V50A User Manual

1. Overview

1.1. Introduction

The Smart Central Controller V50A mainly consists of 4G module EC25 and STM32. The function of EC25 is communication with background system and STM32 is charge of data collection. They communicate each other by means of CAN-bus.

1.2. User Scope

The ECU is applicable to NIU e-bicycle.

2. Mechanical properties
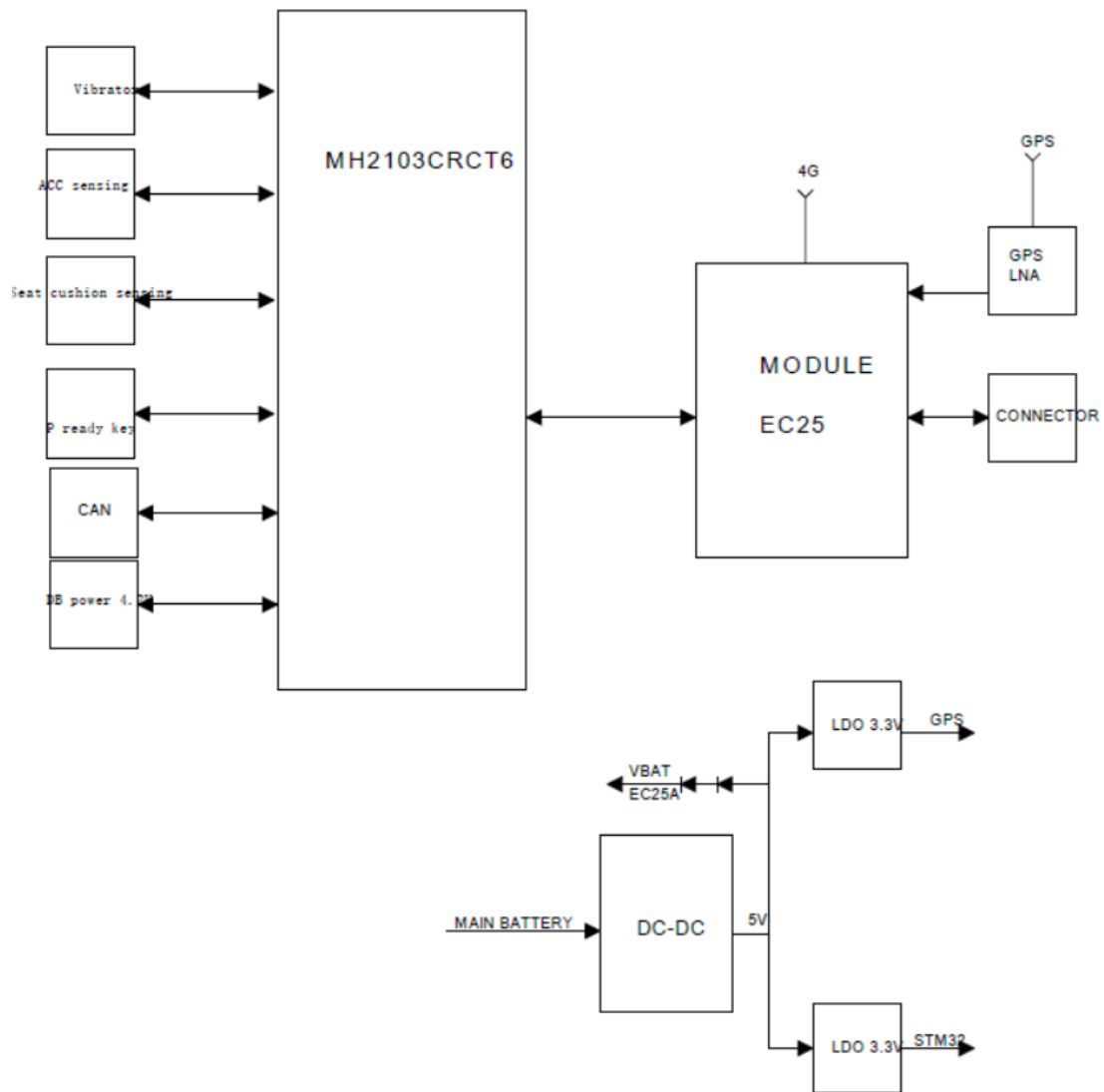
   2.1. Mechanical Parameter

      2.1.1. Shell material：White ABS

      2.1.2. PCB thickness： 1.2mm

      2.1.3. Type of fixing screw： black, cross recessed self-tapping screw

3. Electrical Characteristics

   3.1. Diagram

3.1.1. Power

Item	Typical	Range	Remark
Voltage	48V	36-100V	
Current	100mA	<300mA	

3.1.1.1. CAN BUS Circuit

3.1.2. Battery block

3.1.2.1. Charge Circuit

3.1.2.2. Parameter

Item	Parameter
Rated volume	2200mAh
Type	18650
Rated voltage	3.7V
Charge cut-off voltage	4.2V
Discharge cut-off voltage	3V
Max charge current	200mA

Continued discharge current	600mA

3.1.2.3. Charge

Item	Parameter
Input voltage	5V
Input current	200mA
Trickle charge current	50mA
Constant charge current	200mA
Constant charge voltage	4.2V
Protected temperature	0℃-45℃

3.2. Module Parameter

3.2.1. GPS Module

1. Band GPS/GLONASS/BeiDou/Galileo
2. Rated Voltage 3.3V
3. Impedance 50Ω
4. Fix Time
   a) Cold start 40s
   b) Hot start 5s

3.2.2. 4G Module

5.

Module	LTE	WCDMA
EC25	FDD: B2/B4/B12	B2/B4/B5

4. Features

4.1. Function Description

The ECU is the host on the vehicle, including CAN communication module, 4G communication module, GPS positioning module, ACC detection module, small battery charging module, power supply module, power management module, which can realize GPS positioning, and Network communication between servers, charge and discharge management of small batteries in the central control, vehicle attitude, acceleration detection and vehicle power management.

4.2. Functional Overview

4.2.1. Interact with cloud server through 4G module

Receive remote cloud commands, Collect vehicle data, and send some or all of the data to the cloud when the event is triggered.

4.2.2. Remote Control Vehicle

The APP can control the central locking, unlocking, arming, disarming, starting, shutting down, car searching, alarming, etc. through the cloud remote command.

4.2.3. GPS Position

The ECU can be positioned through the GPS module, and obtain and upload the latitude and longitude, time, heading, positioning error, satellite data data.

4.2.4. Vehicle data transmission

The ECU can control the 4G module to transmit vehicle data to the remote server through the 4G network.

4.2.5. Transaction alarm

The ECU monitors the status of the vehicle in real-time in the parking state, and uploads the data in time when it is detected that the vehicle has fallen or moved.

4.2.6. Robbery data verification

The ECU can upload the serial number of BMS, motor controller, central control and SIM card when the electric door is opened. The server side matches the uploaded serial number with the robbery serial number. Send a car lock order.

4.2.7. Battery removal report

When the main battery is removed, the ECU uploads the battery removal

information.

4.2.8. Main battery sleep

When the main battery is powered off, the ECU enters a low-power mode, controls the GPS, 4G module, and single-chip microcomputer to sleep to achieve the longest standby time.

4.2.9. A-GPS

Automatically download ephemeris data to achieves in a few seconds.

4.2.10. CAN offline upgrade

Through H2 equipment, offline upgrade.

4.2.11. FOTA

Over-the-air upgrade through differential packages. Achieve faster upgrade speed.

4.2.12. Set upload template remotely

The server can arbitrarily define the rules for uploading data in the central control.

4.2.13. Update any data remotely

The server can remotely update any data in the central control data table.

5. Status and Task Descriptions

5.1. Detailed status and description

Vehicle Status			Descriptions	4G Module	GPS	CAN
Poweron			Motor controller serial number and central control verification	Upload vehicle serial number information (MEI, telephone number, motor controller serial number, BMS serial number, central control serial number)	Turn on	Communicate with the motor controller, query the serial number of the motor controller once every 100ms, check with the CRC algorithm after success, enter the main program after success, communicate with the BMS and motor controller, and obtain data.
Driving			Real-time query data, display instrument	Upload location information to the server every 5s and vehicle information every 60s	Turn on	Communicate with a device every 100ms (a total of 300ms is required for the instrument, motor controller, and BMS
Power off			After shutting down through the faucet lock, the central control will save the mileage and report the status.	Upload vehicle status data	Turn on 90s before sending data, then turn off	Save mileage, clear the status bits of BMS and motor controller (see protocol for details)
parking	With Battery	parking	Real-time monitoring, reporting vehicle status and location	When not sending data, the 4G module enters low power consumption mode and exits low power consumption mode each time data is sent. Turn on the first 4h, then upload location information every 5min, and upload vehicle information every 15min.	Turn on	It communicates with the BMS every 5 minutes in the first 2 hours, and every 15 minutes thereafter.
		Alarming	When proactively alarming, upload data quickly.	Upload location information every 6s	Turn on	
		Transaction	Anti-theft / reminder (when the electric door lock is closed, the central control is moved or dumped)	When dumping, the data is continuously uploaded 5 times every 15 minutes. When moving, it is detected that the data is uploaded once.	Turn on	

Remove the battery	Sleep	Lowest power consumption operation, guarantee the longest running time	Upload location information every 15min, then close	Turn on 60s after wake up, then turn off	Module off

5.2. Data upload frequency

Vehicle Status	Send Frequency	GPS switch
ACC ON	GPS data: 5 seconds, system data: 10 seconds	Keep on
ACC OFF	GPS data: 600 seconds, system data: 1200 seconds	Close after the data upload is completed, open the GPS 120s before uploading the data
Transaction alarm status	GPS data: 3 seconds, system data: none	Keep on
Alarm state	Alarm status changes, upload immediately, then 3 seconds	Turn on the GPS when you touch the alarm. After the alarm is over, restore the previous time setting
Pull out the battery alarm	GPS data 900 seconds; system data: none	After the central control wakes up, turn on for 60 seconds

5.3. Communication protocol

5.3.1 In-vehicle CAN-bus communication protocol see, "Maverick Electric Communication Protocol", "Controller Command Table", "BMS Communication Protocol", "Instrument Communication Protocol"

5.3.2 For the network communication protocol, please refer to "Definition of Central Control Data Exchange"

5.4. Light effect description

	Blue Light	Green Light	Blue and green light always on
Always on	Do not connect to the Internet	Positing Failure	Do not have SIM card
Always off	No such status	GPS closed	
Flash fast	No configuration file written (high priority)		100ms on，1s off
Flash slow	Build internet	Positing success	100ms on，3s off

6. Performance requirement

6.1. Humidity

It can work normally when the relative humidity does not exceed 100%. The central control unit should work safely when the surface temperature is lower than the dew point, even if condensation occurs on the surface.

6.2. Salt spray

Meet the relevant regulations in GB / T2423.17.

6.3. Fixed frequency vibration and sweep frequency vibration

Fix the central control unit on the vibration test platform, and perform the vibration test according to the conditions specified in the table below. During the test, there shall be no loose or damaged parts. The performance is intact after the test.

Frequency sweep range（Hz）	Double amplitude （mm）	Frequency sweep	Period（min）
10~25	1.5	16	45

6.4. Waterproof and dustproof

When raining or high-pressure water washing, the construction, installation and ventilation of the central control unit shall ensure that it will not be damaged. The central control unit shall meet the protection level requirements of IP54 products in GB / T 4942.2.

6.5. Temperature insulation resistance

In the dry environment, the insulation resistance of the central control unit is not less than 20MΩ.

6.6. Constant damp heat

The central control unit should be able to withstand a constant humid heat test

at 40 ℃± 2 ℃, a relative humidity of 90% to 95% and a duration of 4 days. The appearance should be free of obvious corrosion and spots, the functions of the central control unit should be normal, the insulation resistance should not be less than 1 MΩ, and should comply with the provisions of e, f of this chapter.

6.7. Electrostatic discharge immunity

The table shall comply with the Class B classification specified in GB / T 17626.2.

6.8. Electromagnetic compatibility

Meet GB / T18655-2002, GB / T17619-1998.

Attention

Hereby, NIU declares that Smart Central Controller V50A is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

In accordance with Article 10(2) and Article 10(10), this product allowed to be used in all EU member states.

Use the V50A in the environment with the proper temperature.

Run the danger of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

FCC Caution

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

(2) This device must accept any interference received, including interference that may cause undesired operation.

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

FCC RF Radiation Exposure Statement: This equipment complies with FCC RF Radiation exposure limits set forth for an uncontrolled environment. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.

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.

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