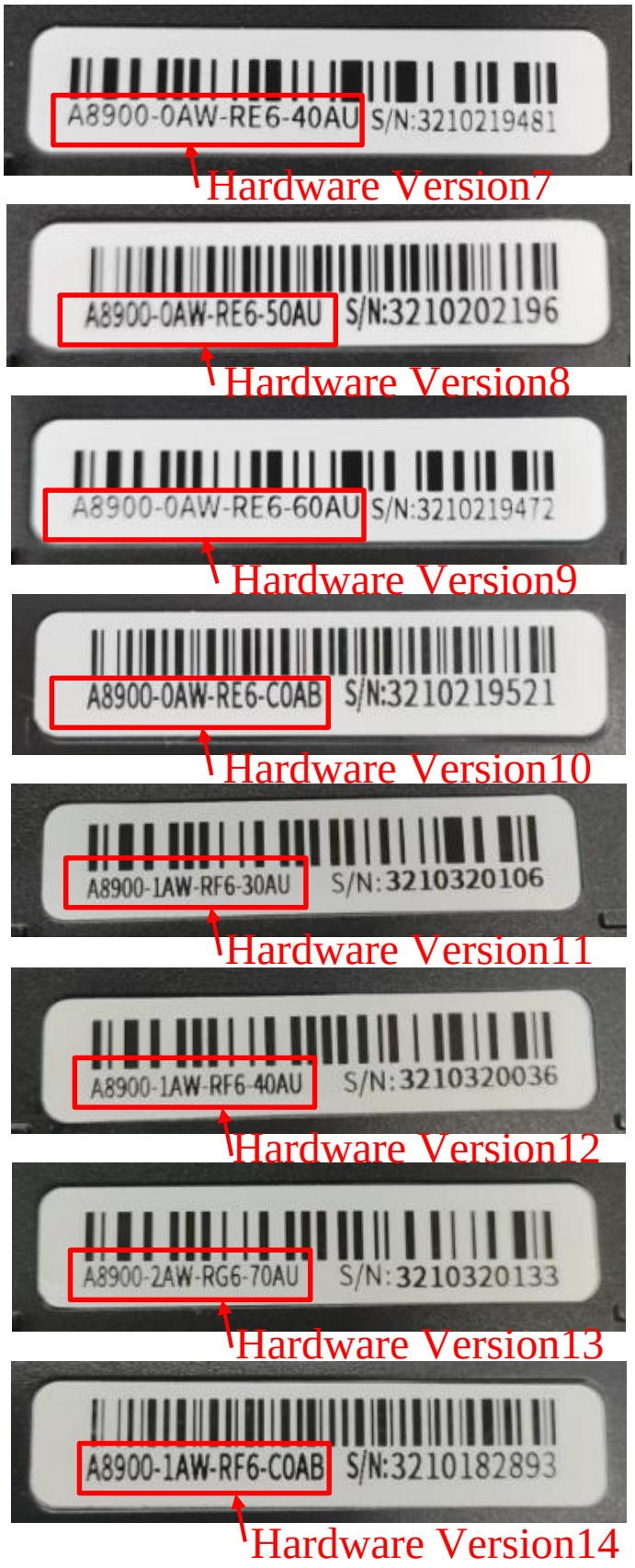



Figure 3 Back View of A8900

### 2.3.2 Software Version

**Firmware Version:**

26.00.xx xxxxx

26.01.xx xxxxx

26.02.xx xxxxx

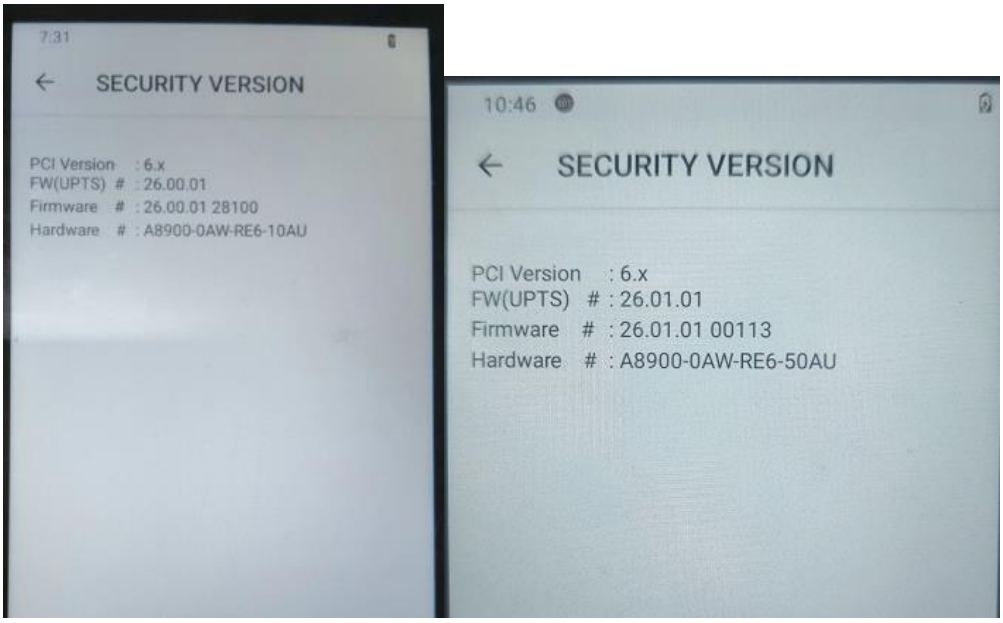
26.03.xx xxxxx

The right seven “x” represents non-security related changes, such as system UI changed, functional bug fixed, drivers updated, etc.

The version information can be retrieved as per the below operations.

1. Power on the device.
2. After the system initializing and automatic self-test, the main screen appears.
3. Find and click "Settings" icon to enter the setting menu.
4. Find and click “About device” menu, then select and enter “SECURITY VERSION” menu. The security version information about the device will appear as follows:

- Firmware Version (shown as “Security Version” and “Firmware #”)
- Hardware Version (same as the label at the back of device)



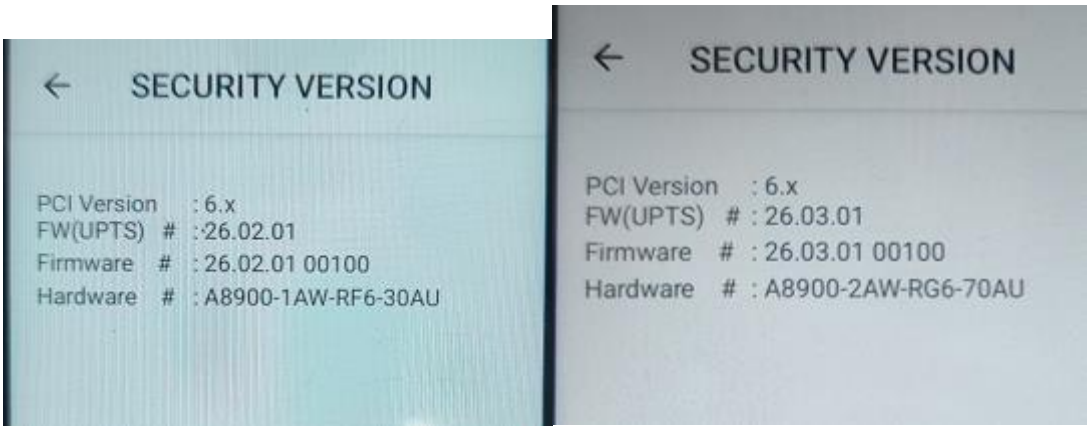



Figure 4 Version Information Example

**Serial Number:**

1. Return to “About device” menu.
2. Find and enter “Model & hardware” menu. The serial number (shown as ‘Serial number’ and same as the label at the back of device) is displayed.

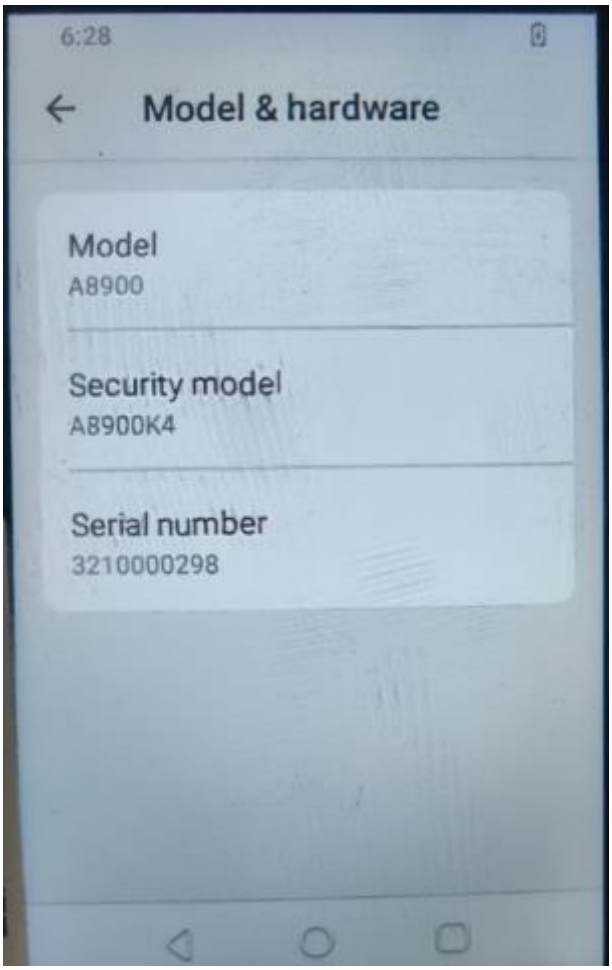



Figure 5 Serial number Example

# 3 Installation and User Guidance

## 3.1 Initial Inspection

In order to make sure the product received is exactly the same as what is specified, the acquirer or merchant must check the product according to the following tips.

- Only obtain devices from PAX or PAX approved resellers.
- Check the integrity and correctness of devices.
  - Check the label of PAX logo outside the master carton is complete and non-defective.
  - Check the labels of serial number listed on the master carton are non-defective.
  - Check the serial number on each device the same as the one shown on the packing box and master carton.
  - Check the contents in each packing box are the same as the packing list.
  - Package style: one machine into a printed box, then boxes into a master carton.
  - Check whether there is tampered message on the display after power up.

Please refer to [3] for more details. If additional technical information is needed, please contact our local support team.

## 3.2 Installation

The terminal must be used in an attended environment.

The terminal should be kept away from the direct sunlight, high temperature, humidity or dusty places.

The wireless terminal should be kept away from the complex environment of electromagnetic radiation.

The terminal should be checked according to section 3.5 when installation.

## 3.3 Environmental Conditions

The environmental conditions to operate the device are specified in the below condition.

- Working Environment:

Temperature: 0℃~+50℃ (32℉~122℉)

R.H.: 5%~96% (Non-condensing)

- Storage Environment:

Temperature: -20℃~70℃ (-4℉~158℉)

R.H.: 5%~96% (Non-condensing)

- Power supply:

  DC 5.0V / 2.0A

- Environmental protection features:

Temperature sensor: -37.5±7.5℃~105±10℃ (-35.5±13.5℉~221±18℉)

Voltage sensor: 2.1±0.1V~4.2±0.1V

The security of the device is not compromised by altering the environmental conditions (e.g., placing the device outside the stated operating ranges' temperature or operating voltages does not alter the security).

## 3.4 Configuration Settings

The security functions are an inherent part of firmware functions. No security sensitive configuration settings are necessary to be tuned by the end user in order to meet security requirements.

## 3.5 Periodic Inspection and Maintenance

Periodic inspection is required every day. Users should check the following items.

- Missing or damaged screws.
- Incorrect or redundant keyboard overlays.
- Holes in the device housing that should not existed.
- External wires around the device.
- Missing or unmatched manufacturer barcode label.
- Any suspicious objects inside or around IC card slot, refer to section 2.1.
- Any suspicious objects internal and around MSR slot, refer to section 2.1.
- Tamper message on the device display, refer to "Tamper Prompt" in section 4.1.

If any anomalies are found which indicate the device may have been opened or tampered, stop using the device immediately and contact the supplier to explain any concern.

## 3.6 Roles and Responsibilities

The customers of PAX are referred to as the Acquirer or Value Added Resellers (VAR). PAX also refers to VAR as the Acquirer directly. PAX sells devices and provides support for technical issues as well as maintenance to the Acquirer. The Acquirer sells the devices to the end users and provides services to their end users. PAX, the Acquirer and the end users play different roles in operating the device. The below table shows different roles and operations:

Table 1 Different roles and responsibilities

| | Role | Responsibilities |
|---|---|---|
| **VAR/Acquirer/ Merchant** | administrator | 1. Organize the third party to develop application program<br>2. Download application, and request certificate from vendor |
| **End user** | operator | Perform transaction |
| **PAX** | maintainer | 1. Sign customer public key<br>2. Repair device and unlock the device if tampered |

## 3.7 Passwords and Certificates

There is no security related default value that is necessary to be changed before operating the device.

The device does not include any certificates for testing purposes after being manufactured.

## 3.8 Decommissioning

Sensitive data and keys must be erased before decommissioning the device and removing it from service permanently. This can be done by rendering the device into tampered status, such as disassemble the device. If removal is just tempory (e.g., maintenance personnel unbind the server, etc.), it's not necessary to remove the keys.

# 4 Hardware Security

## 4.1 Tamper Response

In the tamper event, the device will turn into the locked status and only a tamper message will be displayed on the screen without any other tamper warning, as shown in Figure 6. No further secure functions can be performed on the device.

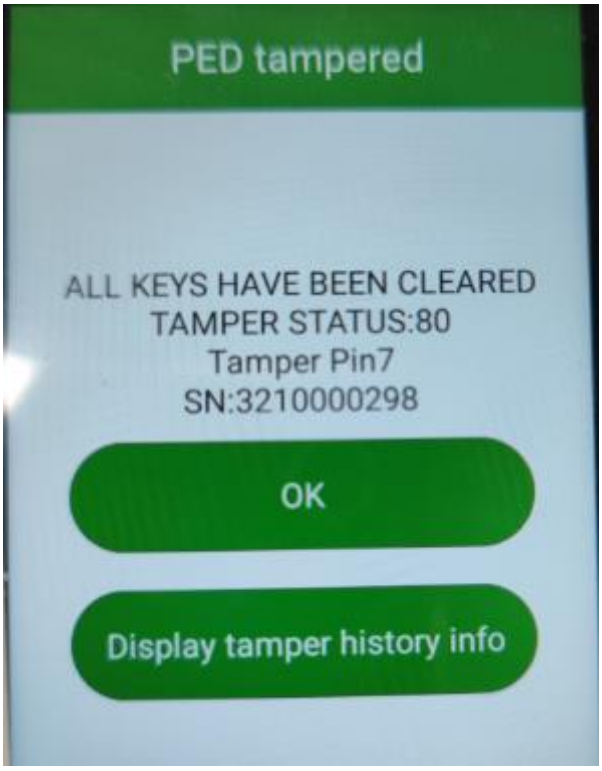



Figure 6 Tamper Prompt

If the device is in tampered state, the user must contact the device maintenance or authorized service center immediately, and remove the device from service.

## 4.2 Privacy Shield

The device is designed to be used on hand; therefore the device does not contain a privacy shield. The device is compliant to the character of a handheld device, as required by Appendix A.2 of the DTRs.

It is recommended to enter the password in the following ways:

- Make sure the cardholder holds the device on hand during PIN entry.

- Make sure the cardholder keeps a distance from others at the check stand.
- Indicate user to use his body or free hand to block the view of keypad.
- Make sure no video camera is aimed towards the keypad.
- Remind the cardholder to examine if anyone can see the keypad before PIN entry.

Table 2 combination of methods to protect PIN entry

| Methods | Observation Corridors | | | | |
|---|---|---|---|---|---|
| | Cashier | Customers in Queue | Customers Elsewhere | On-Site Cameras | Remote Cameras |
| with stand | No action needed. | Customer positions terminal | No action needed. | Out of sight of the camera | Out of sight of the camera |
| without stand | Block the view of cashier by body | Block the view of other customers by body | Block the view of other customers by body | Out of sight of the camera | Out of sight of the camera |
| Customer Instruction | Remind the customer to shield PIN | Keep a distance | Keep a distance | Out of sight of the camera | Out of sight of the camera |

# 5 Software Security

## 5.1 Self-test

The device employs a self-test to confirm the legality of firmware and software, as well as reinitialize memory.

The device performs a self-test during initial start-up and a periodical self-test at least every 24 hours automatically.

The self-test includes:

- Check integrity and authenticity of firmware
- Check integrity and authenticity of application

If any of the above checks fail, the device will be disabled in a secure manner. In this case, please contact the supplier center.

The device provides two periodic restart schemes: 24-hour restart scheme and scheduled restart scheme.

### 5.1.1 24-hour Restart Scheme

The device performs a self-test every time it is turned on. If the device has been running for 24 hours since being turned on, the device will restart, unless there is a delay due to business reasons. The default maximum delay for the device does not exceed 48 hours.

### 5.1.2 Scheduled Restart Scheme

The device also provides a scheduled restart scheme as an option for users.

The user can schedule a fixed time for the restart, in which case the device will restart at the scheduled time every day, unless there is a delay due to business reasons. The default maximum delay for the device does not exceed 48 hours.

## 5.2 Patching and Updating

Update and/or patch to the firmware, software and configuration parameters can be installed into the device. The device supports local update through USB. The device supports remote update through Wi-Fi or Cellular.

Any security related update and/or patch loaded into PAX terminals must be signed using an RSA certificate. If the signature of the update and/or patch cannot be authenticated, the update and/or patch will be rejected and not installed.

For the secure operation of the device, it is recommended to use the latest versions of the released firmware and software.

## 5.3 Software Signing/Authentication

The User Key Management Machine (uKMM) provided by PAX is used to sign User Application. The uKMM administrators perform user private key loading operation and signing process under dual control and split knowledge.

Only the application codes that have been authorized for release should be signed.

Application update uses SHA-256 in combination with RSA 2048 bits for authentication and signature verification.

Application is verified by the firmware before it is loaded and executed. If the verification fails, the application can't be loaded into the device and executed. The signature and verification mechanism ensures the authenticity and integrity of the application that is loaded into device.

## 5.4 Software Development Guidance

PAX provides software programming guide to developers to develop function compliant with PCI security requirement. Please refer to [4] when developing SRED function and OP function.

The device does not allow unauthorized or unnecessary functions.

## 5.5 Account Data Protection

The device always provides SRED functionality and does not support the disablement (turning off) of SRED functionality.

For the SRED module, account data can be encrypted by TDES/AES/RSA encryption. The device supports account data protection by using format-preserving encryption (FPE) with AES FF1 mode.

The firmware of the device does not support the pass-through of clear-text account data using techniques such as whitelisting. For more details, please refer to [4].

# 6 Key Management

## 6.1 Algorithms Supported

The device supports the following algorithms:

- TDES (128 bits/192 bits)
- AES (128 bits/192 bits/256 bits)
- RSA (2048 bits)
- SHA (256 bits)
- ECC (in support with NIST P-256 , P-384 and P-521)

## 6.2 Key Management

The device supports the following key management methods:

- Master/Session Key

  This method uses a hierarchy of Terminal Loading Key, Master Key and Session Key. The highest level of Terminal Loading Key is distributed through the key loading device. The Master Key is distributed under the protection of Terminal Loading Key. The Session Key is distributed under the protection of Master Key. These keys can be replaced by the same methods whenever compromise is known or suspected.

- DUKPT

  This method uses a unique key for each transaction, and prevents the disclosure of any past keys used by the transaction-originating device.

The use of the POI with unapproved key management systems will result in incompliance with PCI PTS POI security requirement.

Table 3 Supported Key Management

| Purpose | Supported Key Management |
|---|---|
| Key Management – PIN encryption | TDES - MK/SK |
| | TDES - DUKPT |
| | AES - MK/SK |
| | AES - DUKPT |
| Key Management – Account Data Encryption | TDES - MK/SK |
| | TDES - DUKPT |

| | |
|---|---|
| | AES - MK/SK |
| | AES - DUKPT |
| | Format-Preserving Encryption |
| | RSA |

## 6.3 Key Table

Table 4 Asymmetric keys

| Key name | Usage | Algorithm | Size (bits) |
|---|---|---|---|
| **US_PUK (PAX_US_PUK/C_US_PUK)** | Public key for application authentication | RSA | 2048 |
| **Trans-Armor public key** | Account data encryption | RSA | 2048 |
| **CA_PUK** | Used for verification of the device, LKI or RKI certificates. | RSA | 2048 |
| **DA_PVK / DA_PUK** | Used for authentication of the device by RKI server. | RSA | 2048 |
| **DE_PVK / DE_PUK** | Used to protect sensitive information during remote key injection. | RSA | 2048 |
| **RKIAK_PUK** | Used for authentication between RKI server and the device during remote key injection procedure. | RSA | 2048 |

Table 5 Symmetric Key

| Key name | Purpose/Usage | Algorithm | Size(bytes) |
|---|---|---|---|
| **DUKPT Initial Key (TIK)** | DUKPT Initial Key, used to generate DUKPT future keys. | TDES | 16 |
| | | AES | 16/24/32 |
| **DUKPT Future Key** | DUKPT Encryption Keys | TDES | 16 |
| | | AES | 16/24/32 |
| **Master Key (TMK)** | To load encrypted session keys | TDES | 16/24 |
| | | AES | 16/24/32 |
| **PIN Key (TPK)** | PIN encryption for PINBLOCK format 0,1,3 under TDES algorithm;<br>PIN encryption for PINBLOCK format 4 under AES algorithm. | TDES | 16/24 |
| | | AES | 16/24/32 |
| **MAC Key (TAK)** | MAC Calculation | TDES | 16/24 |
| | | AES | 16/24/32 |
| **Account Data Encryption Key (TCHDK)** | Account Data Encryption | TDES | 24 |
| | | AES | 16/24/32 |
| **Data Key (TDK)** | Arbitrary Data Encryption | TDES | 16/24 |
| | | AES | 16/24/32 |

| | | | |
|---|---|---|---|
| **FPE Key** | Account Data Encryption under Voltage FPE scheme | AES | 16 |

## 6.4 Key Loading

The terminal supports the following key loading methods:

- Clear-text key injection.
- Symmetric encrypted keys, remote asymmetric key loading.
- Local asymmetric key loading.

The terminal supports clear-text key injection by using a key loader tool under dual control and split knowledge in a secure environment.

## 6.5 Key Replacement

Whenever a compromise of the key is known or suspected and whenever the time deemed feasible to determine the key by exhaustive attack elapses, the key must be removed or replaced with a new key.

# 7 Communication

The device supports the communications methods and protocols listed below. Use of any method not listed here invalidates the PCI PTS POI approval of the device.

## 7.1 Communication Interfaces

The following communication interfaces are available in the device:

- Cellular (including SIM card slot and eSIM card port, supporting 2G/3G/4G)
- Wi-Fi
- Bluetooth BR/EDR/HS, BLE and Beacons
- GPS
- USB and USB-to-serial

## 7.2 Communication Protocols and Services

The following protocols and services are supported for TCP/IP communications by the device:

- IP (IPv4, IPv6)
- ICMP, TCP, UDP
- PPP, ARP
- DHCP client, DNS client
- TLS (TLSv1.2 and TLSv1.3)

About the details, please refer to [4] for more information.

## 7.3 Bluetooth Security Guidance

The terminal supports Bluetooth secure communications:

- BTv5.2 for BR/EDR/HS in Security Mode 4 Level 4;
- BTv5.2 for BLE in Security Mode 1 Level 4;
- Just works cannot be used at any time.

In addition, where the device communicates with Bluetooth BR/EDR/HS 2.1 through 4.0 peripheral devices, it falls back to Security Mode 4 Level 3.

The terminal supports transmit only BLE Beacons (e.g., iBeacon, EddyStone). The use of BLE Beacons is restricted:

1) Over-the-Air provisioning of beacons is not supported.
2) Beacons can only be used in transmit mode and must not be used to transmit sensitive data.
3) Beacons cannot be configured in connectable mode.

Beacons send a universally unique identifier and several bytes that can be used to determine the device's physical location or track customers.

# Appendix

## Acronyms

| Abbreviation | Description |
|---|---|
| PIN | Personal Identification Number |
| RSA | Rivest Shamir Adelman Algorithm |
| SHA | Secure Hash Algorithm |
| TDES | Triple Data Encryption Standard |
| AES | Advanced Encryption Standard |
| DUKPT | Derived Unique Key per Transaction |

## References

[1] ANS X9.24-1, Retail Financial Services Symmetric Key Management Part 1: Using Symmetric Techniques
[2] ANS X9.24-2, Retail Financial Services Symmetric Key Management Part 2: Using Asymmetric Techniques for the Distribution of Symmetric Keys
[3] PAX White Paper
[4] Secure Application Development Guide