Southern Machinery-Electronic Material Rack Interface (v3.1)

1 Overview

1.1 Communication mode

This inductive electronic material rack WCS device (referred to as "WCS" or "device" in the document) communicates based on http protocol + json format.

That is, the device is regarded as a small website, and instructions or data are sent to the device through http connection to complete various tasks (simple testing can be done using tools such as Postman). At the same time, a Web service should be set up on the WMS server to receive the return data of the equipment in and out of the library.

1.2 Basic process

WCS equipment is only the executor of WMS instructions, and reports the incoming and outgoing operations. It does not record storage information and cannot sense existing materials.

Inductive equipment warehousing: WMS transmits the serial number of empty storage location to WCS, and the equipment lights up the storage location lamp bead; After the warehousing operation, turn off the lamp bead and report to the server. Inductive device outbound: WMS transmits the serial number to be outbound to WCS, and the device lights up the lamp bead of the storage location; After the outbound operation, turn off the lamp bead and report to the server. Any unexpected location change will continue to alarm until the error is fixed.

Code scanning type equipment warehousing: WMS transmits the serial number of the empty storage location to WCS, and the equipment lights up the storage location lamp bead; After the warehousing operation, call the lights-out interface to turn off the lamp bead. Code scanning type equipment delivery: WMS transmits the serial number to be delivered to WCS, and the equipment lights up the lamp bead of the storage location; After the delivery operation, call the light-out interface to turn off the lamp bead.

1.3 Lamp bead color, device status enumeration value

The color enumeration will be used to configure the device's default light color and to turn on the device.

White	Red	Yellow	Blue	Green	Orange	Purple
0	1	2	3	4	5	6

The status enumeration will be used to view the status of the device, as well as to give light instructions.

Standby mode	Receipt Mode	outbound mode	Demo Mode
0	1	2	3

1.4 Power on and off

After the device is turned on, a self-test will be carried out. At this time, according to the color enumeration, all LED lamp beads will be lit from 0 to 6 in turn, and each color will last for about 1 second. Then turn on the ceiling light and buzzer (500 milliseconds), and the buzzer can work normally after it stops sounding.

Manually restart the device (power off) and keep the power off state for more than 10 seconds to drain the residual current in the power supply, otherwise it may cause system memory disorder and boot failure. It is **recommended to try to use the interface to provide the restart, shutdown function to operate, in order to protect the system file integrity.** Using the interface restart function, there is no need to keep the power off.

Shutdown using the interface is only to shut down the system, and the hardware is still powered on. It is recommended to perform the shutdown command for 10 seconds before powering off.

1.5 location index

regular material rack provides up to 1400 storage positions, with physical numbers of 1-1400 and corresponding location indexes of 0-1399 in the software. Non-standard racks also follow this rule: the physical number minus 1 is the location index.

1.6 Parameters

All token parameters (see "2 Token authentication" for details) are URL parameters (path parameters), all data parameters are JSON parameters (request body parameters), and WCS return parameters are URL parameters.

1.7 API Interface List

root directory	Configuration	Standby	Light up	Lights out (code scanning)	Restart	Shutdown
/	Config	Standby	TurnOn	TurnOff	Reboot	Shutdown

2 Token authentication

2.1 Description

WCS uses the token scheme (also referred to as "token" in the document) for operation authentication, which is empty by default (indicating that the authentication function is not enabled).

Except for the root directory, each operation interface uses the token parameter as the token verification function. If the token passed to the WCS does not match the reserved token, the device will reject the operation. The return also carries a token to facilitate WMS authentication verification.

2.2 How to use

Pass in the token using the token parameter (url parameter).

Function	Example
Access interface without token	`http://192.168.1.18/TurnOn`
Access interface when token is "sS2000"	`http://192.168.1.18/TurnOn?Token=sS2000`

2.3 How to modify

When using the Config interface, you can modify the token (see 4.1) as follows:

Function	Example
Modify default token to "sS2000"	`http://192.168.1.18/Config?Token=,sS2000`
Modify token to "2000sS"	`http://192.168.1.18/Config?Token=sS2000,2000sS`
Clear Token	`http://192.168.1.18/Config?Token=2000sS,`

3 Find, browse devices

3.1 API

Get device information		
/	GET	Use the IP or hostname to access the device root.
Parameters		
None		
Return		
Id	Int	The Id value of the device bound in WMS to facilitate data update after the report.
Key	string	The unique identifier of the device, an 8-digit English or numeric string, such as "E65B6987".
Name	string	The device name. The default device name is QY-Tech ".
Type	int	Device type, 1 (scanning type), 2 (induction type).
Status	int	Current status of the device: 0 (standby), 1 (receipt), 2 (issue), 3 (demo).
Version	string	The software version number of the device.
EthernetIPAddress	string	Cable network static IP.
WLanIPAddress	string	Wireless network static IP.

3.2 Special procedure to find equipment

open the console program "Qing language shelf scanning applet" and enter the network segment where the device is located to find it. note: only the first 3 addresses of the network segment need to be entered, such as "192.168.1", as

shown in the figure.

3.3 Manually enter the IP address to browse, or write another program to scan the LAN, as shown in the figure below.
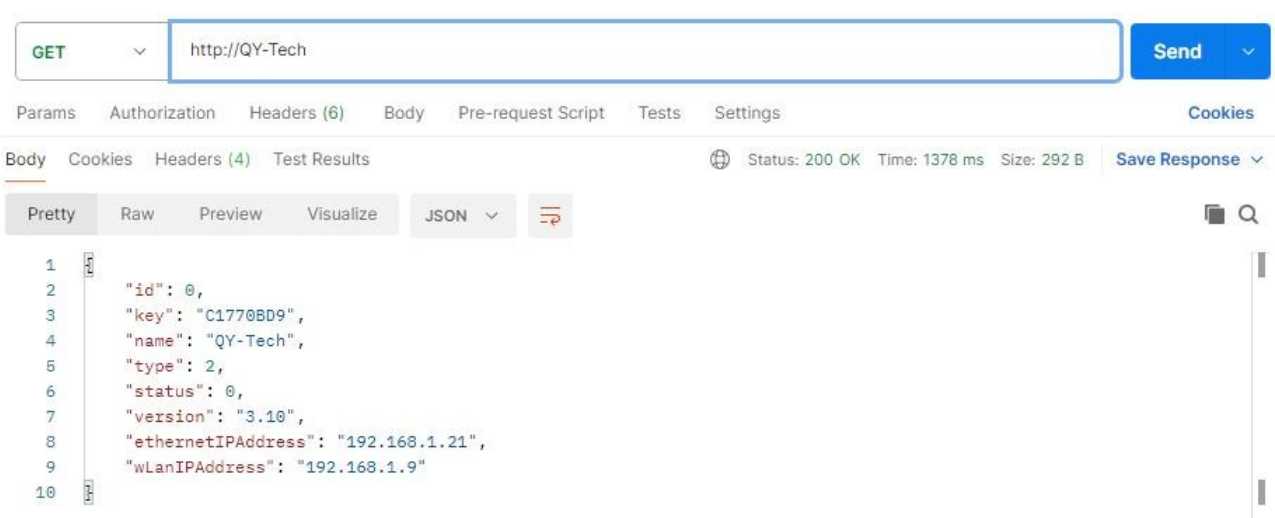

3.4 Host name access. The default host name of the device is QY-Tech. You can modify the device host name (4.2 interface).

Note: When multiple hosts with the same name are registered in DNS, the device registered first will generally be accessed, and the high network segment may not be able to access the DNS of the low network segment.

The host name, depending on the gateway. The ping value of using the host name is high, and it is recommended to use ip access first.

4 Configure devices

4.1 API

Configure devices			
/Config	POST	**If the field is not specified or exceeds the range, the device will use the default value instead, and the device will automatically restart after the configuration is successful.**	
Url parameter			
Token	string	The authentication token, which is empty by default, indicating that it is not enabled. The token string is limited to 6-20 digits of English (upper and lower case) and numbers. See 2.3 for modified examples.	
Json parameter			
Id	int	The Id value of the device bound in WMS, which is used to carry the return of the inbound/outbound operation. The default value is 0.	
Type	int	Device type, 1 (scan code type), 2 (induction type), default value is 2. **Configuration errors will not work**.	
Name	string	Equipment name: 2-20 words. The first character must be English; the middle character can be English, number or connector "-"; the last character must be English or number. **If not filled in, will not modify the name.**	
EthernetIPAddress	string	Wired Network Static IP(v4)	Both need to be filled in at the same time and different in order to take effect.
EthernetNetGateway	string	Wired Network Gateway IP(v4)	**If it is not filled in, the wired network static IP and gateway** will be cleared.
WLanIPAddress	string	Wireless Network Static IP(v4)	Both need to be filled in at the same time and different in order to take effect.
WLanNetGateway	string	Wireless Network Static IP(v4)	**If not filled in, the wireless network static IP and gateway** will be cleared.
WLanSSID	string	Wireless network SSID.	After the setting is successful, the Wi-Fi switch will be turned on automatically.
WLanPassword	string	The wireless network password.	**If not filled in, the WIFI information** will be cleared.
BrightNess	int	LED lamp brightness, default value 5, setting range 1-10.	
BuzzerChirping	bool	After the exit and receipt operations are successful, is there a short prompt? The default value is True.	
WarningColor	int	Warning light color enumeration value, default 1.	
InputPath	string	The return address of the inbound operation, such as "192.168.1.18/Api/In". If not filled in, the setting will be cleared.	
InputColor	int	The color enumeration value of the receipt prompt light. The default value is 0.	
InputConfirmedTime	int	Receipt confirmation duration (milliseconds). The default value is 500 and the setting range is 200-5000.	
OutputPath	string	Return address of outbound operation, such as "192.168.1.18/Api/Out". If not filled in, the setting will be cleared.	
OutputColor	int	The output prompt light color enumeration value, with a default value of 0.	
OutputConfirmedTime	int	The outbound confirmation duration (milliseconds), the default value is 500, and the setting range is 200-5000.	
Return			

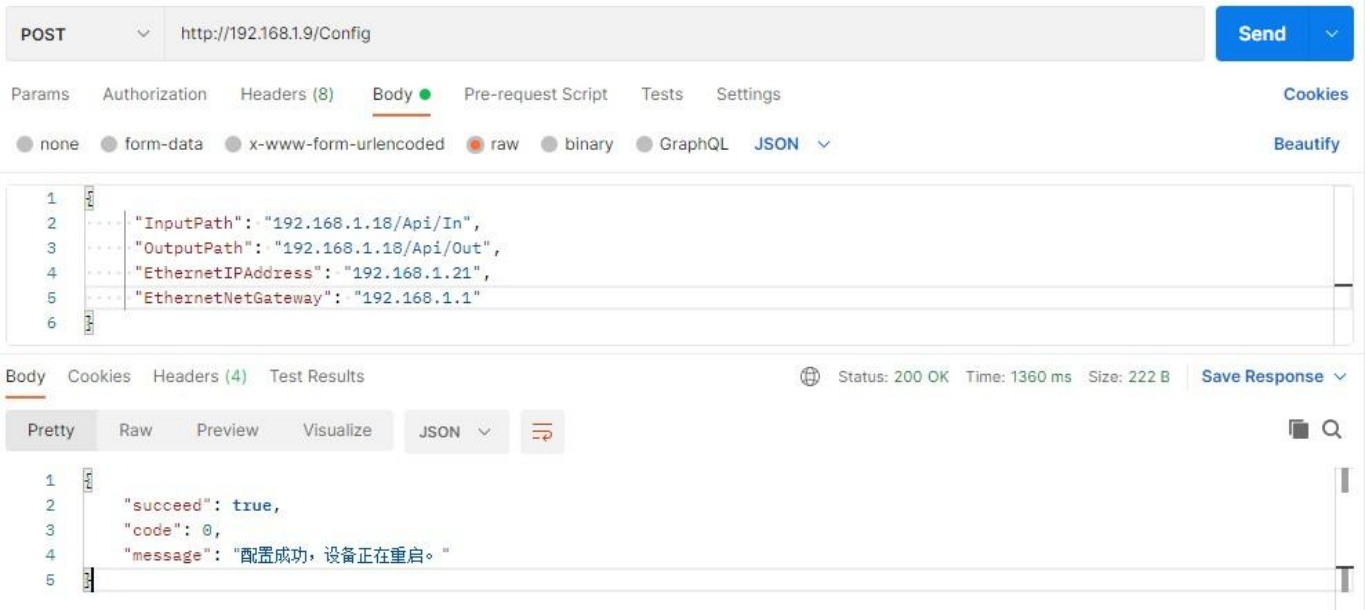{Succeed : true, Code : 0, Message: "The configuration was successful and the device is rebooting."}

{Succeed : false, Code : 10, Message : "Failed: Token error. "}

{Succeed : false, Code : 11, Message : "Failed: The submitted token is not qualified. "} -- When modifying the token, the new token is not qualified.

{Succeed : false, Code : 12, Message: "Failed: The device is still executing the job."}

{Succeed : false, Code : 13, Message: "Failed: Device Name Not Qualified."} -- Name rules are not met when name is modified.

4.2 basic configuration, as shown in figure:

4.3 Configure Overrides

For each configuration, the original configuration needs to be transmitted together, otherwise it will be overwritten by the default value.

For example, the "InputPath" attribute has been configured before. If you configure it again later, you still need to fill in the "InputPath" attribute, otherwise the device will use the default value (blank string) to overwrite the previous configuration.

4.4 Configure Static IP

Static IP and gateway information of wired network and wireless network can be set.

The static IP and gateway must be set at the same time to take effect. If either is left blank, the original static IP and gateway will be cleared. For example, when setting wireless network information, wired network information must also be set, otherwise the wired network IP configuration will also be cleared.

4.5 Configuration Complete

After the configuration is successful, the device will automatically restart to take effect.

5 Standby mode

5.1 **Only standby mode can be switched to other modes, so any process ends, you must call the standby interface**.

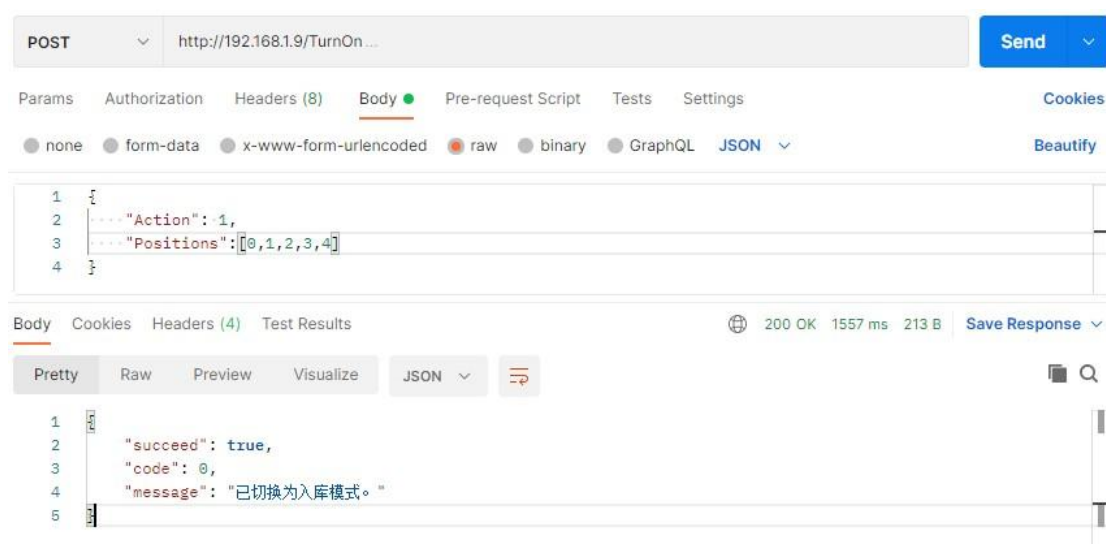| Toggle standby state		
/Standby	POST	Turn off all lamp beads, end the operation or debugging mode, and turn to standby. However, if there is an uncorrected error and the job operation is waiting for confirmation, it will return failure until the error is fixed or the operation is completed.
Url parameter		
Token	string	Validation token, leave blank if none.
Return		
{Succeed : true, Code : 0, Message: "switched to standby mode."} {Succeed : false, Code : 10, Message : "Failed: Token error. "} {Succeed : false, Code : 20, Message: "Failed: There are currently uncorrected errors."} {Succeed : false, Code : 21, Message: "Failed: There are currently incomplete jobs."}		

6 Receipt

6.1 Process

The code scanning device only performs the 6.2 process.

The inductive device first executes the 6.2 process and then repeatedly executes the 6.3-6.5 process until the 6.6 process completes its task.

6.2 Storage first step

Switch Receipt Mode		
/TurnOn	POST	Transfer the index to be stored to the equipment, and the equipment will switch to the storage mode and turn on all target location lights.
Url parameter		
Token	string	Validation token, leave blank if none.
Json parameter		
Action	int	1 must be passed to indicate receipt mode.
Positions	int [ ]	Integer array, fill in the serial number of the lamp bead of the storage location to be lit (0 to 1399).
Color (optional)	int	Enumeration value of the job receipt prompt light color. If it is not filled in, the system default light color will be used. It cannot be the same color as the warning light, otherwise an error will be returned.
Return		

{Succeed : true, Code : 0, Message: "switched to receipt mode."}
{Succeed : false, Code : 10, Message : "Failed: Token error. "}
{Succeed : false, Code : 40, Message: "Failed: The device is still executing the job."}
{Succeed : false, Code : 41, Message: "Failed: No receipt location specified."}
{Succeed : false, Code : 42, Message: "Failed: location index is out of range."}
{Succeed : false, Code : 43, Message: "Failed: Inbound light cannot be the same color as warning light."}
{Succeed : false, Code : 44, Message: "Failed: Not in receipt status, unable to receive."}
{Succeed : false, Code : 45, Message: "Failed: There is already a warehousing operation in progress."}

For example, when the index to be stored is transferred to the equipment, the equipment will switch to the storage mode and light up lamp beads 1, 2, 3, 4 and 5, as shown in the following figure.

6.3 The second step of warehousing

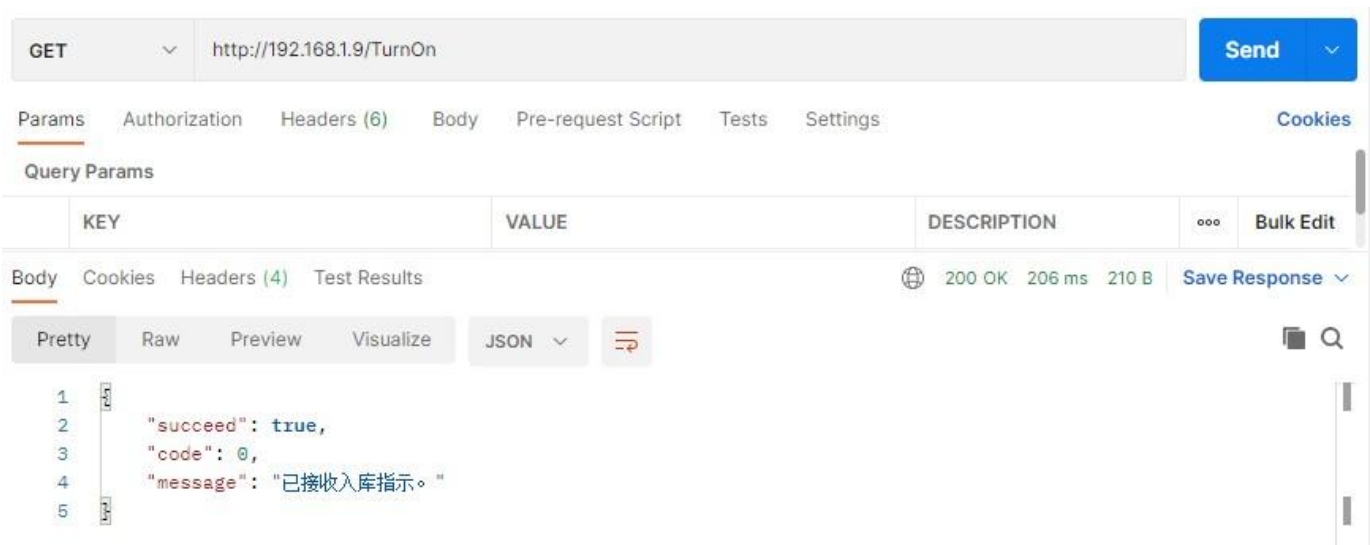| Receive warehousing registration, this interface is only used for inductive devices, and code scanning devices do not need this operation.		
/TurnOn	GET	
Url parameter		
Token	string	Validation token, leave blank if none.
Return		
{Succeed : true, Code : 0, Message: "Indication received."} {Succeed : false, Code : 10, Message : "Failed: Token error. "} {Succeed : false, Code : 43, Message: "Failed: Not in receipt status, unable to receive."} {Succeed : false, Code : 44, Message: "Failed: There is a receipt instruction in progress."}		

Postman test:

Receipt operation can be performed on the target location. WCS will report back after the operation is successful (6.5).

6.4 Operating Materials

After the materials are put into the storage location, the equipment will lock the storage location. At this time, other storage location changes will continue to alarm to avoid misoperation.

The location indicator light flashes continuously, waiting for the receipt operation confirmation (InputConfirmedTime). Before confirmation, the materials leave the location (the indicator light still flashes and does not go WMS report), which is regarded as abandoning the current warehousing operation of the location.

After waiting for the confirmation time, WCS reports to WMS in the POST mode, and the abandonment is invalid at this time.

6.5 Receipt Return

WCS reports inbound information to WMS		
POS	http://{InputPath}?Key ={Key}& ShelfId = {Device Id}& Position = {Receipt location} & Token ={Token}	
Success		
WMS needs to return the **integer 0**	Short beep 1 sound	Turn off the location indicator light
Failed		

Network Error	Beep 2	Network timeout, address failure, return address error.	The storage light flashes continuously and goes out after the material is taken away.
WMS Custom Integer	Beep 3-5	When the value is greater than 5, whistle only 5 times.	
Exception			
If there are materials in a certain storage location, but they are retrieved as storage location and light up the lamp bead, picking up the materials will cause abnormality and continue to report errors until the materials are put back.			

6.6 End Receipt

After each warehousing operation, a standby command must be issued to end the warehousing mode.

7 Outbound

7.1 Process

The code scanning device only performs the 7.2 process.

The inductive device executes the 7.2 process and then iteratively executes the 7.3-7.4 process until the 7.5 process completes its task.

7.2 Switch out mode

Address		
/TurnOn	POST	Transfer the index to be outbound to the equipment, and the equipment will switch to outbound mode and turn on all target location lights.
Url parameter		
Token	string	Validation token, leave blank if none.
Json parameter		
Action	int	Must be passed to 2, indicating issue mode.
Positions	int [ ]	Integer array, fill in the serial number (0 to 1399) of the outbound location lamp bead to be lit. If multiple work orders are issued and the location overlaps, an error will be returned.
Color (optional)	int	The output light color of this job is enumerated. If it is not filled in, the system default output light color will be used. If multiple work orders are out, the color of the work order indicator cannot be the same, otherwise an error will be returned. The color of the indicator light cannot be the same as the color of the warning light,

		otherwise an error will be returned.

Return

{Succeed : true, Code : 0, Message: "switched to issue mode."}
{Succeed : false, Code : 10, Message : "Failed: Token error. "}
{Succeed : false, Code : 50, Message: "Failed: The device is still executing the job."}
{Succeed : false, Code : 51, Message: "Failed: No outbound location specified."}
{Succeed : false, Code : 52, Message: "Failed: The outbound light cannot be the same color as the warning light."}
{Succeed : false, Code : 53, Message: "Failed: the outbound light cannot be the same as other work orders."}
{Succeed : false, Code : 54, Message: "Failed: location index is out of range."}
{Succeed : false, Code : 55, Message: "Failed: duplicate outbound location."}

7.3 Operating Materials

After the material leaves the location, the equipment will lock the location. At this time, other location changes will continue to alarm to avoid misoperation.

The storage location indicator light keeps flashing, waiting for the confirmation of the outbound operation (OutputConfirmedTime), and returning the material before confirmation (the indicator light still flashes and does not send to WMS

Report), which is regarded as abandoning the current issue operation of the location.

Only one issue operation is allowed for the same work order, but different work orders will not affect each other.

After waiting for the confirmation time, WCS reports to WMS in the POST mode, and the abandonment is invalid at this time.

7.4 outbound return

WCS reports outbound information to WMS			
POST	http:// {OutputPath}?Key ={Key}& ShelfId = {Device Id}& Position = {outbound location} & Token ={Token}		
Success			
WMS needs to return the **integer 0**	Beep 1	Turn off the location indicator light	
Failed			
Network Error	Beep 2	Network timeout, address failure, return address error.	The storage light flashes continuously and goes out after the material is put back.
WMS Custom Integer	Beep 3-5	When the value is greater than 5, whistle only 5 times.	
Exception			
If there is no material in a certain storage location, but it is retrieved as an outbound storage location and the lamp bead is lit, the material put in at this time will cause abnormality and continue to report an error until the material is returned.			

7.5 End issue


```
POST        http://192.168.1.9/Standby ...

Params  Authorization  Headers (7)  Body  Pre-request Script  Tests  Settings

Body  Cookies  Headers (4)  Test Results          200 OK  17 ms  213 B  S

Pretty  Raw  Preview  Visualize  JSON

1  {
2      "succeed": true,
3      "code": 0,
4      "message": "已切换为待机模式。"
5  }
```

8 Demo

The demonstration mode has two modes: self-inspection and inventory, see the "Positions" configuration section.		
/TurnOn	POST	
Url parameter		
Token	string	Validation token, leave blank if none.
Json parameter		
Action	int	Must pass 3, indicating demo mode.
Positions	int [ ]	Integer array, fill in the serial number of the location lamp bead to be lit (0 to 1399). If it is not filled in, it indicates a self-test, and the self-test procedure will be executed cyclically. If filled in, it means inventory, and the target lamp bead will be lit. At this time, all storage positions will be locked, and any operation will report an error.
Color (optional)	int	This job demonstrates the light color enumeration. If it is not filled in, the system default receipt light color will be used.
Return		
{Succeed : true, Code : 0, Message: "switched to demo mode (self-test)."} {Succeed : true, Code : 0, Message: "switched to demo mode (inventory)."} {Succeed : false, Code : 10, Message : "Failed: Token error. "} {Succeed : false, Code : 30, Message: "Failed: The device is still executing the job."} {Succeed : false, Code : 31, Message: "Failed: location index is out of range."}		

9 Lights out

The lights-out interface is only available for code-scanning devices to call.		
/TurnOff	POST	
Url parameter		
Token	string	Validation token, leave blank if none.
Position	int	The equipment will turn off the lamp beads in the index of the location index that needs to be turned off.
Return		
{Succeed : true, Code : 0, Message: "The {Position} location bulb is turned off."} {Succeed : false, Code : 10, Message : "Failed: Token error. "} {Succeed : false, Code : 60, Message: "Failed: Not currently in light-up mode."} {Succeed : false, Code : 61, Message: "Failed: location index is out of range."} {Succeed : false, Code : 62, Message : "Failed: This index is not the target location. "} {Succeed : false, Code : 63, Message: "Fail: This interface is available only for swept devices."}		

10 Restart

Using the interface restart function, there is no need to keep the power off.		
/Reboot	POST	
Url parameter		
Token	string	Validation token, leave blank if none.
Return		
{Succeed : true, Code : 0, Message: "Operation succeeded, device is restarting."} {Succeed : false, Code : 10, Message : "Failed: Token error. "}		

11 Shutdown

Shutdown using the interface is only to shut down the system, and the hardware is still powered on. It is recommended to perform the shutdown command for 10 seconds before powering off.		
/Shutdown	POST	
Url parameter		
Token	string	Validation token, leave blank if none.
Return		
{Succeed : true, Code : 0, Message: "The operation was successful and the device was shut down immediately."} {Succeed : false, Code : 10, Message : "Failed: Token error. "}		

Note: WOL cannot be implemented without booting Api.