

# **KT-6101 Smart IO Controller**

## **User's Manual**

Version 1.1, Aug. 2014



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### **Copyright Notice**

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### **Important Note**

#### **Radiation Exposure Statement**

This equipment complies with CE/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.

#### **FCC Information**

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.

#### **Caution:**

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

This product contains a radio transmitter with wireless technology which has been tested and found to be compliant with the applicable regulations governing a radio transmitter in the 2.400GHz to 2.483GHz frequency range.

The KT-6101 Smart IO controller is a standalone remote IO controller that can connect sensors and turn on/off relays or switches for application over Ethernet and IP-based networks.

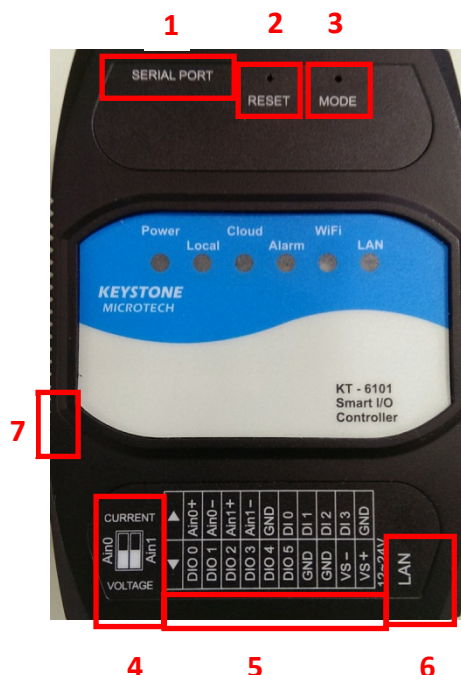
A PLC-like logic processing engine is built in the KT-6101, so the user can program this device for process control, data acquisition or other automation application. One of the most powerful feature of the Smart IO controller is the capability to connect to a cloud on the internet, call K-Cloud service. The K-Cloud service provides the user an infrastructure for remote sensor reading and output control over the Internet without the complex network settings of firewall or VPN (virtual private network).

This user's manual guides you through the following steps to understand the basic operation of the KT-6101 Smart-IO controllers:

- [Understand the hardware](#)
- [Install the hardware](#)
- [Download and install the Android APP](#)
- [Configure and monitor the Smart IO controller via the APP](#)
- [Write and update a control block program to the Smart IO controller](#)
- [Use the K-Cloud service](#)

## 1. Understand the hardware

Hardware description:



1 : Serial Port: RS-232 connector to EZ-extender (Model#: KT-6160)

2 : Reset : System Default Reset

3 : Mode : Local mode or Cloud mode switch

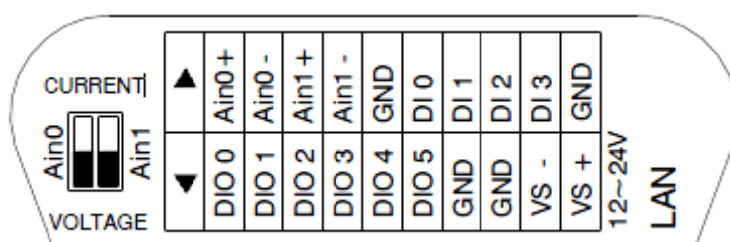
4 : AI0/AI1 : Current mode or Voltage mode selectors

5 : Terminal block for DI, DIO, AI and Power source

6 : LAN: Ethernet RJ-45 connector, also support Power over Ethernet

7 : Grounding

I/O Terminal Block:



#### Ports Description:

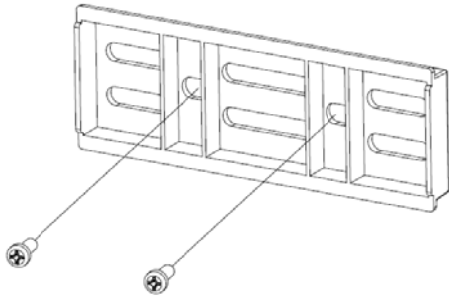
| Ports                | Description                                  | Spec.                                                                                                  |
|----------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <b>DIO 0 ~ DIO 5</b> | Configurable Digital Input/Output ( 6 ports) | <b>Digital Input:</b><br>+5Vdc ~ +30Vdc<br><b>Digital Output:</b><br>+5Vdc ~ +50Vdc<br>@ 200mA/Channel |
| <b>Ain0+/Ain0-</b>   | Analog Input 0                               | <b>Current mode:</b><br>0~20mA; 4~20mA<br><b>Voltage mode:</b><br>0~5V; ±5V; 0~10V; ±10V;              |
| <b>Ain1+/Ain1-</b>   | Analog Input 1                               |                                                                                                        |
| <b>DI 0 ~ DI 3</b>   | Digital Input ( 4 ports)                     | +5Vdc ~ +30Vdc                                                                                         |
| <b>VS - / VS +</b>   | Power Input                                  | DC +10V ~ +30V                                                                                         |
| <b>GND</b>           | Grounding                                    |                                                                                                        |

#### LED Indicators:

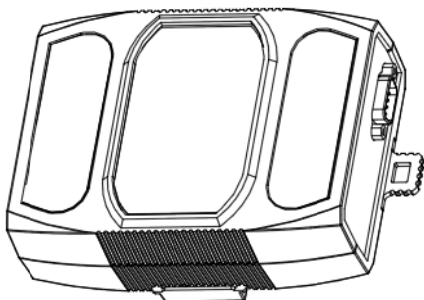
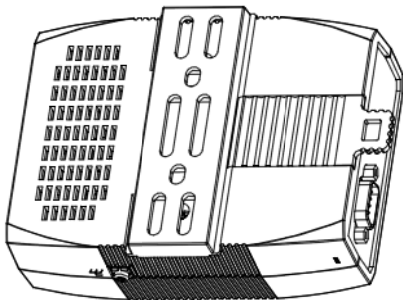
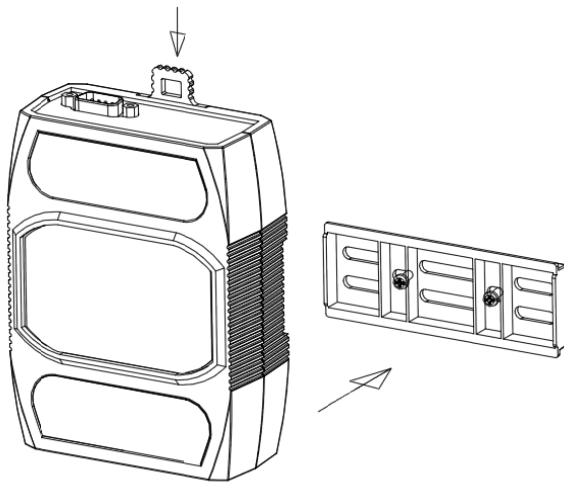
| LED   | Light       | Description                                       |
|-------|-------------|---------------------------------------------------|
| Power | Off         | System power off                                  |
|       | On          | System power on                                   |
| Local | Off         | Not at local mode                                 |
|       | On          | Local mode, not conned to the K-Cloud service     |
| Cloud | Off         | Not at cloud mode                                 |
|       | Blinking    | System is connecting to the K-Cloud but not ready |
|       | On          | Cloud mode, system has connected to the K-Cloud   |
| Alarm | Off         | No alarm                                          |
|       | Blinking    | Device is alarming                                |
| WiFi  | Off         | No host Wi-Fi connection                          |
|       | Blinking/On | Wi-Fi is connected.                               |
| LAN   | Off         | Ethernet connection off                           |
|       | On          | Ethernet connection on                            |

## 2. Install the hardware

(2.1) Installing the devices as following:



Screw: M3X10L



- (2.2) Connecting the power: DC +10 ~ +30V to VS+ and VS-
- (2.3) Grounding the unit
- (2.4) Connect the LAN port to Internet

### 3. Download and install the Android APP

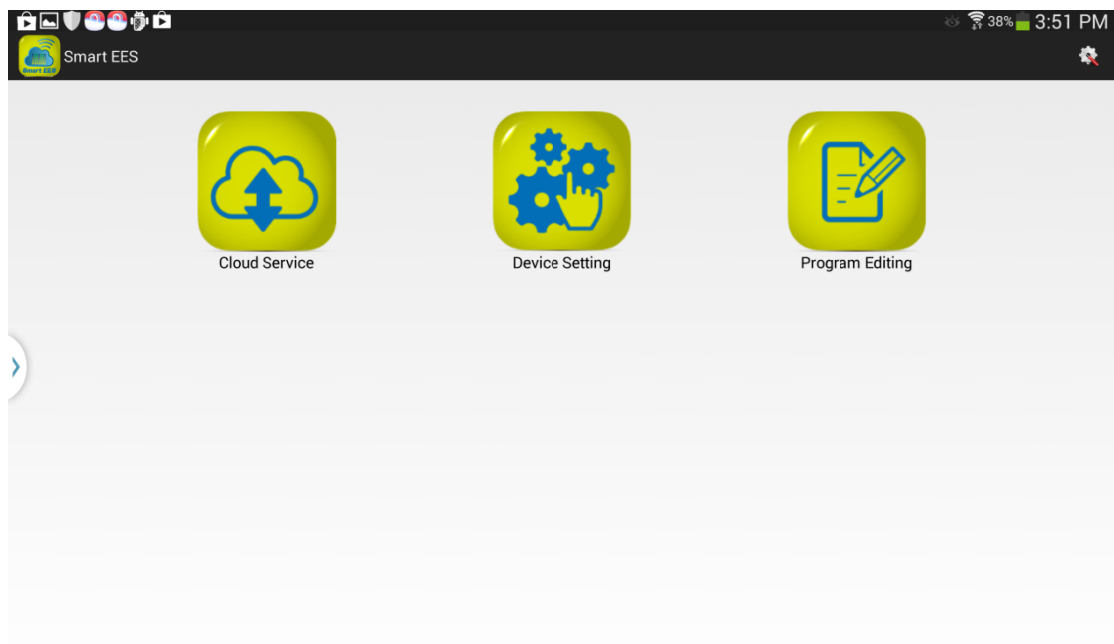
- (3.1) It is suggested to use an Android tablet with Android 4.0 or higher version.
- (3.2) The suggested screen size of the Android tablet is 7 inches or above.
- (3.3) Please download the APP from the Google Play Store: please search the APP with the following keyword: Smart EES



- (3.4) Download and install the APP.

### 4. Configure and monitor the Smart IO controller via the APP

- (4.1) Please make sure the Wi-Fi of the tablet is turned on before using the APP
- (4.2) Click the SmartEES APP, the main screen is as following:



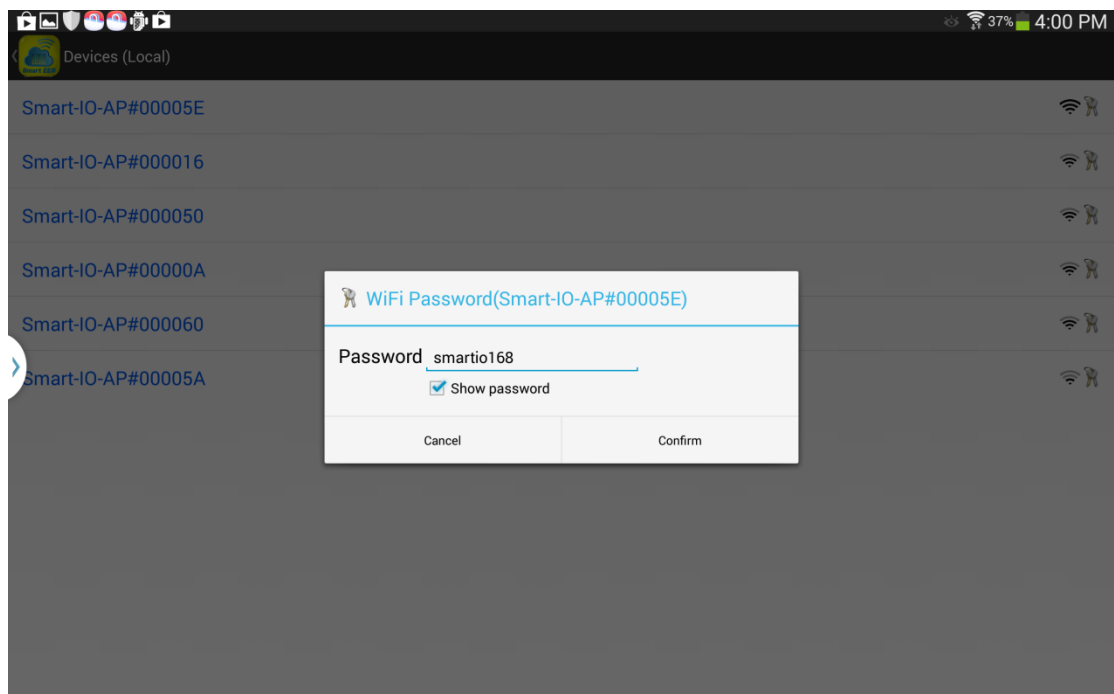
Then, click the **Device Setting** icon for further operations.

- (4.3) A list of Smart IO controllers is shown on the screen.



The default device name is of the format like: Smart-IO-AP#0000XX with different serial number after the # sign for different Smart IO controllers. Here, we select the Smart-IO-AP#00005E.

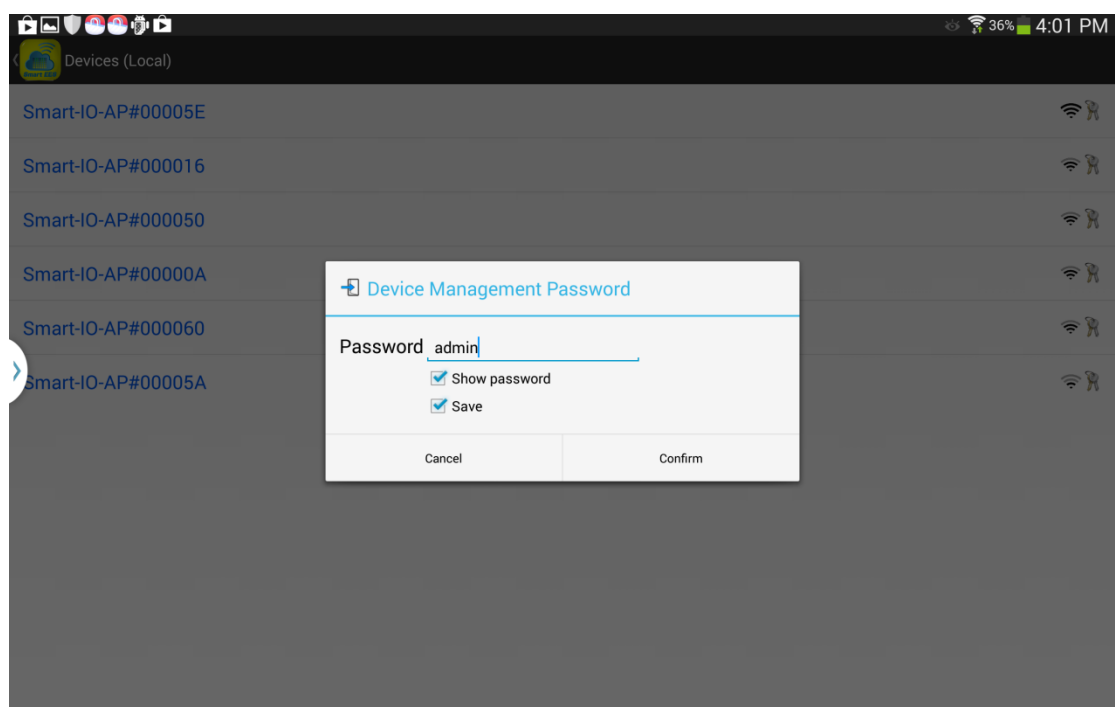
(4.4) A dialog is prompted up to ask for the Wi-Fi password as following:



Please enter the default Wi-Fi password: **smartio168**

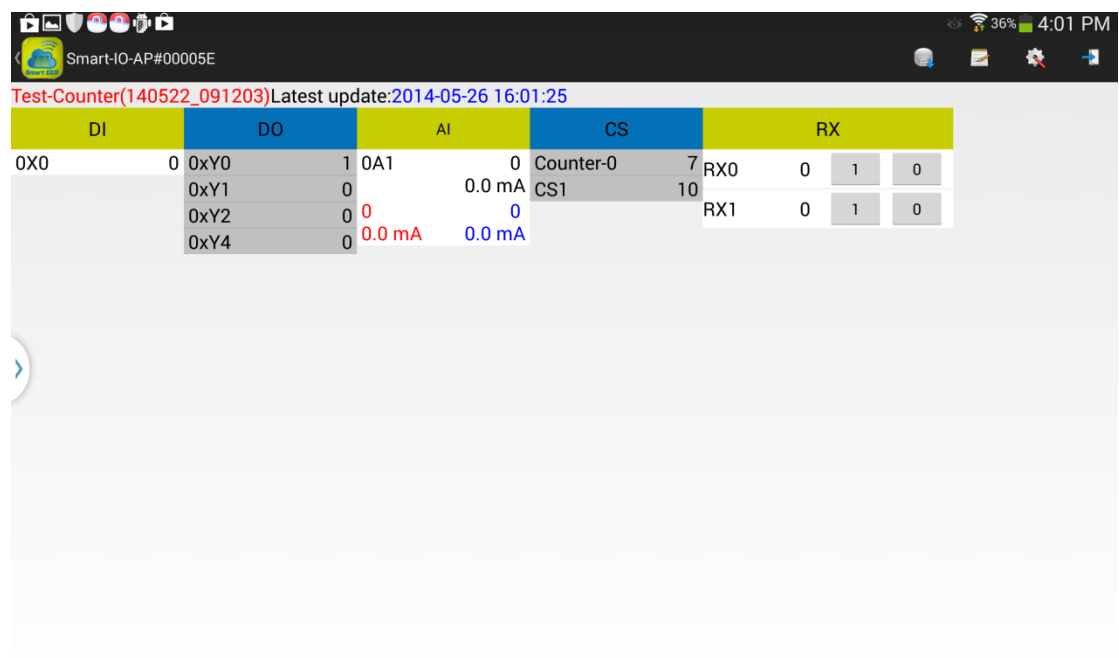
(4.5) Then, a dialog is prompted up to ask for the device management

password as following:



Please enter the default device mangement password: **admin**

Then, a real-time display for the Smart IO controller is shown as following:



You can check the status for the digital inputs (DI), digital outputs (DO), analog inputs (AI), counters (CS) ,remote cloud inputs (RX) on this Smart

IO controller.

## 5. Write and update a control block program to the Smart IO controller

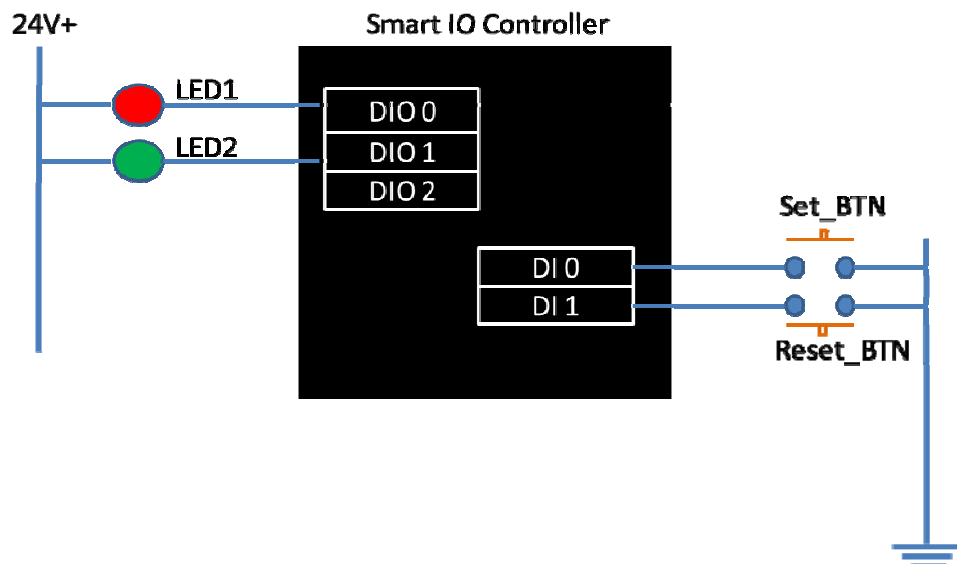
On this section, we will write a simple control program (we call it a “control block” program) to use the following resources:

- 2 digital inputs: DI0 and DI1 (representd as 0X0 and 0X1 at the program).
- 2 digital outputs: DIO0 and DIO1 (represented as 0XY0 and 0XY1 at the program).
- 1 counter: CS0 (CS represents for Counter-Set and CC for Counter-Clear).

Connect DI0 to a push button (called **Set-BTN** ) and DI1 to a second push button(**Reset-BTN**).

And, connect DIO0 to one 24VDC LED(called **LED1**) and DIO1 to the other 24VDC LED (called **LED2**).

The I/O wirinng diagram is shown as below:

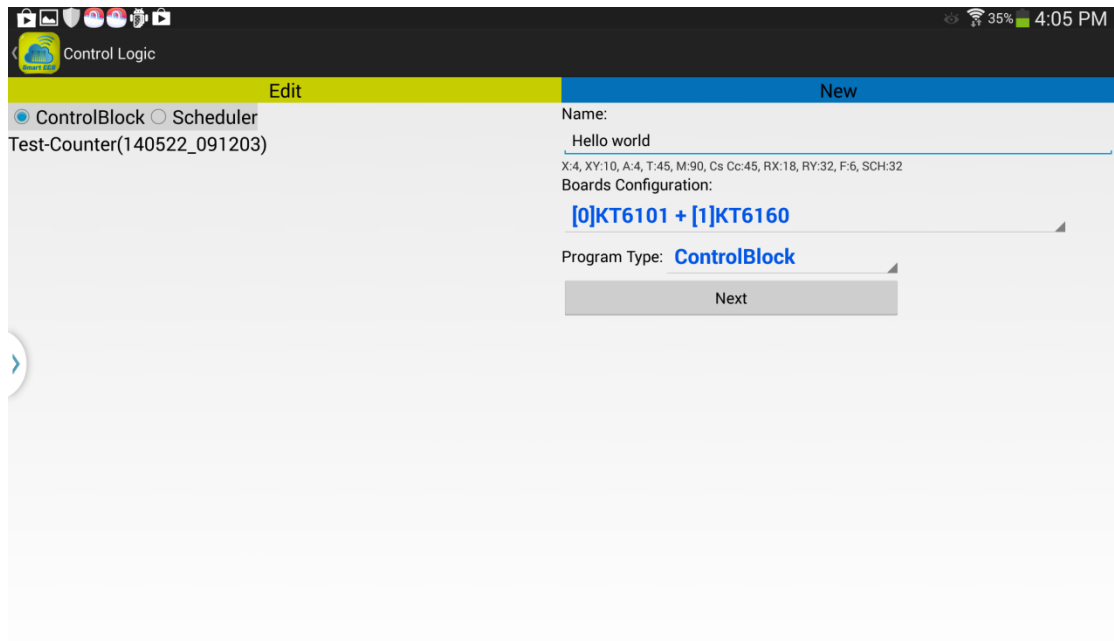


Everytime you push-down/up the Set\_BTN, the LED1 will be turned on/off, and the the counter (CS0) will add one.

Once the CS0 counter is 5 (the threshold) or above, the LED2 will be turned on. However, you can push-down/up the Reset\_BTN to reset the counter to zero and the LED2 will be turned off then.

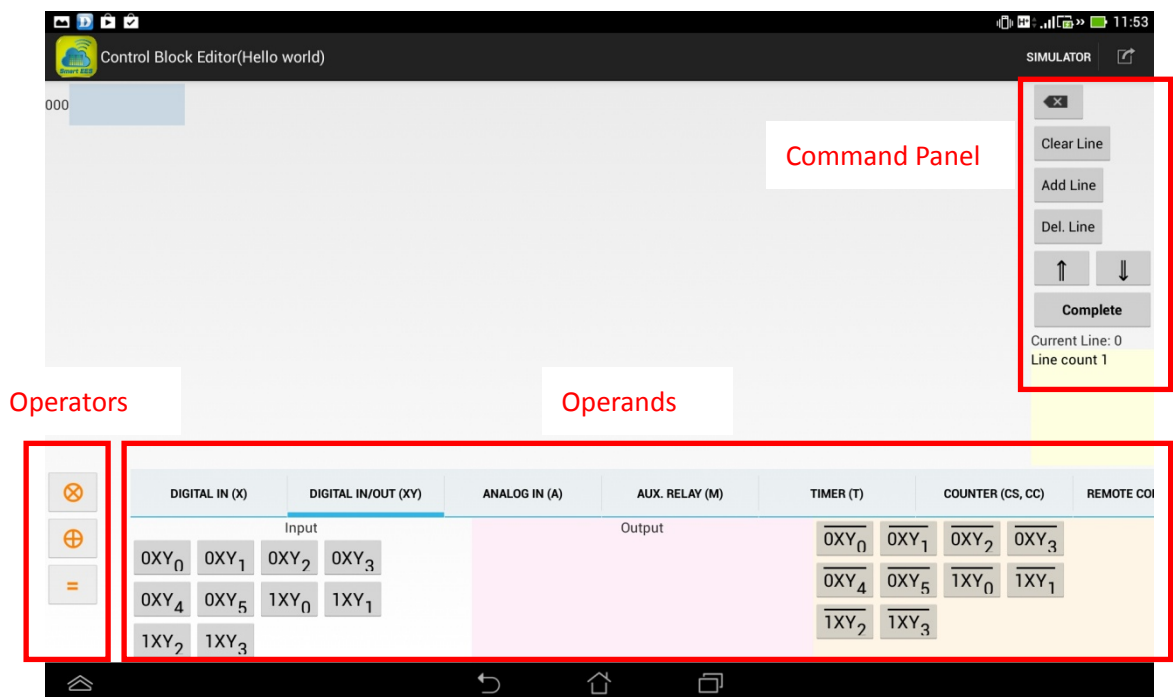
Here are the steps to enter the control block program on the APP:

- (5.1) Back to the main screen, click the “Program Editing” icon, you can start to edit a control logic program.
- (5.2) Enter the program name: **Hello world**  
Select the board configuration and Program Type:  
Then, click the “**Next**” button.



(5.3) You can start to edit your first control block program “Hello world”

(5.3.1) The Control Block Editor is as following:



Where you can press the buttons at the “Command Panel” to edit the control block program, like “Add Line” to add a new program line or “Del Line”. A line of the control block program is composed of operands and operators. Please click the “Operators” and “Operands” panels to select the required components.

(5.3.2) Configure two DIO ports (DIO0 and DIO1) to Digital Output:

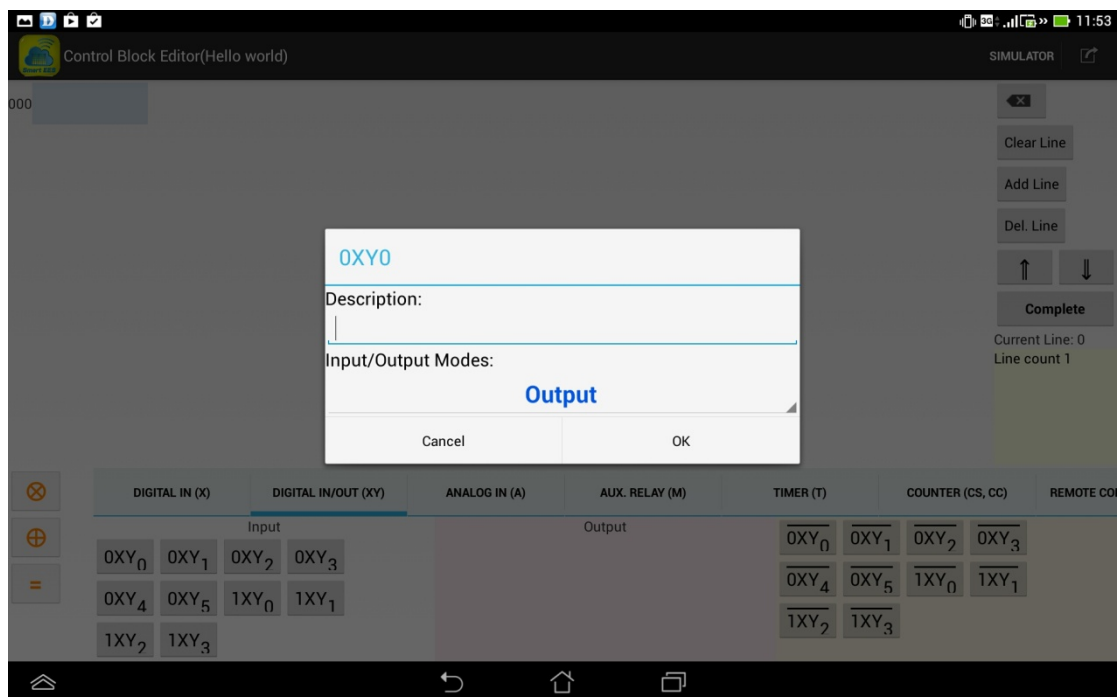
Click on the “DIGITAL IN/OUT(XY)”, you can see all the DIOs are configured as Inputs as default.

0XY<sub>0</sub>, 0XY<sub>1</sub>, 0XY<sub>2</sub>, 0XY<sub>3</sub>, 0XY<sub>4</sub>, 0XY<sub>5</sub>, 1XY<sub>0</sub>, 1XY<sub>1</sub>, 1XY<sub>2</sub>, 1XY<sub>3</sub> are all listed at the “Input” column.

Long-press the “0XY<sub>0</sub>” until the following dialog window pop-up:

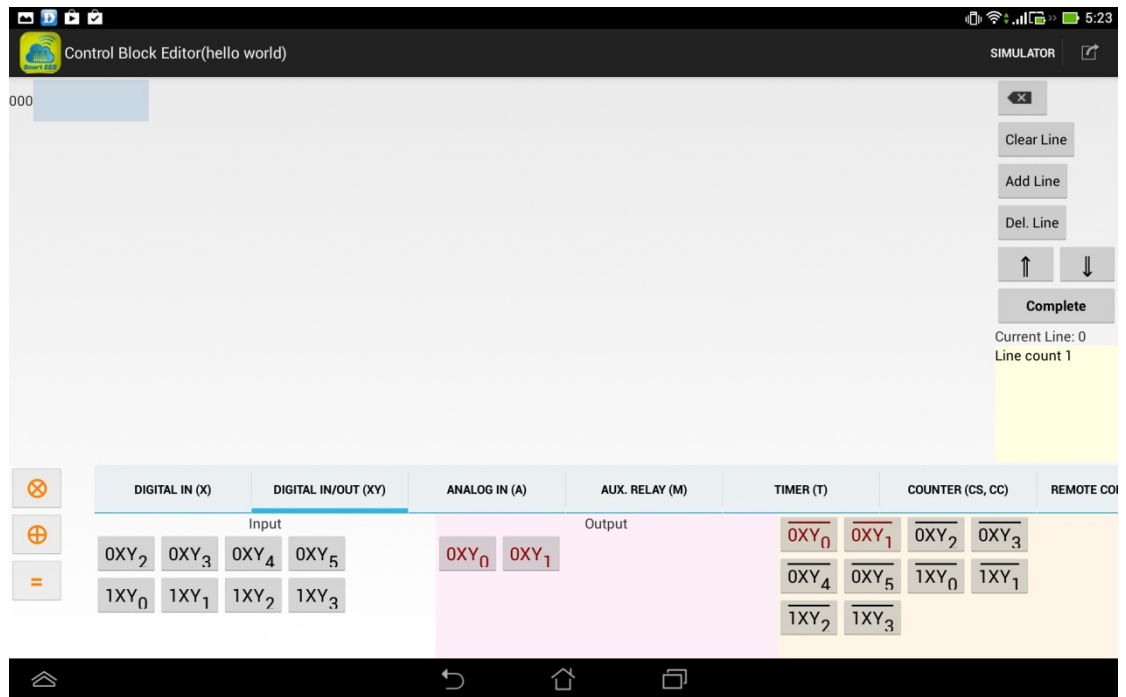
Change it to “Output” and click “OK”.

(Note: “Long-press “ means to touch on the component for 1 to 2 seconds; while, “Click” or “Short-press” means to quickly touch the components for 0.5 second or shorter.)



Long-press the “0XY<sub>1</sub>” and change it to “Output” and click “OK”.

Then, you can see the “DIGITAL IN/OUT(XY)” as following:



Both the 0XY0 and 0XY1 are now configured as “Output” ports.

(5.3.3) Enter the following program

**0X0 = 0XY0**

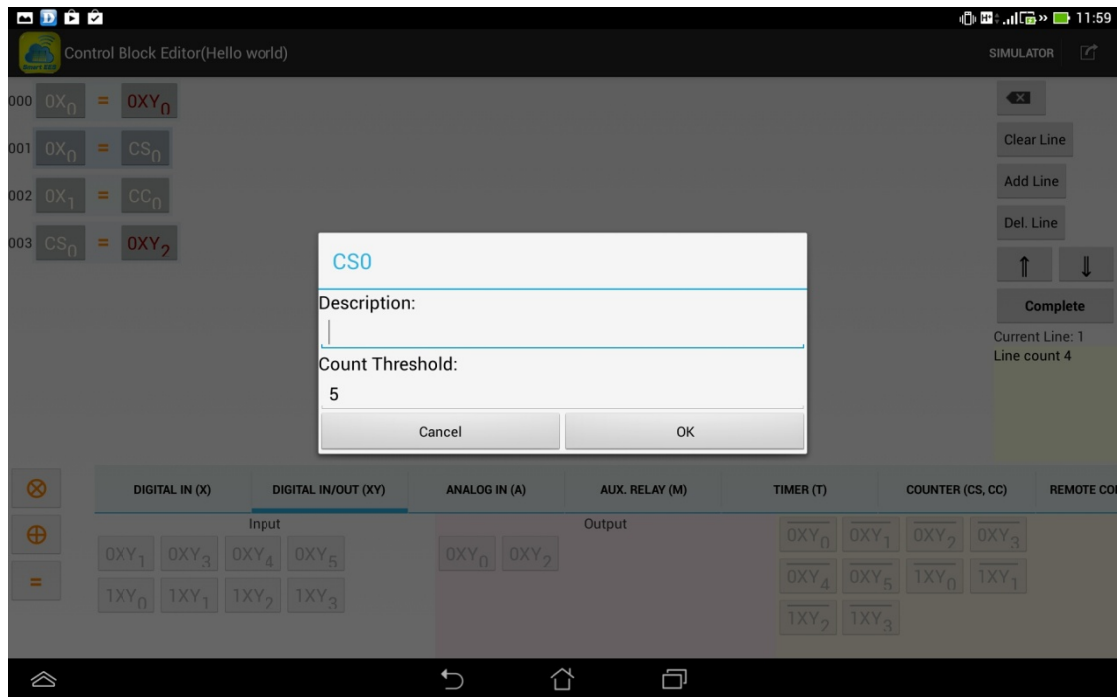
**0X0 = CS0**

**0X1 = CC0**

**CS0 = 0XY1**

(Note: once a DIO port is configured as OUTPUT, its color will be changed from **black** to **red**.)

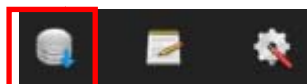
On program line 001, please short-press the CS0 to set the Count Threshold as 5.

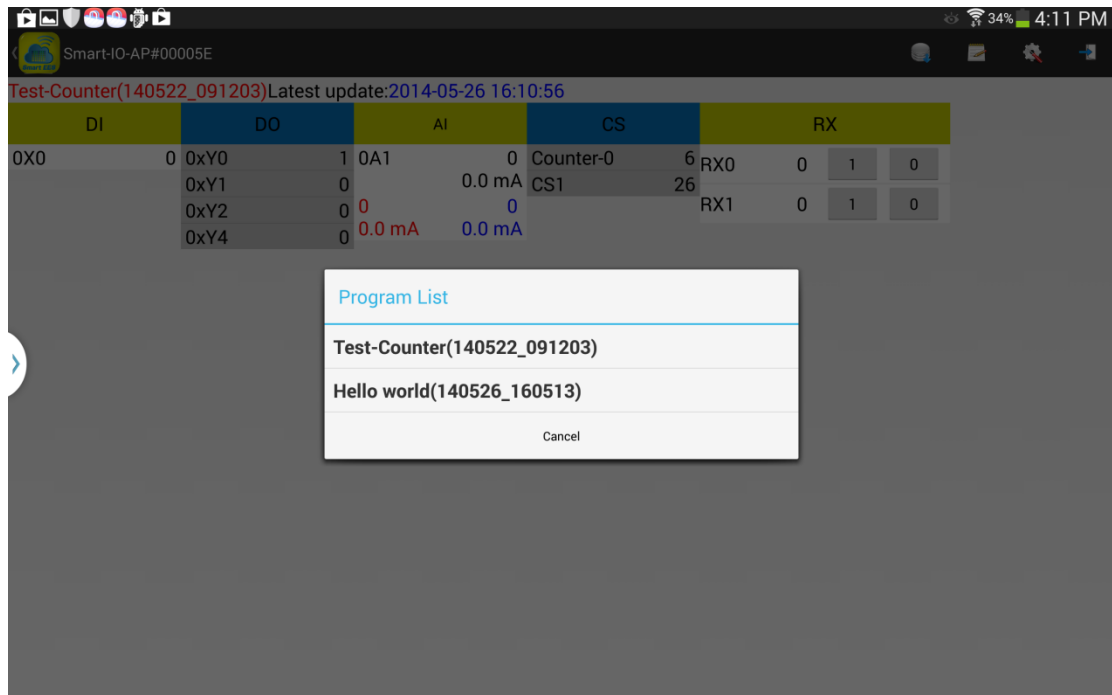


After editing the above program and setting the threshold value for CS0, you can press “Complete” and save the program by replying “Yes” to the “Save Code Confirm?” dialog. The control block program is saved as the name Hello world(14????\_???????) (where ? is a number ). (Note: by replying “Save As”, you can save the program to a new name.)

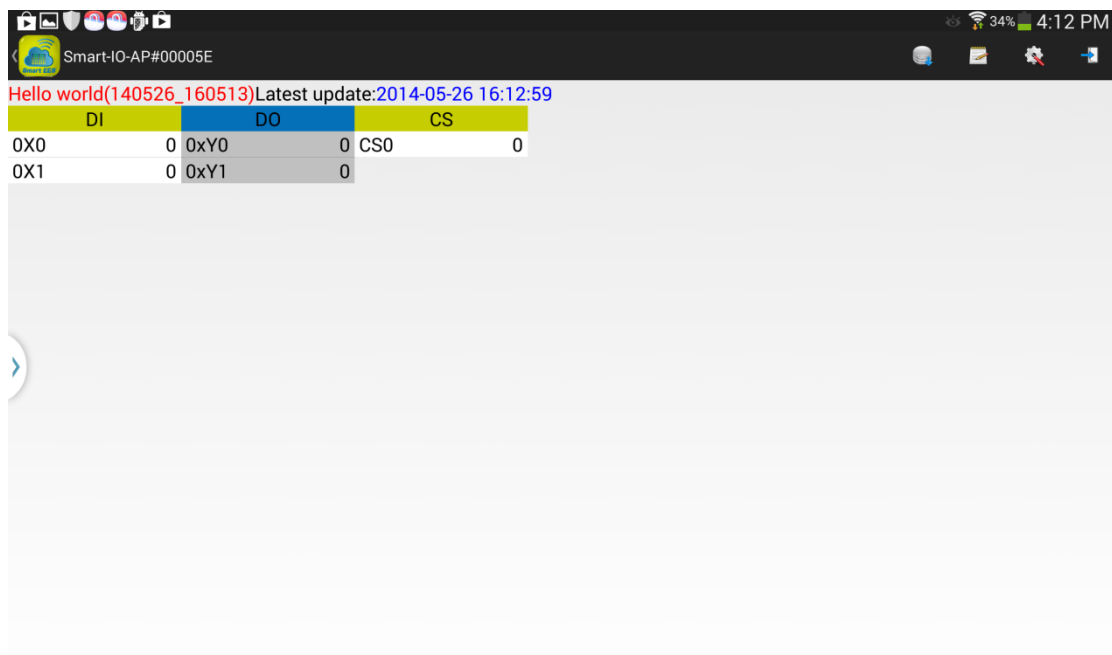
(5.4) Update the program to the Smart IO controller:

Back to the main screen, please follow the procedures from (4.3) to (4.5) and press the “Update program” icon (as below) on the up-right corner to choose the control block program for updating.





Select the program (Hello world) and confirm to update. Then, you will see the following real-time display of the resources



Now, you can start to push the Set\_BTN and monitor the value of DI, DO and CS (counter) on the above screen.

## 6. Use the K-Cloud service:

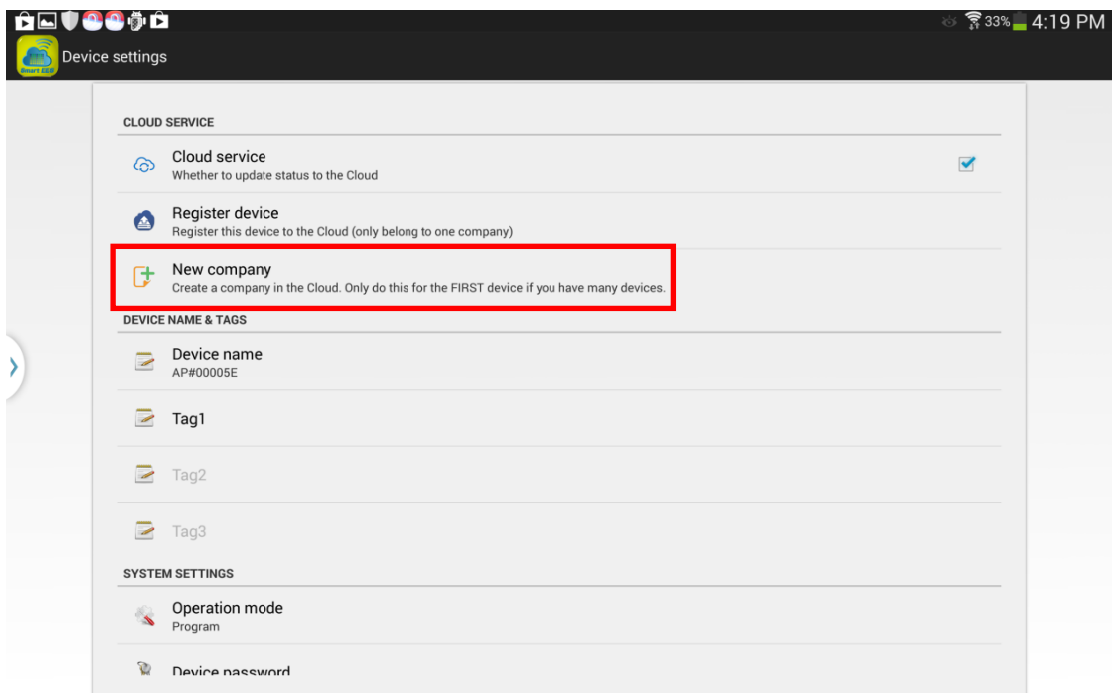
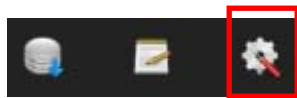
To enable the K-Cloud service, you must prepare a Smart IO controller which has not connected to the K-Cloud service yet. And, you must connect the Smart IO controller to an Ethernet port which is able to connect to the Internet. (Say, an internet gateway or SOHO router with several Ethernet switch ports.)

Please follow the procedures listed below to use the K-Cloud service:

- Create a company cloud space and the company administrator account
- Add a member account
- Assign the permission rights to the member account
- Add a cloud remote input (RX) to the simple “Hello world” program
- Use cloud remote control

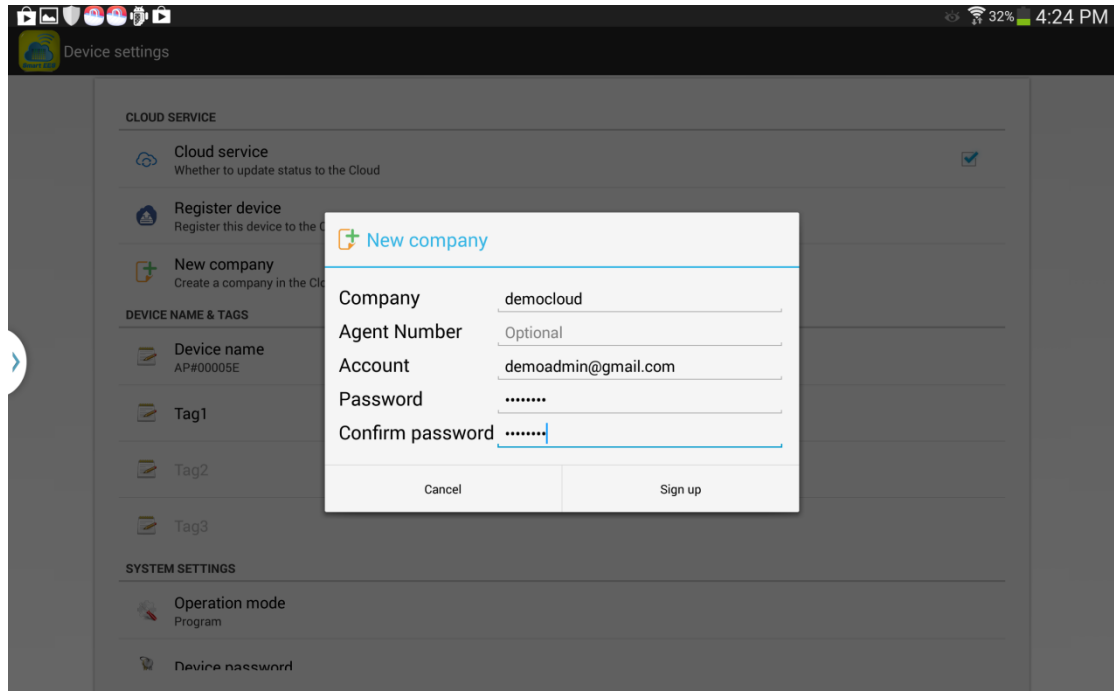
### (6.1) Create a company cloud space and the company administrator account:

Back to the main screen, please follow the procedures from (4.3) to (4.5) and press the “System Setting” icon (as below) to configure the Smart IO controller.



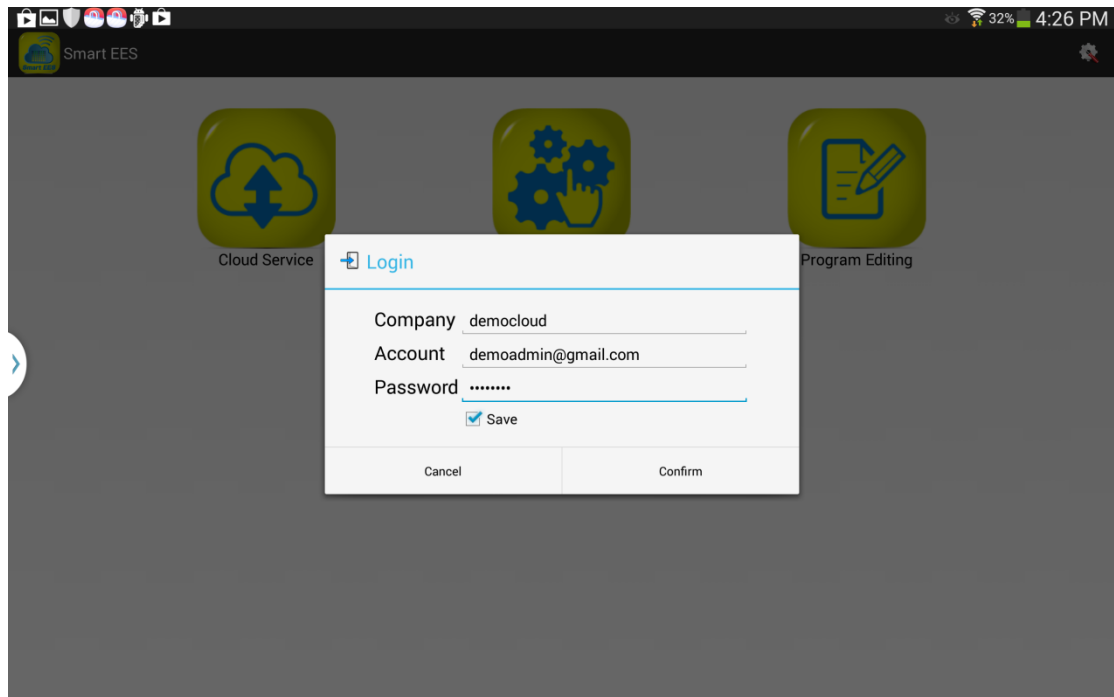
Note 1: Ethernet Setting is way that the Smart IO controller is connected to the SOHO router or Intranet in the company. It is generally configured as DHCP; however, you can change the setting if it is set as a static IP.

Please check the “Cloud service” and click the “New Company” at the Cloud Service. Then, you will be asked to enter more information for the new company.

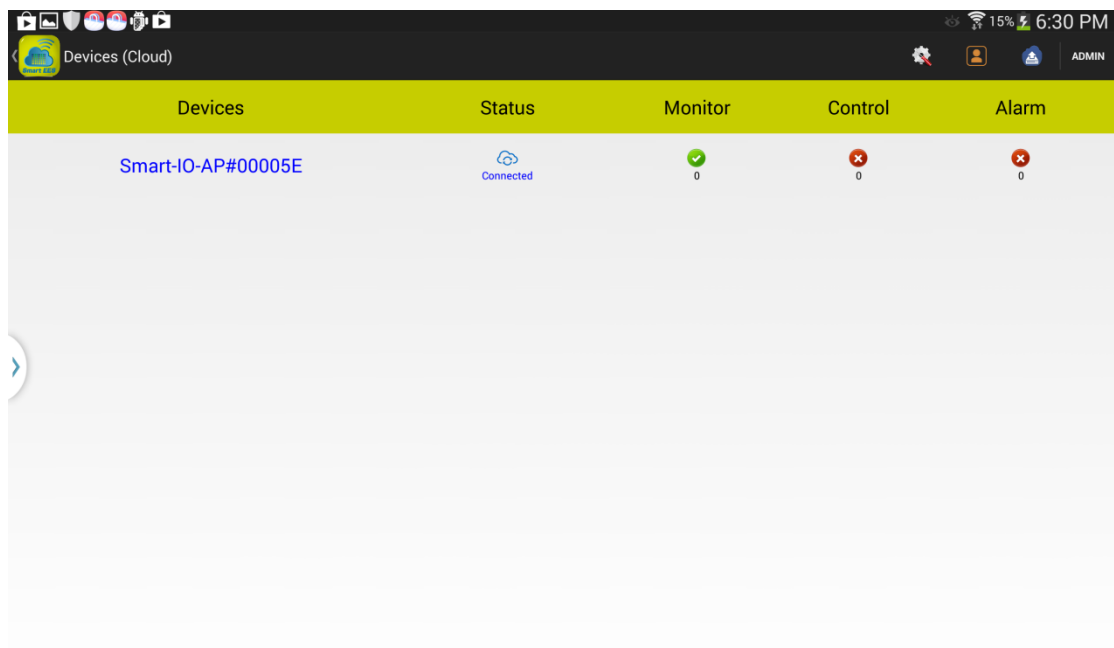


As shown in the screen shot, we create a new company called “democloud” with an administrator account with the email “demoadmin@gmail.com”. Please type in your own company name and your email address as the administrator account. It is suggested to use a Gmail account; however, it is not necessary as long as you provide a valid email address. Agent Number is optional. Your distributor or agent for the Smart IO controller will provide the Agent Number to you. Press “Sign up” and wait for a few seconds and you will get a “Operation Success” confirmation. Now, you have successfully created a company space and an administrator account at the K-Cloud service.

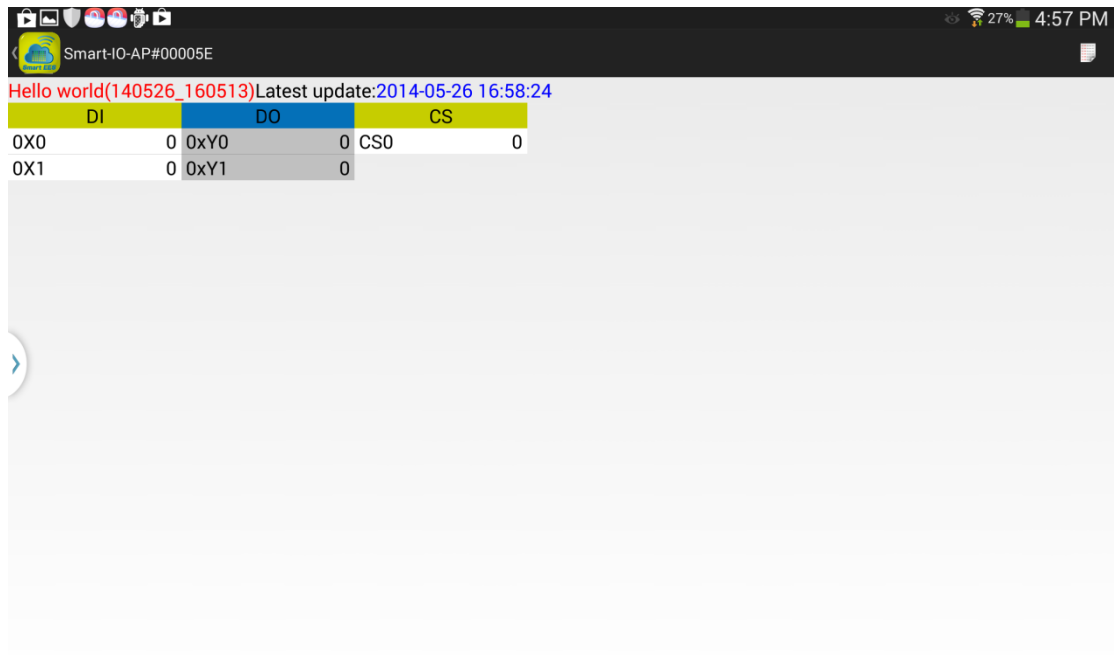
Back to the main screen and click the “Cloud Service” to use the K-Cloud service. First, you must login using the administrator account created previously.



You will see the a summary screen “Devices(Cloud)” which displays all the devices that belong to the company cloud space. At this moment, there is only one Smart IO controller.



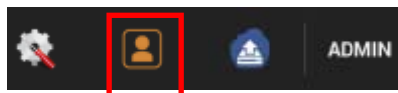
Click on the “Smart-IO-AP#00005E” line, you will see a real-time display of the status update of Smart IO as following.



## (6.2) Add a member account.

In addition to the privileged administrator account, you may want to create some member accounts for the other members in the company. The operation permission of the member account can be assigned by the administrator. Here are the steps:

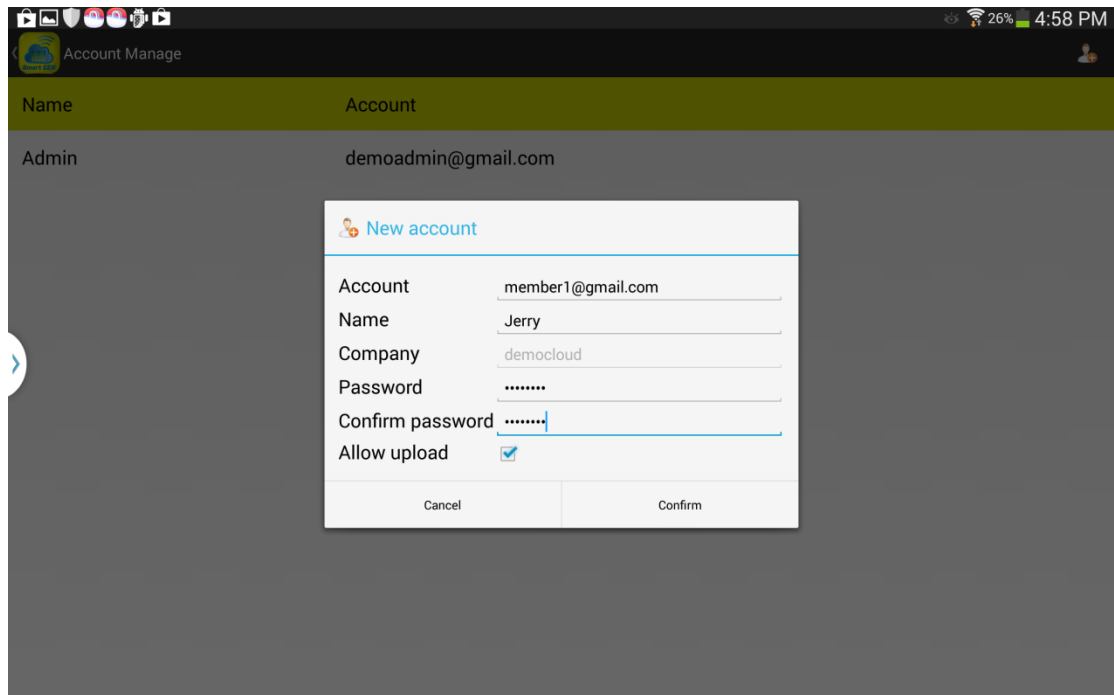
(6.2.1) Back to the cloud main page(Devices(Cloud)), click on the “Account manage” icon.



Please click the New user icon on the upper right corner as below:

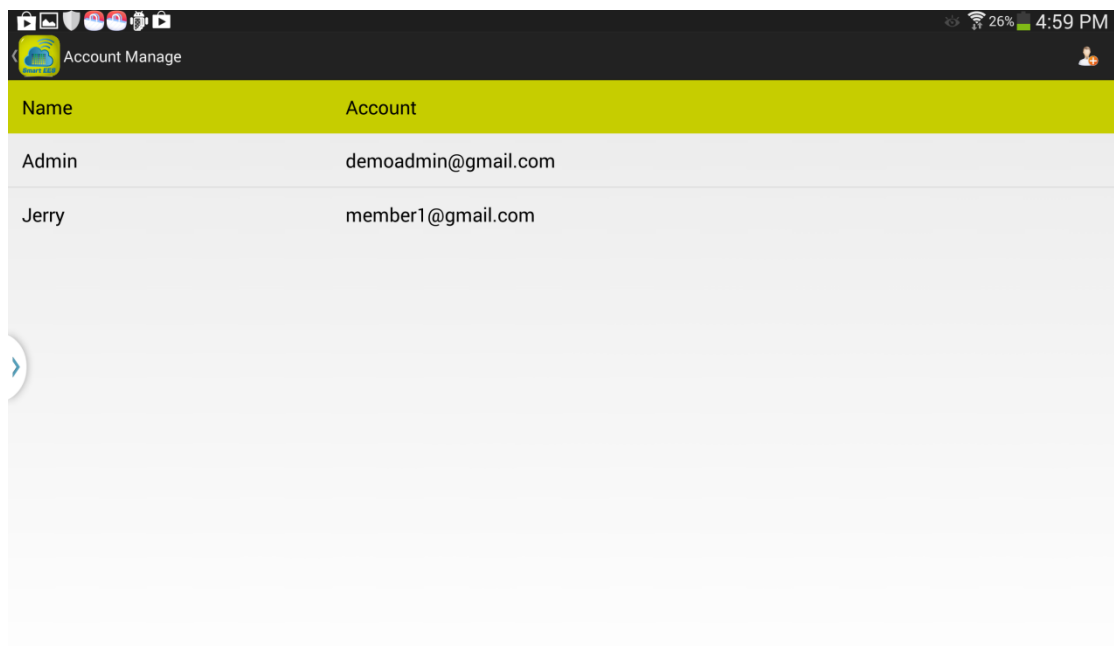


You will be asked to provide the information for the new member account.



Here, in this demonstration, we create a new member account : [member1@gmail.com](mailto:member1@gmail.com) (**Jerry**) for the Company **democloud**. Please add your own member account for your company. Note that, as an administrator, you must assign a password for the the member account. However, as the member log into the system for the first time, he/she will be asked to change the password then.

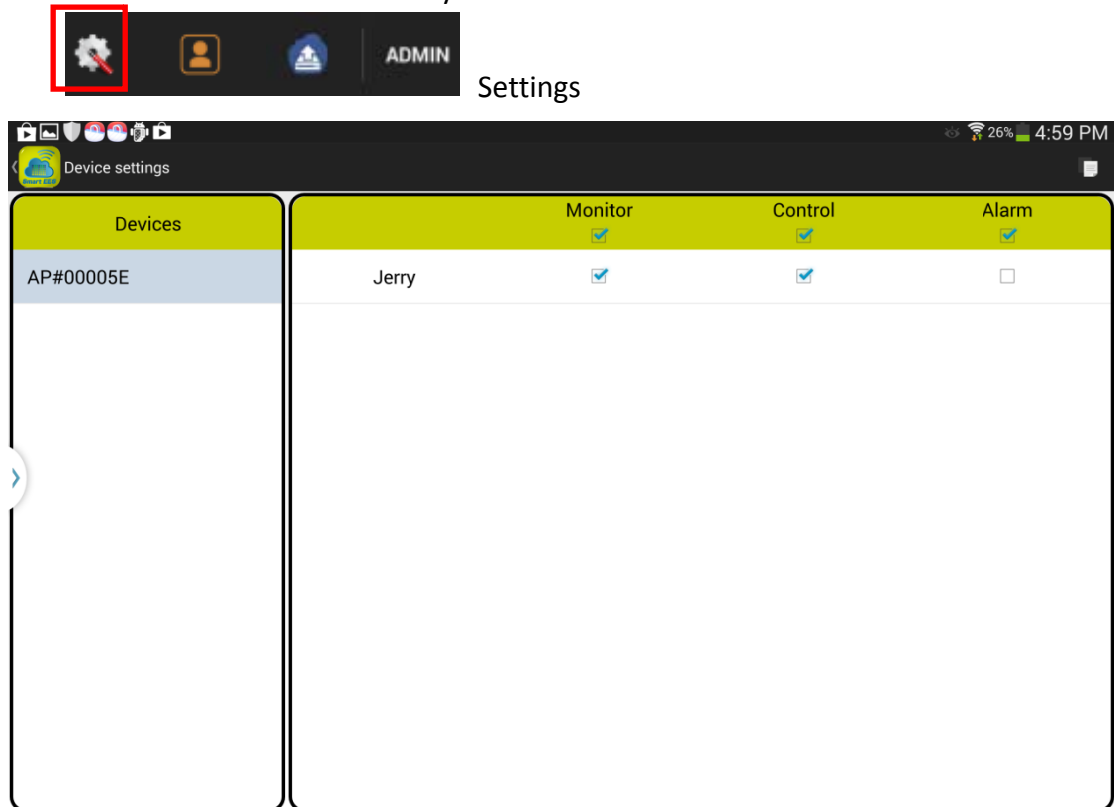
The account management screen will show the 2 accounts as below:



**(6.3) Configure the permission rights to the member account.**

Back to the Cloud summary screen, please click on the “Settings” icon (as below) to configure the permission rights for the member account.

As shown below, we assign the “Monitor” and “Control” permission rights to the member account “Jerry”.



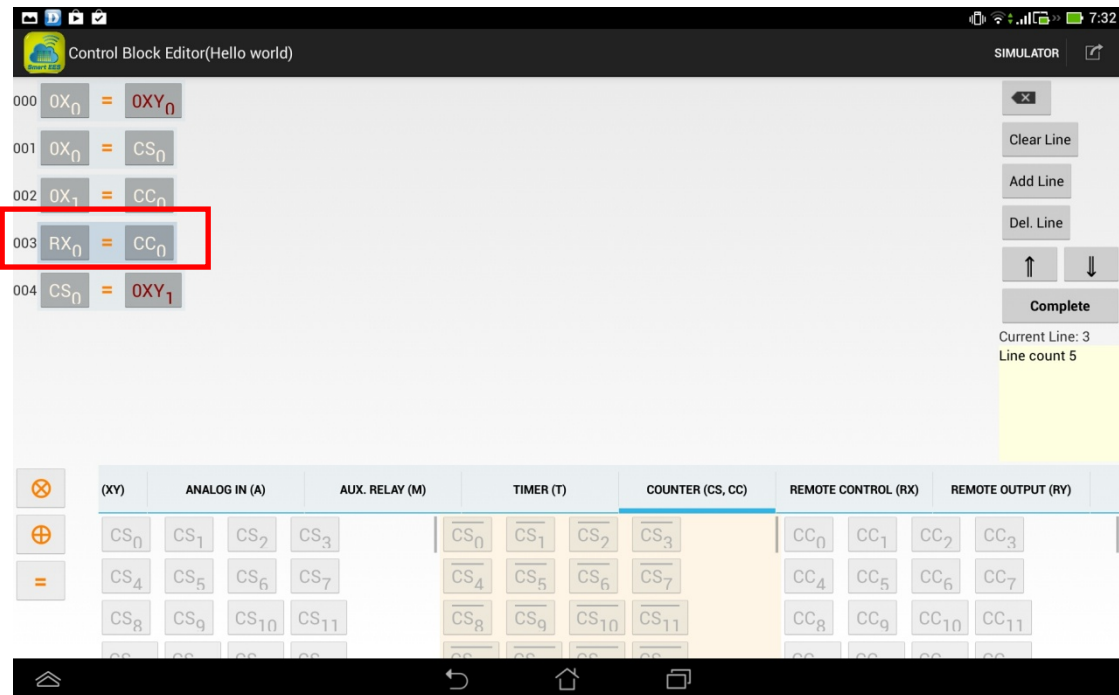
The “Monitor” permission provides “Jerry” the right to monitor the status for the Smart IO controller. And, the “Control” permission allows “Jerry” to send a on/off command to the SIO controller. We will use a cloud remote input (RX) to show the “Control” function on the next section.

**(6.4) Add a cloud remote input (RX) to the “Hello world” program**

Back to the main screen and click the “Program Editing”. Long-press the “Hello world” program file and choose to “Edit” the program. Then add the following line to the original program (5.3.3):

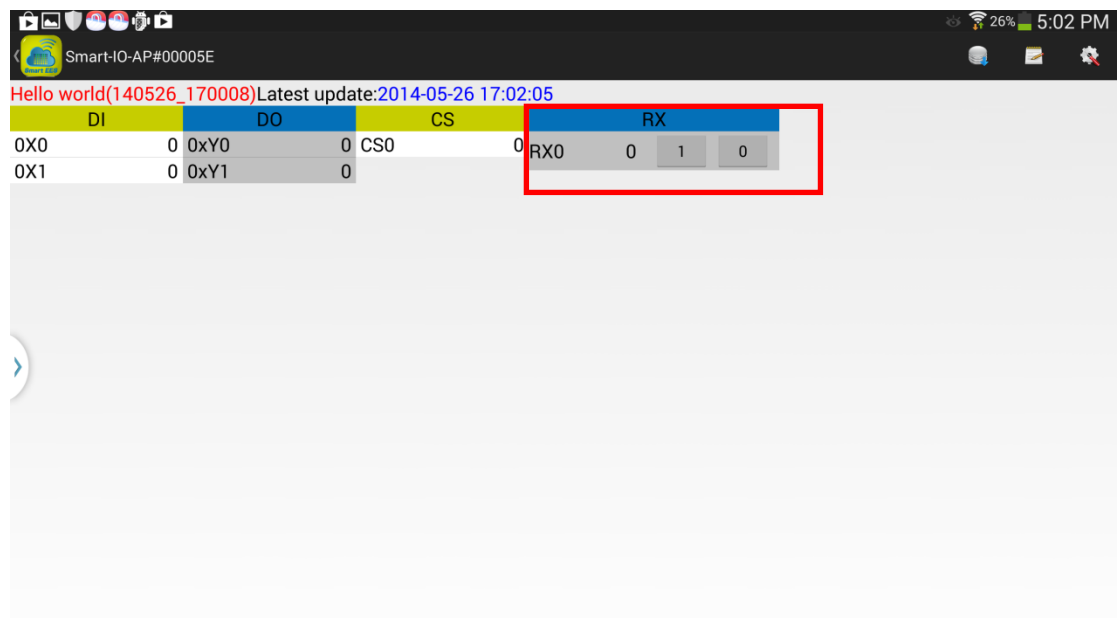
**RX0 = CC0**

Then the new program is as below:



**RX0** is a cloud remote input for the Smart IO controller. It allows the end-user to send the on/off command to change the status of the virtual input of the controller. The command is issued from the APP and forwarded by the K-Cloud service to reach the Smart IO controller.

Please follow the procedures on (5.4) to update the new code the the Smart IO controller and you can see the real-time display as following:



A new component, RX0, is shown on the screen. You can change the status of

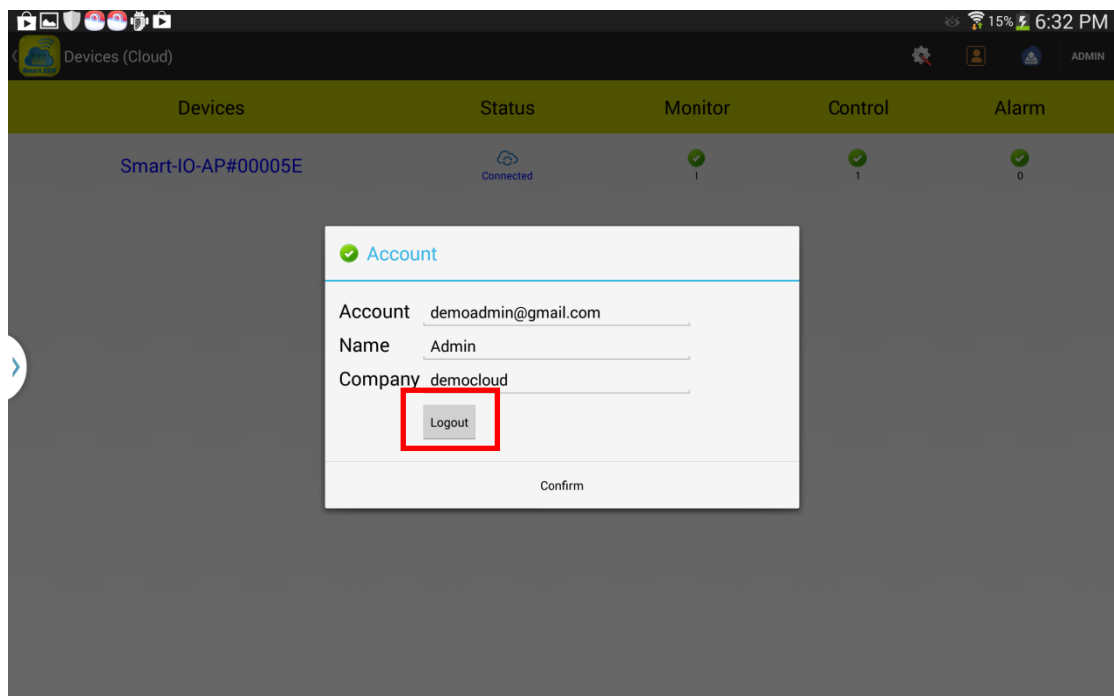
RX0 by pushing the 1 or 0 button of RX0 . This is ,however, just a short-distance local Wi-Fi remote control. On the next section, we will perform a long-distance cloud remote control over the Internet.

#### (6.5) Use cloud remote control

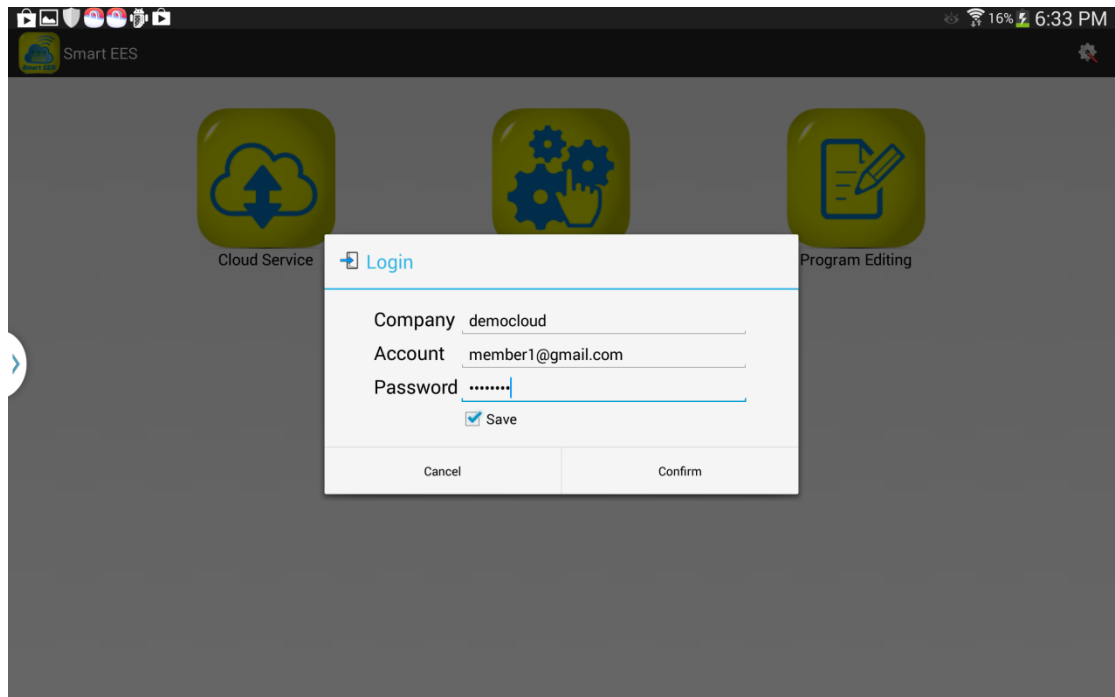
Back to the main screen, click on the “Cloud Service”. Please logout from the administrator account by clicking on the ADMIN on the upper right corner of the screen.



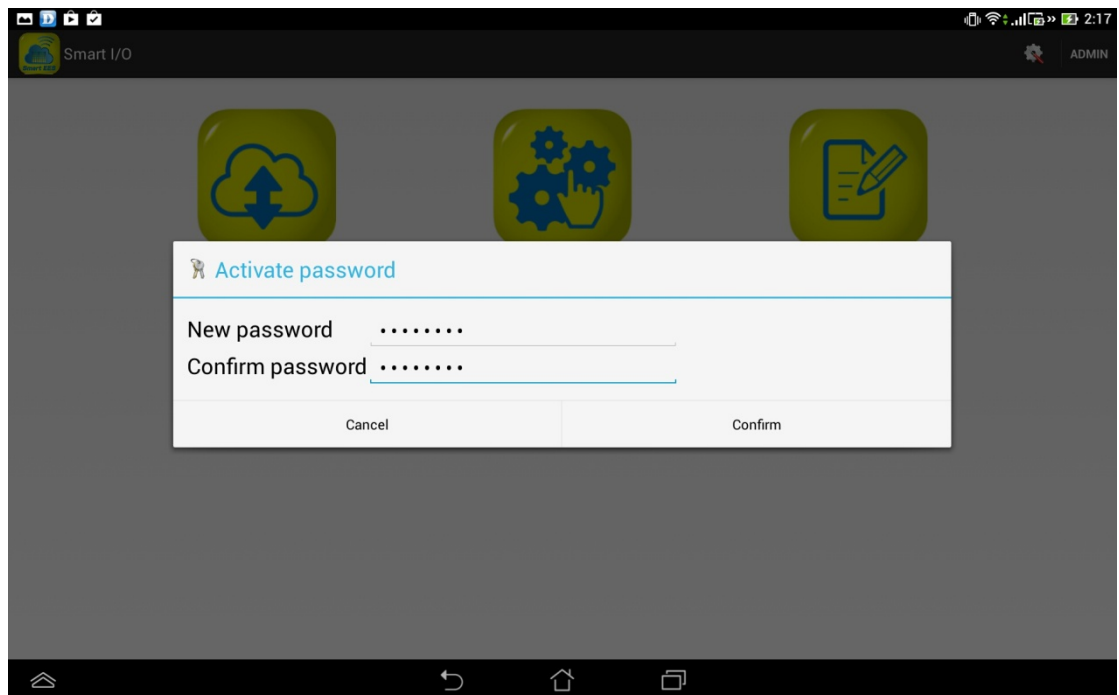
Then, click the Logout button:



Please login again with the following account: [member1@gmail.com](mailto:member1@gmail.com) (The “Jerry” member account you just created on Sec. (6.2)).



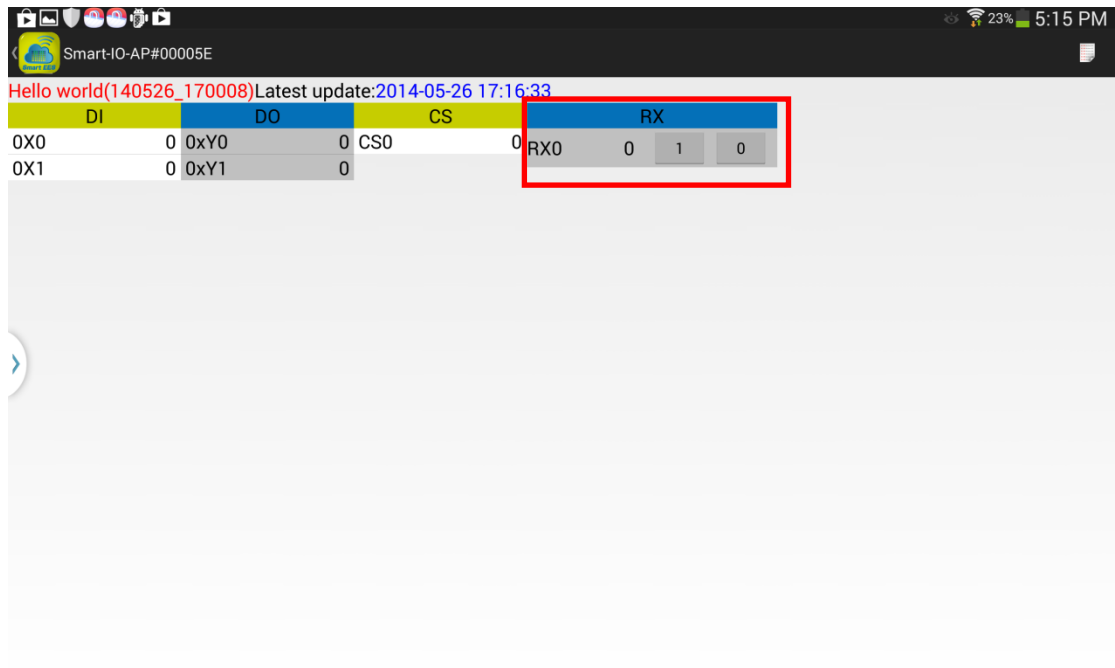
You will be asked to activate a new password as following:



Please type-in a new password and confirm again.

You are now logging as the member Jerry.

You can click the Smart-IO-AP#00005E to get the Cloud status update and do remote control by pressing the 1/0 button of RX0



It is a remote control from the Internet, so you can go to the place far from the Wi-Fi coverage of the Smart IO controller and reset the counter CS0 and turn off the LED2 for the example on section 5.

## Federal Communications Commission

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radiofrequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

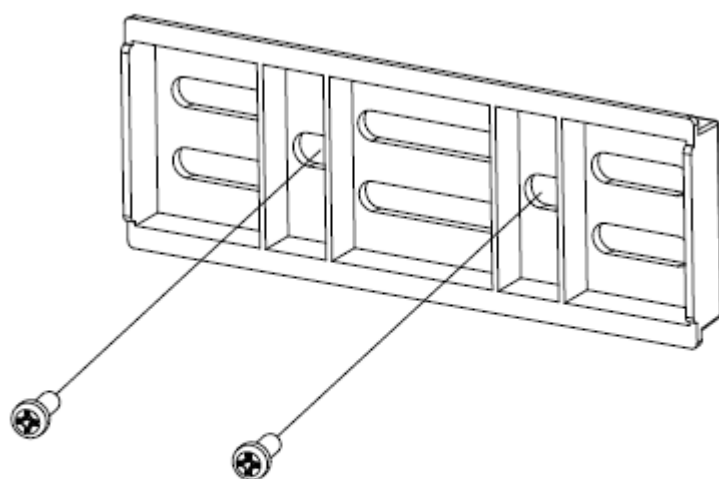
**Professional installed device must not be distributed through retail store.**

### **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.

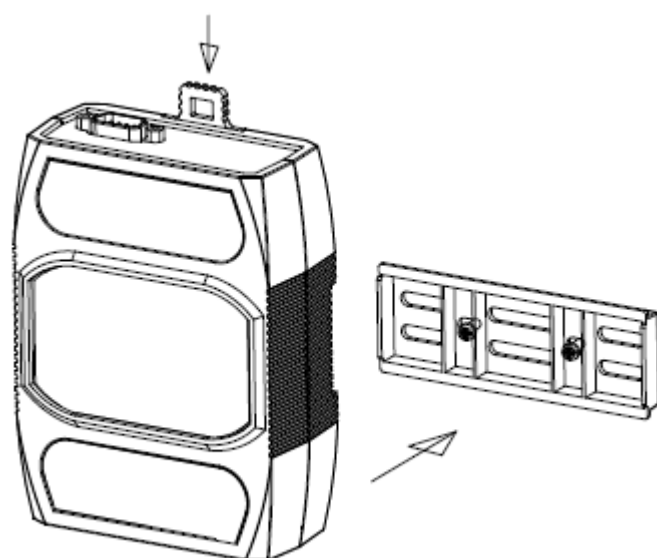
## 壁掛示意圖

①.

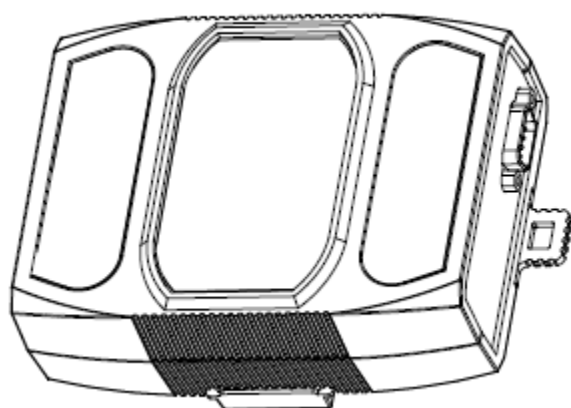
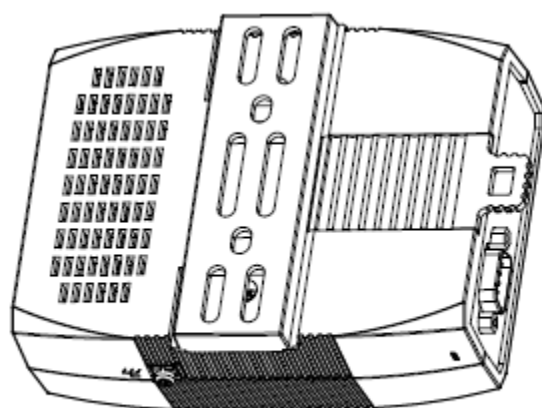


M3×10L 自攻螺絲 QTY:2pcs

②.



③.



M3\*10L 自攻牙尖尾螺絲 \* 4pcs



M3\*5L 機械牙+螺帽 \* 2pcs