

IBOX3588 Edge AI Embedded Industrial Computer



User Manual

Version: 1.1

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Foreword

Thank you for purchasing IBOX3588 Edge AI Embedded Industrial Computer (“the Device” or “the Product”). This manual intends to provide guidance and assistance necessary on setting up, operating or maintaining the Product. Please read this manual and make sure you understand the structure and functionality of the Product before putting it into use.

Intended Users

This manual is intended for:

- Operator of the Product
- Technical support engineers
- Other users

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Disclaimer

While all information contained herein has been carefully checked to assure its accuracy in technical details and typography, Vantron does not assume any responsibility resulting from any error or features of this manual, nor from improper uses of this manual or the software.

It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without notice.

Technical Support and Assistance

Should you have any question about the Product that is not covered in this manual, contact your sales representative for solution. Please contain the following information in your question:

- Product name and PO number;
- Complete description of the problem;
- Error message you received, if any.

Vantron Technology, Inc.

Address: 48434 Milmont Drive, Fremont, CA 94538

Tel: (650) 422-3128

Email: sales@vantrontech.com

Regulatory Information



The Product is designed to comply with:

- Part 15 of the FCC Rules;
- CCC
- UL

Please refer to the Appendix for Regulatory Compliance Statement.

Symbology

This manual uses the following signs to prompt users to pay special attention to relevant information.







	Caution for latent damage to system or harm to personnel
	Attention to important information or regulations

General Safety Instructions

The Product is supposed be installed by knowledgeable, skilled persons familiar with local and/or international electrical codes and regulations. For your safety and prevention of damage to the Product and other equipment connected to it, please read and observe carefully the following safety instructions prior to installation and operation. Keep this manual well for future reference.

- Do not disassemble or otherwise modify the Product. Such action may cause heat generation, ignition, electronic shock, or other damages including human injury, and may void your warranty.
- Keep the Product away from heat source, such as heater, heat dissipater, or engine casing.
- Do not insert foreign materials into any opening of the Product as it may cause the Product to malfunction or burn out.
- To ensure proper functioning and prevent overheating of the Product, do not cover or block the ventilation holes of the Product.
- Follow the installation instructions with the installation tools provided or recommended.
- The use or placement of the operation tools shall comply with the code of practice of such tools to avoid short circuit of the Product.
- Cut off the power before inspection of the Product to avoid human injury or product damage.

Precautions for Power Cables and Accessories

-  Use proper power source only. Make sure the supply voltage falls within the specified range. The Product is designed to use 9-36V DC. Always check whether the Product is DC powered before applying power.
-  Place the cables properly at places without extrusion hazards.
-  Use only approved antenna(s). Non-approved antenna(s) may produce spurious or excessive RF transmitting power which may violate FCC limits.
-  Cleaning instructions:
 - Power off before cleaning the Product
 - Do not use spray detergent
 - Clean with a damp cloth
 - Do not try to clean exposed electronic components unless with a dust collector
-  Power off and contact Vantron technical support engineer in case of the following faults:
 - The Product is damaged
 - The temperature is excessively high
 - Fault is still not solved after troubleshooting according to this manual
-  Do not use in combustible and explosive environment:
 - Keep away from combustible and explosive environment
 - Keep away from all energized circuits
 - Unauthorized removal of the enclosure from the device is not allowed
 - Do not replace components unless the power cable is unplugged. In some cases, the device may still have residual voltage even if the power cable is unplugged. Therefore, it is a must to remove and fully discharge the device before replacement of the components.

CHAPTER 1

INTRODUCTION

1.1 Product Overview

Vantron IBOX3588 Edge AI Embedded Industrial Computer is powered by Rockchip latest flagship RK3588 AIoT chipset that is equipped with an 8-core 64-bit CPU, an ARM Mali-G610 MP4 quad-core GPU, and a built-in AI acceleration NPU, capable of providing 6 TOPS computing power and supporting mainstream deep learning frameworks. With the development of the technology, there definitely will be a rising demand for AI-based products from the industrial control market, including but not limited to industrial robots, automated control, drones, etc.

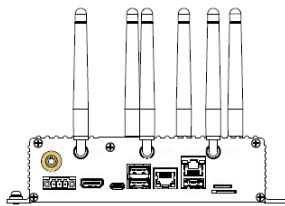
The industrial computer offers two Gigabit Ethernet ports, supports 2.4GHz/5GHz Wi-Fi 6 and Bluetooth 5.0, and provides an M.2 slot for 4G/5G expansion to keep communication uninterrupted. It also supports 8K video decoding and encoding to deliver optimized display performance.

Since the industrial computer provides rich interfaces, a wide range of peripherals can be connected for extended applications like ARM PC, edge computing, cloud server, smart NVR, and other fields. Moreover, the different operating systems provide a stable and secure system environment for users.

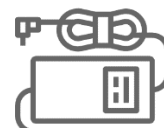
1.2 Unpacking

The Product has been carefully packed with special attention to quality. However, should you find any component damaged or missing, please contact your sales representative in due time.

Accessories:



1 x IBOX3588



1 x Power adapter




1 x Power cable



2 x Wi-Fi & BT antenna



4 x 4G/5G antenna (Optional)

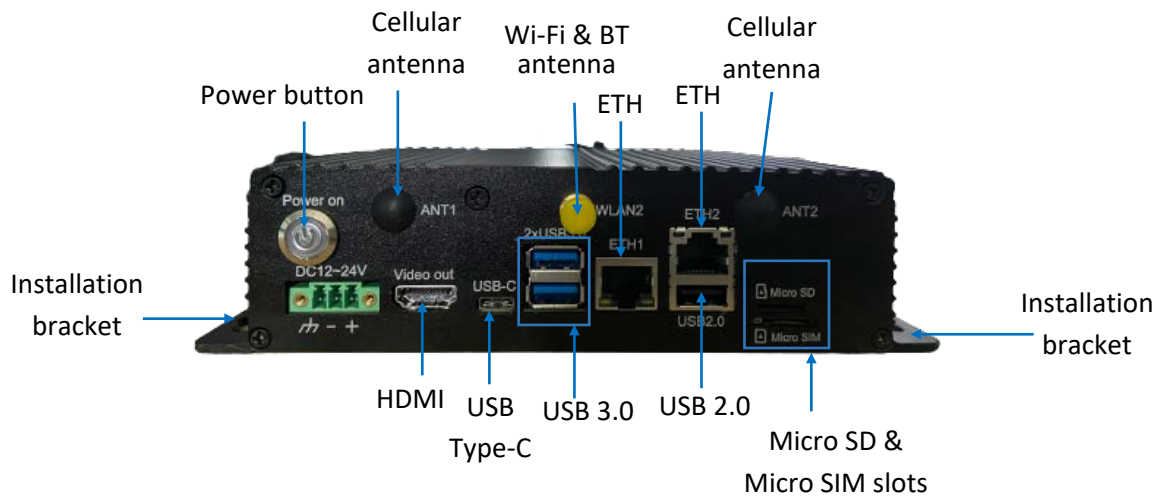
 Actual accessories might vary slightly from the list above as the customer order might be different from the standard configuration options.

1.3 Specifications

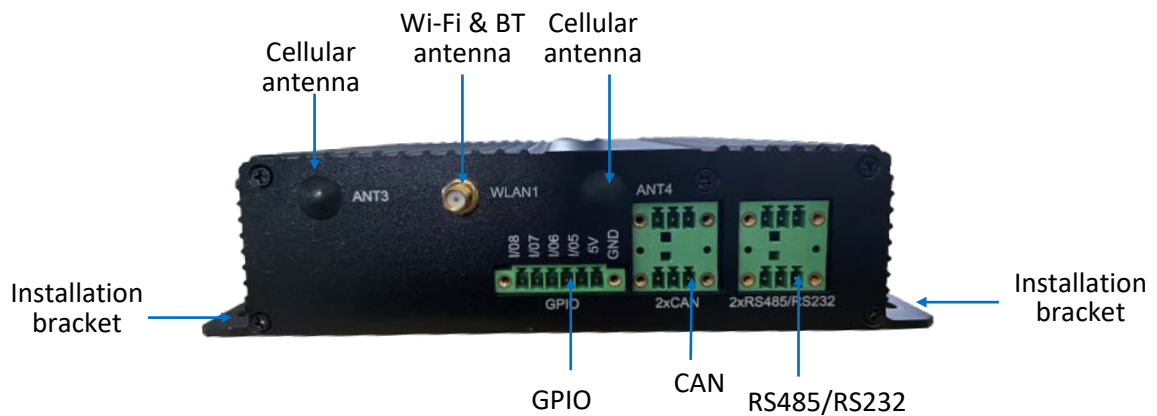
IBOX3588		
System	CPU	RK3588 Quad-core Cortex-A76 + Quad-core Cortex-A55, Max. 2.4GHz
	GPU	ARM Mali-G610 MP4
	NPU	6 TOPS
	Memory	LPDDR4 8GB (Optional: 16GB)
	Storage	eMMC 32GB, up to 128GB M.2 SSD supported (256GB ~ 1TB)
Communication	Ethernet	2 x RJ45, 10/100/1000Mbps Base-T4
	4G/5G	Supported (expansion by an M.2 slot)
	Wi-Fi & Bluetooth	Wi-Fi 802.11 a/b/g/n/ac/ax + BT 5.0
Media	Display	1 x HDMI (4096 x 2160 @60Hz)
I/Os	USB	2 x USB 3.0 Host, Type-A 1 x USB 2.0 Host, Type-A 1 x USB Type-C OTG
	Serial port	2 x RS232/RS422/RS485 on the Phoenix terminal
	Fan	1 x Built-in CPU fan connector
	SIM card slot	1 x SIM card slot
	Micro SD card slot	1 x Micro SD card slot
	RTC	Supported
	Watchdog	Supported
Expansion	M.2 slot	1 x M.2 M-Key 2260/2280, PCIe 3.0 x 4, for SSD 1 x M.2 B-Key 2242/3052, USB3.0/SATA3.0, for 4G/5G/SSD
	GPIO	4 x GPIO on the Phoenix terminal
	CAN	2 x CAN on the Phoenix terminal
System Control	Button	1 x ON/OFF button (long press to reset)
	LED	1 x LED indicator for power and system status
Software	OS	Debian, Android
	Language	English (default), Chinese
	Device management platform	Vantron BlueSphere
Power	Input	1 x Power distribution block 12V/5A, 24V/3A
Mechanical	Dimensions	161.9 mmx 141mm x 45.9mm (enclosure only) 190mm x 141mm x 45.9mm (with brackets)
	Enclosure	Aluminum + metal plate, black
	Weight	750g
	Shock test	IEC 60068-2-27
	Water and dust resistance	IP40
Environment Condition	Temperature	Operating: 0°C~+60°C Storage: -40°C~+85°C
	Humidity	RH 0~95% (non-condensing)
	Certification	FCC, CCC, UL

1.4 Product Layout

1.4.1 Front view



1.4.2 Back view

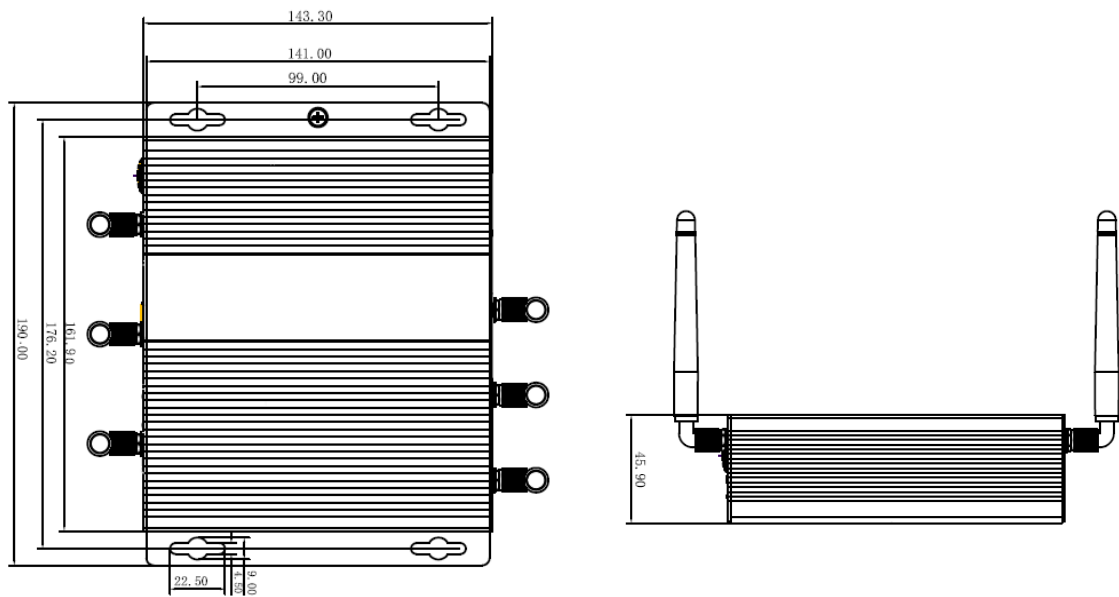


1.5 Operating System

Customers have the option between Debian and Android operating systems before placing an order.

1.6 Mechanical Dimensions

- 161.9mm x 141mm x 45.9mm (Enclosure only)
- 190mm x 141mm x 45.9mm (With installation brackets)



1.7 Power Supply and Consumption

IB0X3588 works with 12V/24V DC power input supplied by a DC connector.

The power consumption of the Device is largely dependent on the RAM, storage capacity, peripherals, and other configurations of the Product.

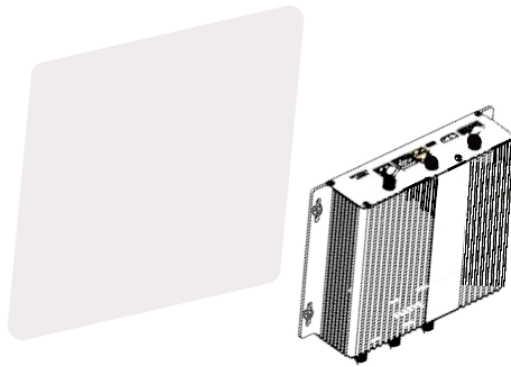
CHAPTER 2

GETTING STARTED

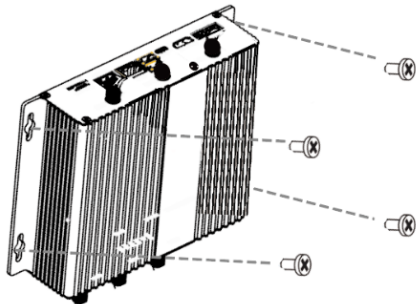
2.1 Hardware Connection

Before you proceed with the configuration of IBOX3588, follow the steps below to finish hardware connection.

1. Position the Device on a desired place, for instance, a wall or a desktop;



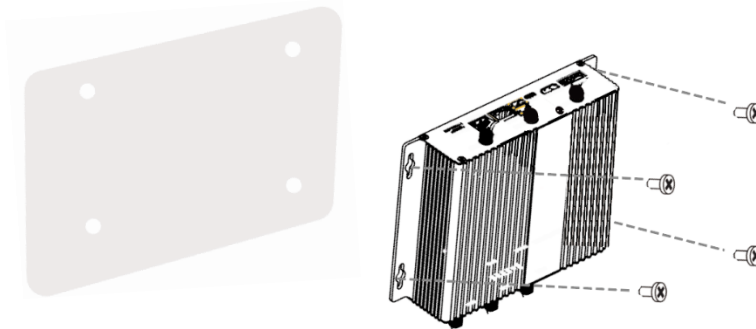
2. Align the screws (M4 x 6 / M4 x 8 recommended) to the screw holes reserved on the mounting bracket, and mark the position of the screws on the wall or the desktop;



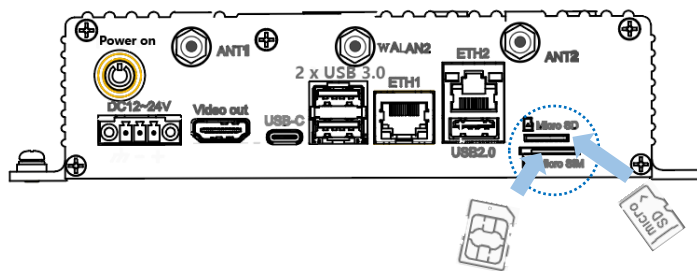
3. Drill four screw holes on the marks made in the prior step;



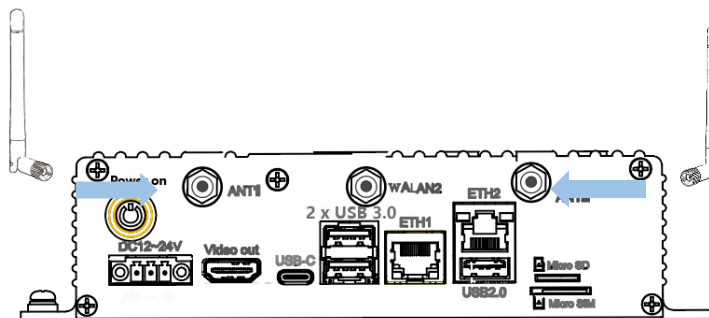
4. Place the Device back and adjust the position of the bracket, if needed, then use a screwdriver to tighten the screws and secure the Device;



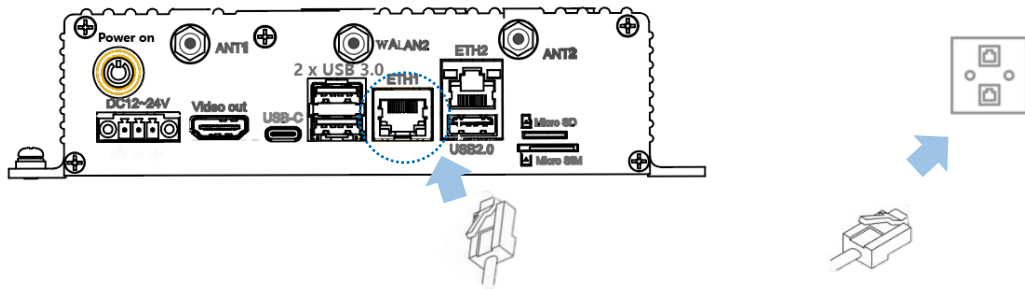
5. Insert an active SIM card into the Micro SIM slot with the gold-colored contacts facing up and insert an SD card into the Micro SD slot with the gold-colored pins facing down;



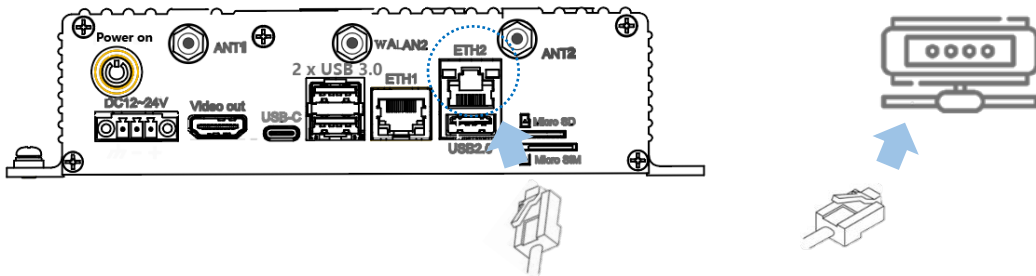
6. Install the antennas to the antenna connectors and tighten the connectors;



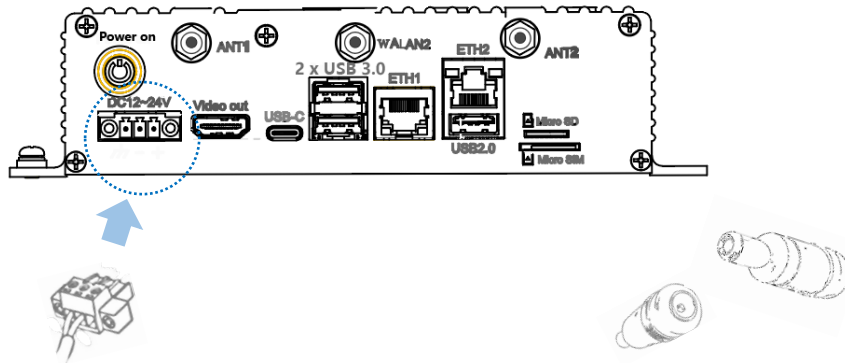
- When necessary, plug one end of an Ethernet cable into the Ethernet jack of IBOX3588 and the other to a live Ethernet port;



- When necessary, connect the other Ethernet jack of the Device with a switch or client device;



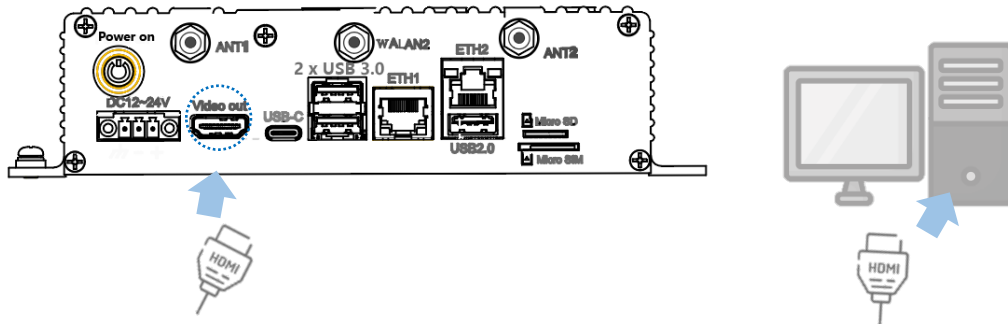
- Connect the female connector plug of the power adapter to the power connector of IBOX3588 and the round end to the adapter;



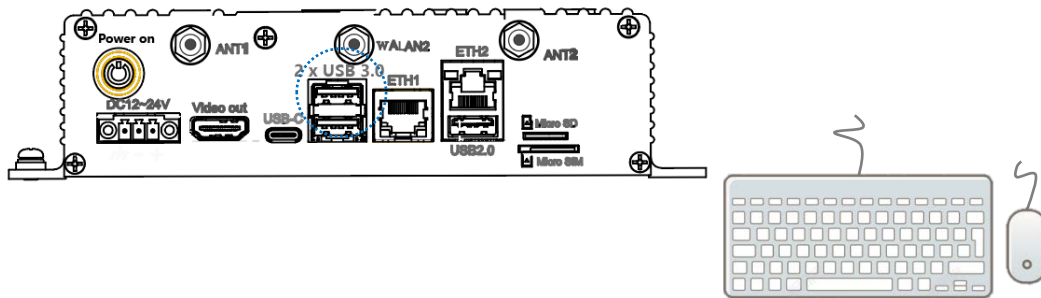
- Plug in the power adapter to power on the Device, and the LED indicator on the power button will turn solid green after power application.

2.2 Connecting a Host Computer

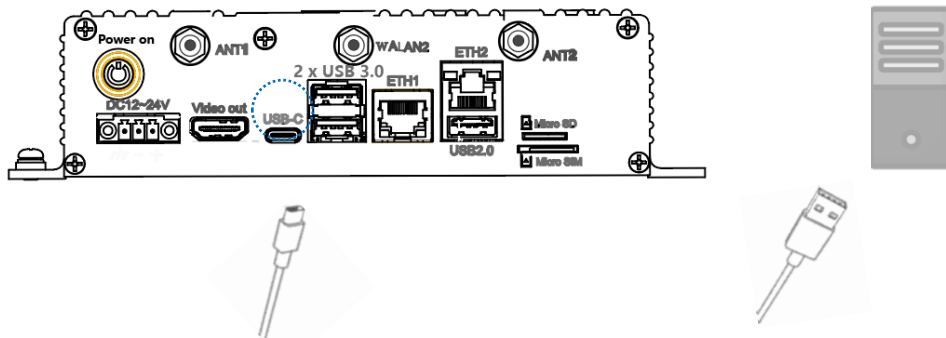
1. Insert one end of a display cable to the HDMI interface and the other end to a host computer;



2. Connect the mouse and keyboard to the USB interfaces on the Device for easier operation;



3. To use the Device as an ADB device, use a USB cable to connect the host computer and the USB Type-C interface on the Device;



► If you connect a touch monitor other than a host computer, remember to use the data cable included in the package of the touch monitor to connect the touch monitor and IBOX3588 to enable touch control.

2.3 Turning on/off the Device

Having set up IBOX3588 according to the aforementioned steps, users can turn on/off the Device following the steps below:

1. Connect the host computer/touch monitor to a power source that conforms to its rating, and turn it on;
2. Connect IBOX3588 to a live electrical outlet that provides 12V/24V voltage;
3. Short press the ON/OFF button and wait a few seconds;
4. The device will launch the operating system selected by the customer.

After IBOX3588 starts up, users can:

1. Press the ON/OFF button once to turn off the display;
2. Press the ON/OFF button and hold for 2 seconds to call the power menu, and click **Power off** to turn off the device orderly;
3. Press the ON/OFF button and hold for about 5 seconds to turn off the device directly;
4. When necessary, unplug the power adapter from the power connector of IBOX3588 or the outlet to force shutdown.

 The actions might vary with the operating system.

2.4 First-time Setup Guide (applicable to Android OS)

Follow the setup wizard to finish the device setup for the first-time use.

1. Choose a system language and click **START** for device setup;
2. Connect the Device to a Wi-Fi network or skip the step and continue without connecting to a network;
3. Set the date and time;
4. Enable **Google services** as needed;
5. Set a PIN code for screen unlock;
6. Customize more system settings from the **Settings** application.

CHAPTER 3

HARDWARE DESCRIPTION

This section briefs on the hardware definition and connector/jumper pinout.

3.1 Power input

IBOX3588 is designed to connect to a 12V/24V DC (12V 4A recommended) power supply with OVP/OCP protection.

Specification of the power connector: 1 x 3-pin, 3.81mm (ANYTEK: OQ-3.81-3P-90D W/F)



Pin 1

Pinout description:

Pin	Signal	Description
1	GND	Ground
2	-VDC	Power input -
3	+VDC	Power input +

3.2 ON/OFF button



Button definition (Android OS):

Action (with power connected)	Description
Short press	Turn on/off the display, if any Turn on the device if it is previously turned off
Press and hold for 1~2 seconds	Open the power menu to power off/restart the device/make an emergency call
Press and hold for 5 seconds	Power off

Button definition (Debian/Ubuntu OS):

Action (with power connected)	Description
Short press	Turn off/wake up the screen
	Log out the account / Restart/shut down/lock the device
Press and hold for 1~2 seconds	Turn on the device
	Log out the account / Restart/shut down/lock the device
Press and hold for 5 seconds	Power off

There is an LED indicator on the ON/OFF button. When the Device is connected to a live power source, the indicator will turn solid green.

3.3 Ethernet jack

IBOX3588 implements two Ethernet jacks.

Specification: RJ45, supporting 10M/100M/1000M Base-T4. Each Ethernet jack has two LED indicators to indicate the link/activity status of the network.

The following is ETH1.



3.4 USB 2.0 + Ethernet jack

The second Ethernet jack is integrated with a USB 2.0 Type-A port (NANSIDA: ZLRJ-010A). The maximum output of the USB port is 5V/0.5A.



3.5 USB 3.0

IBOX3588 offers two USB 3.0 Type-A ports for connecting peripherals. Specification: Max. output 5V/1A; MOLEX: 48406-0003.

3.6 USB Type-C

IBOX3588 offers a USB Type-C port that supports USB 3.0 OTG and DP 1.4 video output.

Specification: Max. output 5V/1.5A; MOLEX: 1054500101.

3.7 HDMI port

IBOX3588 offers an HDMI port (Type-A), supporting HDMI 2.1 protocol with resolution up to 4096 x 2160 @60Hz.

3.8 Micro SD & Micro SIM slots

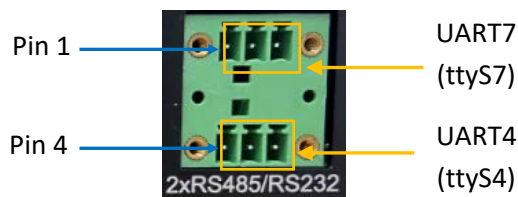
IBOX3588 provides a Micro SD card slot that supports a storage device of up to 128GB.

The SIM card slot (MUP-C792-3) supports SIM card hot plugging. The 4G LTE module is AT&T and Verizon pre-certified, and you may consult your sales executive for the module name before applying a SIM card from the carrier.

3.9 Serial connectors

IBOX3588 implements two RS232/RS485 multiplex connectors on a phoenix terminal and four on-board RS232/RS485 multiplex connectors.

The two multiplex connectors on the phoenix terminal are named as UART4 and UART7, corresponding to nodes /dev/ttyS7 and ttyS4, respectively.



Pinout description of RS232/RS485 connectors:

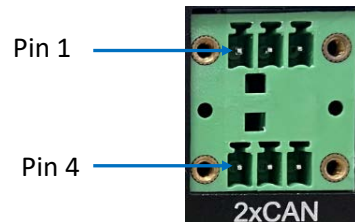
Pin	Signal	Description
1	RS485_A_2/ RS232_TX2	RS485 Bus I/O port, A / RS232 data output
2	RS485_B_2/ RS232_RX2	RS485 Bus I/O port, B / RS232 data input
3	ISO GND	Isolated ground
4	RS485_A_1/ RS232_TX1	RS485 Bus I/O port, A / RS232 data output
5	RS485_B_1/ RS232_RX1	RS485 Bus I/O port, B / RS232 data input
6	ISO GND	Isolated ground

Refer to **4.1** for serial connector function testing.

3.10 CAN

IBOX3588 implements two CAN connectors on a phoenix terminal.

Specification: 2 x 3 x 3.81mm; GOLTEK: 15EGTRHM-3.81-06P-14-00AH



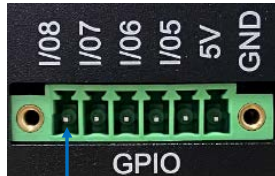
Pinout description:

Pin	Signal	Description
1	CAN0_H	High-level CAN0 bus line
2	CAN0_L	Low-level CAN0 bus line
3	GND	Ground
4	CAN1_H	High-level CAN1 bus line
5	CAN1_L	Low-level CAN1 bus line
6	GND	Ground

3.11 GPIO

IBOX3588 provides 4 GPIOs on a phoenix terminal to allow custom development of the Device.

Specification: 1 x 6 x 3.81mm; JTC: EC501RM-3.81-6P-4



Pin 1

Pinout description:

Pin	Signal	Description
1	GPIO8_5V	GPIO, 5V Level
2	GPIO7_5V	GPIO, 5V Level
3	GPIO6_5V	GPIO, 5V Level
4	GPIO5_5V	GPIO, 5V Level
5	VCC_5V0	5V power output
6	GND	Ground

3.12 M.2 slots

IBOX3588 offers two M.2 slots, including an M.2 M-Key slot (2260/2280) that supports PCIe 3.0 x4 for SSD expansion and an M.2 B-Key slot (2242/3052) that supports SATA 3.0 for SSD expansion or USB 3.0 for 4G/5G module connection.

The slots can be configured before shipment upon request from customers.

3.13 Antenna connectors

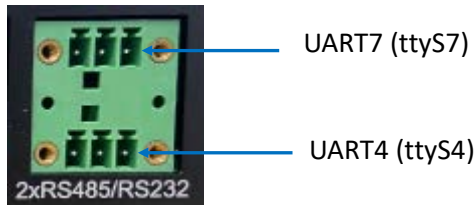
The antenna connectors marked as ANT1, ANT2, ANT3, ANT4 on the enclosure are designed to connect 4G/5G antennas. WLAN1 and WLAN2 antenna connectors are designed to connect Wi-Fi & Bluetooth antennas.

CHAPTER 4

SOFTWARE DEFINITION

4.1 Serial connectors

IBOX3588 offers two RS232/RS485 multiplex connectors on the Phoenix terminal, named as UART4 and UART7, corresponding to node `/dev/ttyS7` and `ttyS4`, respectively.



There are four additional built-in RS232/RS485 multiplexers, corresponding to node `/dev/ttyS8`, `ttyS0`, `ttyS3`, and `ttyS1`, respectively.

To test if the serial connectors function properly, use a USB to serial adapter to connect a serial connector of the Device and the host computer first, then use a serial tool for the serial debugging.

Or, you can short the two serial connectors and use one connector for transmitting data and the other for receiving data.

In the latter case, if the Device is running Debian/Ubuntu system, you can execute the following commands directly in the system terminal and check the execution result without connecting the host PC. If the Device is running Android system, please remember to connect the Device to the host PC and execute the commands on the host. Debian system is used here for illustration.

To test the serial functions, follow the steps below:

1. Short the serial connectors as shown below;



2. Open a terminal and use UART4 to transmit data;

```
# gpioset gpiochip7 4=0
# gpioset gpiochip7 5=1
# echo "Test string" > /dev/ttyS4
```

```
linaro@linaro-alip: ~
File Edit View Search Terminal Help
linaro@linaro-alip:~$ sudo su
bash: warning: setlocale: LC_ALL: cannot change locale (zh_CN.UTF-8): No such fi
le or directory
root@linaro-alip:/home/linaro# gpioset gpiochip7 4=0
root@linaro-alip:/home/linaro# gpioset gpiochip7 5=1
root@linaro-alip:/home/linaro# echo "Test string" > /dev/ttyS4
root@linaro-alip:/home/linaro# echo "Test string" > /dev/ttyS4
root@linaro-alip:/home/linaro#
```

3. Open another terminal and use UART7 to receive data;

```
# gpioset gpiochip7 6=0
# gpioset gpiochip7 7=1
# cat /dev/ttyS7
```

```
linaro@linaro-alip: ~
File Edit View Search Terminal Help
linaro@linaro-alip:~$ sudo su
bash: warning: setlocale: LC_ALL: cannot change locale (zh_CN.UTF-8): No such fi
le or directory
root@linaro-alip:/home/linaro# gpioset gpiochip7 6=0
root@linaro-alip:/home/linaro# gpioset gpiochip7 7=1
root@linaro-alip:/home/linaro# cat /dev/ttyS7

Test string
Test string
```

4. The result will be printed as shown above.

The following is a summary of the commands for the two serial connectors in different modes.

RS232 mode		
UART4	Transmit data	<pre>gpioset gpiochip7 4=0 gpioset gpiochip7 5=1 echo "Test string" > /dev/ttyS4</pre>
	Receive data	<pre>gpioset gpiochip7 4=0 gpioset gpiochip7 5=1 cat /dev/ttyS4</pre>
UART7	Transmit data	<pre>gpioset gpiochip7 6=0 gpioset gpiochip7 7=1 echo "Test string" > /dev/ttyS7</pre>
	Receive data	<pre>gpioset gpiochip7 6=0 gpioset gpiochip7 7=1 cat /dev/ttyS7</pre>

RS485 mode		
UART4	Transmit data	<pre>gpioset gpiochip7 4=1 gpioset gpiochip7 5=0 echo "Test string" > /dev/ttyS4</pre>
	Receive data	<pre>gpioset gpiochip7 4=0 gpioset gpiochip7 5=0 cat /dev/ttyS4</pre>
UART7	Transmit data	<pre>gpioset gpiochip7 6=1 gpioset gpiochip7 7=0 echo "Test string" > /dev/ttyS7</pre>
	Receive data	<pre>gpioset gpiochip7 6=0 gpioset gpiochip7 7=0 cat /dev/ttyS7</pre>

4.2 CAN

The Device implements two CAN bus connectors (CAN0 and CAN1). To test data transmitting and receiving of the connectors, input the following commands on the host PC or Debian terminal to check if the connectors can write and read data:

- CAN0 transmitting/receiving data

```
# ip link set can0 up type can bitrate 125000
# cansend can0 500#1E.10.12.22
# candump can0
```

```
root@linaro-alip:/# ip link set can0 up type can bitrate 125000
root@linaro-alip:/# cansend can0 500#1E.10.12.22
root@linaro-alip:/# candump can0
```

- Check the status of CAN0

```
# ip -details link show can0
```

```
root@linaro-alip:/# ip -details link show can0
2: can0: <NOARP,UP,LOWER_UP,ECHO> mtu 16 qdisc pfifo_fast state UP mode DEFAULT
group default qlen 10
    link/can promiscuity 0 minmtu 0 maxmtu 0
    can state ERROR-PASSIVE (berr-counter tx 0 rx 0) restart-ms 1
        bitrate 125000 sample-point 0.871
        tq 60 prop-seg 57 phase-seg1 57 phase-seg2 17 sjw 1
    rockchip_canfd: tseg1 1..128 tseg2 1..128 sjw 1..128 brp 1..256 brp-i
nc 2
        clock 99000000 numtxqueues 1 numrxqueues 1 gso_max_size 65536 gso_max
_segs 65535
root@linaro-alip:/#
```

- CAN1 transmitting/receiving data

```
# ip link set can1 up type can bitrate 125000
# cansend can1 500#1E.10.12.22
# candump can1
```

- Check the status of CAN1

```
# ip -details link show can1
```

4.3 GPIO

The Device implements four GPIOs. You can set the high/low level of the GPIO pins and use a voltmeter to check if the settings are valid.

Input the following commands on the host PC or Debian/Ubuntu terminal to check the status of the GPIOs:

```
# cat /sys/kernel/debug/gpio
```

```
root@linaro-alip:/# cat /sys/kernel/debug/gpio
gpiochip0: GPIOs 0-31, parent: platform/fd8a0000.gpio, gpio0:
gpio-0 ( |bt_default_wake_host) in hi
gpio-21 ( |bt_default_wake ) out hi
gpio-22 ( |bt_default_reset ) out hi

gpiochip1: GPIOs 32-63, parent: platform/fec20000.gpio, gpio1:
gpio-35 ( |watchdog ) out hi ACTIVE LOW
gpio-40 ( |wp ) out lo ACTIVE LOW
gpio-41 ( |enable ) out lo

gpiochip2: GPIOs 64-95, parent: platform/fec30000.gpio, gpio2:

gpiochip3: GPIOs 96-127, parent: platform/fec40000.gpio, gpio3:
gpio-106 ( |vbus5v0-typec ) out lo
gpio-111 ( |snps,reset ) out hi ACTIVE LOW
gpio-112 ( |sbu1-dc ) out lo
gpio-113 ( |sbu2-dc ) out hi

gpiochip4: GPIOs 128-159, parent: platform/fec50000.gpio, gpio4:
gpio-130 ( |reset ) out hi
gpio-135 ( |enable ) out hi
gpio-143 ( |vcc-3v3-sd-s0 ) out lo ACTIVE LOW
gpio-144 ( |vcc5v0-gl3523-usb3 ) out lo ACTIVE LOW
gpio-145 ( |vcc5v0-gl3523-usb2 ) out lo ACTIVE LOW
gpio-148 ( |bt_default_rts ) out lo
gpio-150 ( |vcc12v-edp ) out hi

gpiochip8: GPIOs 485-492, parent: i2c/2-0022, 2-0022, can sleep:

gpiochip7: GPIOs 493-500, parent: i2c/2-0021, 2-0021, can sleep:
gpio-493 ( |red:system ) out lo
gpio-494 ( |vcc3v3-pcie30 ) out hi

gpiochip6: GPIOs 501-508, parent: i2c/2-0020, 2-0020, can sleep:

gpiochip5: GPIOs 509-511, parent: platform/rk806-pinctrl.0.auto, rk806-gpio, ca
n sleep:
```

The following is a summary of the commands for setting the high/low level of the GPIO pins.

GPIOs		
GPIO5	High level	gpioset gpiochip8 4=1
	Low level	gpioset gpiochip8 4=0
GPIO6	High level	gpioset gpiochip8 5=1
	Low level	gpioset gpiochip8 5=0
GPIO7	High level	gpioset gpiochip8 6=1
	Low level	gpioset gpiochip8 6=0
GPIO8	High level	gpioset gpiochip8 7=1
	Low level	gpioset gpiochip8 7=0

4.4 Watchdog Timer

The watchdog timer is disabled by default. Once enabled, the watchdog timer is supposed to communicate with the system within every 44 seconds (dog feeding). If not, the system will reboot when the watchdog times out, indicating a system or application failure.

1. Write any character except capital V to open the watchdog;

```
# echo A > /dev/watchdog
```

2. Set the Runtime for dog feeding (e.g., 22 seconds) and the interval for system reboot upon an abnormality (e.g., 2 minutes);

```
[Manager]
LogLevel=warning
LogTarget=journal
#LogColor=yes
#LogLocation=no
#DumpCore=yes
#ShowStatus=yes
#CrashChangeVT=no
#CrashShell=no
#CrashReboot=no
#CtrlAltDelBurstAction=reboot-force
#CPUAffinity=1 2
#NUMAPolicy=default
#NUMAMask=
RuntimeWatchdogSec=22s
RebootWatchdogSec=2min
#ShutdownWatchdogSec=10min
#KExecWatchdogSec=0
#WatchdogDevice=
```

3. Disable the watchdog;

```
# echo V > /dev/watchdog
```

4. Users can also enable hardware watchdog in “systemd” and configure it likewise.

```
# /etc/systemd/system.conf
```

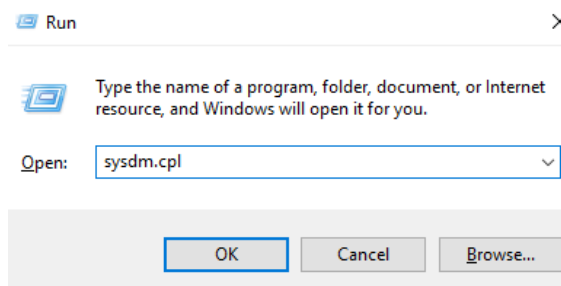
CHAPTER 5

ANDROID SYSTEM MANUAL

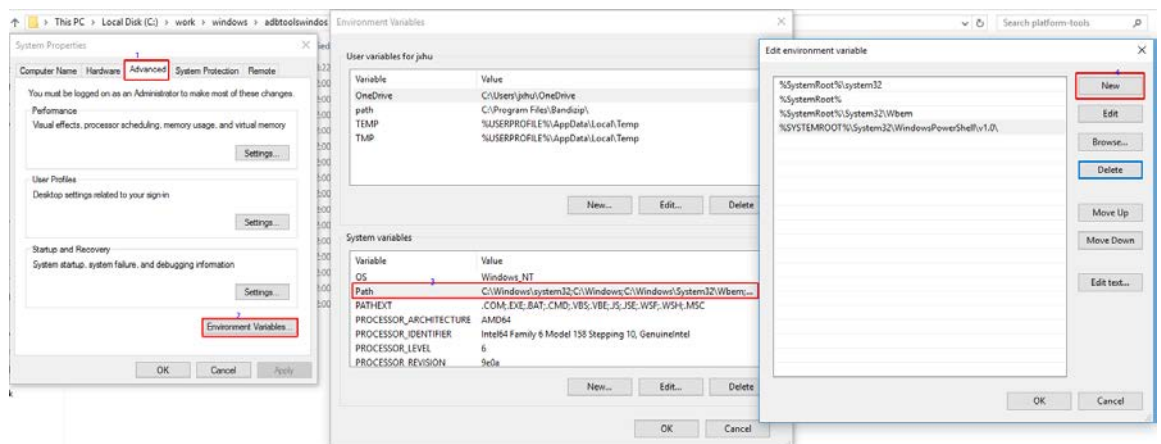
5.1 ADB Setup

Android Debug Bridge (ADB) is a tool that is designed to connect your development workstation directly to your Android device for debugging, device upgrading, app installation, etc.

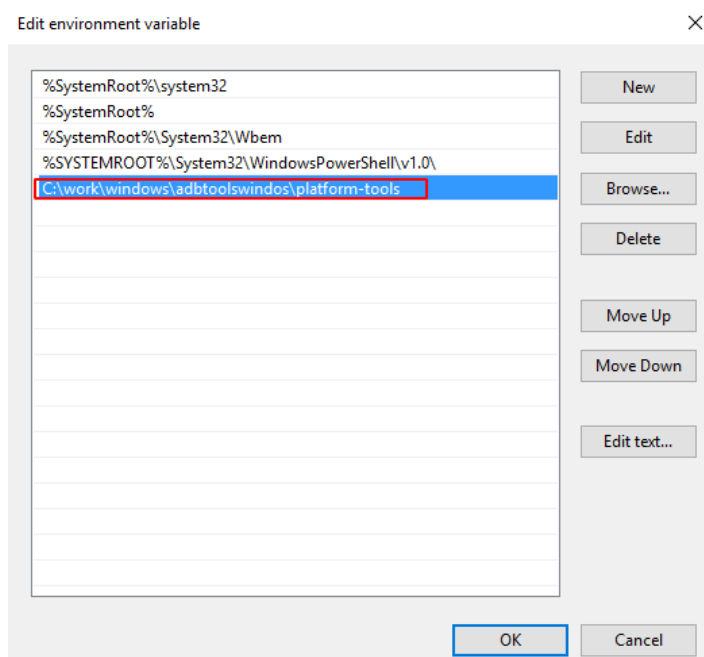
1. Follow the steps in **Section 2.2** to connect the host computer and the Device with the USB cable;
2. Use the cursor and keyboard to navigate to **Settings > About AIV** (the name may vary with the device) > **Build number** of the Device, click the build number consecutively seven times to enable **Developer options**;
3. Go back to **Settings > System > Advanced > Developer options**, and toggle on **USB debugging** on the Device;
4. Open the release package and navigate to the following directory: SW \ adb_fastboot and double click **adb.exe** to run the adb tool, or you can go through steps 5-7 instead of running the adb tool;
5. Press “Win + R” and input “sysdm.cpl” in the dialogue box to open the settings interface;



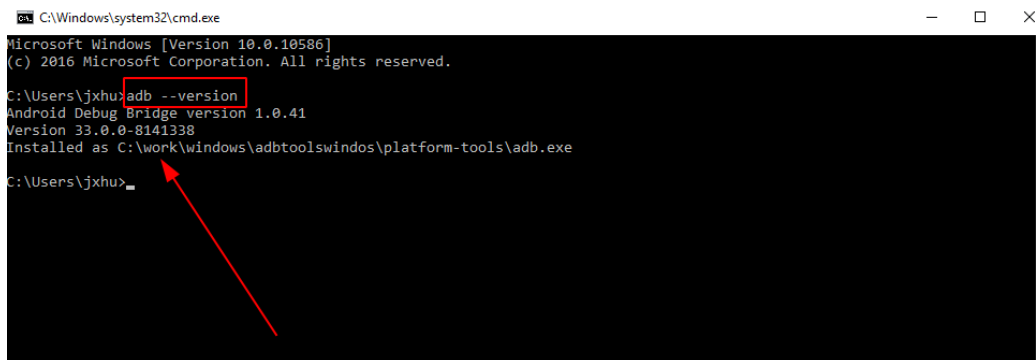
6. Click in sequence **Advanced > Environment Variables > Path > Edit**, and click **New** in the pop-up;



- Copy the path of **adb.exe** as mentioned in step 4, and click **OK** to confirm;



- Press "Win + R" and input "cmd" in the dialogue box;
- Input "adb version" in the command prompt to check if the ADB tool is installed.



5.2 App Installation via ADB Commands

In addition to the standard pre-installed Android applications, users can install their own applications on the Device when it runs Android operating system. All tools to be used for the installation are available in the product release package provided by Vantron.

You can install the apps either in Windows environment or Ubuntu environment, and commands for the installation are the same. Windows environment is used for illustration in the following section.

5.2.1 Prerequisites

- IBOX3588 running Android operating system
- A host computer running Windows 7 or later (Ubuntu 18.04 or later recommended for Ubuntu environment)
- A USB cable (Type-A to Type-C)

5.2.2 App installation

1. Connect the Device and the host computer via the USB cable;
2. Input “adb devices -l” in the command prompt to check if the Device is connected to the host computer;

```
C:\Users\Administrator>adb devices -l
List of devices attached
674cc0aaede7d049    device product:occam model:Nexus_4 device:mako transport_id:1
```


3. When the device information is displayed under the command, the Device is an ADB device and you can copy the serial number (squared as shown above) for the next step;
4. Input the following command line to install the app;

```
adb -s <serial number> install <APP path>
```

5. The installation will be executed after the command line is input and the result of installation will be displayed below;

```
C:\Users\Administrator>adb -s 674cc0aaede7d049 install "C:\Users\Administrator\Desktop\Libraries for developers_v3.83_apkpure.com.apk"
Performing Streamed Install
Success
```

6. The newly installed app will be displayed on the App drawer in the Alphabetic order.

 In step 6 shown above, you can drag the .apk file from the local directory to the command line to replace the <App path> you typed in manually.

5.3 Image Flashing on a Windows Host

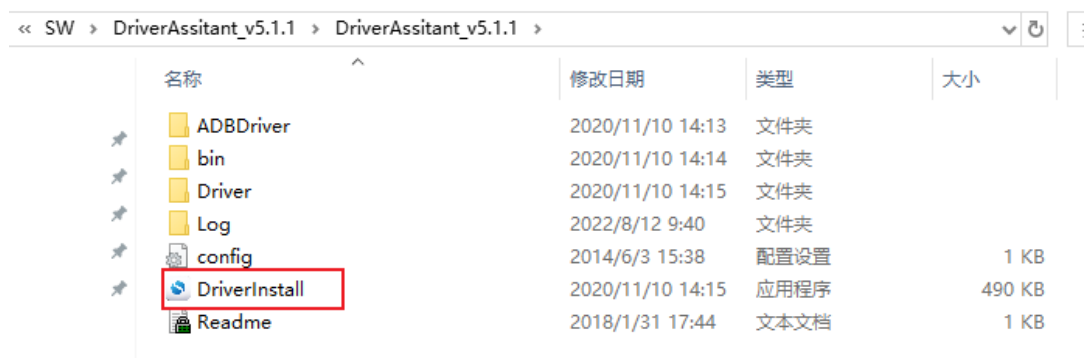
Whenever a new image is available, Vantron will provide a release package consisting of all the tools/files necessary so that you can flash the image as needed.

5.3.1 Prerequisites

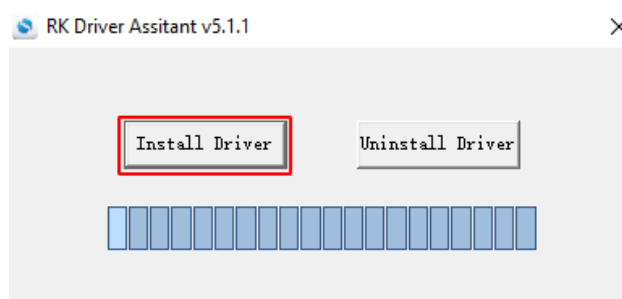
- IBOX3588
- A host computer running Windows 7 or later
- A USB cable (Type-A to Type-C)

5.3.2 Driver installation

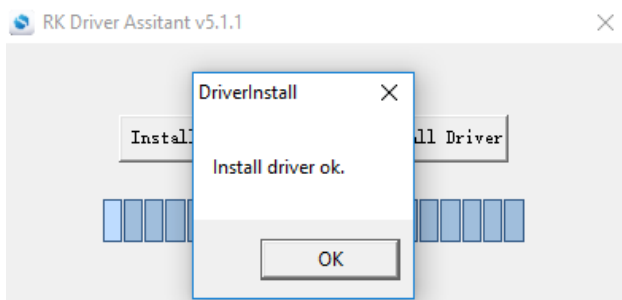
1. Unzip the release package sent from Vantron, and open the folder;
2. Navigate to the following directory: SW \ DriverAssitant_vxxx \ DriverAssitant_vxxx, and locate **DriverInstall.exe**;



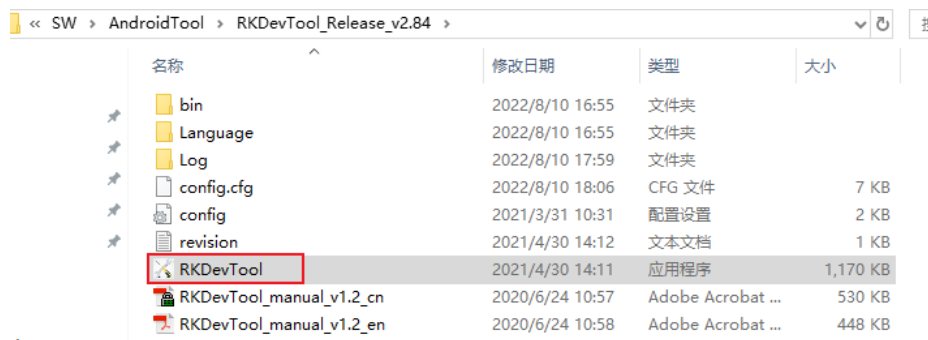
3. Right click the mouse and run the program as administrator;
4. Click **Uninstall Driver** first to remove the previously installed driver, if any, then **Install Driver** and wait;



5. A pop-up will appear in a second suggesting the driver is installed;



6. Return to the SW folder and open **RKDevTool.exe** in the following directory: SW / AndroidTool / RKDevTool_Release_vxxx / RKDevTool to install the **RK Device Tool**;



7. Connect the Device and the host computer via the USB cable. Normally, a message suggesting the existence of an ADB device will show up at the bottom of the tool window in about 10 seconds;
8. Input “adb shell” in the command prompt so that you can execute shell commands on the Device;

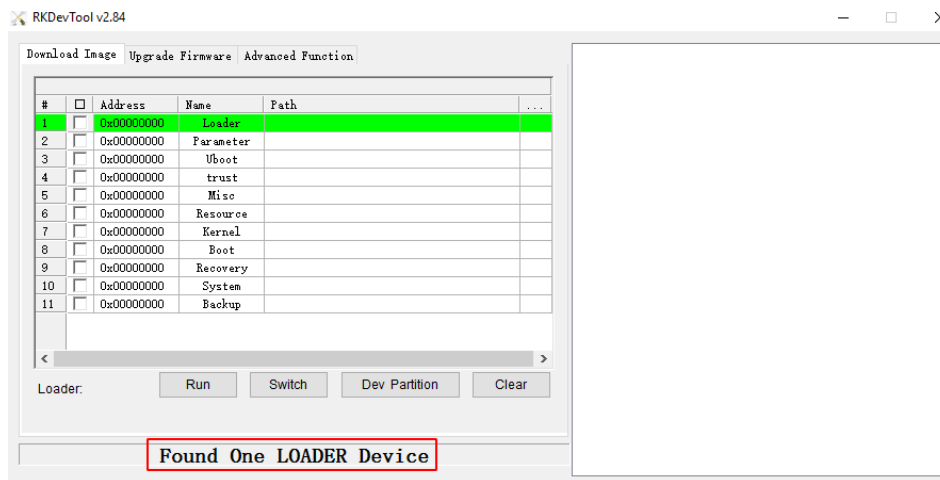
```
C:\Users\Administrator>adb shell
root@linaro-alip:/#
root@linaro-alip:/# ls
bin    home    oem      run      srv      userdata
boot  lib     opt      sbin     sys      usr
data  lost+found  proc    sdcard   system   var
dev   media   rockchip-test  sha256sum README  tmp    vendor
etc   mnt     root     sha256sum.txt  udisk
root@linaro-alip:/#
```

9. Enter “reboot loader” in ADB shell to enter the Loader mode, and the Device will reboot automatically;

```
root@linaro-alip:/# reboot loader
root@linaro-alip:/#
C:\Users\Administrator>
```

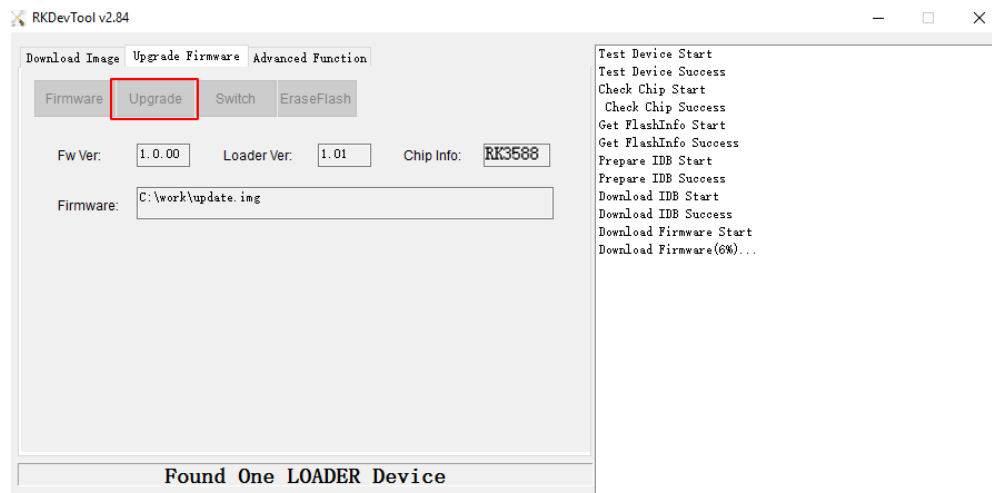
10. Or, you can replace step 8 & 9 with a click of the **SWITCH** button on the RK Device Tool window to enter the Loader mode;

- Go back to RK Device Tool window, and you will see a message suggesting the existence of a loader device at the bottom;



5.3.3 Image Flashing

- Click **Upgrade Firmware** tab in the RK Device Tool window (the second tab at the top of the window) and then **Firmware** button;
- Select **update.img** from the directory: **SW \ Image** and click **Open**, and the details of the firmware will be automatically populated in the firmware information box;
- Click **Upgrade** button (next to **Firmware** button), and the device will start to download the image and upgrade;



- When the upgrade finishes, the Device will reboot automatically.

CHAPTER 6

DEBIAN SYSTEM MANUAL

6.1 About the System

Debian is a Linux distribution and the Device was built by Debian GNU/Linux 11 operating system.

6.1.1 User and password

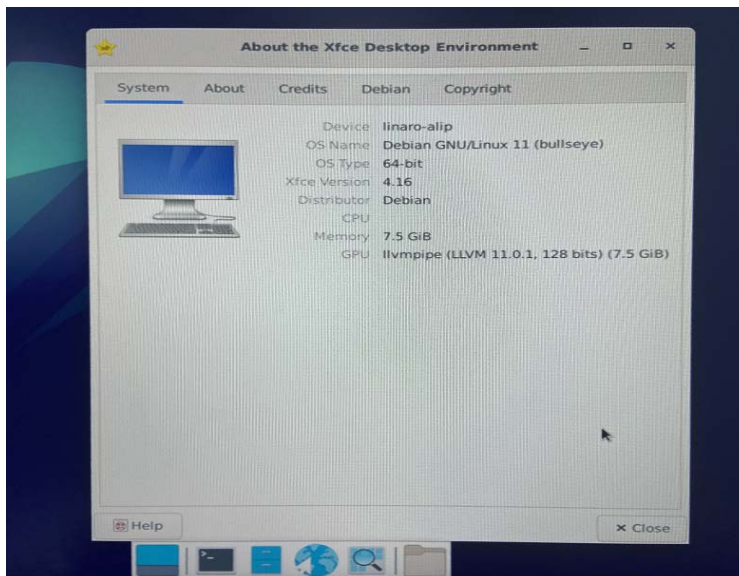
The system will automatically log in to **linaro** as the default user after bootup.

- User: linaro
- Password: linaro

You can use the “sudo su” command to switch to the root user (no password).

6.1.2 System information

1. Connect the Device with a monitor using an HDMI cable, or using an HDMI to VGA adapter if necessary;
2. Power on the Device and the system will log in to linaro as the default user;
3. Right click the mouse in an empty area to open the property dialogue of the Device;
4. Click **Applications > About Xfce** to enter the desktop environment, then you can check the system information like device name, operating system, copyright statement, etc.



6.2 System Settings

By clicking on **linaro** on the top right corner of the screen, you can

- Lock the screen;
- Switch the user;
- Shut down/suspend the Device;
- (Upon a click of the “Log out” option) Log out/restart/shut down/suspend the Device or switch the user while saving the session for future logins.

The menu bar on the top of the screen allows the user to:

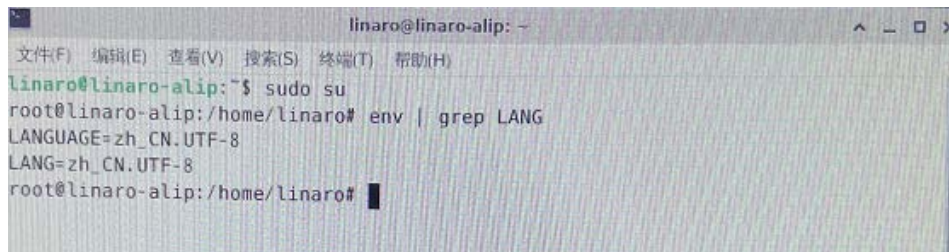
- Change the brightness and power settings of the Device;
- Adjust the system volume and sound settings;
- Add the Device to a Wi-Fi network and pair it with a Bluetooth device;
- Switch between different workspaces.

Other system settings are accessible from **Applications** on the top left corner of the screen or upon a right click of the mouse in an empty area of the screen.

6.2.1 Language setup

1. Open the Terminal from the bottom of the desktop and input “sudo su” to switch to the root mode;
2. Run the following command to check the language currently used by the system (the system uses zh_CN.UTF-8 as the default locale);

```
# env | grep LANG
```



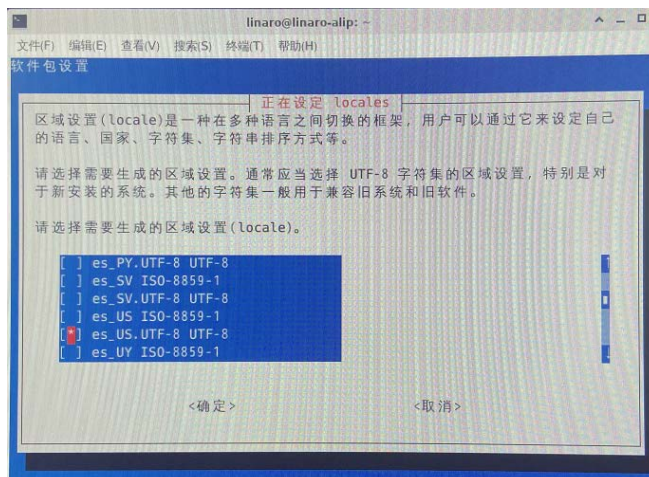
3. Run the following command to call the locale configuration page ([en_US.UTF-8](#) refers to the locale for the target language that you wish to switch to);

```
# export LANG=en_US.UTF-8
```

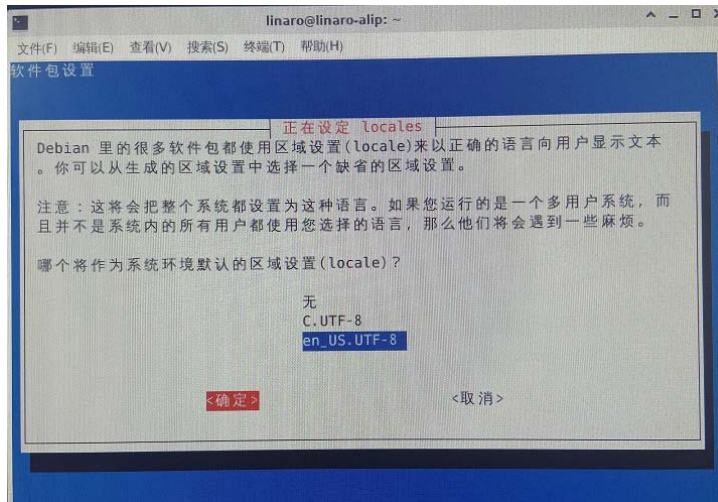
4. Use the following command to re-configure the locales;

```
# dpkg-reconfigure locales
```

5. Use the up and down arrows on the keyboard to move to the target locale, press “Space” in front of the target locale ([en_US.UTF-8](#) for instance) to select the language, and press “Space” in front of the current locale (zh_CN.UTF-8) to uncheck the current language, then press “Tab” to move the cursor to the left option (Yes) and “Enter” to confirm your choice;



6. Use the up and down arrows to select the locale from the list that you wish to use as the default locale for the system, then press “Tab” to move the cursor to the left option (Yes) and “Enter” to confirm your choice;



7. Wait a few seconds for the locale to take effect;

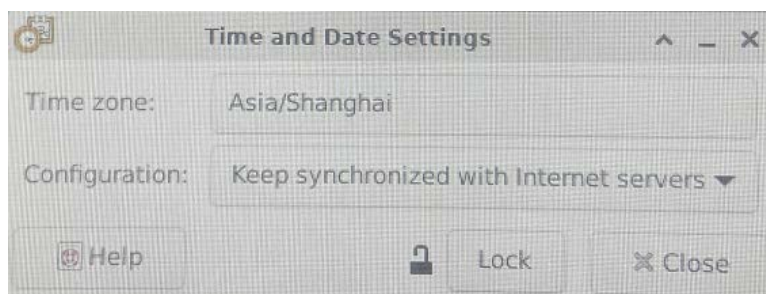
```
linaro@linaro-alip: ~
文件(F) 编辑(E) 查看(V) 搜索(S) 终端(T) 帮助(H)
linaro@linaro-alip:~$ sudo su
root@linaro-alip:/home/linaro# env | grep LANG
LANGUAGE=zh_CN.UTF-8
LANG=zh_CN.UTF-8
root@linaro-alip:/home/linaro# export LANG=en_US.UTF-8
root@linaro-alip:/home/linaro# dpkg-reconfigure locales
Generating locales (this might take a while)...
  en_US.UTF-8... done
Generation complete.
root@linaro-alip:/home/linaro#
```

8. Input “reboot” to restart the system and use “locale -a” to check if the locale is set as default.

6.2.2 Time and date setup

To change the system time and date, click **Applications** on the top left corner of the screen or right click the mouse in an empty area of the screen to call the menu:

1. Click **System > Time and Date** to open the Time and Date setup page;
2. Click **Unlock** and enter the password (linaro) before editing;
3. Click Time zone and select your own time zone from the list;
4. Choose to synchronize the time with the Internet server or fill in the time manually;



5. Click **Lock** to let the settings take effect.

6.2.3 Network Configuration

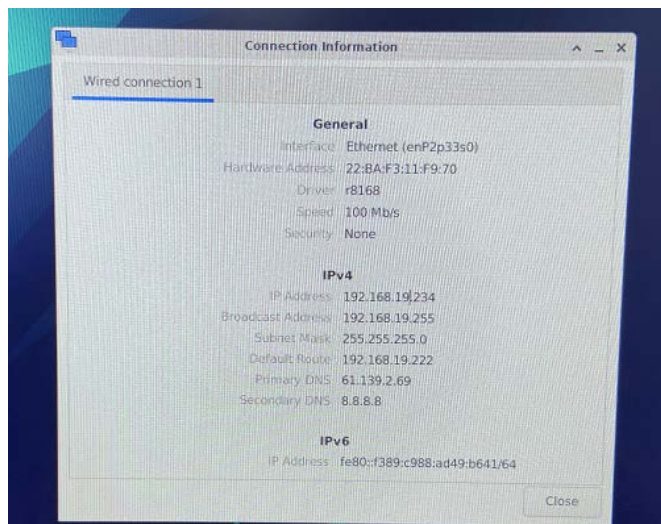
The Device is configured to have Internet access once it connects to a live Ethernet or joins to a Wi-Fi network.

Make sure you have installed the Wi-Fi antennas before connecting to an existing wireless network.

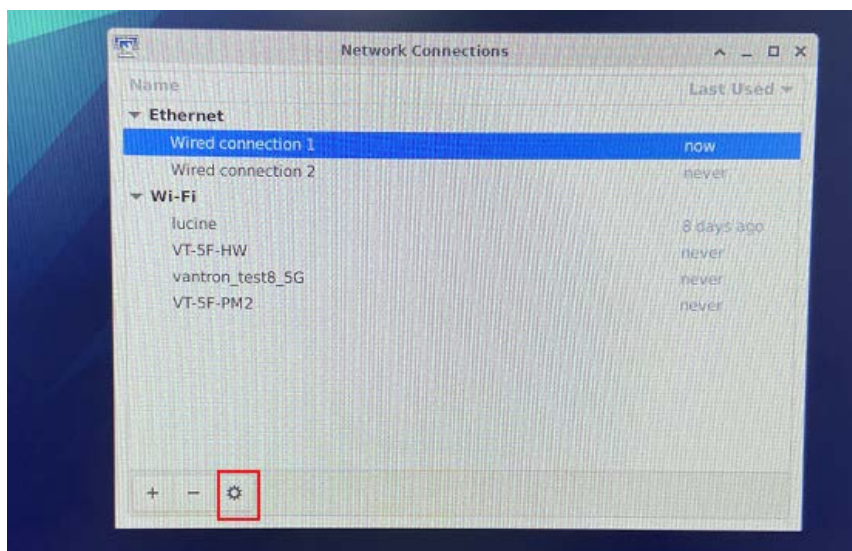
1. To join to a Wi-Fi network, click the network icon (dual-host/Wi-Fi icon) on the menu bar and search for the target network in the list;



2. To check the current network connection, you can move the cursor to the network icon, and right click the mouse to select **Connection Information**:



3. To edit the network configurations, you can right click the network icon and select **Edit Connections**, then select a connection point and click the cog icon to edit the network settings.



6.3 Image Flashing on an Ubuntu Host

6.3.1 Prerequisites

- IBOX3588
- An Ubuntu host (Ubuntu 18.04 or later recommended)
- A USB cable (Type-A to Type-C)

6.3.2 Image flashing

1. Connect the Device with the host computer via the USB cable;
2. Open the Terminal and input the following command line to install ADB tool;

```
$ sudo apt-get install adb -y
```

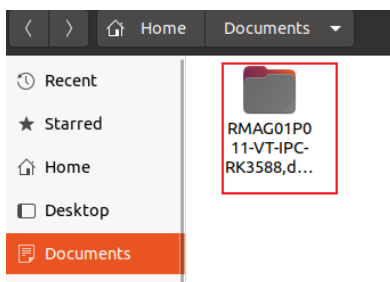
3. Check if the Device is connected to the Ubuntu host via ADB;

```
$ adb devices -l
```

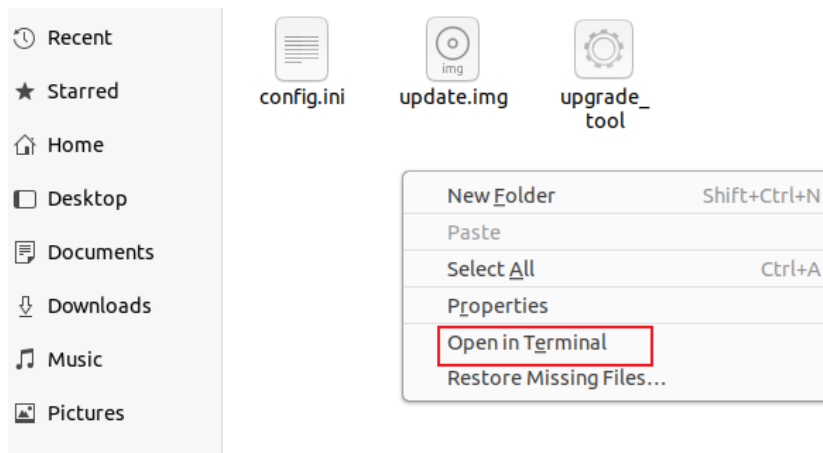
4. Run “adb shell” to execute shell commands on the Device;
5. Enter “reboot loader”, and the Device will reboot automatically and enter the loader mode;

```
e@ubuntu:~$ adb shell
root@linaro-alip:/# reboot loader
root@linaro-alip:/# e@ubuntu:~$
```

6. Copy the image package provided by Vantron to the Ubuntu host (for instance, in the Documents folder);



- Unzip the package and open the **img** folder, right click the mouse in an empty area and click **Open in Terminal** to execute the subsequent commands in the new Terminal;



- Input the following command line in the Terminal to download the upgrade image;

```
sudo ./upgrade_tool uf update.img
```

- Input the password to download the system image;

```
root@ubuntu:~/Documents/RMAG01P011-VT-IPC-RK3588,debian,V1.0.0,2022-08-01/img
$
sudo ./upgrade_tool uf update.img
[sudo] password for root:
Using /home/root/Documents/RMAG01P011-VT-IPC-RK3588,debian,V1.0.0,2022-08-01/
img/config.ini
Program Log will save in the /root/upgrade_tool/log/
Loading firmware...
Support Type:RK3588      FW Ver:1.0.00   FW Time:2022-07-30 16:22:22
Loader ver:1.0b Loader Time:2022-07-30 16:02:36
Download Image Total(5829691K),Current(2798535K)
```

- The system will start upgrading once the download finishes, and the Device will reboot automatically when the upgrade finishes.

```
Program Log will save in the /root/upgrade_tool/log/
Loading firmware...
Support Type:RK3588      FW Ver:1.0.00   FW Time:2022-07-30 16:22:22
Loader ver:1.0b Loader Time:2022-07-30 16:02:36
Upgrade firmware ok.
```

CHAPTER 7

UBUNTU SYSTEM MANUAL

7.1 About the System

Ubuntu is a Linux distribution and the Device is running Ubuntu 20.04.LTS.


7.1.1 User and password

Users need to login to the system after system boot.

- User name: vantron
- Password: 123456

You can use the “sudo su” command to switch to the root user (password: 123456).

7.1.2 System information

1. Connect the Device with a monitor using an HDMI cable, or using an HDMI to VGA adapter if necessary;
2. Power on the Device and input the password to login the default user (“vantron”);
Password: 123456
3. Click the **Show Applications** icon  on the bottom left corner to access the system applications;
4. Click **Settings > About** to check more information about the device system.

7.2 System Settings

Upon a click of **Show Applications**, users can click or search a single application for specific use, or modify system settings in **Settings** application.

7.2.1 Language setup

Users may set the display language and language format after accessing **Settings > Region & Language**. With the use of **Language Support**, users can also install/remove input languages. All the modifications will take effect after system reboot.

Commands for language settings are same as those in 6.2.1.

7.2.2 Date & time setup

To change the system date and time, click **Setting > Date & Time** to open the setup page:

1. Click **Unlock** and enter the password (123456) before editing;
2. Toggle on **Automatic Date & Time** to keep the device time with the Internet, or toggle off the option and input the date and time manually;
3. Select/search the target time zone and set the time format;
4. Click **Lock** at the top of the interface to save the settings;
5. Exit and await the settings to take effect.

7.2.3 Network/Wi-Fi

The Device is configured to have Internet access once it connects to a live Ethernet or joins to a Wi-Fi network. Users can add a VPN network in **Settings > Network** interface.

Make sure you have installed the Wi-Fi antennas before connecting to an existing wireless network.

You can input the following command to check the information of the network interface: `ip link show`.

7.2.4 User

Users will be able to edit the system account and add/delete a user after inputting the password and unlocking the current user.

7.3 Image Flashing on an Ubuntu Host

7.3.1 Prerequisites

- IBOX3588
- An Ubuntu host (Ubuntu 18.04 or later recommended)
- A USB cable (Type-A to Type-C)

7.3.2 Image flashing

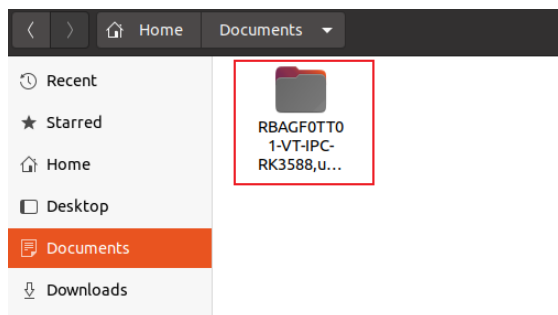
1. Connect the Device with the host computer via the USB cable;
2. Open the Terminal and input the following command line to install ADB tool;

```
$ sudo apt-get install adb -y
```

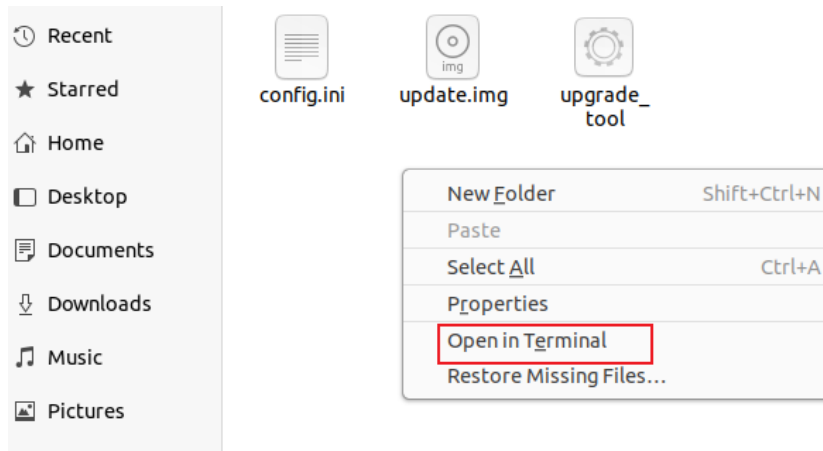
3. Check if the Device is connected to the Ubuntu host via ADB;

```
$ adb devices -l
```

4. Run “adb shell” to execute shell commands on the Device;
5. Enter “reboot loader”, and the Device will reboot automatically and enter the loader mode;
6. Copy the image package provided by Vantron to the Ubuntu host (for instance, in the Documents folder);



- Unzip the package and open the **img** folder, right click the mouse in an empty area and click **Open in Terminal** to execute the subsequent commands in the new Terminal;



- Input the following command line in the Terminal to download the upgrade image;

```
sudo ./upgrade_tool uf update.img
```
- Input the sudo password to download the system image;
- The system will start upgrading once the download finishes, and the Device will reboot automatically when the upgrade finishes.

7.4 ROS Tutorials

Please refer to <http://wiki.ros.org/ROS/Tutorials> for the details of the ROS system.

CHAPTER 8

DISPOSAL AND WARRANTY

8.1 Disposal

When the device comes to end of life, you are suggested to properly dispose of the device for the sake of the environment and safety.

Before you dispose of the device, please back up your data and erase it from the device.

It is recommended that the device is disassembled prior to disposal in conformity with local regulations. Please ensure that the abandoned batteries are disposed of according to local regulations on waste disposal. Do not throw batteries into fire or put in common waste canister as they are explosive. Products or product packages labeled with the sign of “explosive” should not be disposed of like household waste but delivered to specialized electrical & electronic waste recycling/disposal center.

Proper disposal of this sort of waste helps avoid harm and adverse effect upon surroundings and people’s health. Please contact local organizations or recycling/disposal center for more recycling/disposal methods of related products.

8.2 Warranty

Product warranty

VANTRON warrants to its CUSTOMER that the Product manufactured by VANTRON, or its subcontractors will conform strictly to the mutually agreed specifications and be free from defects in workmanship and materials (except that which is furnished by the CUSTOMER) upon shipment from VANTRON. VANTRON's obligation under this warranty is limited to replacing or repairing at its option of the Product which shall, within **24 months** after shipment, effective from invoice date, be returned to VANTRON's factory with transportation fee paid by the CUSTOMER and which shall, after examination, be disclosed to VANTRON's reasonable satisfaction to be thus defective. VANTRON shall bear the transportation fee for the shipment of the Product to the CUSTOMER.

Out-of-Warranty Repair

VANTRON will furnish the repair services for the Product which are out-of-warranty at VANTRON's then-prevailing rates for such services. At customer's request, VANTRON will provide components to the CUSTOMER for non-warranty repair. VANTRON will provide this service as long as the components are available in the market; and the CUSTOMER is requested to place a purchase order up front. Parts repaired will have an extended warranty of 3 months.

Returned Products

Any Product found to be defective and covered under warranty pursuant to Clause above, shall be returned to VANTRON only upon the CUSTOMER's receipt of and with reference to a VANTRON supplied Returned Materials Authorization (RMA) number. VANTRON shall supply a RMA, when required within three (3) working days of request by the CUSTOMER. VANTRON shall submit a new invoice to the CUSTOMER upon shipping of the returned products to the CUSTOMER. Prior to the return of any products by the CUSTOMER due to rejection or warranty defect, the CUSTOMER shall afford VANTRON the opportunity to inspect such products at the CUSTOMER's location and no Product so inspected shall be returned to VANTRON unless the cause for the rejection or defect is determined to be the responsibility of VANTRON. VANTRON shall in turn provide the CUSTOMER turnaround shipment on defective Product within **fourteen (14) working days** upon its receipt at VANTRON. If such turnaround cannot be provided by VANTRON due to causes beyond the control of VANTRON. VANTRON shall document such instances and notify the CUSTOMER immediately.

Appendix Regulatory Compliance Statement

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of 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.

Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate this equipment.