Hanshow ESL Controller HS_C09978 Product Manual

V1.0.0

HS-AP-USB001

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ABOUT THE DOCUMENT

This document contains the uses, functions, hardware parameters, performance characteristics, installation and precautions of HS_C09978, as well as all the information that can help you install and achieve good performance.

Thank you very much for using the HS_C09978 of Hanshow.

If it is your first time to use the controller, we kindly suggest you to read the manual and understand all items mentioned within in advance. In case that you are confronted with any uncertainty or difficulty, please contact our customer service center (400-0365-305), and we shall spare no efforts to provide multi-channel services for you.

TARGET USERS

This document is a provider for necessary data and manual for the use of ESL controller. The reader of this document is required to master the basic knowledge of DSP and network and so on. This manual is applicable for the below engineers:

- Testing engineer
- Technical support engineer
- After sales engineer

SYMBOL DESCRIPTION

Icon	Description
⚠	Information indicated with this icon should be paid special attention and attached great importance by the reader.
🕮	Information indicated with this icon is the explanation on the formal text for the readers to comprehend the text better.
[X-X]	It means special noun definition is provided here.

EXPLANATION OF TERMS

Term	Expanded form	Description
AP	Wireless Access Point	ESL Controller
ESL	Electronic Shelf Label	Electronic Shelf Label
Wi-Fi	Wireless Fidelity	WLAN
RF	Radio Frequency	Electromagnetic frequency to the space

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1 Overview

HS_C09978 is the third generation ESL controller with USB interface embedded micro-PCB, which can be integrated to WLAN device, as well as providing the Wi-Fi and ESL services. It is applicable to various Wi-Fi AP that has an USB interface, such as Extreme AP-8432I Wi-Fi AP, and Aruba Wi-Fi AP with software version 8.6 and above (hereinafter referred to as Extreme and Aruba). The lightweight innovative design of HS_C09978 provides the system with higher integration, easier deployment and maintenance.

HS_C09978 works in the 2.4GHz wireless environment. It is responsible for the data transmission and information interaction between ESL and ESL-Working. HS_C09978 adopts a modular and omnidirectional in-board antenna design with an ARM A7 processor and two RF modules. HS_C09978 supports all Hanshow products including hardware and software, and its appearance is as shown in *Figure 1-1* and *Figure 1-2*.

Figure 1-1 HS_C09978 appearance

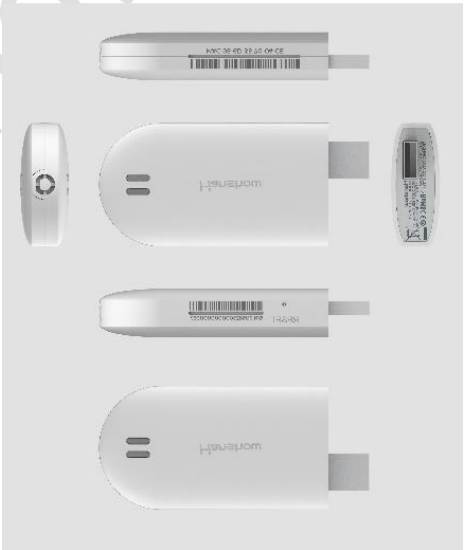

Figure 1-2 Six views of HS_C09978

HS_C09978 need to work with Extreme or Aruba, and the integration APs are shown in *Figure 1-3* and *Figure 1-4.*

Figure 1-3 Aruba integration AP

Figure 1-4 Extreme integration AP

1.1 System architecture

ESL controller is a key part of Hanshow ESL system. Specifically, it is as wireless access point between ESL-Working and ESLs. ESL controller system includes ShopWeb, ESL-Working, ESL controller (AP), Electronic Shelves Label (ESL) and Hand-hold Terminal (PDA). The system architecture is as shown in *Figure 1-5.*

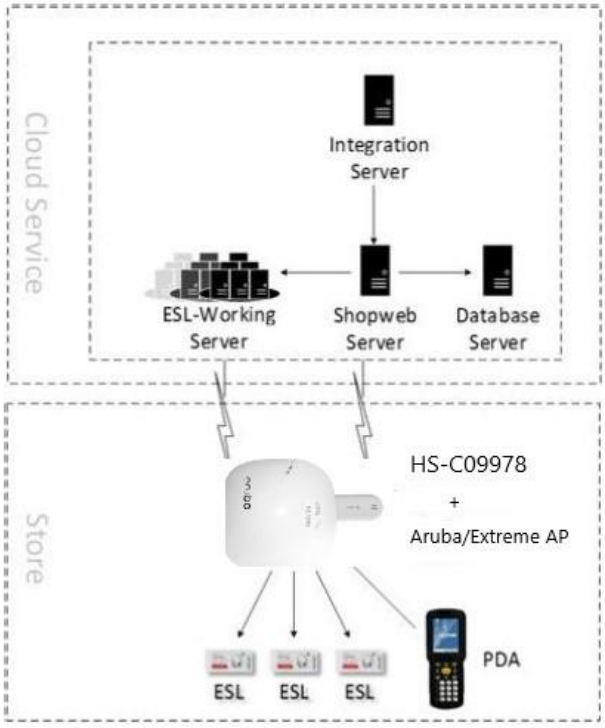

Figure 1-5 ESL system architecture

HS_C09978 as data transmission links is responsible for data forwarding between ESL-Working and ESL. HS_C09978 builds the TCP connection with ESL-Working and bidirectional 2.4GHz wireless communication with ESL through the Ethernet interface provided by Extreme and Aruba AP.

- Downlink: HS_C09978 receives downlink package of ESL-Working, and sends the data like price, inventory and template, etc.
- Uplink: HS_C09978 forwards the information to ESL-Working such as ESL heartbeat package and others.

1.2 Features

HS_C09978 has the following main features:

- OS: Embedded Linux is responsible for data interaction with ESL-working system, including registration of ESL controller system, heartbeat reception, data transmission and online upgrading, etc.
- RF system: Two RF modules. Each of them has independent antenna and supports concurrent communication to enhance data transmission rate and improve channel utilization.
- Memory: Support 256M FLASH + 512M RAM.
- Compatibility: Support all Hanshow ESLs including LCD ESLs and EPD ESLs.
- Management configuration: Support Web configuration mode.
- Hardware interface: Use USB interface as virtual Ethernet port, power port, and serial communication interface.
- LED indicator: Can real-time display working status.

2 Hardware performance

This chapter mainly introduces the basic configuration, hardware interface, press instruction, indicator meaning and nameplate information of HS_C09978.

2.1 Basic configuration

The basic configurations of HS_C09978 are as shown in *Table 2-1.*

Table 2-1 HS_C09978 specifications

HS_C09978 specifications	
Power supply	
Input voltage	DC 5V
Rated current	240mA
Rated power	1.2W
Other parameters	Over-load/over-voltage/over-heat protection
Main configuration	
Processor	528MHz ARM A7 processor
Memory	256M FLASH + 512M RAM
OS	Linux4.1.15
RF module	
Work frequency	2402MHz ~ 2480MHz
Output power	Default power: 6dBm
Antenna gain	0.5dBi
Antenna features	Omni-directional antenna
Sensitivity	500Kbps: -95dBm
Ethernet module	
Connection rate	10/100M (USB virtual network port, self-adaptive)
Auto-negotiation	Support
MAC address	The unique legal MAC address in the world
Power parameters	
Idle power consumption	0.8W
Maximum power consumption	2W
Demension&weight	

HS_C09978 specifications	
Size (mm*mm*mm)	40*88*16
Weight (g)	40.2
Temperature	
Operation temperature	0℃ ~ 50℃
Storage temperature	-40℃ ~ 70℃

2.2 Hardware interface

The hardware interface of HS_C09978 is as shown *Figure 2-1*, and the interface description is as shown *Table 2-2*.

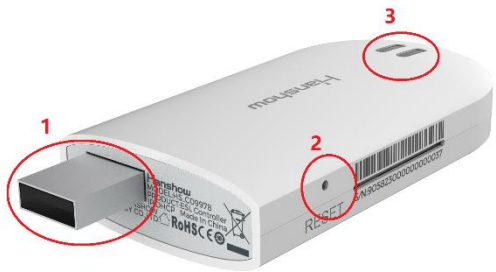

Figure 2-1 Hardware interface of HS_C09978

Table 2-2 Function description for each interface

No.	Interface name	Description
1	USB interface	Used for power port and virtual network port.
2	RESET hole	System software reset. Support for press and hold and press operation, see section of *2.3.*
3	LED indicator	System status indicator. For more details, see section of *2.4.*

2.3 Key operation

RESET hole supports press and press and hold operations, which have different function respectively.

2.3.1 Press

Press is used to switch IP address acquisition mode. This feature is strictly limited and just to operate when AP is not connected to the network. AP address will switch between DHCP and static IP with each press.

- When AP works at DHCP client mode, its IP address will get from DHCP server.
- When AP works at static IP mode, its default settings are: IP --192.168.1.199, Subnet mask -- 255.255.255.0, and Gateway -- 192.168.1.1.

🕮 **Note:** The protection time between two operations is 30s, that is, if you press again in 30s after the last successful operation, your operation will be invalid.

2.3.2 Press and hold

Press and hold **RESET** is more than 5s, and the AP will restore factory setting. Restore factory setting has the following contents:

- Restore to DHCP client mode
- Restore to auto search mode of ESL-Working
- Clear the custom description

2.4 Indicator meaning

HS_C09978's indicator has the following meanings, as shown in *Table 2-3.*

Table 2-3 Indicator description of HS_C09978

Status	Description
Green is always on	Ethernet runs normally, but ESL-Working is not connected.
Green flashing	Startup flashing without getting IP in the system.
Green slow flash	Ethernet runs normally, and ESL-Working connect normally.

2.5 Nameplate information

HS_C09978's nameplate information has the following implications, as shown in *Figure 2-2*.

- IP address and MAC address are default configuration in HS_C09978.
- IP address can be modified through configuration page.

Figure 2-2 Nameplate information for HS_C09978

Note: SN and MAC address are all on the side of HS_C09978.

3 Installation

HS_C09978 integration AP supports the following four installation modes. It highly recommend the mode of Ceiling Horizontal Suspended Mounting, making better coverage and faster and more reliable for data transmission.

- Ceiling horizontal suspended mounting
- Wall mounting
- Threaded hanger mounting
- Cross bar mounting

In actual use, HS_C09978 should be installed in a higher position to achieve better transmission and coverage. Moreover, the higher the installation height, the smaller the device spacing should be, as shown in *Figure 3-1*.

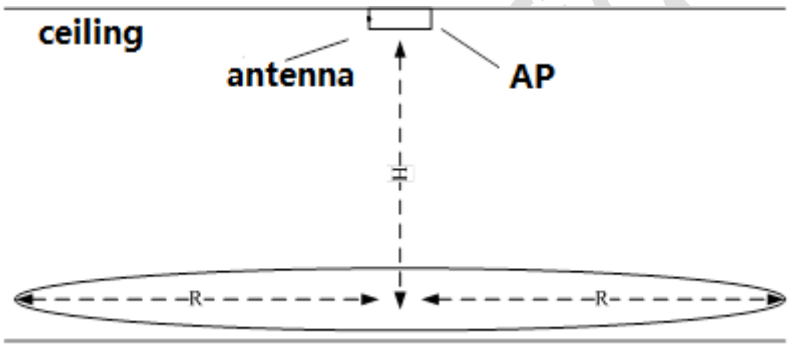

Figure 3-1 HS_C09978 installation

The recommendations for installation scenario are as follows:

- When the shelf height is ⩽3m, **H** in *Figure 3-1* is recommended to 3m ~ 5m, and the coverage radius **R** is 10 ~ 15m. It is recommended that the installation distance of two Hanshow APs is about 25m, and at least 5m.
- When the shelf height is 3 ~ 5m, **H** in *Figure 3-1* is recommended to 5 ~ 8m, and the coverage radius **R** is 7 ~ 12m. It is recommended that the installation distance of two Hanshow APs is about 20m and at least 5m.

⚠Notice:

- If shelf height exceeds 5m, the installation height of AP is determined according to the actual situation.
- The installation height of AP should be higher than shelf height to avoid signal occlusion.

- For the Ceiling horizontal suspended mounting, it is recommended the installation distance is more the 6cm from the ceiling.

🕮 **Note**: About the detailed installation mode of Extreme and Aruba AP, see related Extreme and Aruba AP *AP3800 Installation Manual or Instruction.*

4 Parameter configuration

Before HS_C09978 parameter configuration, please ensure Cisco device powered-on runs normally.

4.1 Association parameters

Before HS_C09978 runs normally, you need to configure parameters with Extreme and Aruba device.

4.1.1 Aruba association parameters

Aruba AP supports HS_C09978 runs normally without association parameters configuration by default.

4.1.2 Extreme association parameters

When HS_C09978 connects to Extreme AP, Extreme will automatically detect the HS_C09978 and map to ‘usb0’ by default. You can implement HS_C09978 status configuration using Extreme CLI command, ‘usb0’ can be put in the Up or Down state. The initial default state is in the Up state.

CLI commands are as follows:

```
ap8432-123456#show interface usb0
Interface usb0 is UP
  Hardware-type: ethernet, Mode: Layer 2, Address: A2-70-1C-66-32-AB
  Index: 7, Metric: 1, MTU: 1494
  Speed: Admin Auto, Operational n/a, Maximum 1G
  Duplex: Admin Auto, Operational n/a
 Active-medium: n/a
  IP-Address: 172.18.0.251/24 [MAC: 20-64-32-18-47-78]
    Input packets 3007, bytes 84732, dropped 0
    Received 3007 unicasts, 0 broadcasts, 0 multicasts
    Input errors 0, runts 0, giants 0
    CRC 0, frame 0, fragment 0, jabber 0
    Output packets 120, bytes 3124, dropped 0
    Sent 110 unicasts, 0 broadcasts, 0 multicasts
    Output errors 0, collisions 0, late collisions 0
    Excessive collisions 0
```

In the Extreme profile or device configuration, use the ‘interface usb0’, ‘shutdown’ or ‘no shutdown’ configuration command to control the HS_C09978’s status. If more control is

needed, then use the ‘power-config usb-enable’ and ‘no power-config usb-enable’ commands to power up or power down the HS_C09978. The initial default is that HS_C09978 is enable.

HS_C09978’s status configuration commands are as follows:

```
ap8432-123456(config-device-12-34-56-12-34-56)#power-config usb-enable
ap8432-123456(config-device-12-34-56-12-34-56)#no power-config usb-
enable

ap8432-123456(config-device-12-34-56-12-34-56-if-usb0)#shutdown
ap8432-123456(config-device-12-34-56-12-34-56-if-usb0)#no shutdown

[To verify, use the show context command]
ap8432-123456(config-device-12-34-56-12-34-56)#show context
ap8432 12-34-56-12-34-56
 use profile default-ap8432
 use rf-domain WR
 hostname ap8432-123456
 no power-config usb-enable
 interface usb0
  no shutdown
```

⚠**Notice:** In the ‘power-config’ parameters of Extreme, it must be set to a 3at mode to enable HS_C09978 powered-on, while a setting of 3af disables it. For example, setting ‘power-config mode 3af’ will also turn off the HS_C09978, independently of the ‘power-config usb-enable’ setting.

4.2 HS_C09978 parameter configuration

HS_C09978 supports Web configuration mode, users can manage devices via Web.

4.2.1 Homepage

Before HS_C09978 parameter configuration, please ensure that Cisco device is online and runs normally.

You can configure parameters by logging on Web corresponding to HS_C09978 IP address. For example: HS_C09978 IP address is 192.168.51.100, you can log on to *http://192.168.51.100* to implement the configuration.

When logging on to the Web in first, you need to set a password, consisting of 12 ~18 digits, letters and special symbols, as shown in *Figure 4-1*.

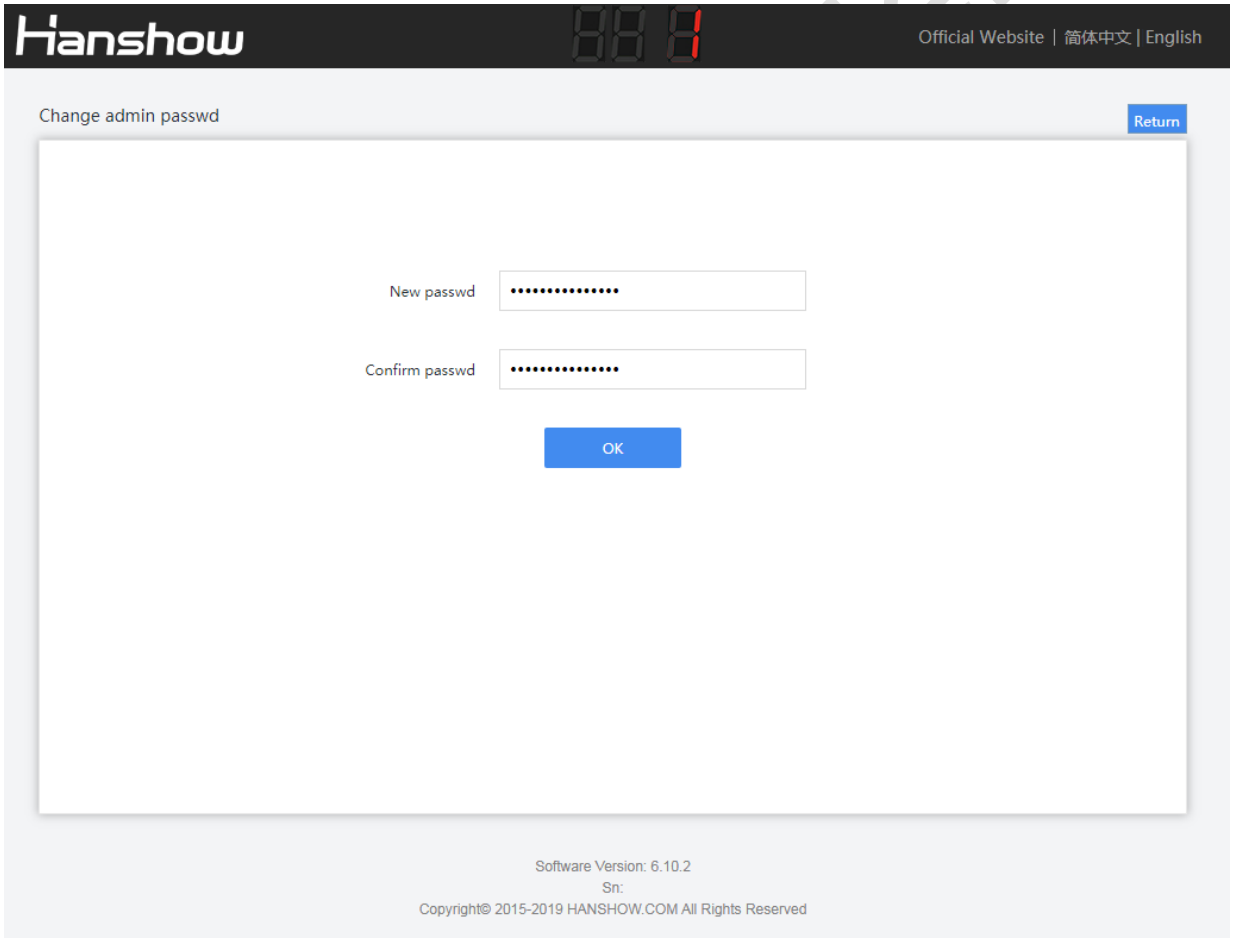

Figure 4-1 Password setting 1

If the password is incorrect, it will appear prompt message, as shown in *Figure 4-2*.

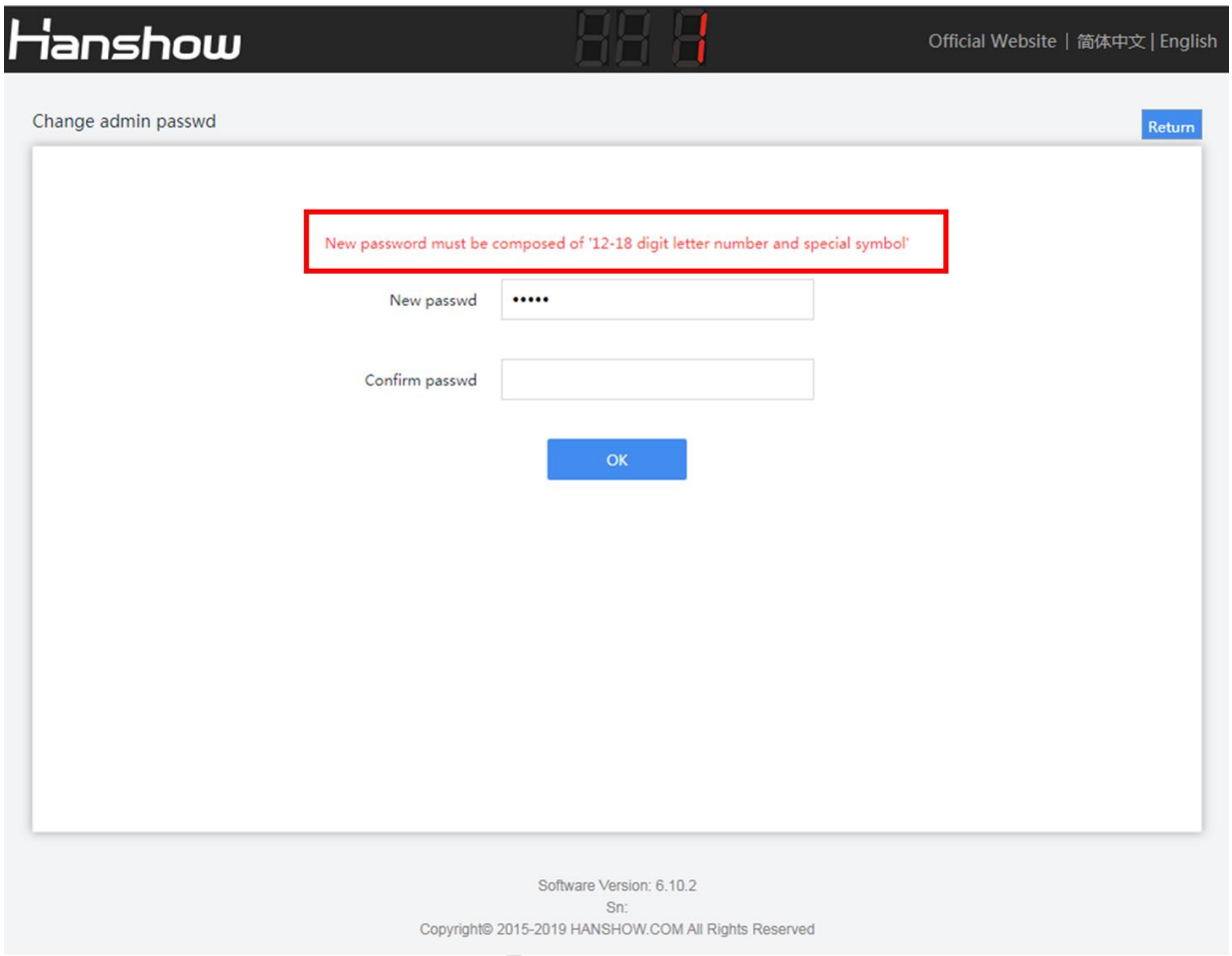

Figure 4-2 Password setting 2

After the password is set, click **OK**, pop-up a box as shown in *Figure 4-3*, and continue to click **OK**.

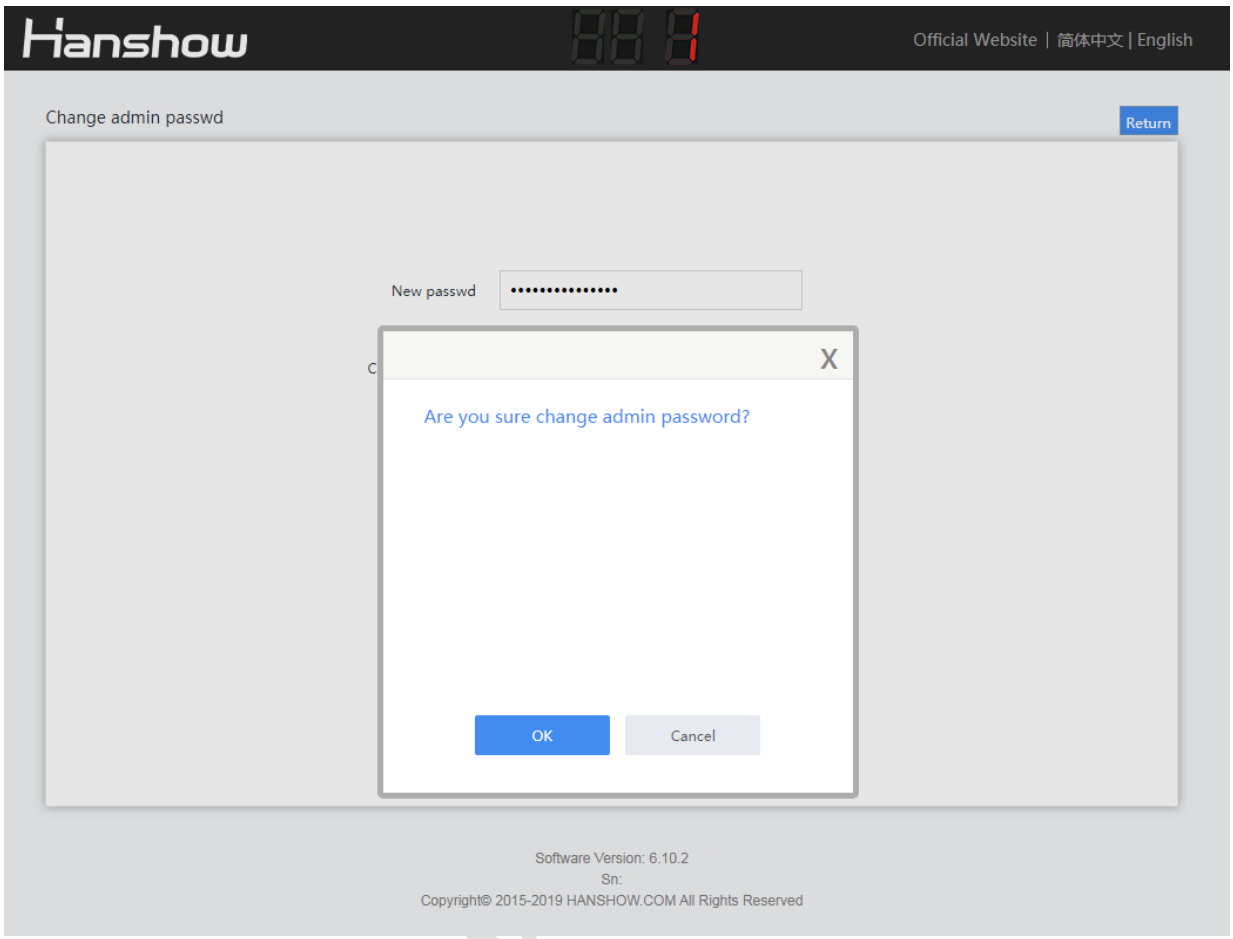

Figure 4-3 Password setting 3

Enter the logon page of HS_C09978 to input the setup password, as shown in *Figure 4-4.*

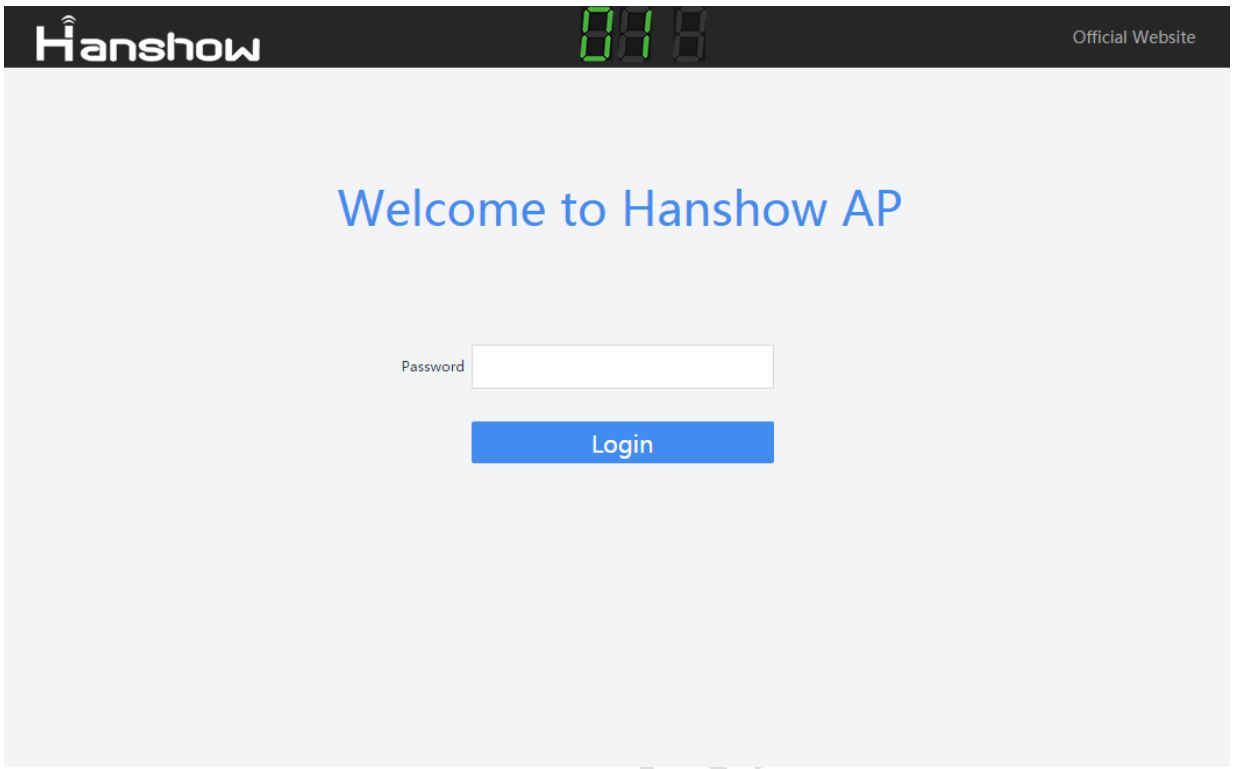

Figure 4-4 HS_C09978 login page

Note: Both Chinese and English are supported on the page, and users can switch the language by the upper right corner.

The homepage of HS_C09978 is as shown in *Figure 4-5*.

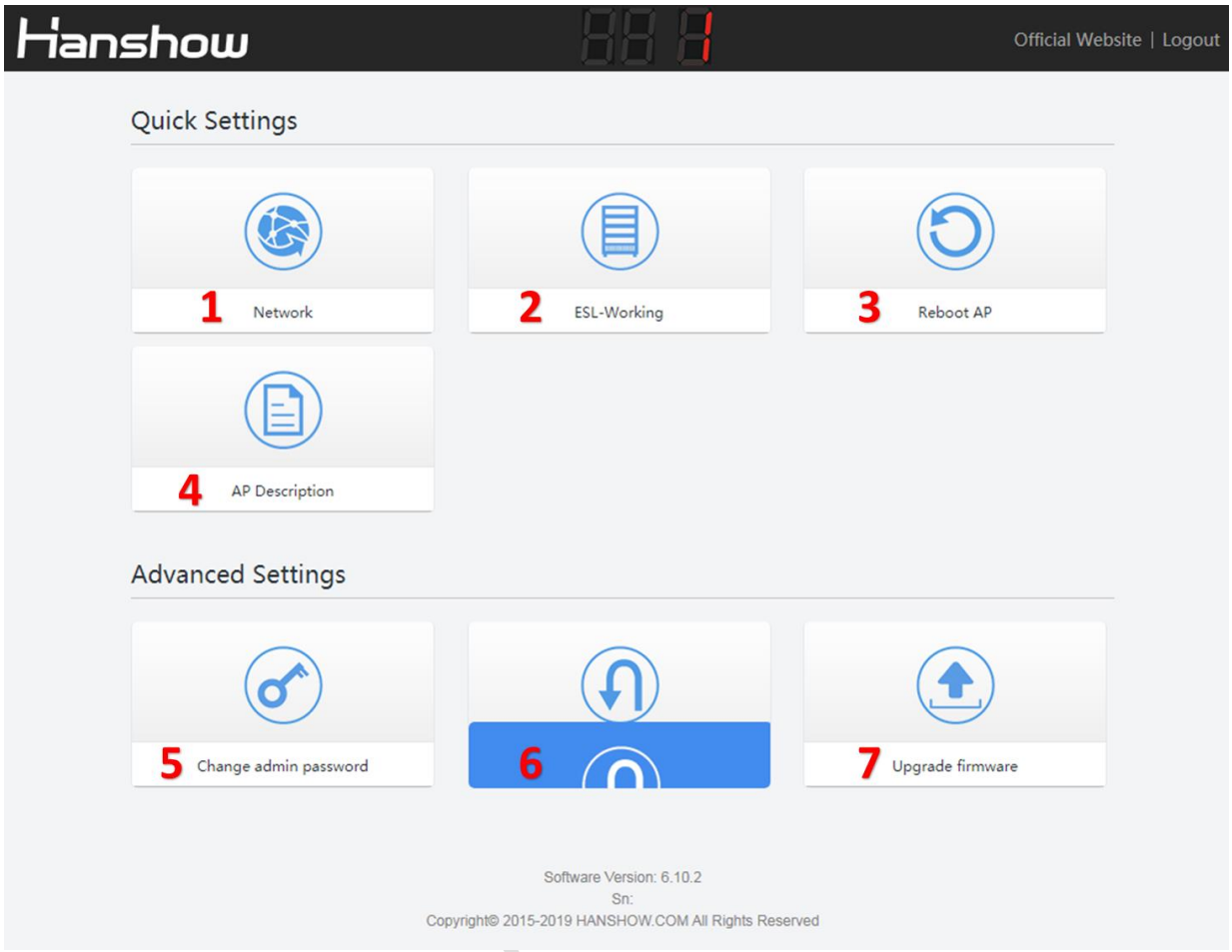

Figure 4-5 Configuration homepage

The configuration item on device homepage is as shown in *Table 4-1*.

Table 4-1 Configuration item description

No.	Configuration item	Description
1	Network	Configuration network parameters
2	ESL-Working	Configuration ESL-Working parameters
3	Reboot AP	Reboot AP
4	AP description	Add description information
5	Change admin password	Change the password
6	Restore factory settings	Restore factory settings

No.	Configuration item	Description
7	Update firmware	Update firmware

4.2.2 Network setting

Network setting is used for setting the network parameter of HS_C09978. It supports two IP address acquiring modes: DHCP or static IP.

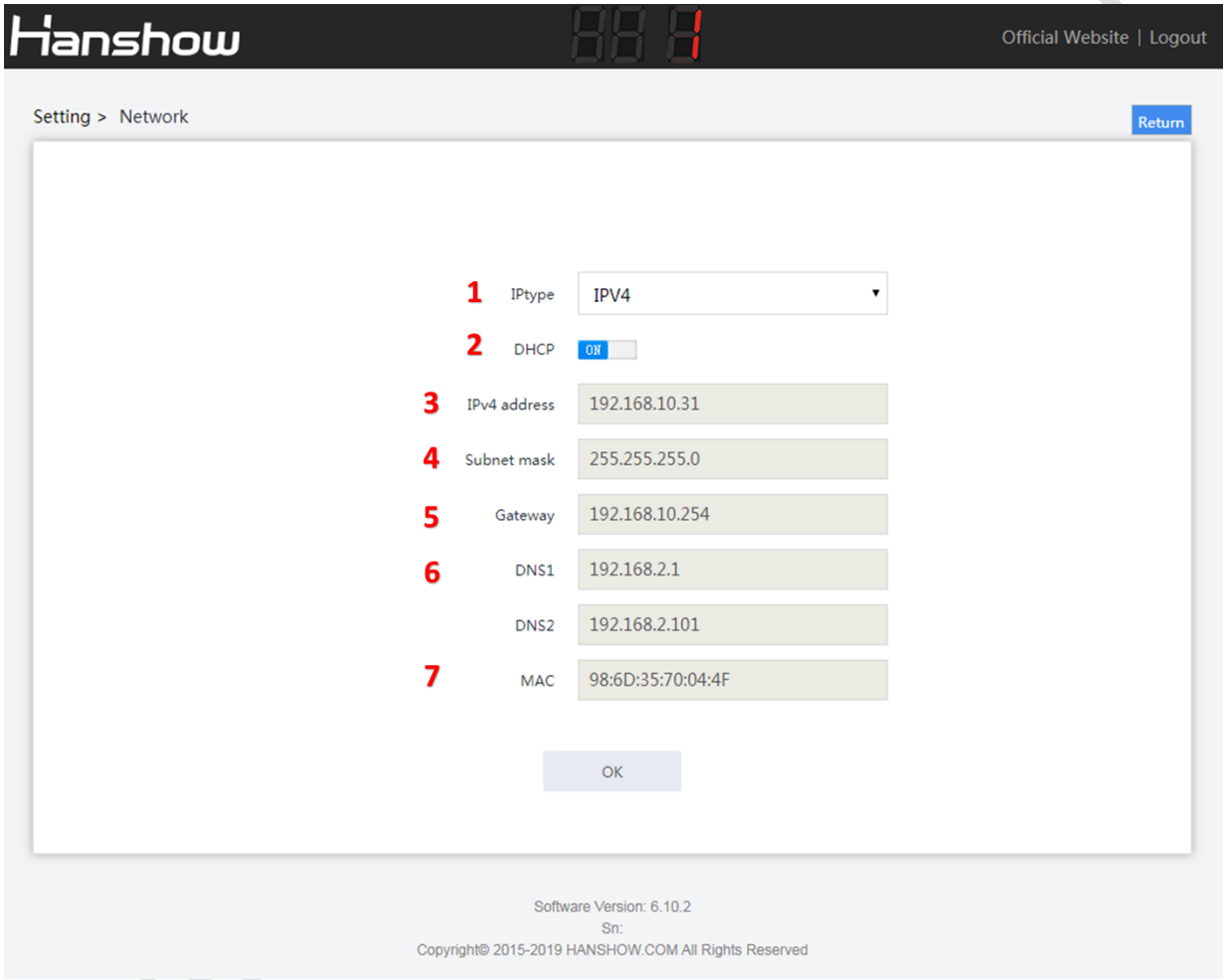

Figure 4-6 Network configuration page

Configuration item description is as shown in *Table 4-2*.

Table 4-2 Configuration item description

No.	Configuration item	Description
1	IP type	Support IPv4 protocol stack
2	DHCP	When set to OFF, AP IP address should be configured manually;

No.	Configuration item	Description
		When set to ON, the device is DHCP client, and IP address should be get from DHCP server.
3	IPv4 address	IPv4 address, can configure when the DHCP is OFF.
4	Subnet mask	Subnet mask, can configure when the DHCP is OFF.
5	Gateway	Gateway, can configure when the DHCP is OFF.
6	DNS	Domain Name Server (DNS), DNS1: Primary DNS server; DNS2: Secondary server. Must be set when the ESL-Working address is configured as domain name address; Enable DHCP, to get DNS from DHCP.
7	MAC	Unique legal MAC address of device.

Note: Network modified will effective immediately, and you need to re-enter setting website to access.

4.2.3 ESL-Working setting

ESL-Working setting: Can set the IP address and port number of ESL-Working, as shown in *Figure 4-7*.

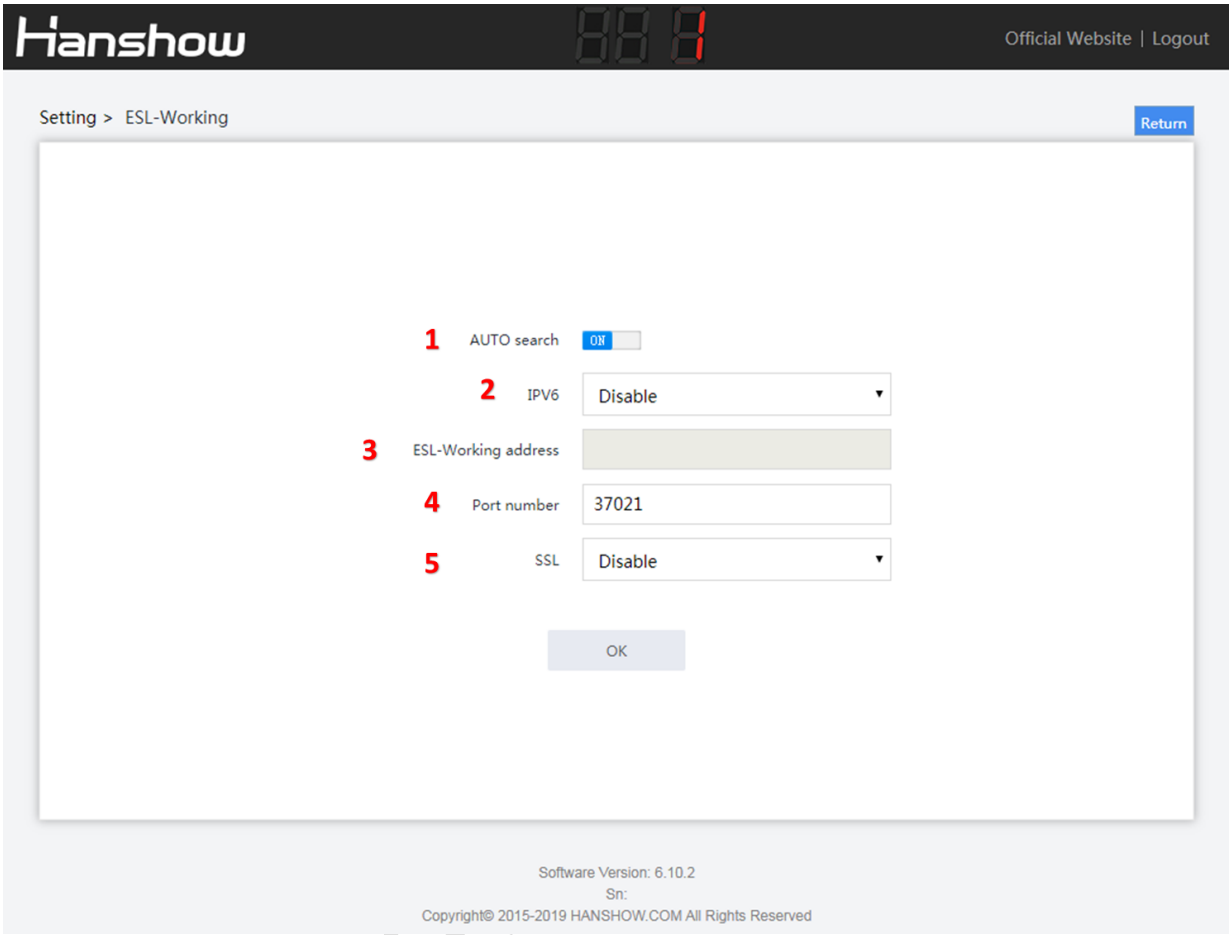

Figure 4-7 ESL-Working setting

Network configuration items description are as shown in *Table 4-3*.

Table 4-3 Configuration item description

No.	Configuration item	Description
1	AUTO search	When set to OFF, it need to specify relative parameter of ESL-Working manually; When set to ON, AP will search ESL-Working address in local area network (LAN), as well as accessible to ESL-Working automatically.
2	IPv6	Disable: Indicates ESL-Working address can configured to IPv4 format address when AUTO search is set to OFF. If the configuration format is incorrect, it will report error.

No.	Configuration item	Description
3	ESL-Working address	The IPv4/IPv6 or DNS in ESL-Working can configure when AUTO search is set to OFF.
4	Port number	Port number of ESL-Working: When AUTO search is set to ON, this port number is the target one for AP accessible to ESL-Working; When AUTO search is set to OFF, this port number is the target one for AP accessible to ESL-Working.
5	SSL	Whether to use SSL to connect securely with ESL-Working

Note:

- AP 6.10.3 and above can support the domain name address function.
- After the domain name address of ESL-Working is set, you need to check if DNS server is configured correctly.
- AP 6.10.3 and above and ESL-Working 2.2.0 and above can support SSL connection.
- After configuring SSL is enable, please confirm whether the port number is correct. Generally, the port number of SSL and Non-SSL is different.
- The modified ESL-Working will take effect after 30 seconds, and no need to reboot AP.

⚠**Notice:** Please configure ESL-Working address manually when ESL controller and ESL-Working are used cross-segment.

4.2.4 Reboot AP

Click **Reboot AP** on the homepage, then click **OK** again on the pop-up confirmation dialog. The device will restart, as shown in *Figure 4-8*.

AP restart takes about 1min.

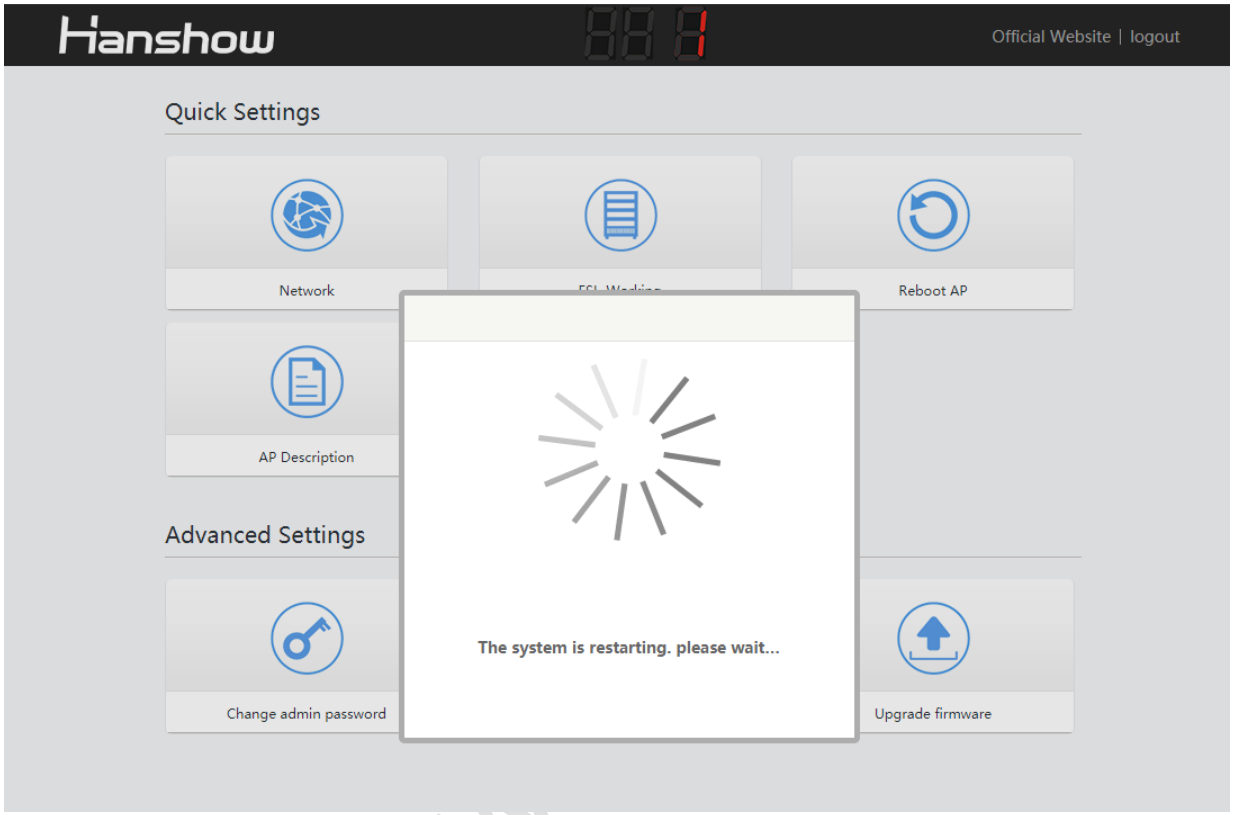

Figure 4-8 Reboot AP

4.2.5 AP description

The description setting item of HS_C09978 can add custom device information description for record and recognition, as shown in *Figure 4-9*.

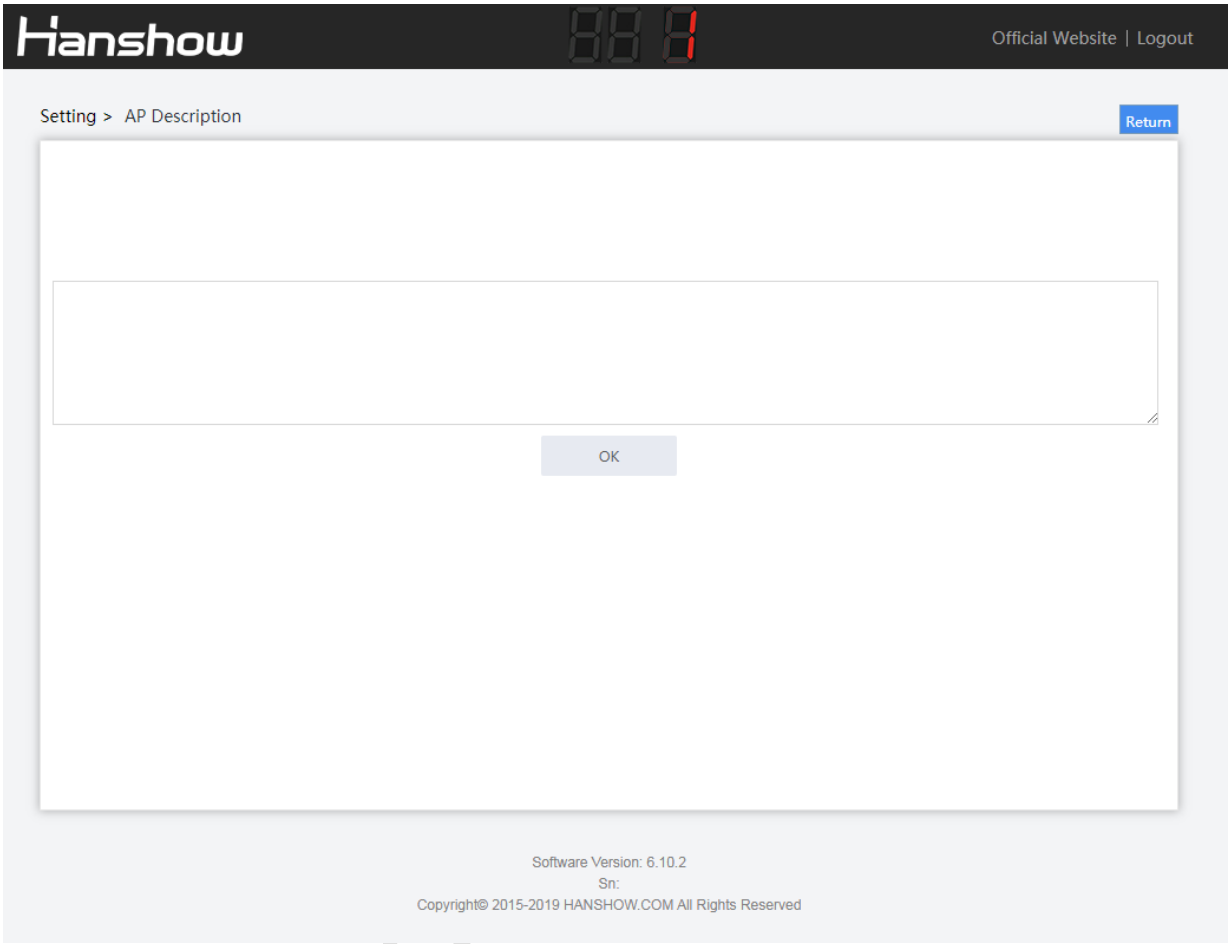

Figure 4-9 AP description

4.2.6 Change admin password

It is used to change the logon password of configuration page, as shown in *Figure 4-10.*

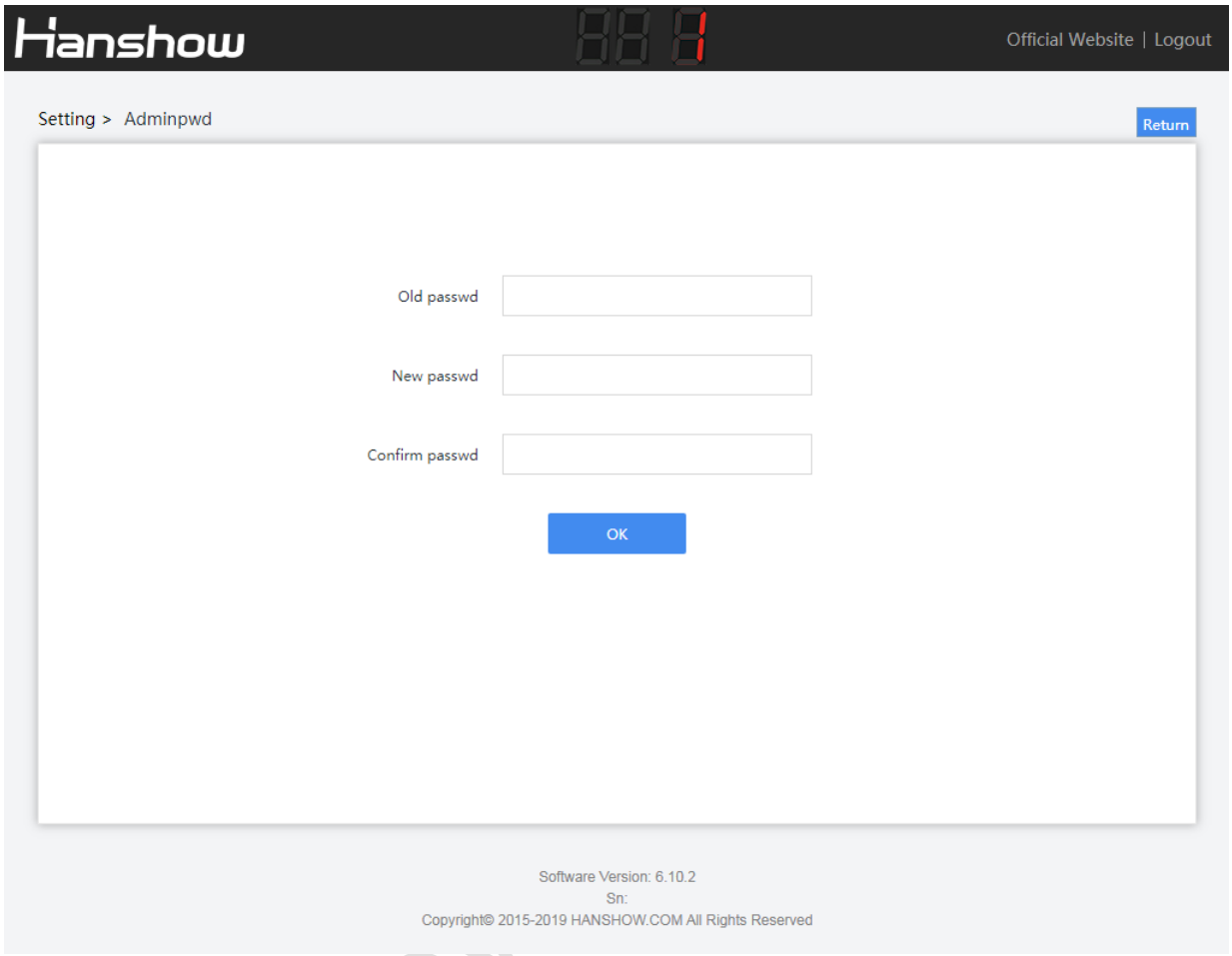

Figure 4-10 Change password

4.2.7 Restore factory settings

It can restore the factory setting of AP. You need to check again on the pop-up dialog, click **OK**. The AP will restore factory setting and restart, as shown in *Figure 4-11.*

It takes about 1 min to restore the factory setting.

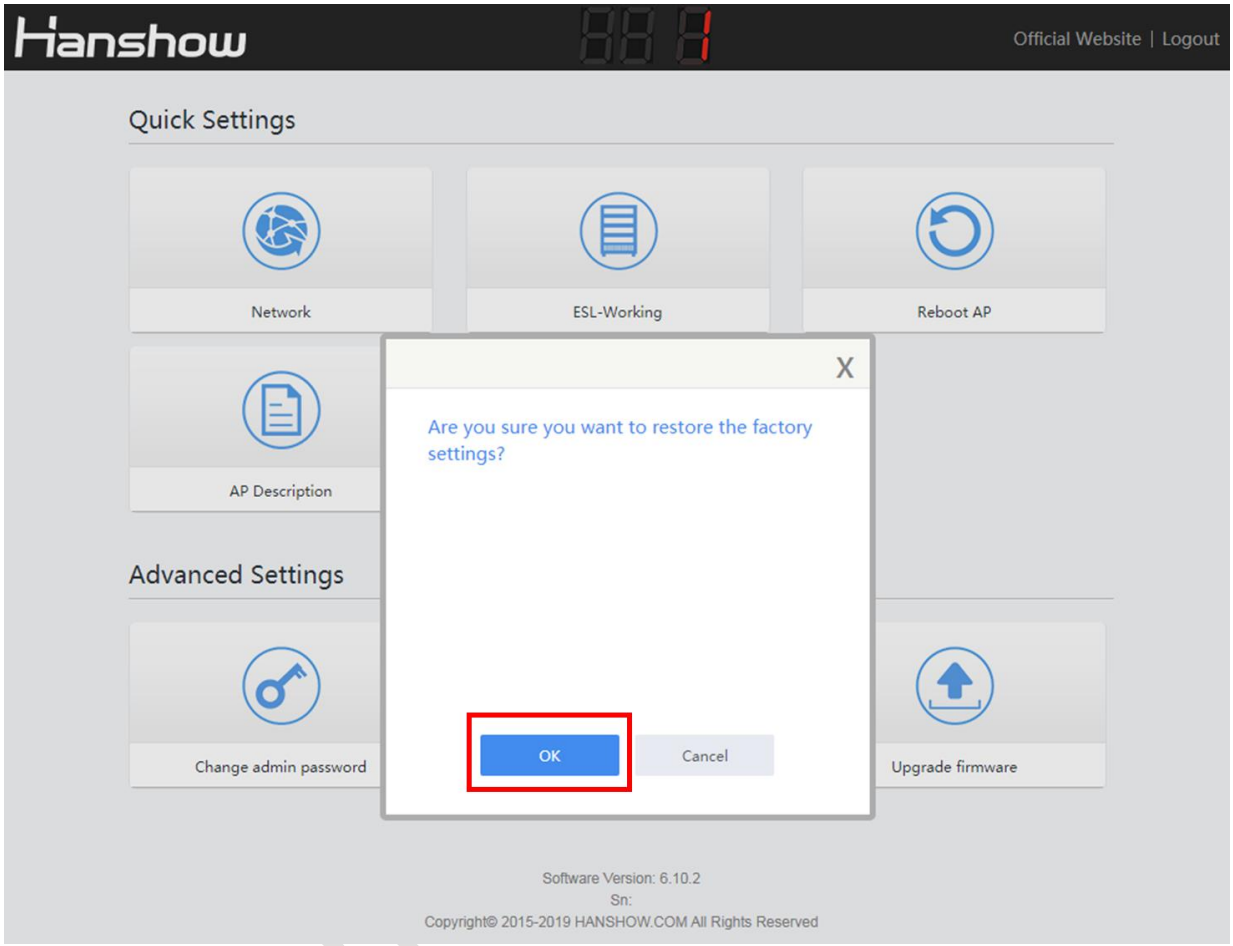

Figure 4-11 Restore factory settings

Note: Don't cut off the power during the process of restoring factory setting, otherwise the device will be damaged.

4.2.8 Upgrade firmware

HS_C09978 is used to upgrade for main system and RF subsystem. It supports local upgrade and remote upgrade.

- Local upgrade: It is not recommended to use company's similar AP upgrade packages for upgrade testing to prevent incorrect upgrades.
- Remote upgrade: Remote upgrade: Currently, it is limited to local area network (LAN) environment upgrade. If it is cross-network upgrade, you need to implement port mapping in advance.

⚠Notice:

- Don’t cut off the power during upgrading process to prevent damage to the system.
- Upgrade the main PCB and three-way sub-PCB of RF.
- The entire upgrade process takes about 10 min.

For more details, see *(HS-AP-CISCO003) Hanshow ESL controller HS_C09978 Upgrade Manual*.

5 Workflow

Before HS_C09978 is powered on, please ensure that the Extreme or Aruba series AP works normally. Specifically, the workflow of integration AP is as shown in *Figure 5-1*.

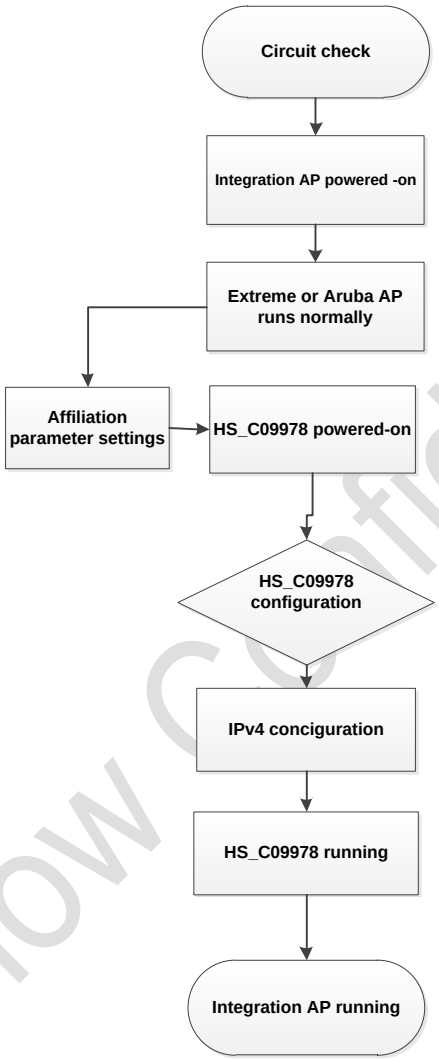

Figure 5-1 Workflow of Extreme or Aruba integration AP

The workflow of integration AP are as follows:

1. Before starting HS_C09978, please check if the Extreme or Aruba AP meets 5V/500mA and USB 2.0 and above, and software supports USB virtual network port.
2. Check if the power and network cables are connected properly
3. After powered-on, waiting for Extreme/Aruba is officially started (about 5min), then HS_C09978 starts to boot.
4. The startup time is about 1min. After the system is started, status's green light is on, which indicates working status.

5. After the system starts, please follow the section of *1.1* to configure HS_C09978's IP and ESL-Working's IP.
6. HS_C09978 will automatically connect to ESL-Working after the configuration is correct. If success, the business and status indicators of the system will flash green; if failed, they will timing reconnect until the connections are successful.
7. HS_C09978 can perform data communication operations, including heartbeat reception, data transceiver, and label inquiry, etc.

6 Package

HS_C09978's packaging is as shown in *Figure 6-1,* and the package contains:

- One HS_C09978 (ESL controller)
- One fixed accessory

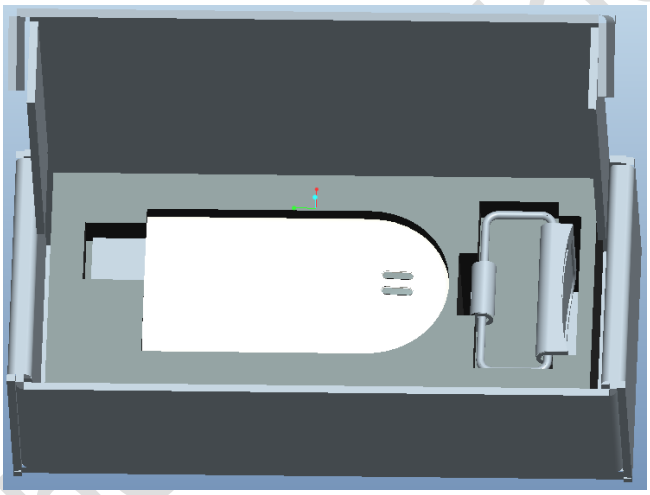

Figure 6-1 Package of HS_C09978

7 Precautions and suggestions

When installing and using Cisco integration AP (hereinafter referred to as AP), please pay attention to the following precautions and suggestions:

Table 7-1 Precautions and suggestions

Item	Description
Pre-installation check	● Ensure the device is Extreme AP-84321 Wi-Fi AP or Aruba with USB interface and software version 8.6 and above. ● Please check if there is no structural interference between the used Extreme or Aruba AP and HS_C09978.
Installation scenario	Avoid metal interference around the AP, especially the cage interference effect.
USB interface	Please check if USB power supply device can support at least 500mA, and support the USB virtual Ethernet function.
Installation distance	● If the shelf height is ≤3m, it is recommended that the installation distance of two Hanshow APs is about 25m, and at least 5m. ● If the shelf height is 3 ~ 5m, it is recommended that the installation distance of two Hanshow APs is about 20m and at least 5m. ● If shelf height exceeds 5m, the installation height of AP is determined according to the actual situation. ● The installation height of AP should be higher than shelf height to avoid signal occlusion. ● For the Ceiling horizontal suspended mounting, it is recommended the installation distance is more the 6cm from the ceiling.
Installation check	Make sure the installation is fixed firmly in case of the loosening and falling-off.
Network settings	● It is suggested to replace 2.4GHz frequency band using AP3800 5GHz frequency band for Wi-Fi coverage. ● It is suggested to set the channel of 2.4GHz as 1, 6 or 11 in case of using 2.4GHz Wi-Fi. ● It is required to stagger the time of RF optimization and ESL updating if users want to use 2.4GHz Wi-Fi. ● It is required to allocate the 2.4GHz wireless communication channel in advance in void of disturbance if other Internet of Things devices with 2.4GHz frequency band are used (such as Zigbee and BT).