# VoltBot

## Graphical DC charger & Power Supply

User Manual

V1.5

SillyComm

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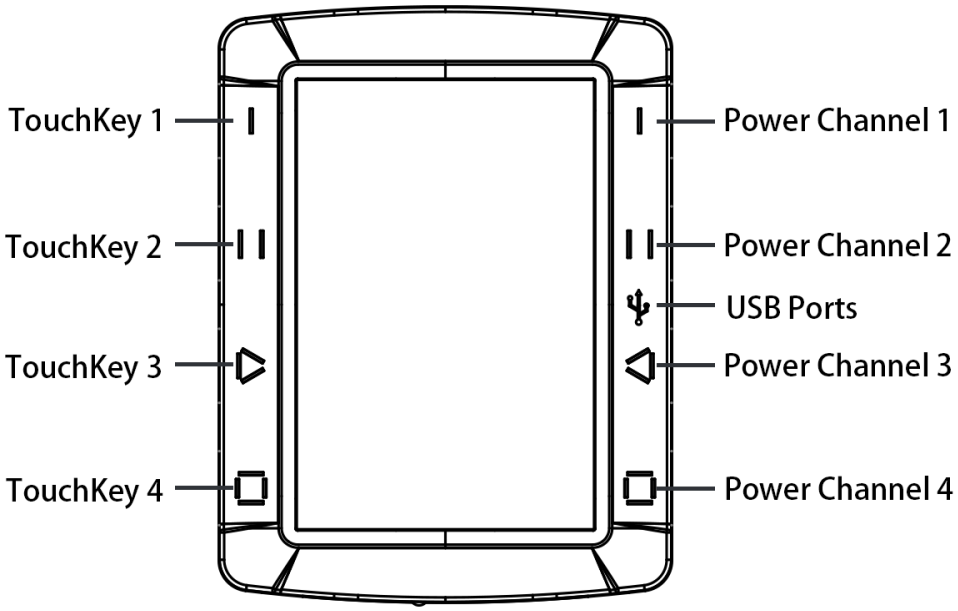
# 1. Summary

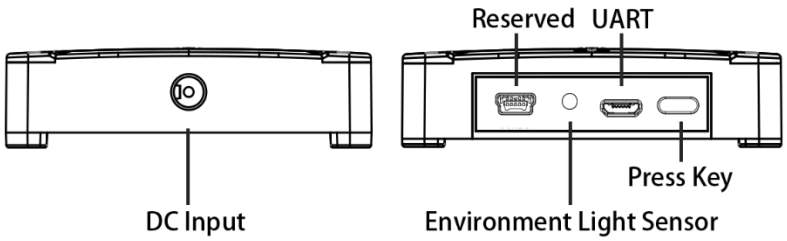
Volt-Bot is a multi-channel charger and power supply.

- Support quick charge technology
- Real-time voltage & current display
- Manually arbitrarily assigned output voltage
- Multiple user-interfaces: Touch-Key, Wi-Fi and UART

# 2. Introduction

## 1) Ports and Symbols



| TERMINOLOGY | DETAILS |
|---|---|
| **CHANNEL** | A circuit module that implement independent functions. Channels are working parallel, with no interference with each other. |
| **USB PORT** | USB 2.0 has four leads. VBUS and GND are power leads. D+ and D- are data leads. Standard USB 2.0 ports has a current limit of 0.5A (such as PC, notebook). Normal USB Battery Charger has a current limit of 1.5A~2A. USB port on VoltBot is specially fabricated and can stand 3A~4A. |
| **TOUCH KEY** | Electric field sensor, when a finger or an object comes near and changes the electric field, it will detect and generate a touch signal. Calibrated every power-up time to fit the environment. |
| **DC INPUT** | Normal 5.5*2.5 socket, but it only fits for 5.5*2.5*12mm plug. 5.5*2.5*9mm plug is too short to reach the leads. |
| **LIGHT SENSOR** | Sense the environment light to auto-adjust the LCD back-light. |
| **UART** | 3.3V TTL UART，115200 Baud, 8N1, no parity, no flow-control. Meant to be used to connect with external MCU, PLC or PC. |
| **RESERVED PORT** | A reserved port, do not use it. |
| **PRESS KEY** | Single press: enable touch-key for a while<br>Double press: switch on/off screen<br>Long press: switch on/off sound |

# 2) Functions and Parameters

## Working Conditions

| | |
|---|---|
| Recommended Input | 14.5V~20V |
| Input Range | 7~20V |
| Maximum Rated Input | 20.5V |
| Weight | 120g |
| Dimension | 97*74*18mm |
| Wireless | Wi-Fi：802.1 b/g/n |
| LCD | 3.5’ 72*49mm |
| Resolution | 480*320 |
| Input Socket | 5.5*2.5mm 12mm length<br>Type-C: Need PD Kit |

| | |
|---|---|
| Max Input Current | 5A |
| Max Input Power | 100W (20V/5A) |
| Output Socket | USB2.0 (Strengthened for 3A)<br>USB-Type C (Extendable) |
| Recommended Environment Condition | Temperature 0~55℃， Humidity 0%~60% |
| Maximum Rated Environment Condition | Temperature -20~75℃， Humidity 0%~99% |

## Charger Parameters

| | |
|---|---|
| Output | 3V~12V 3A |
| Maximum Ports | 4 |
| Short Protect | 4A |
| Charge Mode | Quick charge and Normal charge |
| Quickcharge protocols | QC 1/2/3、MTK Pump-express， FCP,<br>Apple 2.4A, Samsung 2.1A<br>PD Kit: PD2 full support PD3 partial support (no PPS) |
| Wire Compensation | 0.125V per A, only available on 5V charging. If HV or LV charging is on, wire compensation is not needed and off. |
| Battery Protect | Auto Shutdown with current thread<br>Auto Shutdown with timer |
| Charge Curve | Graphical: Power, Voltage, Current<br>Raw Data Sheet (CSV): Power, Voltage, Current |
| Curve Type | 1 second: precision 0.1s<br>1 minute: precision 1s<br>1 hour: precision 1min<br>1 day: precision 10min |

## DC Supply Parameters

| | |
|---|---|
| Output | Min: 2.50V<br>Max: the lower between (Vin-2) and 12.5 V<br>For Example: if input with 9V, the maximum output is 7V<br>If input with 15V, the maximum output is 12.5V |

| | |
|---|---|
| Mode | Voltage Source, Current Source, Battery Charger (current source with max voltage limiting) |
| Precision | 0.01V |
| Voltage Accuracy | Typical:0.1%, Max:0.2% |
| Current Accuracy | 1% ±0.02A (Hard Ver: 8072)<br>1% ±0.01A (Hard Ver: 8081+) |
| Line regulation | <0.1% |
| Load regulation | <0.1% |
| Ripple Vrms (no-load, 0~20M) | <1mV |
| Ripple Vpp (no-load, 0~20M) | <10mV |
| Ripple Vpp (no-load, 0~20M) | <5mV |
| Efficiency (full-load) | 94% |
| Transient Characteristics | |
| Short Protect One-time | 11A |
| Short Protect Recoverable | 4A |
| Current limits (>250ms) | 3~4A |
| Current limits (<250ms) | 8A |
| Note: 1. For pulsed current (below 250ms) larger than 11A would cause the channel being totally shut-down. It needs a re-power-up to recover.<br>2: The contact resistor of USB connector limits the continuous current. Considerable temperature rise would occur if current is larger than 3A. Due to contact resistor is not predictable, you can touch the plug to make sure the temperature is OK. | |
| Charge Curve | Graphical: Power, Voltage, Current<br>Raw Data Sheet (CSV): Power, Voltage, Current |
| Curve Type | 1 second: precision 0.1s<br>1 minute: precision 1s<br>1 hour: precision 1min<br>1 day: precision 10min |

## Other Functions

| | |
|---|---|
| Backlight Adjustment | Auto adjusting backlight intensity with reference of environment light. |
| Channel Timer Switch | Equipped |
| LCD Flipping | Equipped |
| Unique ID | To identify several VoltBots in the same room, two numbers can be post-fixed to wireless name. These two numbers are also shown on screen. |
| WiFi channel adjustment | WiFi channel=unique ID tailing digit+1 |
| Sound Switch | Equipped |
| Touch-key Input | Equipped |
| UART Port | 3.3V TTL-Level Baud 115200 8N1<br>Leads: VBUS: Floating, ID: Floating, D-: RX, D+: TX, GND<br>There are a level shifter board shipped with VoltBot, the level shifter could covert 3~12V logic level into 3.3V TTL logic. |
| Wireless Configuration | WPA/WPA2 security, Static IP, Configurable host address |

# 3. Graphical UI

## A. Overview

## B. Channel Icons

| | | | |
|---|---|---|---|
| | Channel Number | | Charger Mode |
| | DC source Mode | | Apple supported |
| | Android supported | | Quickcharge enabled |
| | Quickcharge detected | | Device detected |

| | | | |
|---|---|---|---|
| | Under DC mode, if voltage is higher than 5.5V, this icon is on to indicate that you should watch out. Don't insert normal USB device. | | factory test & calibration passed |

## C. System Icons

| | | | |
|---|---|---|---|
| | Backlight:<br>Auto-mode: bright<br>Manual-mode: dim | | WIFI:<br>Wi-Fi on: bright<br>Wi-Fi off: dim<br>Communicating: blink |
| | Joined to hotspot: bright<br>Un-joined: dim<br>Communicating: blink | | Reserved, it indicate some internal process has unexpected response |
| | UART Link: blink | | Sound on: bright<br>Sound off: dim |
| | Over heat or over current: bright<br>Otherwise: dim | | Touch-key off: bright<br>Touch-key on: dim |

# 4. Quick Start Guide

## 1) Opening the box

1) The sticker on the bottom side is intended for the custom (the export & import administration agency). You could remove it immediately.
2) Take 10 minutes to read the next 4 sections, follow the steps to experience how to operate.

## 2) Charge a Normal Phone

1. Connect Power Input
2. Channel 4 for example. Check channel 4 is under charger mode
3. Check channel 4 has quick charge switch on
4. Connect data-cable in channel 4 and start charging.

## 3) Charge an iPhone X (PD support)

1) Plug-in the A-to-C (Type-C) extender.
2) Follow the steps in previous section and adapt a C to Lightening Data Cable.
3) The iPhone 8P/X/XR/Xmax will start quickcharge and auto set the voltage into 9V.
4) If the 9V charging didn't start, you could try: reversing the C plug and plug again, reversing the Lightening plug and plug again, and checking if the battery level is below 60% (The phone won't start quick charge if the battery is almost full).

# 4) Power a Board

1. Make sure the input voltage required by the board.
2. Press the side-key once. There will be some tips shown on the screen. You will see 1324 is the right code to configure output.
3. Touch these symbols as 1324 in a row.

4. If you touched the wrong button, touch any key 3~4 times to see “Fail” page, or press the side-key again. (Old code cleared and new code are ready).
5. Select a channel, channel 1 for example
6. Choose mode for channel 1, touch 2 (DC source)
7. Choose the voltage
8. Use a certain cable to connect the USB port 1 and the board.

# 5) Debug a Developing Board

1. Estimate the working current for the board, if no data for estimating. Assume a small value (0.5A).
2. Press the side-key once. There will be some tips shown on the screen. You will see 1324 is the right code to configure output.
3. Select a channel, channel 1 for example
4. Choose a mode for channel 1, touch current source
5. Touch to select a current limit, for example, 2 times of the estimated current value or the original value (0.5A).
6. Touch to select the voltage to match for the board.
7. Now you could wire the board safely, with safe curren limitations.

# 6) Charge a Li+ battery

1) It demands the same operations above. Choose current source mode.
2) Check the Li+ battery capacity and output voltage range, voltage (usually 4.2V is the voltage limit for 3.7V Li+ battery) and DOUBLE CONFIRM Positive & Negative Leads.
3) Set current to a portion of the capacity value (For example, for a 2000mah battery, set charging current 500~1000mA. However, 0.25*Capacity is conservative.), and set voltage limit to 4.10~4.15V (near the max voltage limit of Li+ battery).

4) Connect the output + to the positive lead, and – to the negative lead. The VoltBot will adjust the voltage automatically to meet the designated current.
5) Wait the current drop down to 0 and the battery is full.
6) Notes: If you want to end the charging process automatically, you could enable the "threshold shutdown function" AFTER the battery is connected and the current ramp up to the setting value. For example: The current rises to 1A soon after connecting. Then set auto shutdown, to avoid float charging process to protect the battery, or to prepare the battery for long-term storage. Set the threshold current (low current limits) to 0.2A through App. After set the threshold, the channel will shut down automatically when the current drops to 0.2A, and finally, leaving the battery 85% charged. For details of operation, please refer to "Connect VoltBot with App" - "C. Demos" – "Demo to shutdown Channels"

# 7) Power a LED, Test a Diode or Power a Lamp

1) Disable the channel.
2) Connect the circuit before run, because current source shouldn't start without a active circuit loop. (Current cannot fly!)
3) Choose Current Source mode, set an estimated current, (for example 0.05~0.1A), and set the voltage limit to maximum rated voltage.
4) Enable the channel.
5) Wait until the current become stable. The working voltage could be measured then to get voltage-current characteristic for the LED.
6) If you could read the specification of the Diode or Lamp, you could set a better estimated value according to the documents.

   Note: Do not enable the channel before you have done the loop setup, because transient current could be as large as 11A if you let the voltage ramp freely. Usually large pulse current won't destroy a diode easily but over-voltage could breakdown the MOSFETs in chips.

## 8) Repair a device with the Banana Kit

1) Assemble the Banana Converter.

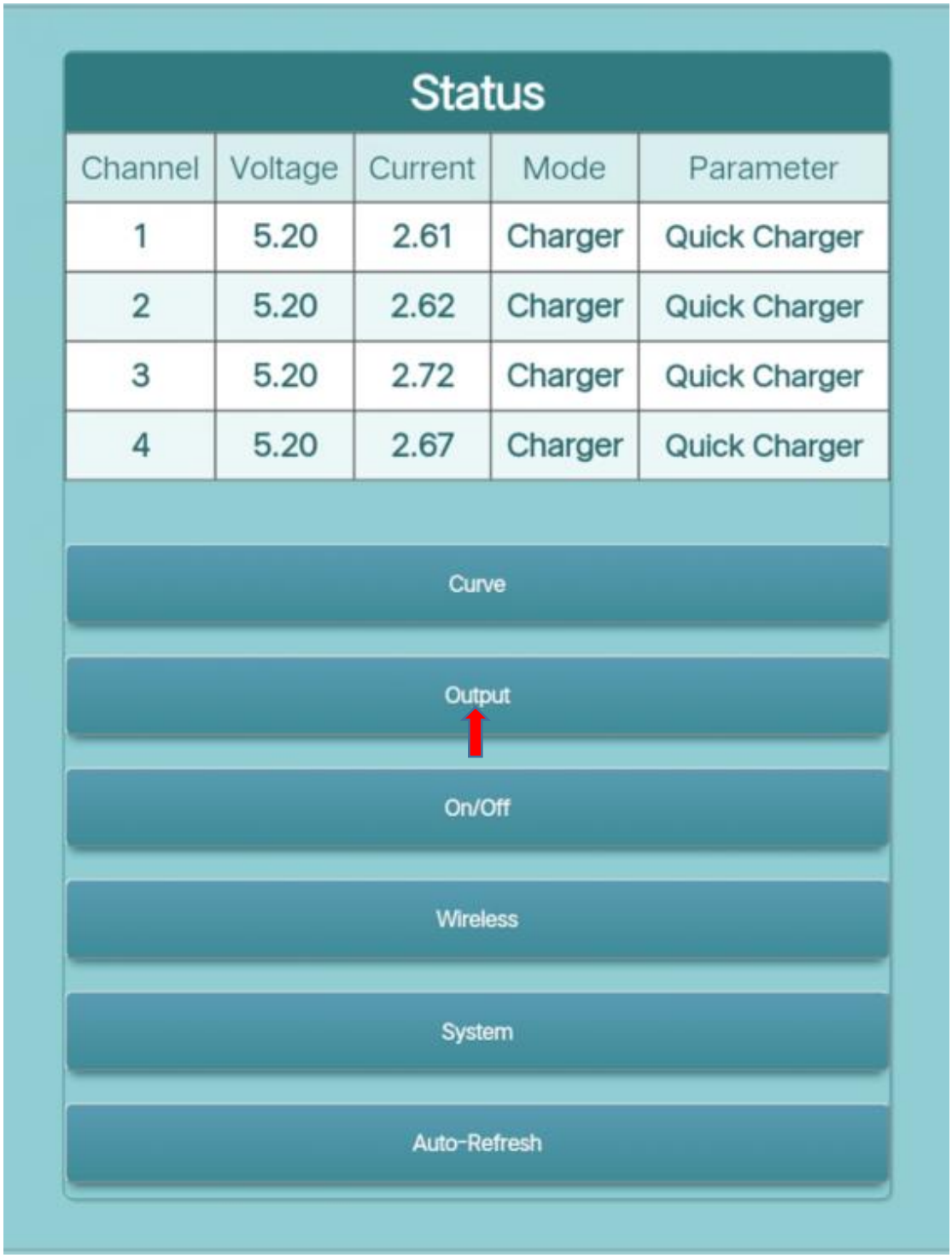
2) Choose one channel and set its mode into current source mode (both voltage and current limit is assigned by the user in this mode). And in the current source mode, Voltage will take a conservative strategy, by ramping up the voltage slower and damping down faster.
3) Set a safe voltage limit and a safe current limit. For example, 4.1V and 1A is useful for most phone's battery power connector.
4) Connect the Banana to probe pen with the Banana Converter, and insert it into the very channel.
5) Now you could use it as a common laboratory DC power supply.

# 5. Connect with a Web-browser

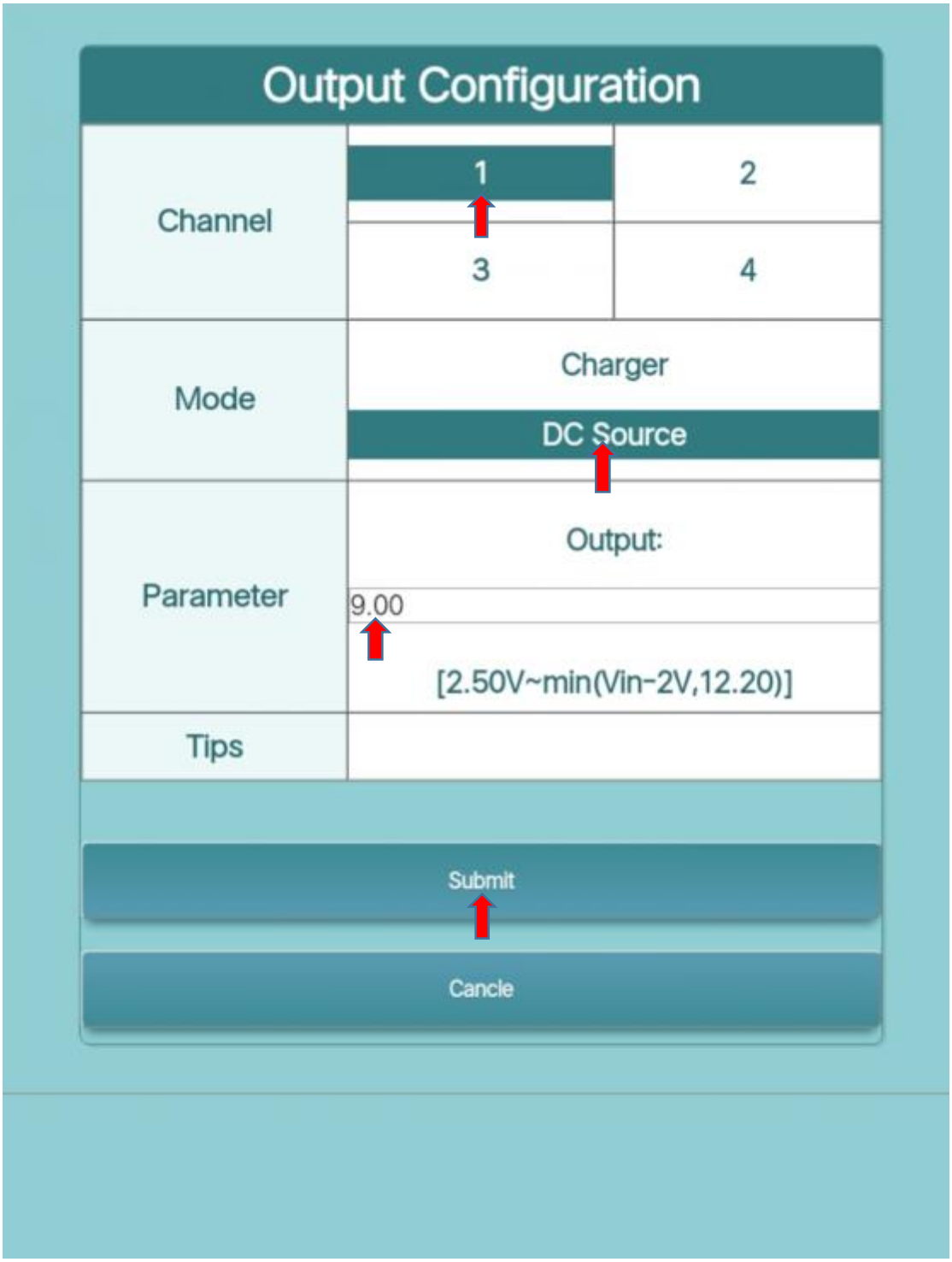
Here is a demo to turn Channel 1 into DC output of 9v, and then restore Channel 1 back into quick charge model.

1. Power on VoltBot.
2. Search the WiFi hotspot list of your phone, find one named with "VoltBot".
3. Join it.
4. Check the IP you got. (if you don't know how to, google "What is my iPhone's IP?")
5. You probably see the IP is 1.1.1.X or 10.1.1.X.
6. Open the web browser on your phone (Safari).
7. Type in http://1.1.1.1 or http://10.1.1.1. It depends on the result by replacing X with 1 in

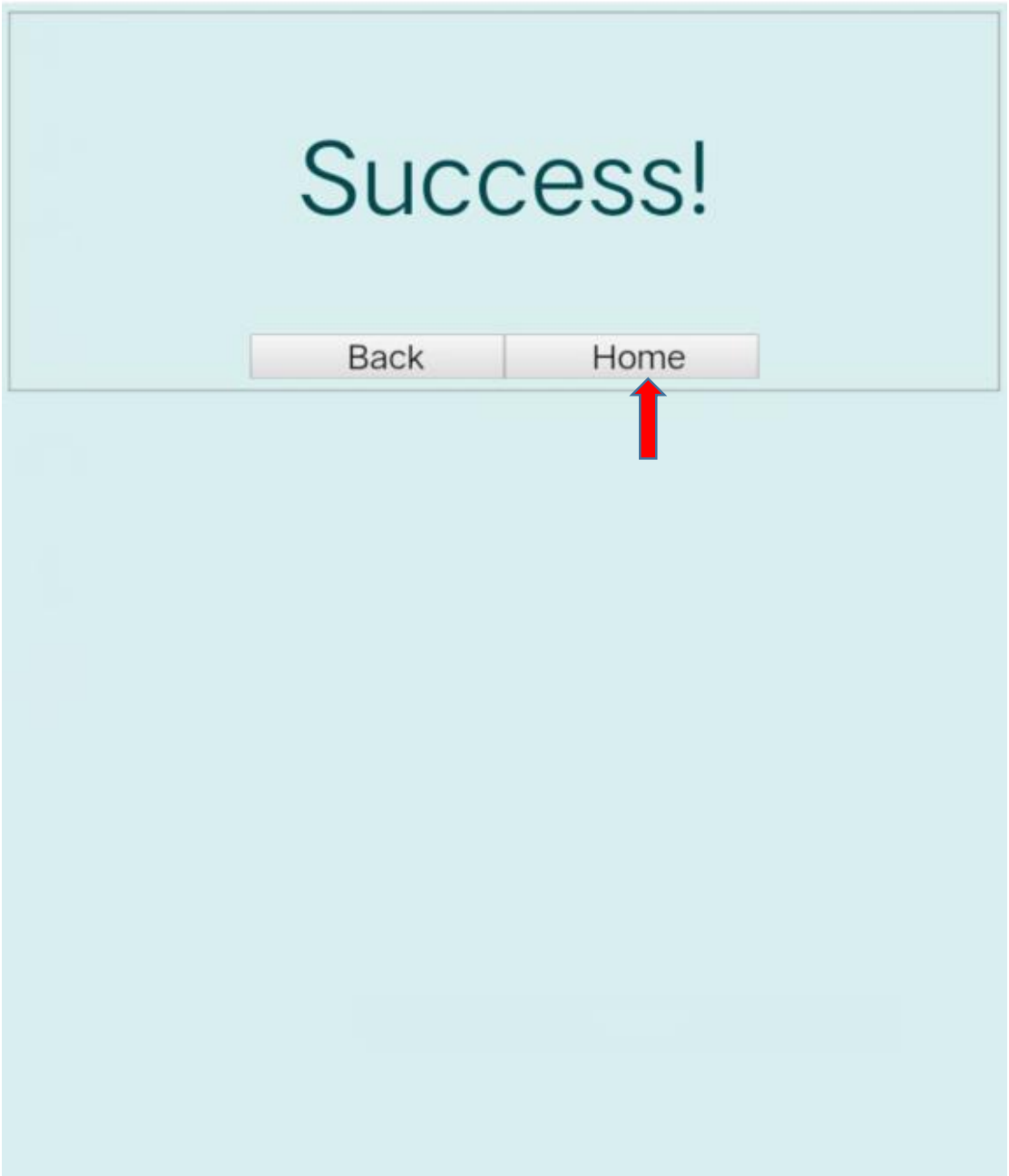
the IP of step 5. Then press “Go” open this address. (Note: There might be some compatible issues on Chrome, you could try Firefox or Opera if you meet something wrong.)



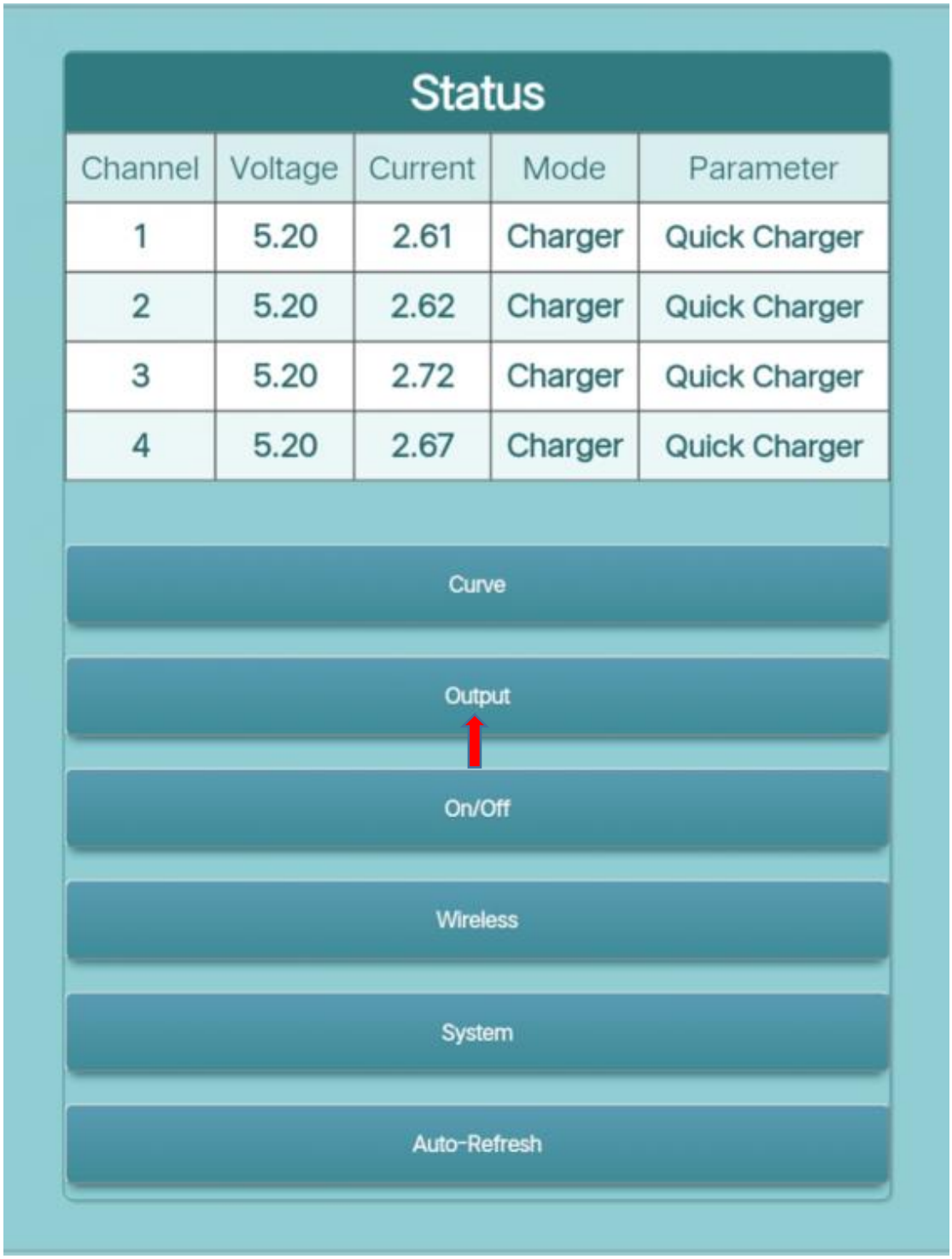

8. Press “Output”



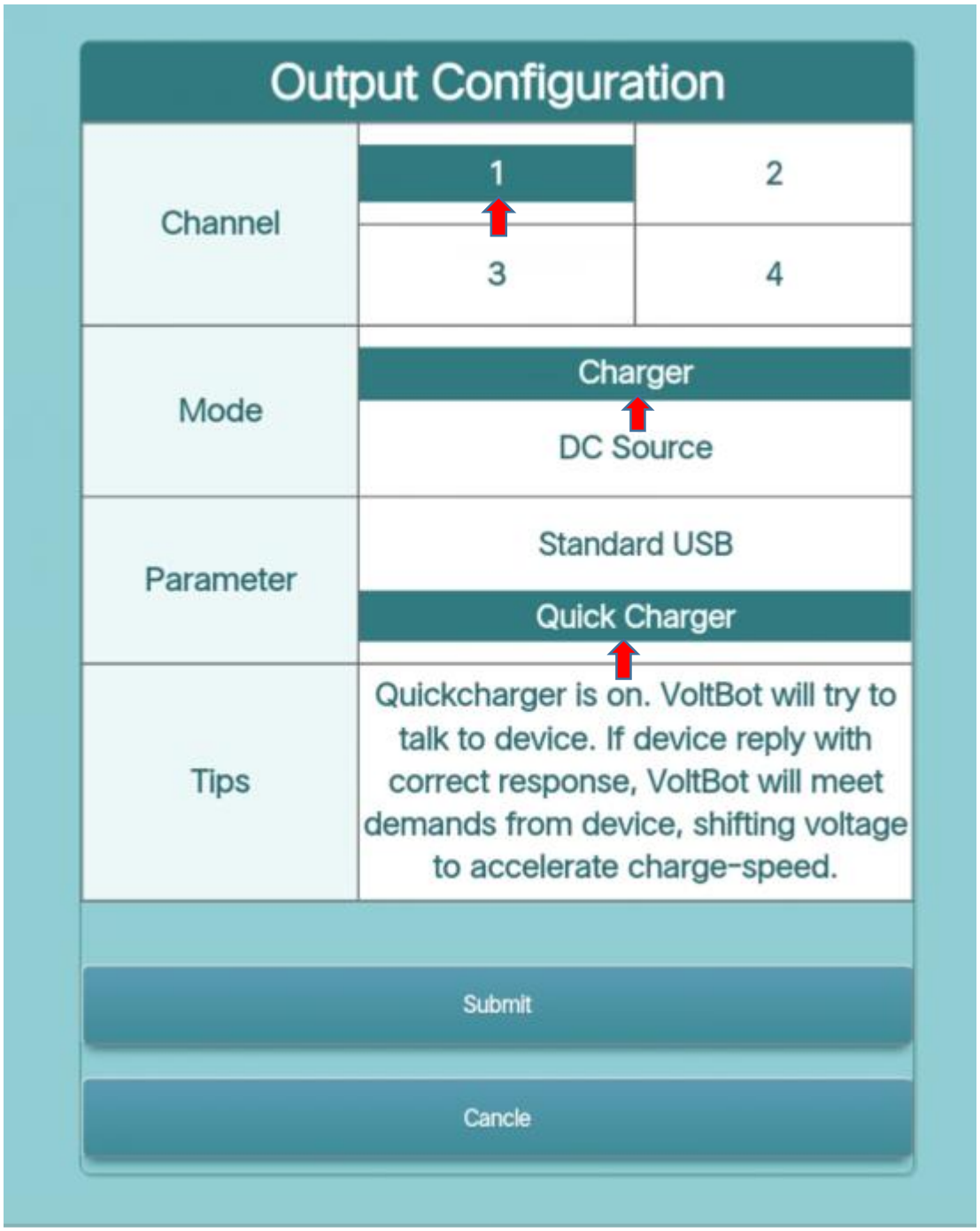

9. Press “1”, “DC Source” in turn, then enter the number 9.00 and press “Submit”. Now you probably see the Channel 1 in VoltBot has been assigned with 9.00 Volts and under DC power supply mode now.



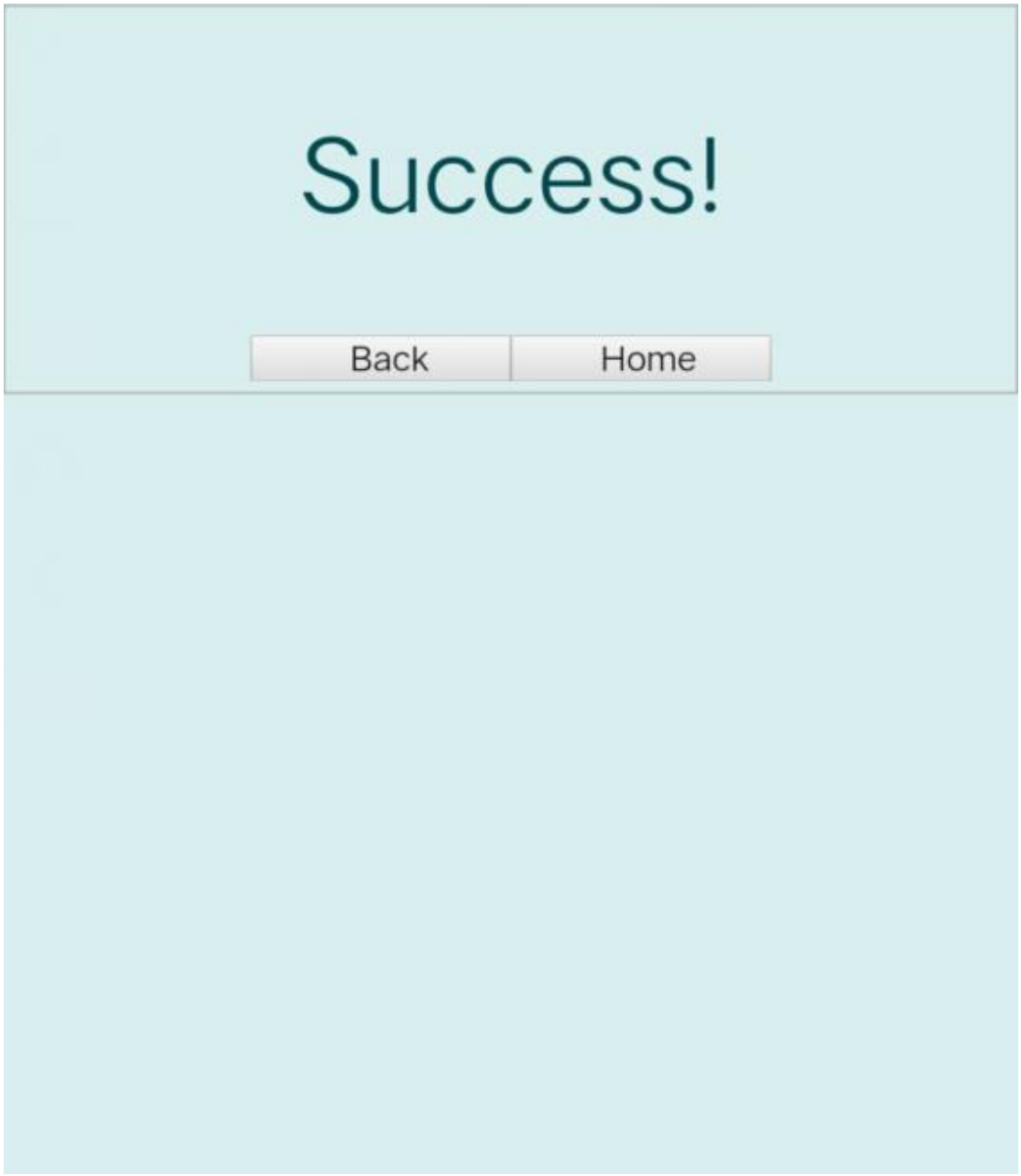

10. Press “Home”




11. Press “Output”

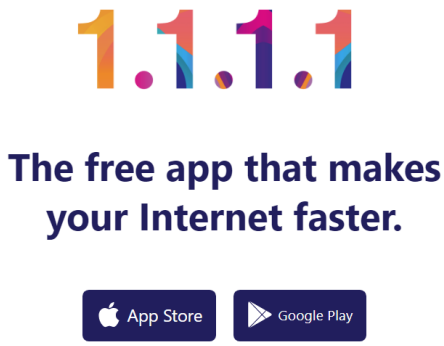



12. Press “1” “Charger” “Quick Charger” in turn.




13. “Success” will be shown on the image. The Channel 1 in VoltBot comes back to Charge mode now.

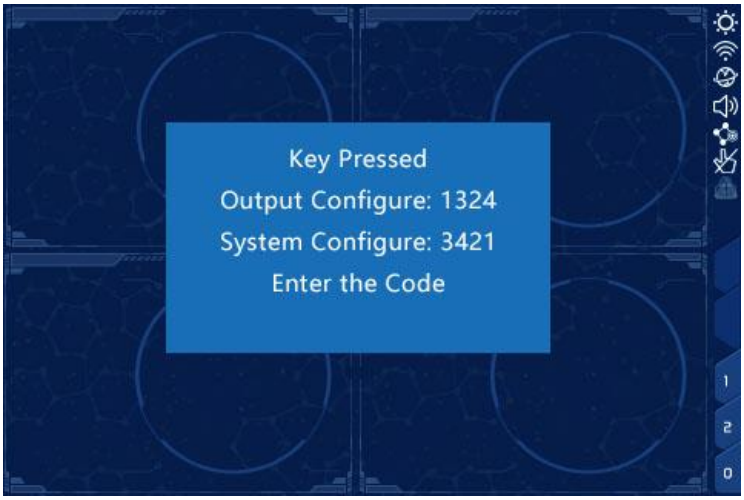
14. If you opened 1.1.1.1 and find it is a site named “Cloud Flare” instead the page above.




This is because the phone didn’t request the right address from VoltBot. You need to close mobile data link (forcedly request from VoltBot), and clear the history of the web-browser (request the real page instead of one stored in cache).

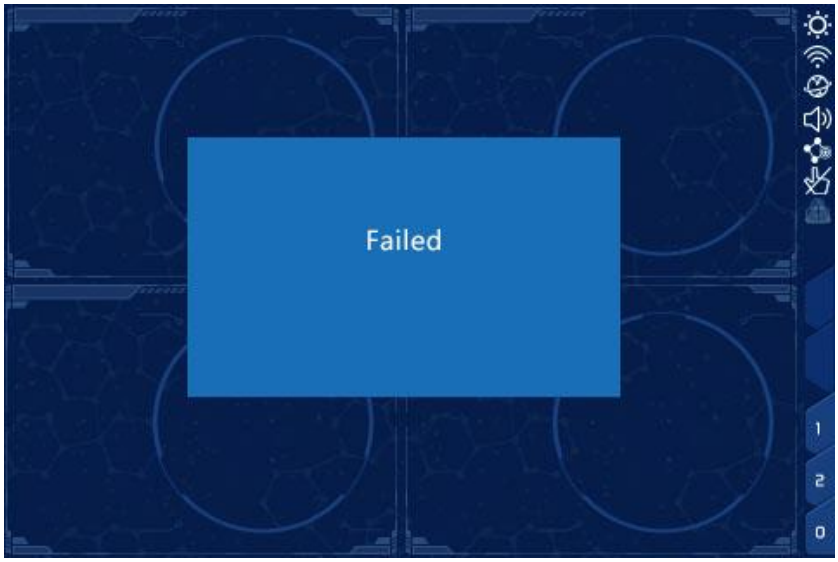
# 6. Touch Key

Here is a demo to turn Channel 1 into DC output of 9v.

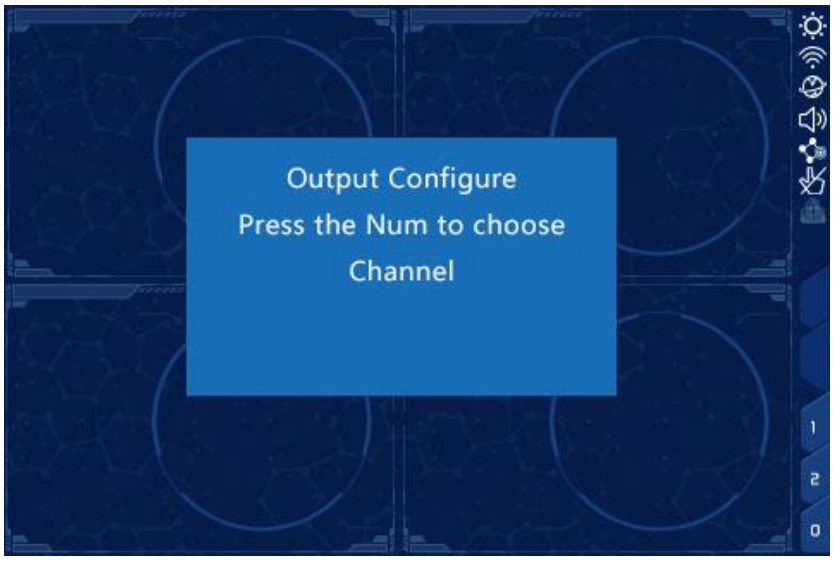



1. Press the side-key (the single yellow key on the side of VoltBot), then you will see the image above. It requests you to input 1324.

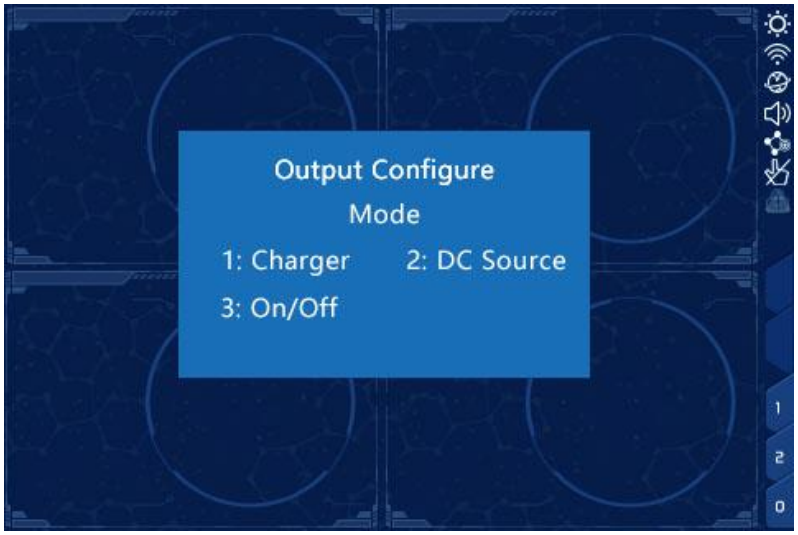
2. Find these marks on the top of VoltBot. These marks is where you need to touch. 1324 is what they mean.



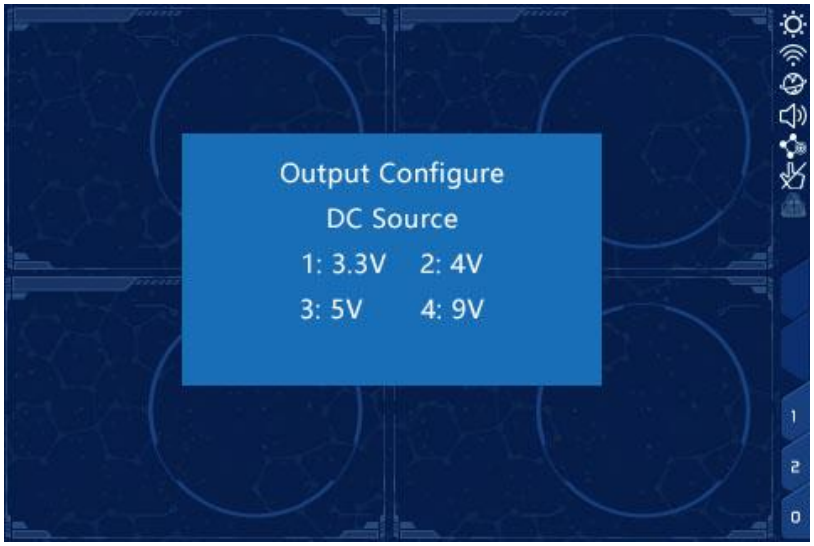

3. If you touched the wrong sequence, “Failed” is shown on screen. If failed is shown, the input is reset. And you could retry the right sequence.




4. Press the touch key 1324, and press 1 to choose channel 1.




5. Press 2 to choose DC Source




6. Press 4 to choose 9v

7. “Success” will be showed on the image.

Note: You could also click http://oss.sillycomm.com/demos/key_touch_01.mp4 to see the

process of turning Channel 1 into DC output of 9v.
Note: If the touch key triggered itself while no touch action did, go to the trouble-shooting chapter.

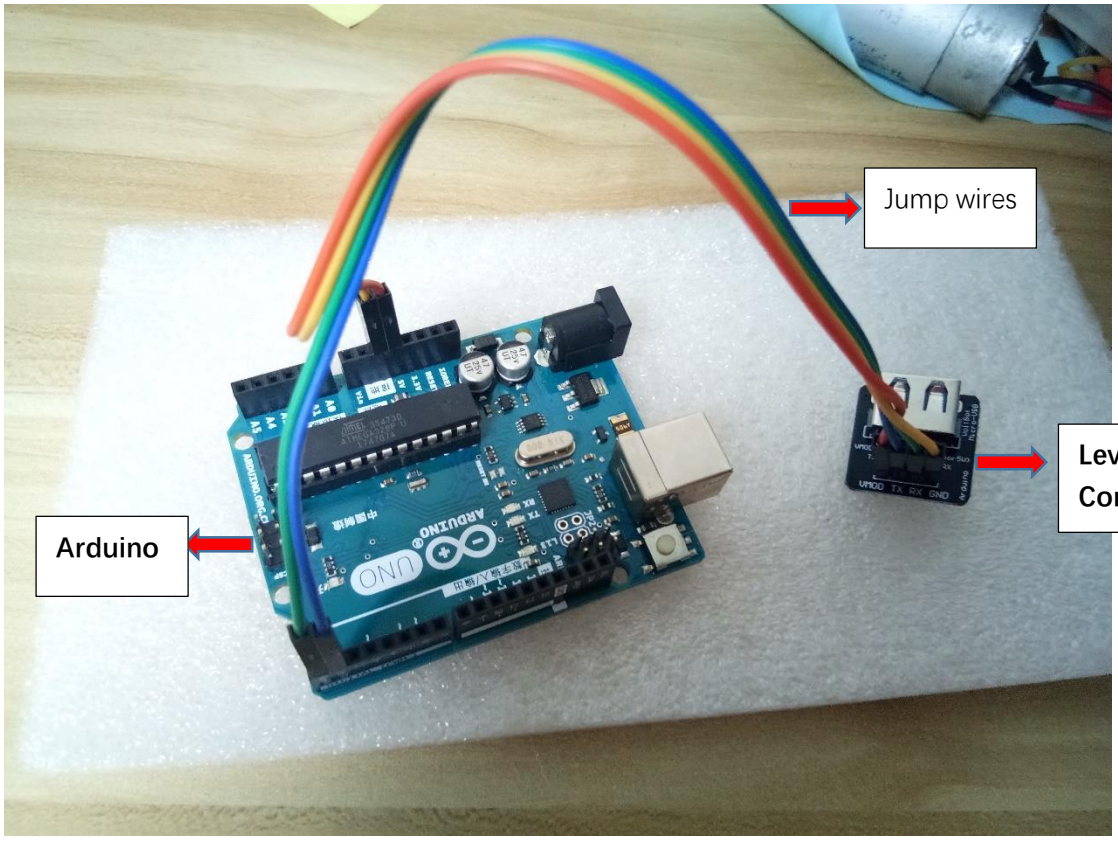
The Touch-Key could be configured by APP and Web Page.

| Access Method | Advantage |
|---|---|
| Side-key to enable touch-key | Touch-key won't be triggered easily by frequent touching on VoltBot. |
| Always enabled | Easier for frequent operation. |
| Input a sequence to unlock | Anti-Noise and anti-false triggering. Menus could be selected by the sequence. |
| No sequence needed | Easier for frequent operation. |

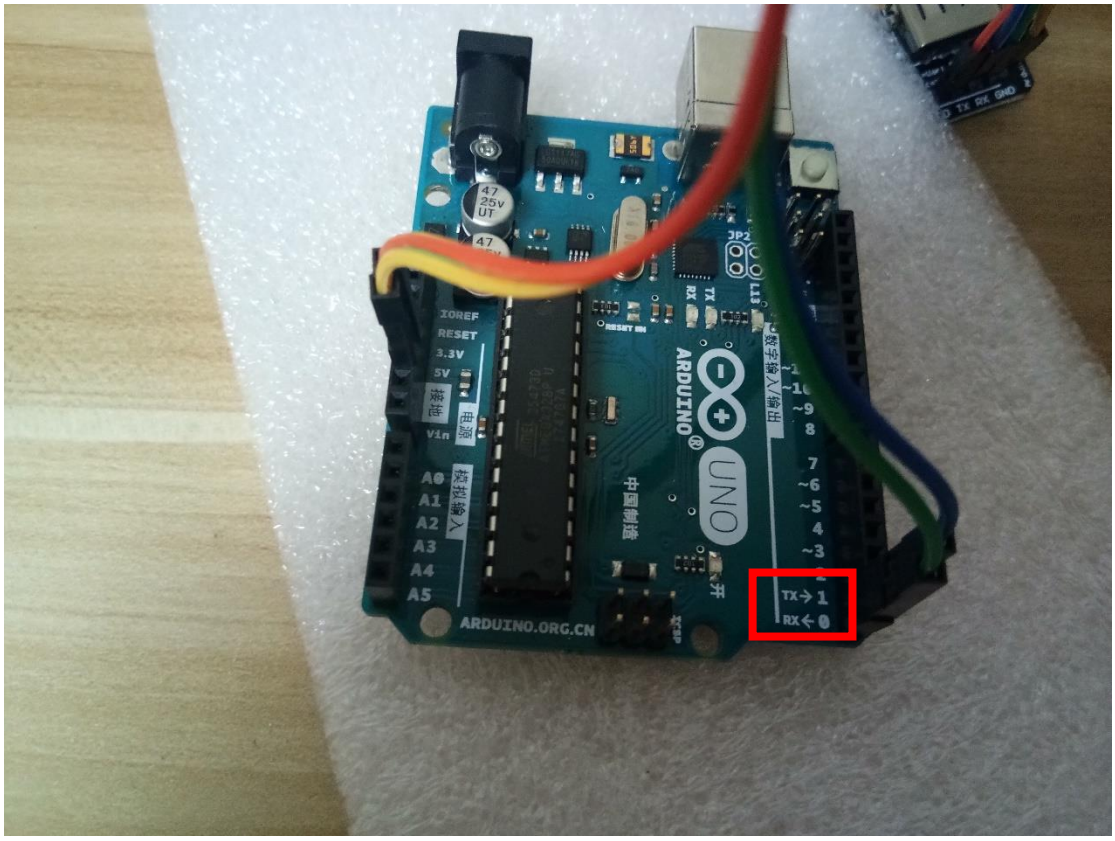
# 7. Connect with Arduino

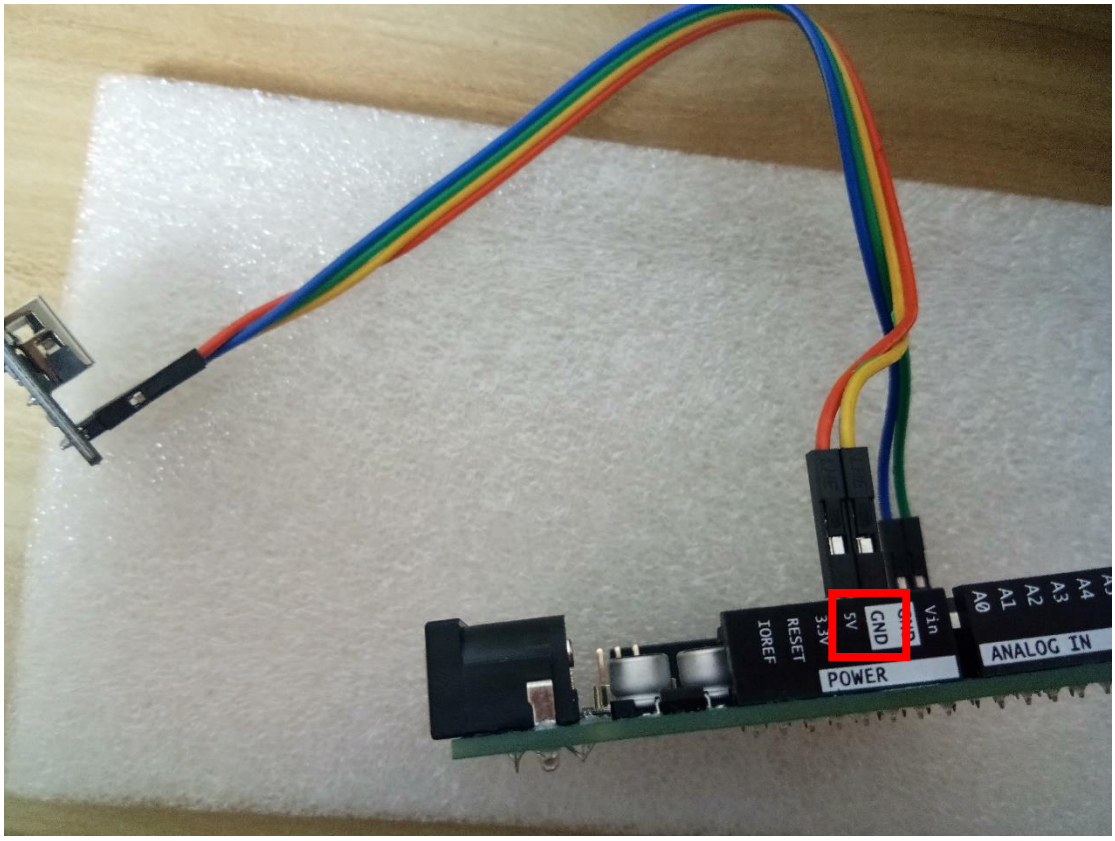
Arduino is a convenient and flexible open-source electronics prototyping platform which includes Arduino boards and Arduino IDE. When you connect Arduino with your VoltBot, you could follow the instructions below and communicate with UART Communication Protocol.

Here is something you need:
Level Convertor
Arduino
Jump wires
USB to Micro-USB cable




Then here is the way to connect:


IOREF
RESET
3.3V
5V
GND
Vin
A0
A1
A2
A3
A4
A5
ARDUINO.ORG.CN
ARDUINO
UNO
TX→1
RX←0


GND
POWER
ANALOG IN
IOREF
RESET
3.3V
5V
Vin
A0
A1
A2
A3
A4

| Arduino | Level Convertor |
|---|---|
| GND | GND |
| RX | RX |
| TX | TX |
| 5V | UMOD |

After wiring, you could download Communication Protocol from our site, to learn how to program Arduino. The link is https://www.sillycomm.com/voltbot/documents/

# 8. Connect with App

## A. App download

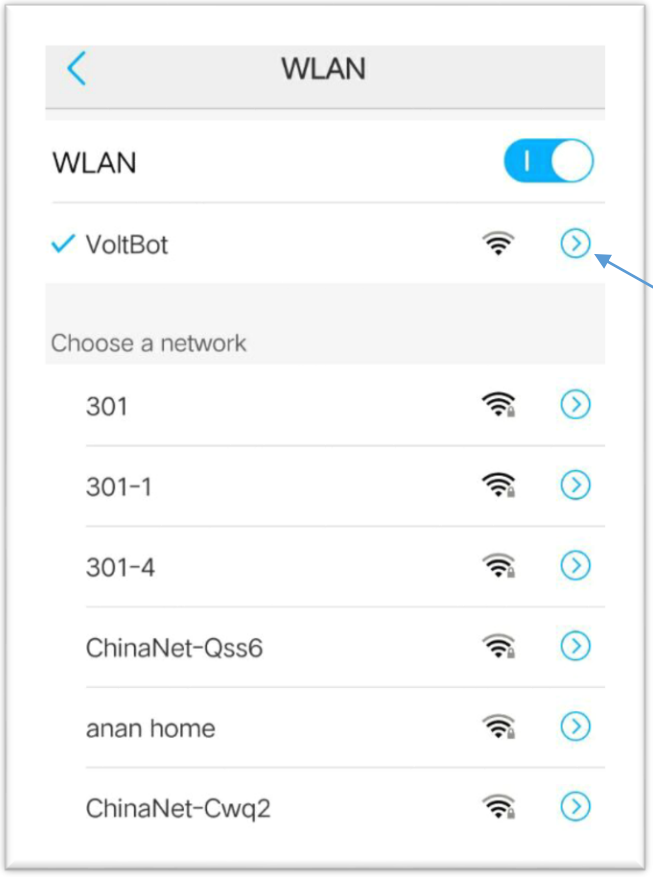
Google Play or App Store, search VoltBot.

## B. APP requirement：

| | |
|---|---|
| Android Version | 4.0 and higher |
| IOS Version | 10.0 and higher |
| Screen Resolution | 1280*720 and higher |

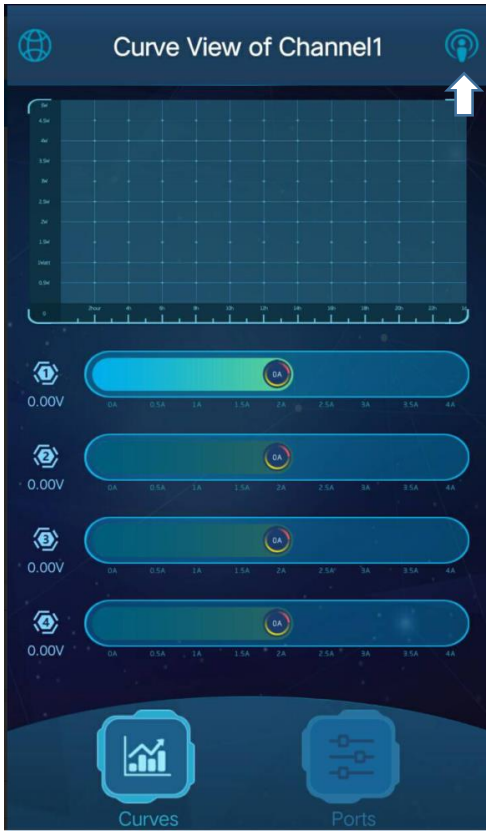
## C. Demos

Demo to connect VoltBot

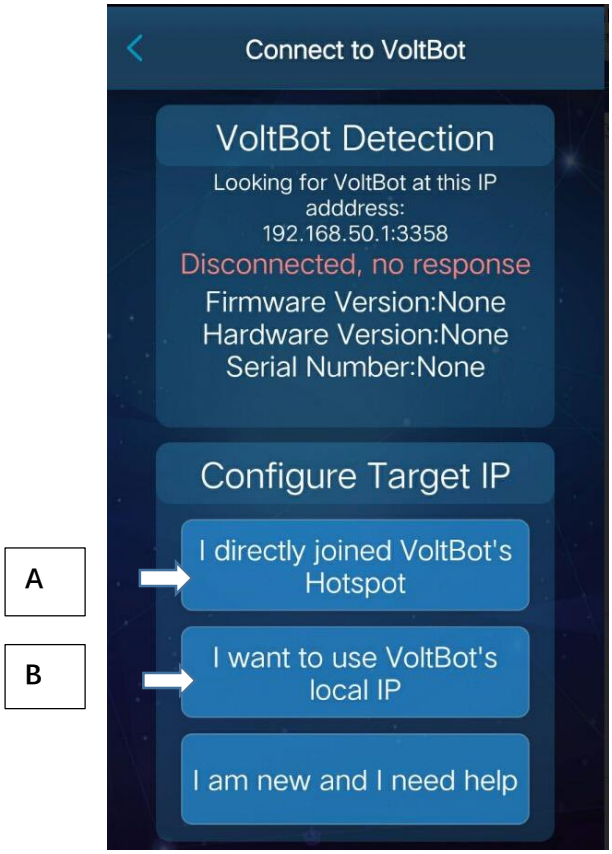



1) Connect VoltBot WiFi. Tap the info button on the right side.

2) Read the Router line or Gateway line. That's the VoltBot IP.




3) Open the APP-VoltBot. Then you could press the radio icon.



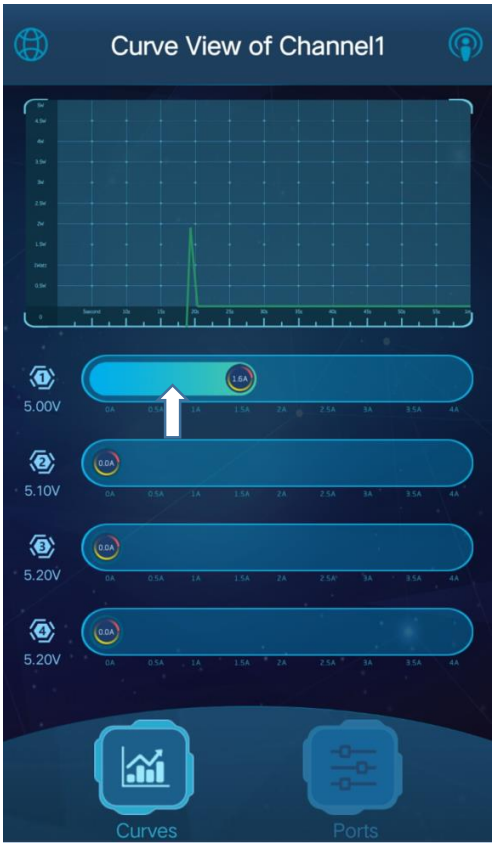

4) Press the button labeled with A.

Note:

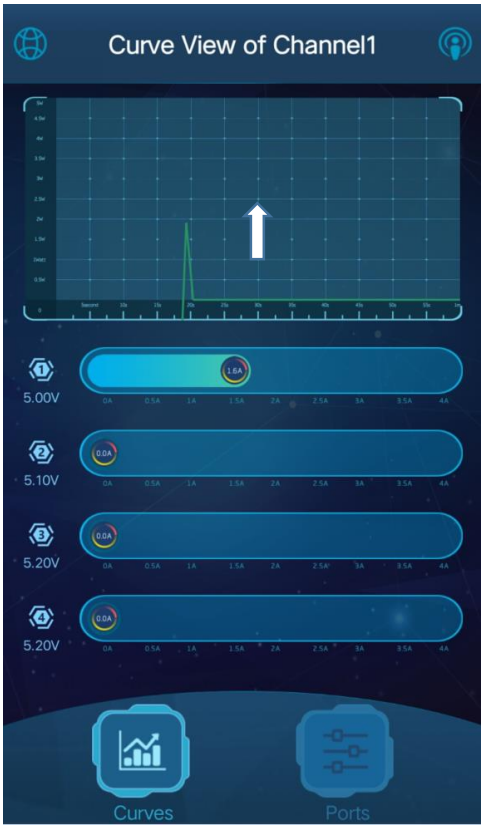
A: Using the gateway IP as VoltBot IP. The app will auto-search the IP of the phone, and then replace the last digit into 1 as VoltBot IP.

B: Assign VoltBot IP manually. This applies to situations that VoltBot has multiple IPs or a wrong IP are assigned by auto-searching. Therefore, this option allows to access VoltBot via the Internet, which will be elaborated in next chapters.

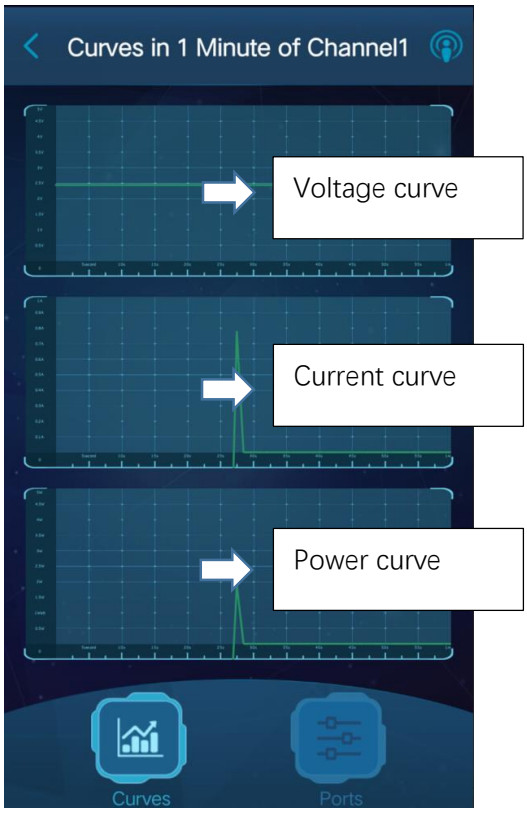
Demo to watch curves of Channel 1.




1. Press the first row to choose Channel 1, then the power curve of Channel 1 is shown on the screen.



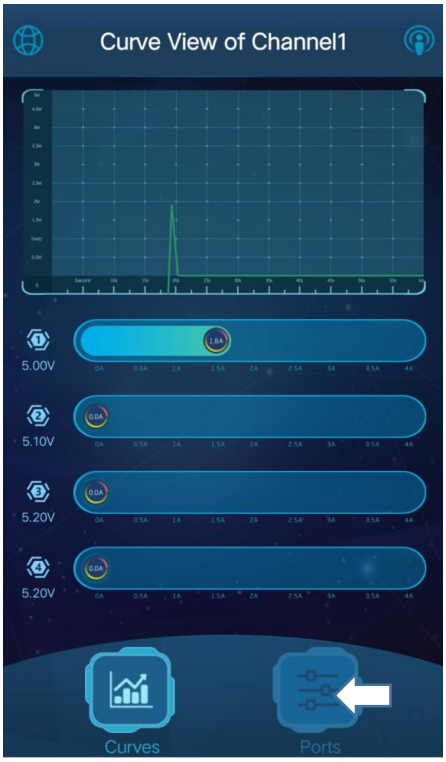

2. Press the curve area.



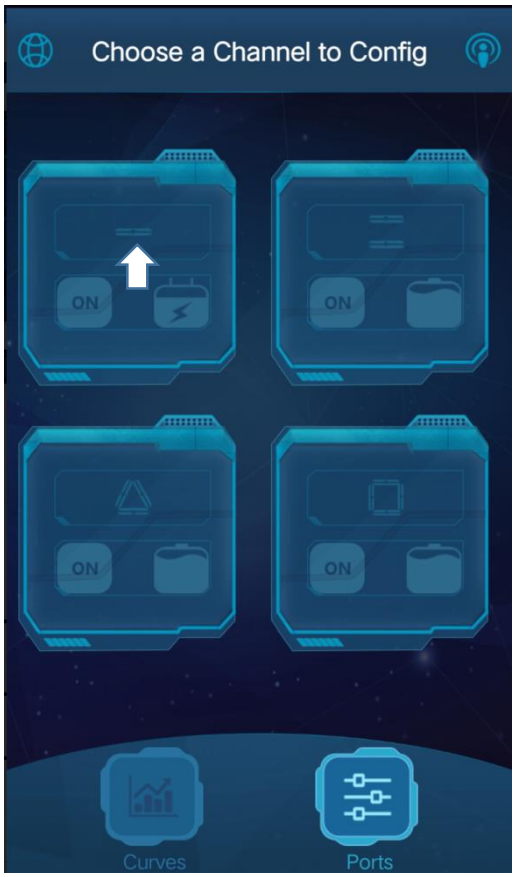

3. Then voltage, current and power curves are shown on the screen. Slide left or right, you could toggle the curves among 6 seconds, 1 minute, 1 hour and 1 day. If you

touch one of the three, it will zoom. If you long-touch on it, the raw data in the curve will be paste into the clipboard.

## Demo to turn Channel 1 into DC output of 9V.




1. Press “Ports”

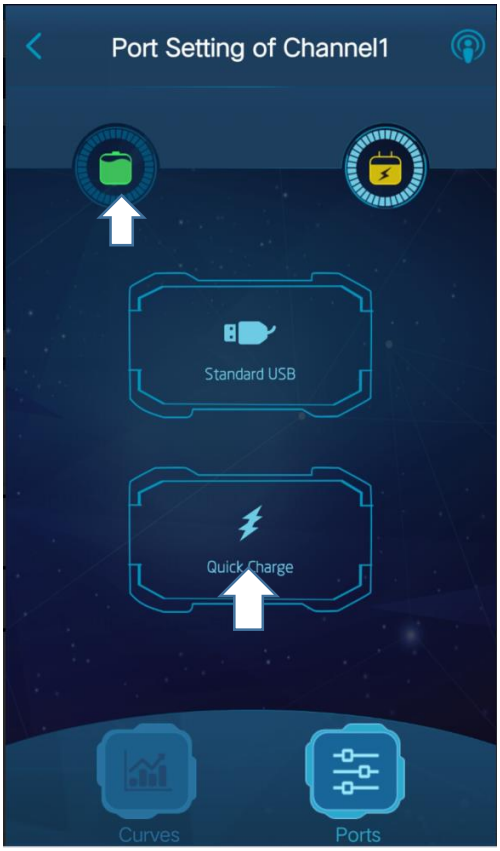



2. Press “1” to choose Channel 1

3. Press the yellow button (DC Mode), enter 9 volts, and press “OK”. Then you will see

the output of Channel 1 is 9 volts on VoltBot.

Demo to restore Channel 1 back into quick charge model.



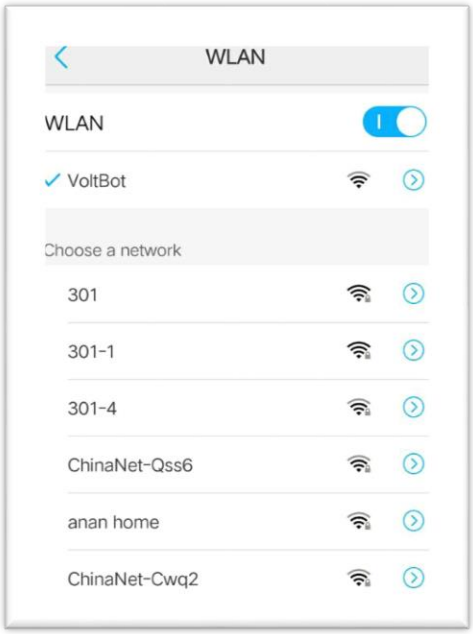

1. Press the Charge Mode, and “Quick Charge” in turn. Then your Channel 1 of VoltBot is in Quick Charger mode.

## Demo to shutdown Channel 1

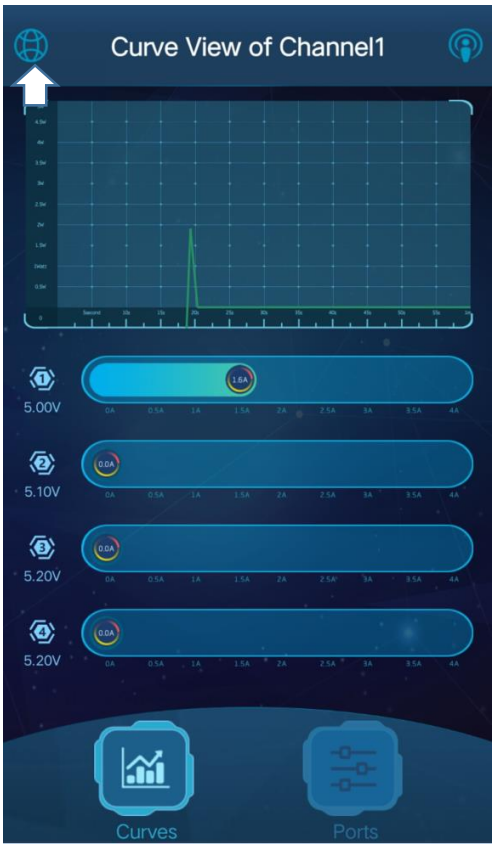
1. Click the section in the picture, you will see the On/Off setting.
2. Follow the instructions on the page to finish.

## Demo to update firmware

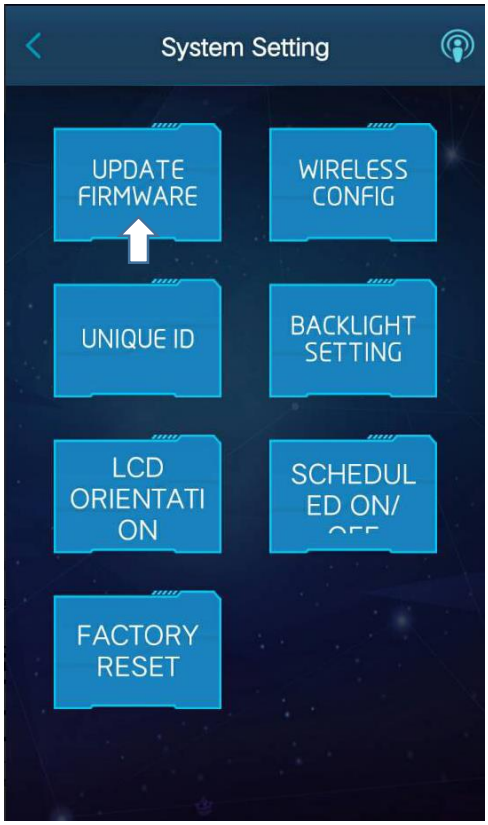
1. Open Google Play or App Store to check the APP is the newest version.



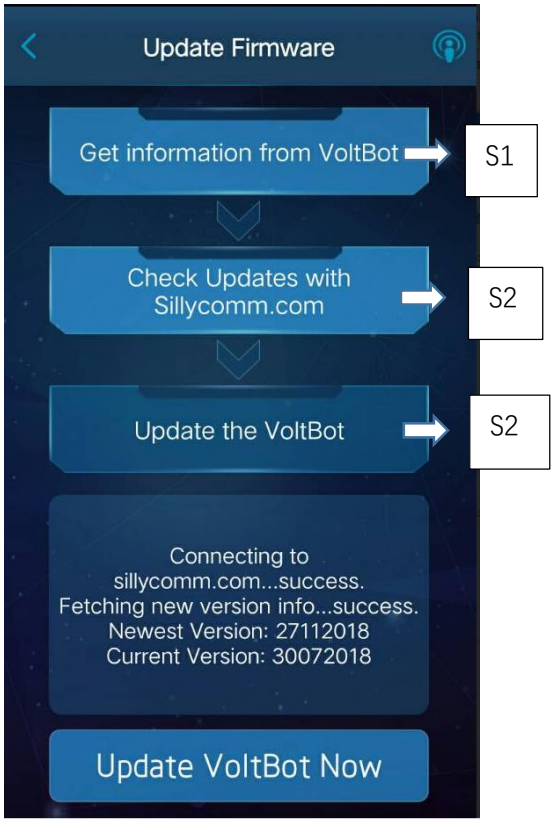

2. Connect VoltBot's WiFi.




3. Press the System Setting icon.



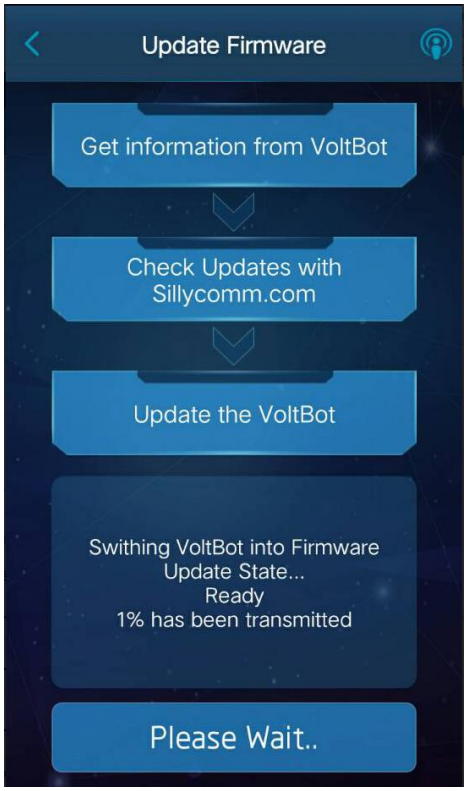

4. Press “Update firmware”




5. S1: If a VoltBot is connected, the title of S2 will go bright. Otherwise, diagnose the IP setting.

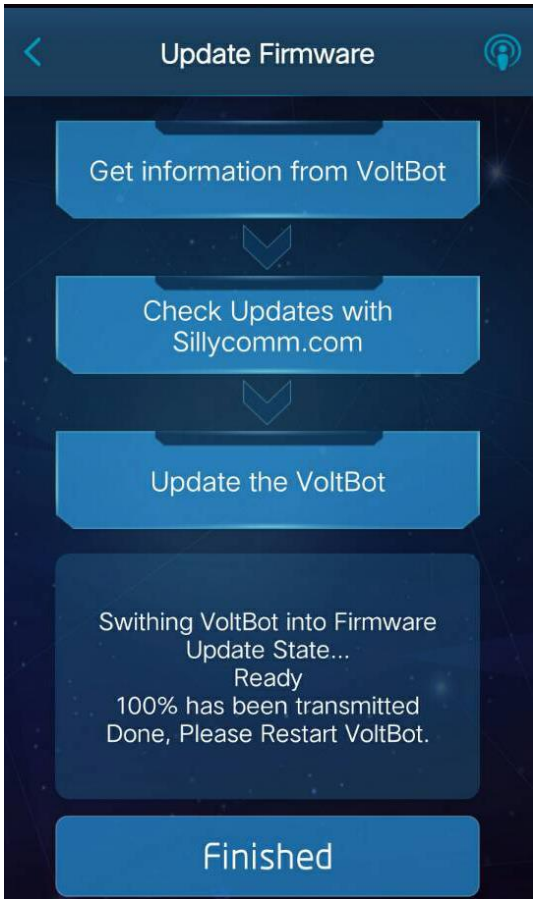
S2: In this step, the APP need to connect to update server to check updates. Currently we connected the hotspot 'VoltBot', which has only local access instead of Internet access. So we need to shutdown WiFi connection, use mobile data and retry step 2. Or we could connect another hotspot which has Internet access. If the APP connect the server successfully, the newest version will show, then you could decide whether to update the VoltBot.

S3: In this step, the APP need to connect to VoltBot to download the update files. So we need to enable WiFi connection back, or connect VoltBot's hotspot back. If done, both the APP and VoltBot will show the progress of downloading.



6. Just wait until its done, but don't be afraid of any break. Because this downloading is not in real-time. If it 100% done, next power-up will enter the new version. If it not done,

next power-up will keep the current version and nothing bad will happen.



7. Re-power your VoltBot, and the new version will show.

Note: After the updating, there are two issues in updating process of some very old firmware:

1. Sounds off

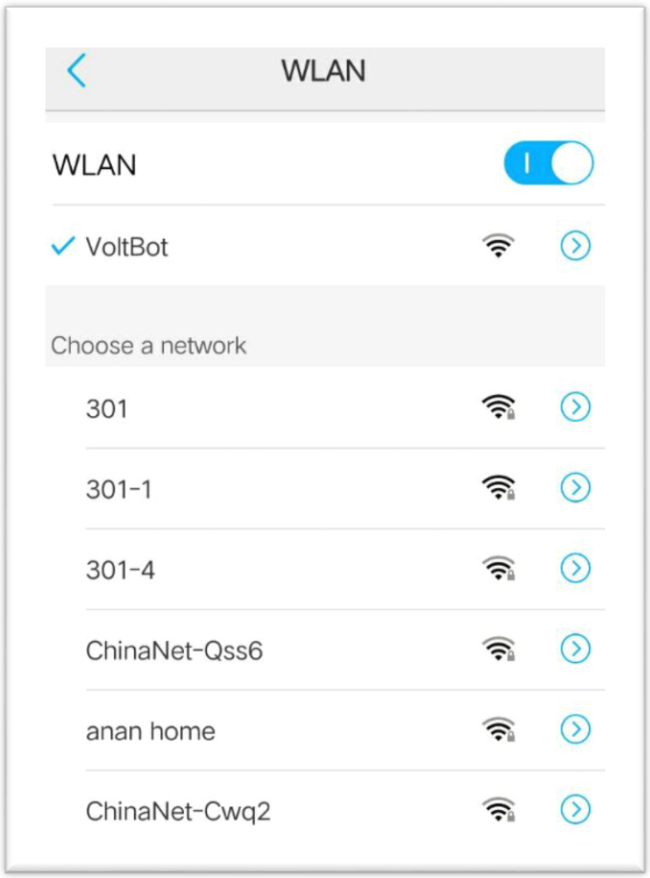
When you start updating, the sound is turned off by default. You could long press the key on the right side of your VoltBot to turn sounds back on.

2. Channel 1 off

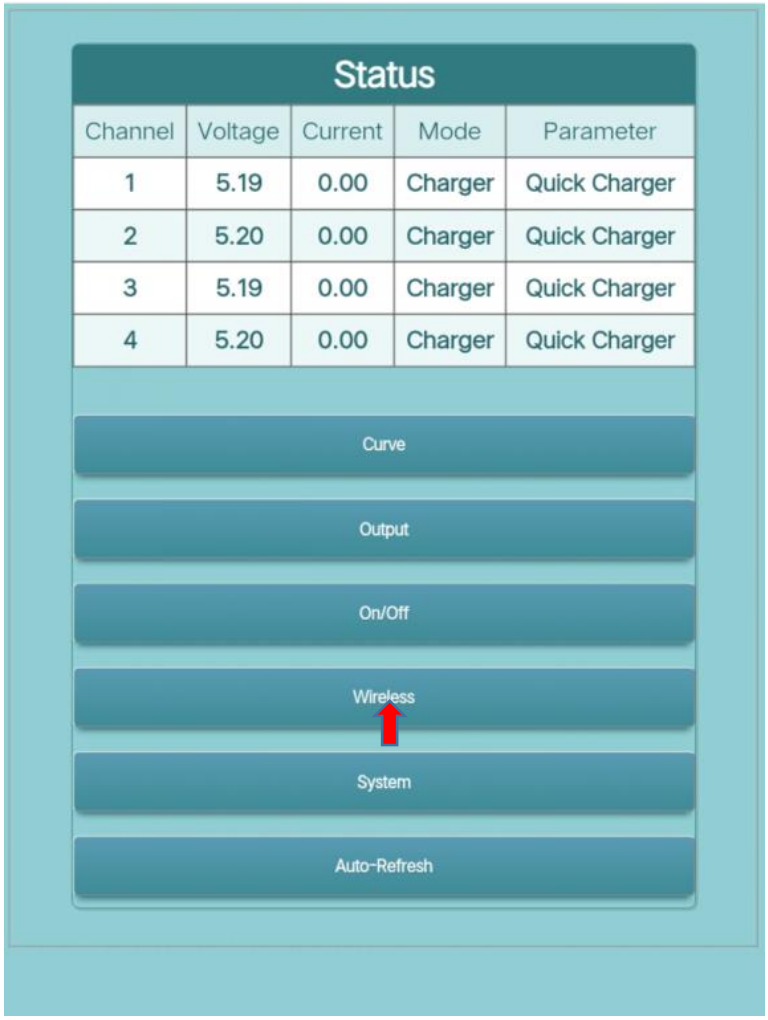
This is a bug if the version is lower than 27112018, Channel 1 will be closed by mistake. You could re-enable Channel 1 after you have updated your VoltBot.

# 9. Share VoltBot on Internet

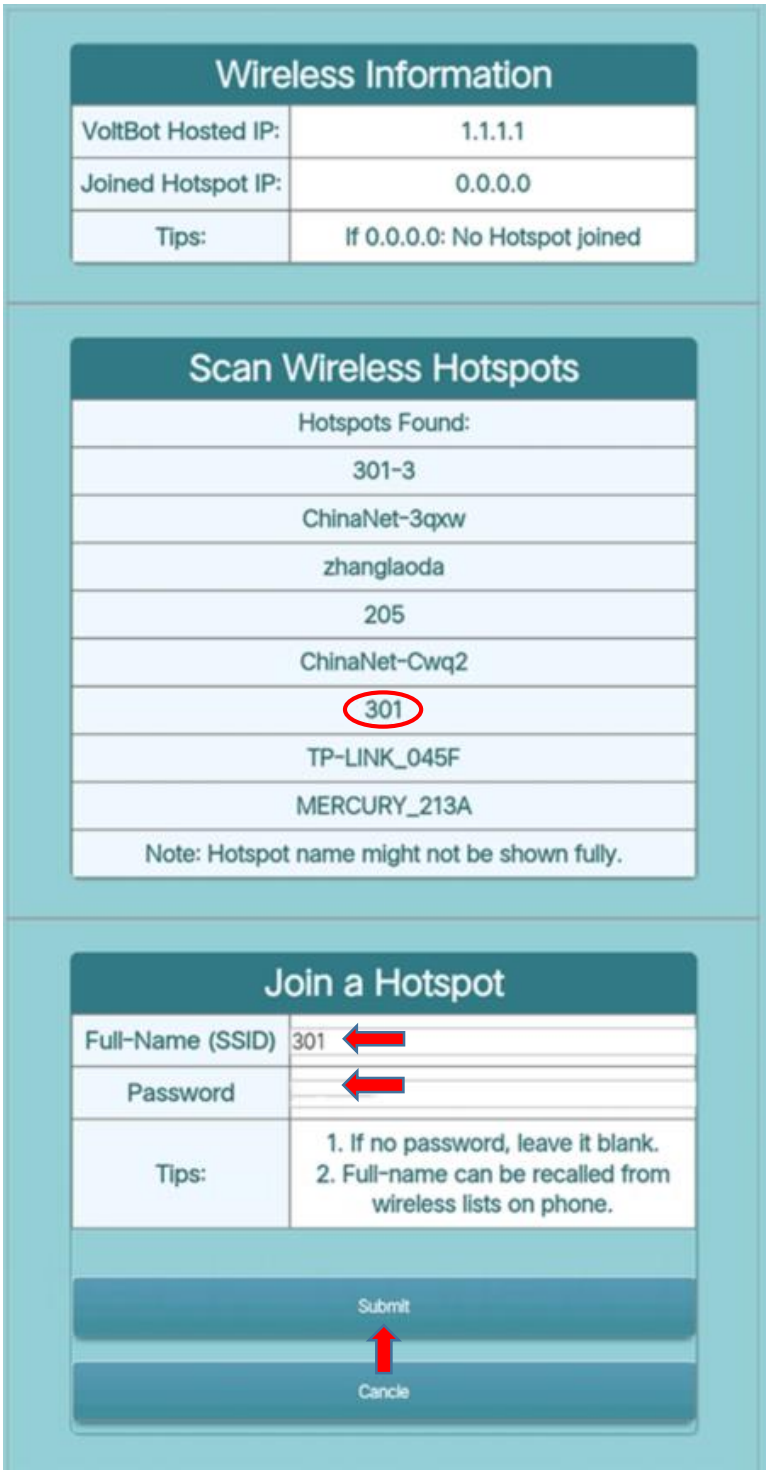
Here is a demo to make VoltBot join the home WiFi



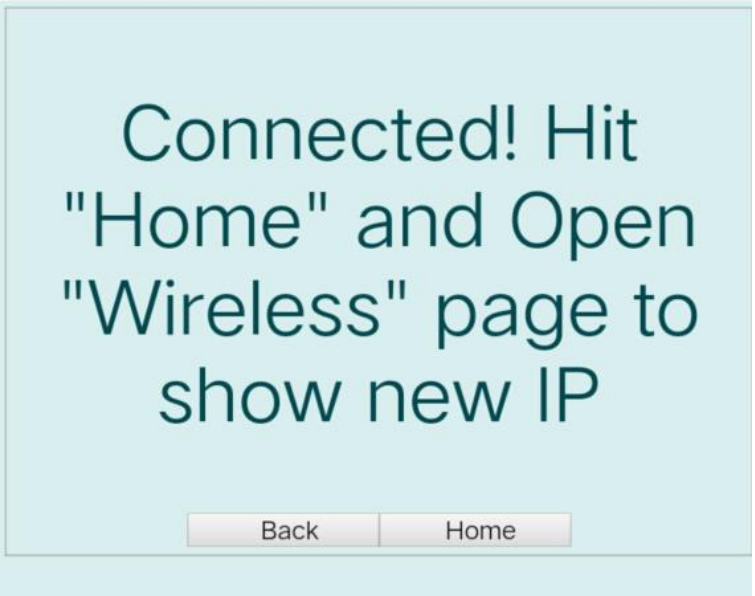

1. Connect VoltBot WiFi
2. Connect VoltBot with a Web-browser



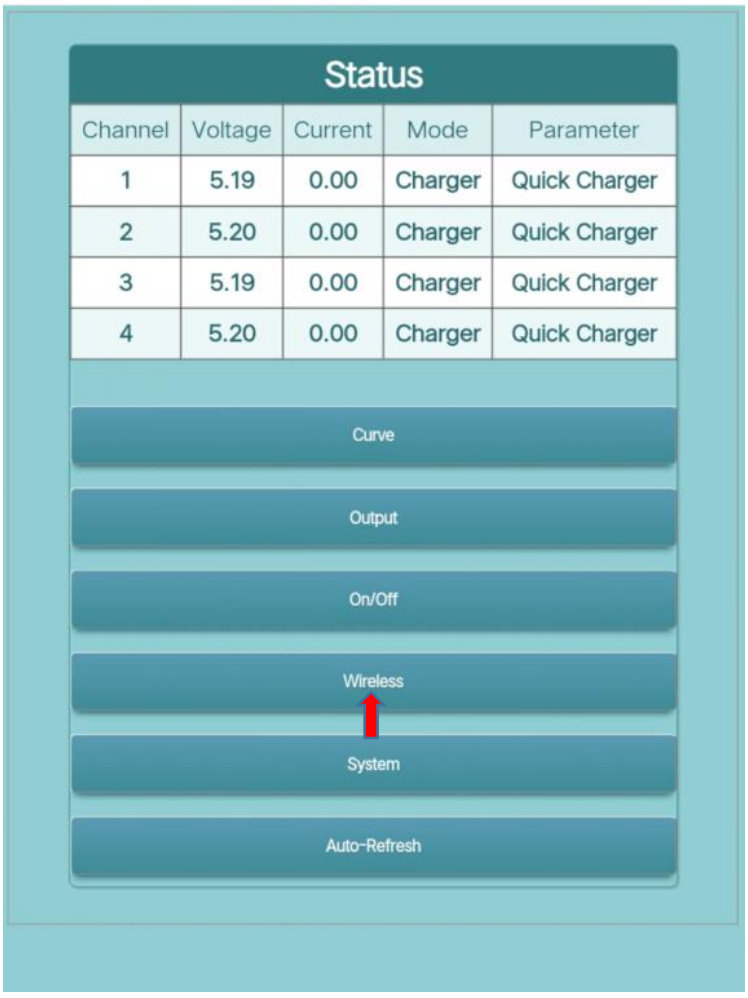

3. Press" Wireless", this page will take a while to open. Because it will instruct VoltBot to scan every hotspot it can reach.




4. Check whether your home WiFi is in the connectable list (If the name is too long, only first characters will show). Then fill-in its full-name and its password, then press “Submit”

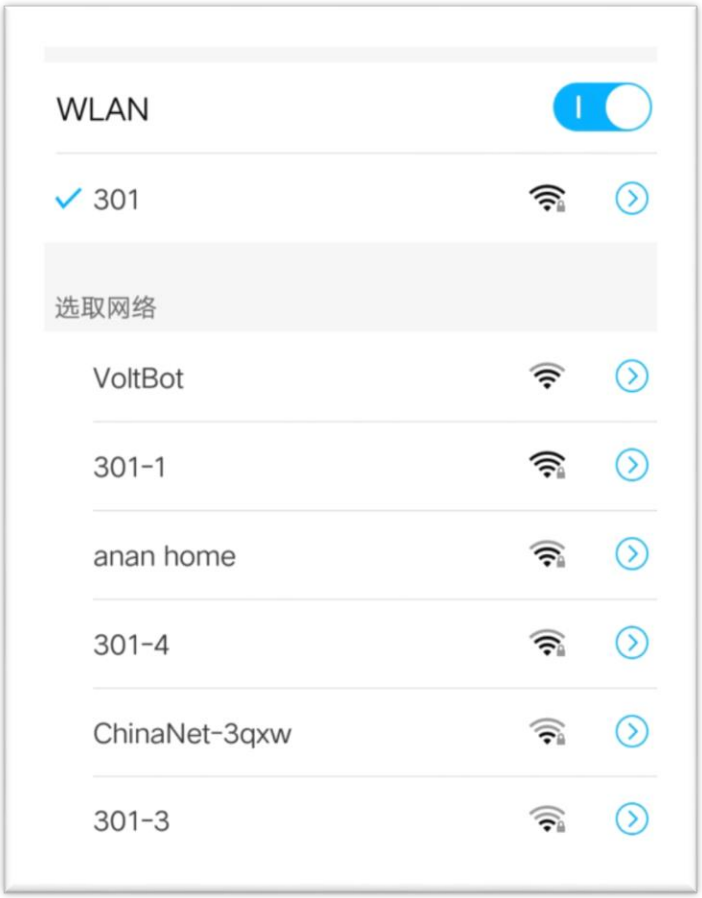



5. Wait about 60 seconds generally, the image above will be shown, then press “Home”.

6. 

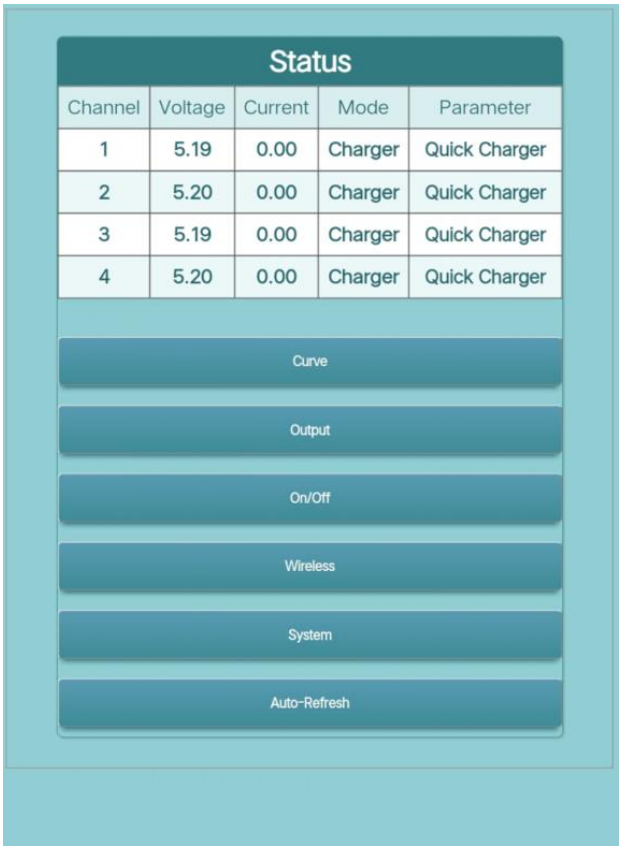

7. Press “Wireless” again.

8. Remember the joined Hotspot IP.




9. Connect your home WiFi (the 301 is an example).

10. Enter the Joined Hotspot IP in the web-browser.




11. You could use this IP as VoltBot IP from now on. It is a better way because:
    - No need to connect VoltBot's hotspot every time. One-click then VoltBot is there.
    - You can surf the Internet at the same time.
    - No need to switch the WiFi in firmware updating.
    - If you know how to set port forwarding on your router. You can access VoltBot remotely using the router's IP just as a HTTP Web Server.

# 10. Clear all Configuration

Press side-key then plug-in power cable, hold side-key until "Factory Reset" screen appears. This could clear all channel setting and wireless setting. It will be helpful when you forget wireless password or static IP address.

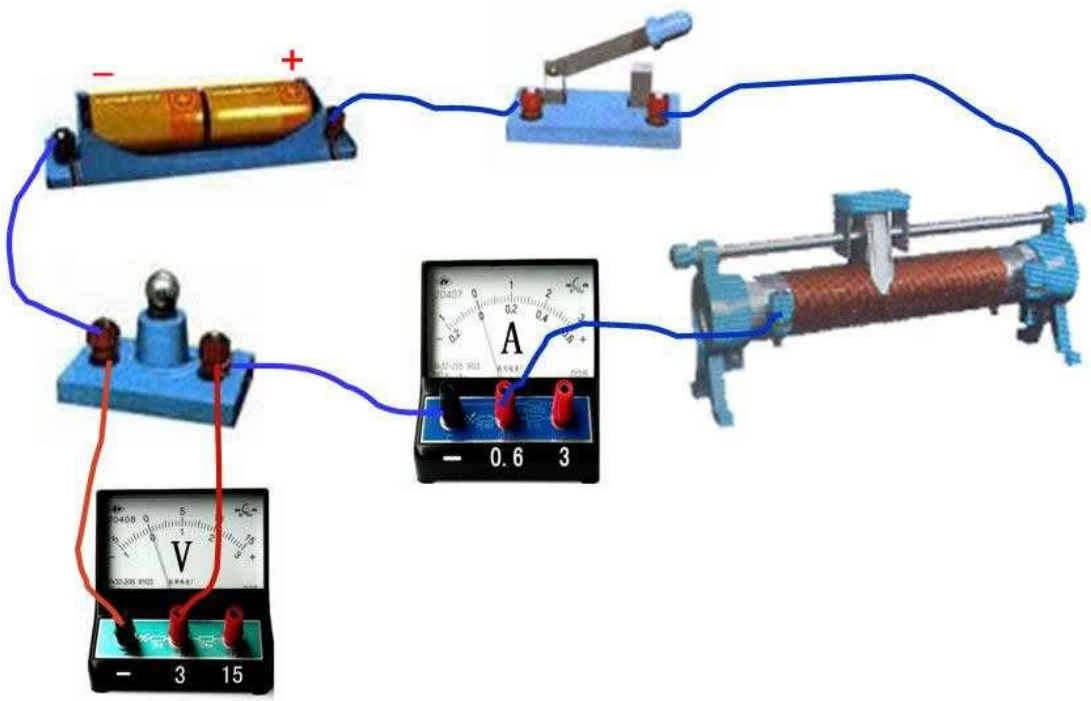
# 11. Calibration

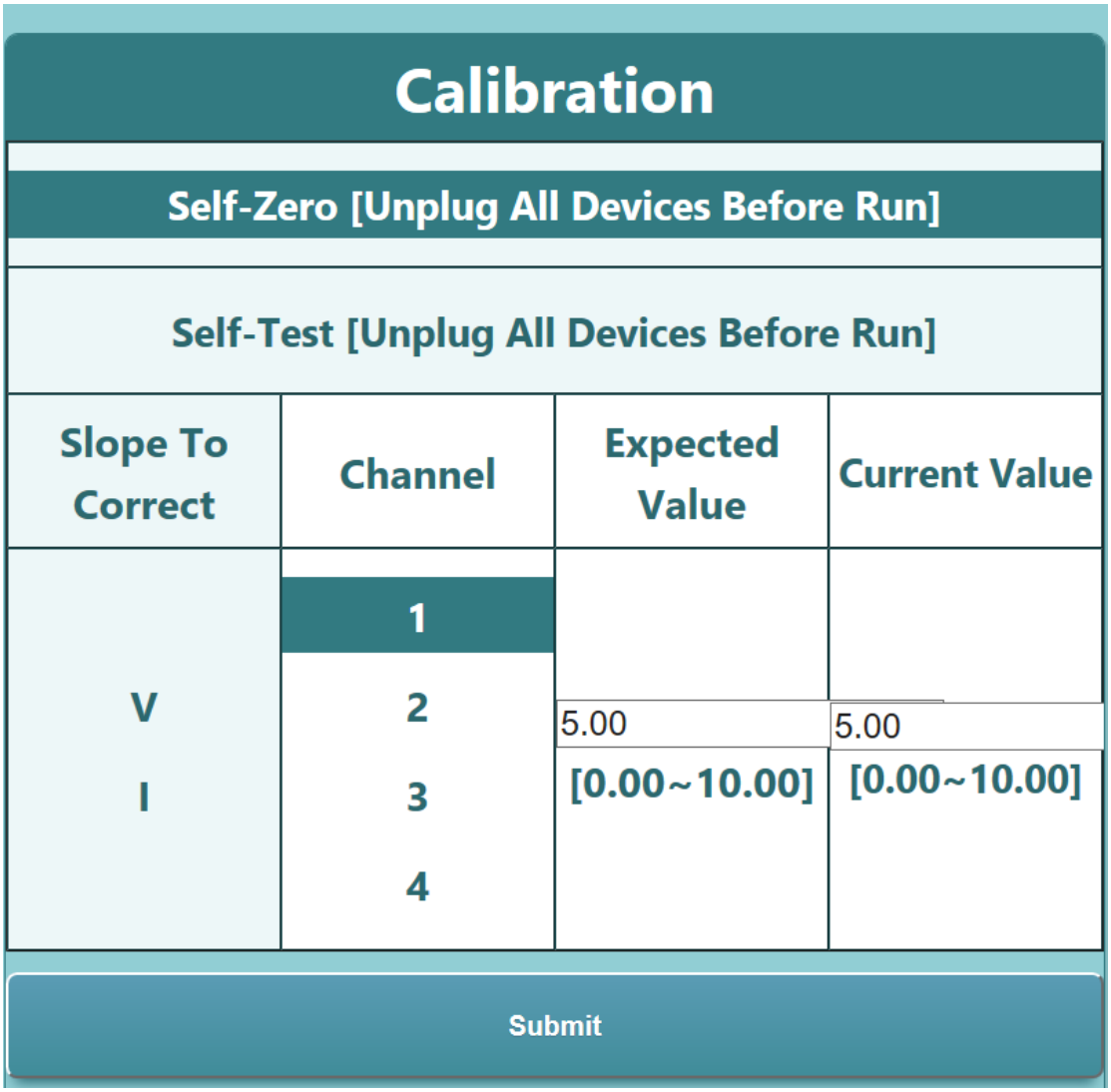
There is a calibration function. To access it, go visit http://votbot ip/calibration.html
In order to calibrate, you need a reference. A multi-meter or voltage meter could be the right

choice. A multi-meter or ampere meter and a current load circuit could be the right reference to calibrate current.

Note: to measure voltage, you could directly measure the open-circuit voltage.

To measure current, a circuit loop is needed, and the current meter must be serial in the loop, DO NOT PARREL. Make sure you understand what does all these thing means before you start to calibrate the current.






1. To calibrate voltage, just click V in “Slope to correct”, and choose the channel, then enter the measured true value in “Expected Value” field, and enter the value shows on VoltBot’s screen into “Current Value”. Finally, click submit. The Voltage in the channel would be calibrated. You could use this method to calibrate all channels.
2. To calibrate current, first unplug all devices, and click self-zero to calibrate zero point of current. And then you could set up your circuit, using the ampere meter to monitor the actual current. Click I in “Slope to correct”, choose the channel, and enter the actual value into the “Expected Value” field, enter the value shows on VoltBot’s screen into “Current Value”, click submit. You could use this method to calibrate all channels.

# 12. Trouble Shooting

You could visit the link below.
http://www.sillycomm.com/voltbot/trouble-shooting/

# 13. Tips

1. If charge iPhone X, purchase a PD kit to unlock quickcharge.
2. Engineer Kit might help you if you use VoltBot as a DC power supply.
3. You could use Mount Kit to power VoltBot by car.
4. If you travel a lot, use a travel kit or a PD kit + a newest GaN Type-C adapter. The newest generation-GaN adapter is not cheap but only in 30% size of the old generation.

# 14. Privacy Disclaimer

The APP only store configuration of VoltBot, it collects no user data or environment data. VoltBot stores power data to show curves, no other data related. VoltBot only takes passive connections. It has no function that requires an active connection, and we have no server to accept any active connection.

# 15. Moral Disclaimer

SillyComm is a manufacturer of industrial instruments, established in 2012. We are an entity owned by 100% private shareholders and we will not have any contract with the CCP government, or its agents (including state-owned research facility, state-owned enterprises, social group, and so on). We believe in freedom could help the improvement of technology and we confidently provide noble, decent, stable and reliable products for customers in the world.

# 16. Customer Service

| | |
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| Full Name | Beijing SillyComm Co., Ltd. |
| 中文 Name | 北京易信通达科技有限责任公司 |
| Site | www.sillycomm.com |

| | |
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