

Major Boards Descriptions

Android board - PCBA-CAP-CA03AN-RK39

The Android board is used for running our Cart App. We need to have a strong enough processor to make the experience fantastic. In addition, it runs some core machine learning algorithms to identify the product.

Android Board Specs

Input power	Battery (15V~21V) or 24±1V
SoC	Rockchip RK3399
OS	Android 10
ROM/RAM	LPDDR4 4GB + eMMC 32GB
SoC power	PMIC RK809
LCD	10.1" TFT 1920*1200 LVDS
HDMI tx	HDMI 2.0 type-A
Touchpanel	10.1" 5 dot Capacitive touch screen, IIC interface
Communication with cart	Ethernet (local) with AI subsystem CAN (local) WIFI (Internet) 4G LTE (Internet)
Cellular module	Quectel EC25AFXDGR-128-SGAS (Version:08/06/2020)
Cellular chipset	Qualcomm MDM9207
SIM card	eSIM on board/Nano sim socket for debug
Cellular module band support	FDD-LTE : Band 2/4/5/12/13/14/66/71 WCDMA : Band 2/4/5
LTE category	Cat4
Antenna of communication	4G main antenna*1

	4G diversity antenna*1 WIFI antenna*2+BT antenna*1
WIFI	AP6275S 802.11a/b/g/n/ac/ax
Bluetooth	AP6275S BT5.1
ETernet PHY	RTL8211
CAN	MCP2515+TCAN1044
Audio PA	3W class-D single ch
Barcode scanner	USB2.0 interface
Produce Camera	USB2.0/2.0MP/FOV
Stock Camera	USB2.0/2.0MP/FOV 110°
Speaker	4Ω/3W
POS	USB 2.0
Hardware version	GPIO*4

AI board

The AI board is a computing power board. It empowers Cart's computer vision function, all the CV algorithm and calculate is happened here.

AI Board Specs

Input power	Battery (15V~21V) or 24±1V
GPU	NVIDIA® Xavier AGX
ROM/RAM	eMMC 32GB on carrier board/LPDDR4x 32GB + eMMC 32GB in AGX module
Communication with cart	1000M Ethernet (local) with Android subsystem
Industry Camera	6.3M/mono/60fps*4
Camera Interface-1	USB type C in AI carrier board
Camera Interface-2	MIPI CSI 16 lane
MIPI interface	Board edge connector
MIPI Deserializer	V-By-1
Hardware version	GPIO*4

The Powerboard is used to control the battery, ADC of load cell and the power logic for all the electric parts of the cart. These are 2 major sensor data we need on it. The battery level is calculated on the MCU on the bottom board. A high-accuracy ADC is used to give us very accurate weight readings. The ADC is also controlled by MCU via SPI interface. All the other electric parts will be accessed via CAN interface.

Power Board Specs

Input power	Battery (15V~21V) or 24±1V 8A AC-DC adapter
MCU	STM32
Power topology	Support AC/Battery path management
Communication with cart	CAN with cart ; IIC with Battery
Hardware version	GPIO*4 or ADC
Wheel lock motor	Support lock and unlock status determination of lock pin

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Manufacturing

Weighing Instruments Quality Control

Testing weighing instruments.

Along with the hardware peripheral's functional test, the integrity and quality of the Caper Smartcart weighing instrument are tested thoroughly, designed to make sure the load cell is functional in reference to the software logic.

1. Calibration
2. Shift test
 - a. Using a 25kg weight to test 4 corners of the basket. If it fails at 1 corner, we will adjust until the reading at all the corners passes the test.
3. Increasing-decreasing load test
 - a. After passing the shift test, we will run an increasing-decreasing load test.
4. Protection screw installed for all the carts
5. We will put 40kg into the cart and use a screw to make sure the deformation of the load cell will not exceed 35kg.
6. Monthly testing
 - a. To make sure our testing result is reliable, we calibrate and test weight every month.

1. Temperature chamber
2. The minimum-maximum temperature at which the Smartcart is tested must be certified is operating at 30° Celsius
 - a. The lowest and highest temperature at which the Smartcart is tested is -10° to 40° Celsius
3. Humidity Devices are tested at 50%, 85%, and 90%
4. Immunity to electromagnetism
5. Immunity to electrostatic discharge
6. Immunity to radio signals

FCC & IC Statement:

FCC Statement:

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.

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

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Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses 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.

FCC 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 and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The equipment is limited to OEM installation only

The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install equipment

The user manual for LE-LAN devices shall contain instructions related to the restrictions mentioned in the above sections, namely that:

- i. the device for operation in the band 5150 – 5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

ISED Statement:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est

This equipment complies with Canada 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.

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

The user manual for LE-LAN devices shall contain instructions related to the restrictions mentioned in the above sections, namely that:

- i. the device for operation in the band 5150 – 5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and
- iv. where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.
- i. les dispositifs fonctionnant dans la bande de 5150 à 5 250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux⁴;

ADC

Analog digital converter

MCU

Microcontroller

UART

Universal asynchronous receiver-transmitter

SPI

Serial Peripheral Interface