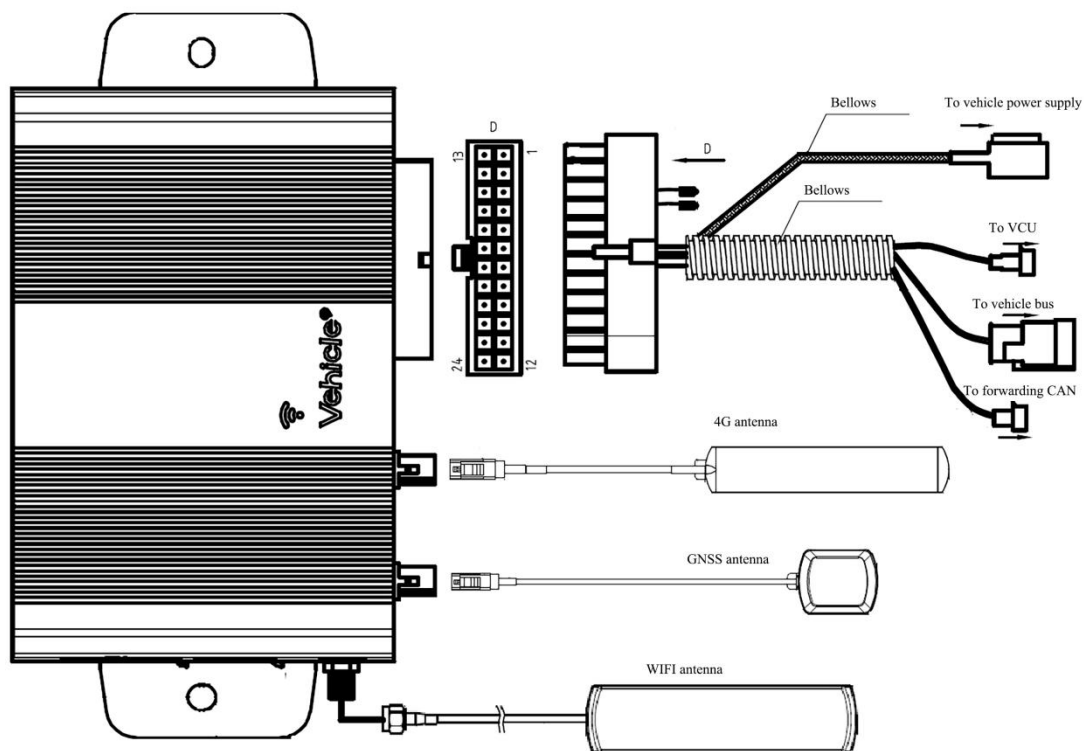


Description and Repair Manual of Vehicle + Monitoring Host

Vehicle + monitoring host (icard) integrates wireless communication module, data storage module, satellite positioning module and data acquisition interface; it can function vehicle data acquisition, operation data recording, fault reporting and driving track recording. It can cooperate with different platforms to form a set of vehicle operation management and safety management solutions with customized and upgradeable functions. The solutions can realize comprehensive monitoring of vehicles and effectively ensure the safe, efficient and standardized operation of vehicles.

1. Introduction to vehicle + monitoring host

1.1 Appearance diagram and product interface definition of vehicle + monitoring host (icard1 and iCard1S)

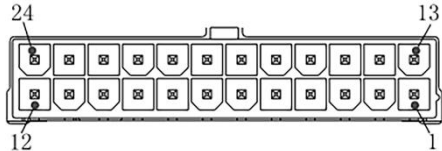


With supporting antenna and wiring harness:

S/N	Annex name	Material pictures
1	Additional wiring harness (iCard 1)	
2	Additional wiring harness (iCard1S)	

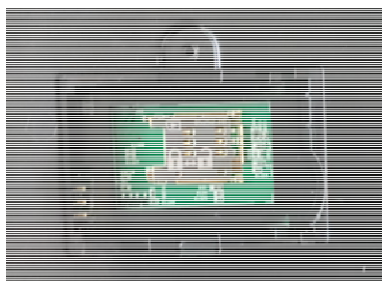
3	Additional wiring harness (iCard 1S2.0)	
4	Communication antenna (3G)	
5	Communication antenna (4G)	
6	GPS antenna (side outgoing line)	
7	GPS antenna (bottom outgoing line)	

24-pin external plug-in definition

 Peer end model: 5557HP-24P Model of terminal block: MOLEX 874272402					
S/N	Description	Definition description	S/N	Description	Definition description
D12	Reserved	Reserved IO port;	D24	Reserved	Reserved IO port;
D11	Reserved	Reserved IO port;	D23	CAN2 120ohm	CAN2 bus (to VCU)
D10	Speed pulse signal	VSS vehicle speed detection	D22	CAN2H	

D9	Reserved	Reserved IO port;	D21	CAN2L	
D8	Reserved	Reserved IO port;	D20	Reserved	Reserved IO port;
D7	CAN3 120ohm	CAN3 bus (to forwarding CAN)	D19	Reserved	Reserved IO port;
D6	CAN3H		D18	Reserved	Reserved IO port;
D5	CAN2L		D17	Reserved	Reserved IO port;
D4	Reserved	Reserved IO port;	D16	CAN1 120ohm	CAN1 bus (to vehicle bus)
D3	Charging power supply	Vehicle charging power supply 12/24V input	D15	CAN1H	
D2	ACC	Ignition signal (wake-up signal)	D14	CAN1L	
D1	Vehicle power supply+	Main power supply 12/24V input	D13	Vehicle power supply -	GND

SIM card port (iCard1 and iCard1S)

iCard1	iCard1S
	

SIM card port (iCard1S2.0)

Pin	Interface name	Functional description	Remarks
1	SIM	Metal upward, notch inward; SIM card stopper with 3M adhesive; This interface is not used for terminals with eSIM cards	
2	Reset button	Reset button hole	
3	Silica gel protection	Silica gel protective cover (dustproof)	

USB Interface

Pin	Interface name	Functional description	Remarks
1	USB_5V	5v power supply	 MINI USB interface
2	USB_D-	Data pin	
3	USB_D+	Data pin	
4	GND	Ground	

Red and green indicators

Pin	Interface name	Functional description	Remarks
1	Red-green indicator	Normal operation: The bi-color light flashes 4 times and stops for 1 second, flashing circularly;	The situation should be noted

Product Description and Repair Manual of IOV Terminal

		1st flashing: green-positioned, red-not positioned; 2nd flashing: green-normal CAN communication, red-abnormal; 3rd flashing: green-registered network, red-unregistered network; 4th flashing: green-connected to cloud platform, red-not connected to cloud platform; Device failure: The two-color light is not on, and the red light flashes slowly	when one color light of the two-color light is damaged.
--	--	--	---

RS232 interface 1

Function	Pin	Definition	Remarks
Communicate with the host through the co-processor, write the co-processor program, and access the data acquisition terminal or sensor.	1	+5V	
	2	TX	
	3	RX	
	4	GND	

RS232 interface 2

Function	Pin	Definition	Remarks
Debugging software interface	1	GND	
	2	RX	
	3	TX	

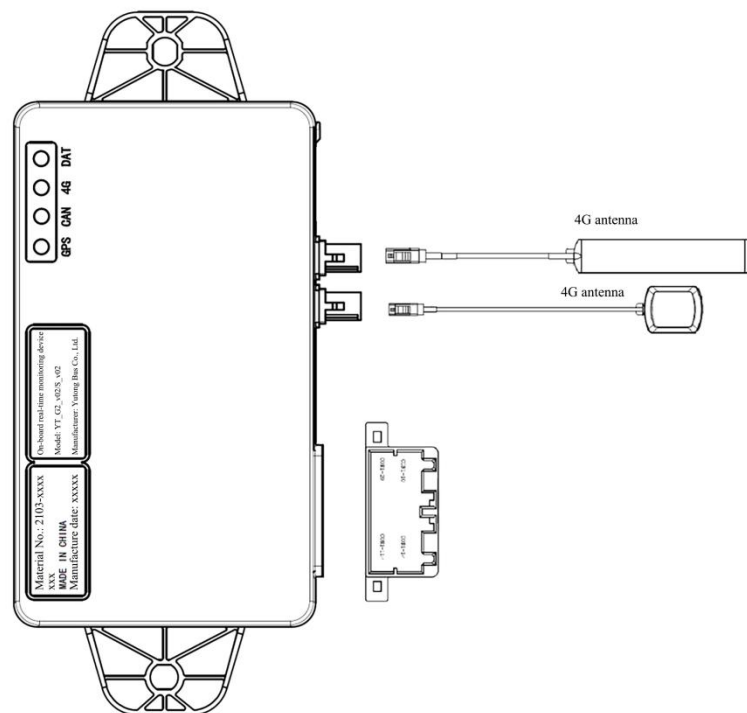
485 interface

Circuit	Pin	Definition	Color	Remarks
485 reserved cable	1	RS485_B	White	 AMP282088-1
	2	RS485_A	Blue	
	3	RS485_GND	Black	
	4	Power supply +12V	Red	

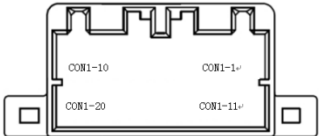
Audio output interface

Circuit	Pin	Definition	Specification	Remarks
Audio reserved cable	1	Hands-free speaker +	3.5 mm stereo audio jack	
	2	Hands-free speaker -		

1.2 Appearance diagram and product interface definition of vehicle + monitoring host (iCard1S 3.0)



20-pin external plug-in definition

			AMP 175975-2		
S/N	Description	Definition description	S/N	Description	Definition description
CON1-1	Reserved	Ethernet +	CON1-11	Reserved	Ethernet-
CON1-2	12/24V power supply	Wake-up	CON1-12	RS232-TX	RS232 sending data
CON1-3	GND	RS232 GND	CON1-13	RS232-RX	RS232 receiving data
CON1-4	CAN1 120ohm	To vehicle CAN (if terminal resistance is required, short-circuit CAN1 120ohm with CAN1L)	CON1-14	CAN3 120ohm	Reserved (if terminal resistance is required, short-circuit CAN3 120ohm with CAN3L)
CON1-5	CAN1H		CON1-15	CAN3H	
CON1-6	CAN1L		CON1-16	CAN3L	
CON1-7	BMS power supply+	BMS power supply	CON1-17	CAN2 120ohm	Reserved for OTA (if terminal resistance is required, short-circuit CAN2 120ohm with
CON1-8	Charging power supply	Vehicle charging power supply 12/24V input	CON1-18	CAN2H	

	+				CAN2L)
CON1-9	ACC signal	Ignition signal (wake-up signal)	CON1-19	CAN2L	
CON1-10	Vehicle power supply+	Main power supply 12/24V input	CON1-20	Vehicle power supply -	GND

SIM card and USB debugging interface

SIM card interface			Remarks
1	SIM	Metal upward, notch inward; SIM card stopper with 3M adhesive; This interface is not used for terminals with eSIM cards	 USB Type-C interface
2	Reset button	Reset button hole	
3	Silica gel protection	Silica gel protective cover (dustproof)	
Description of USB Interface			
1	USB_5V	5v power supply	
2	USB_D-	Data pin	
3	USB_D+	Data pin	
4	GND	Ground	

Indicator

Sign	Color	Description of indications	Remarks
GPS	Blue	ON: GPS positioned; FLASH: GPS not positioned	GPS status
CAN	Red	ON: normal data receiving; FLASH: abnormal data receiving	CAN bus state
4G	Green	ON: normal network connection; FLASH: network connection failed	Communication status
DATA	Yellow	ON: normal data transmission; FLASH: data transmission failure	Data transmission status

1.3 Vehicle + technical parameters

- Operating voltage: nominal voltage 24V/12V, normal operating voltage 9V~36V
- Operating temperature: iCard1 and iCard1S: -30°C – +70°C; iCard1S3.0: -40°C – +85°C
- Overall dimensions: iCard1 and iCard1S: 150mm*100mm*32mm;
iCard1S3.0: 190mm*94mm*34mm;
- Communication mode: iCard1: WCMA, 3G; iCard1S: 4G;
- Installation mode: vertical installation

1.4 Vehicle + monitoring host state indicator

The iCard1 and iCard1S indicators detect the four states of GPS positioning, CAN communication, SIM card reading and successful networking. The indicators are indicated in the form of flash codes, with four as a group. Abnormal status is red and normal status is green.

① After the terminal is powered on, it enters the initialization state by default. At this time, the red light flashes: The light will be on for 2 seconds and off for 1 second, flashing circularly;

② After the initialization is completed, stop the red light flashing, and display the status of four key functions with a group of four combined light states: GPS positioning status, CAN bus connection status, communication network connection status (whether the SIM card has been identified and connected to the communication network base station), registration status. The red light indicates that the status is abnormal, and the green light indicates that the status is normal. Each group has 4 light states, the pause time between two light states is 0.25s, and each light state lasts for 0.25s; one group pauses for 0.75s after display.

③ If the terminal is normal, the light state of the terminal will be green-green-green-green combined flashing state.

The iCard1S3.0 indicators are blue, red, green and yellow, corresponding to GPS status, CAN communication status, networking status and data communication status respectively. When the status is normal, the indicators stay ON; when the status is abnormal, the indicators flash.

① The terminal enters the initialization state by default after being powered on. At this time, 4 indicators flash at a frequency of 2 seconds until the function is ready;

② After the initialization is completed, the function state is ready, and the indicator stays ON. The indicator corresponding to any function failure flashes, and other indicators are not affected.

2. Vehicle + new energy monitoring host maintenance

2.1 Remove vehicle + monitoring host

Vehicle + monitoring host: When used as a new energy monitoring host, it is mainly installed in the air duct above the driver's head, at the last access hole of left air duct, or in the electrical cabinet behind the driver.

The removal operation is as follows:

Step 1: Power off the vehicle and unplug the 24-core power supply cable, GPS antenna and 3G/4G antenna at the lower part of the device.

Step 2: Remove the self-tapping screws at both ends of the device with a cross head screwdriver/socket wrench, and remove the device from the mounting rack.

2.2 Replace SIM card inside the device

Vehicle + monitoring host is equipped with a SIM card. If it needs to be replaced, please follow the steps below.

Replacement steps of SIM cards for iCard1 and iCard1S:

Step 1: Place the device on a platform, open the back battery cover plate with a cross head screwdriver, and pull out the lithium battery to see the SIM card slot.

Step 2: Push the card slot horizontally in its opening direction, turn over the cover plate of the card slot and take out the SIM card.

Step 3: Record the number of SIM card in the installation device

Step 4: Open the battery cover on the back of the device with a cross head screwdriver, and install the SIM card into the slot to ensure that the SIM card slot cover plate is fastened without looseness.

Step 5: Press the lithium battery in the packaging bag into the battery slot, add a cover plate and fix it

Step 6: Record "vehicle VIN, on-board terminal number, phone number of the telephone card, license plate number and other information", and record the phone number in the vehicle nameplate during pre-installation.



Step 7: Connect the debugging software to adjust and register the internal information of the device.

SIM card replacement steps for iCard1S2.0 and iCard1S3.0 (except eSIM cards):

Step 1: Find the SIM card port. The SIM card ports of iCard1S2.0 and iCard1S3.0 are in the side rubber plugs and sealed with shutters.

Step 2: Open the shutter of the SIM card and push it inward. The SIM card will automatically pop up a little, and then pull out the SIM card.

Step 3: After replacing the new SIM card, reseal the SIM card with a shutter and install the rubber plug back.

2.3. Place the antenna

The satellite positioning antenna is mainly used to receive the vehicle positioning information fed back by the satellite, including longitude, latitude, speed, altitude and direction. It is generally placed on the top of the vehicle or on the front instrument panel of the vehicle to ensure that the number of satellites received by the satellite

positioning antenna is normal. It is forbidden to place the positioning antenna in a closed metal bin.

The data communication antenna is mainly used for device data networking communication enhancement, and the communication antenna can be pasted on the terminal surface.

2.4 Confirm the working state of vehicle + device

Vehicle + monitoring host mainly uses the device working indicator to indicate the working status of the device. The specific steps are as follows:

Step 1: Power on the vehicle, and observe the indicators on the front of the device. The indicators of iCard1 and iCard1S work in green or the four indicators of iCard1S3.0 stay ON. All functions are normal.

Step 2: As soon as the device is powered on, the indicator starts to flash at a frequency of 1S. At this time, the device is in the startup state. After 30s, the device startup is completed. At this time, the indicator flashes four times as a group for detection, and the device fault is judged according to the order of red flashing.

Step 3: If the first flash is red, it indicates that GPS cannot be positioned. Please check the GPS antenna (blue plug-in) and replace it.

Step 4: If the second flash is red, it indicates a CAN bus fault. Please check the ON-OFF state of the ignition key first. If it is ON and the indicator is still not red, please check the connection state of the CAN bus near the device for looseness.

Step 5: If the third flash is red, it indicates a network communication status fault. The causes include that the SIM card is not installed or loosely installed, resulting in the device's failure to identify the SIM card, network failure due to SIM card arrearage, and no network signal at the vehicle location. Please remove the device and check the installation status of SIM card or whether the SIM card is in arrears.

Step 6: If the fourth flash is red, it indicates that the device fails to connect with the monitoring platform. The causes include no registration information in the device, no maintenance of platform information, and inconsistency between device

and platform information. Firstly, log in to the platform or check whether the terminal vehicle information (VIN, SIM card number, terminal ID) is consistent. If it remains unsolved, please prepare a laptop to correct the registration information with debugging software.

iCard1S3.0 has 4 indicators. The fault is judged according to the function definition and handled with reference to the fault handling method of iCard1.

2.5 View and adjust the internal information of vehicle + device

Vehicle + device has no interactive interface such as a keypad screen, and requires a laptop, debugging cable (material number 9302-61123), USB-to-RS232 interface cable (iCard1S3.0 with USB Type-C cable) and vehicle + debugging



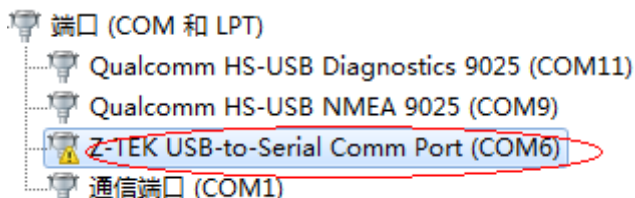
iCardSetupTool.rar
software.



Download address of debugging software:

The specific operation steps are as follows:

Step 1: The laptop has USB read and write permissions, and Driver Genius is installed to install the USB driver of the USB-to-RS232 interface cable. In the Device Manager of My Computer, if the port line shows the following identification without yellow identification, it means that the USB driver is successfully installed.



Step 2: Connect the laptop with USB-to-RS232 interface and debugging cable, and connect the debugging cable interface with vehicle + device to realize reading and writing of internal information of the device.



Step 3: Open the debugging software , and log in with user name and password. User name: develop; Password: develop



The screenshot shows a Java Swing window titled "User Login". The window has a light blue background and a standard Windows-style title bar with a red close button. Inside the window, there are two text input fields. The first field is labeled "User Name" and contains the text "develop". The second field is labeled "Password" and contains masked text represented by seven asterisks "*****". Below these fields, there are two buttons: "Login" and "Exit". The "Login" button is a light blue button with a thin blue border, and the "Exit" button is a light gray button with a thin gray border.

Step 4: The software interface is as shown in the figure below. Select the communication port and open the serial port. If the software prompts "Equipment has been connected!", the debugging interface communication is normal. Click "Read Parameters" to view the internal information of the equipment, and manually enter the information and save the parameters.

Production Testing Tool V2.3.8194 (Device: iCard1s User Name: guoliu)

COM COM22 Close Conn Status: Equipment has been connected! Result: Read the parameter successfully! About

RegisterCancel Function Proper Key Parameters Update Parameters Setting 国六参数设置 ReConfig SwitchUser

Production Serial
2209080-QKYY * (For example: 16P233A-0001)

Terminal parameter
Tel 41075649474 * Terminal ID VTXXQD1 *

Vehicle
Plate Color None * Speed Source CAN-Engine *
Plate No 豫AYXQD2 * Pulse Coefficient 12800 *
VIN 11111111111VTXXQD1 * Factory Mileage 0 km
Vehicle Status Information
Speed 0 Km/h Mileage 0 Km

Server And Network
Server
Platform New energy Vt platform
Platform Name: New energy Vt platform

Main IP cpxny.sxsc.cn * TCP Overtime 10
IP Port 20000 * TCP Retransmission Times 3
Auxiliary IP cpxny.sxsc.cn UDP Overtime 5
UDP Port 20000 UDP Retransmission Times 3
Interval 60

SIM
☒ Public APN
Private APN: User Name MCC
hostname 460 *
APN Name Password MNC
UNIM2CM.NJUM2MAPN * 123456 08 *

Read Parameters Save Parameters Restore Factory Settings

The Remote Address Of The Registered File
URL
Read Address Write Address

Register Cancel Forcible Cancellation

View Authentication Code

GPS not located 4G connected SIM connected Intensity: -88 CAN1 not connect CAN2 not connect CAN3 not connect Time 6/18/2024 5:50:31 PM
Print check

2.6 Debug the vehicle + monitoring host debugging software

After successfully logging in to the "vehicle + monitoring host debugging software", you can use the device to change your mobile phone number, vehicle information and platform server address. The specific methods are as follows:

Step 1: Select the communication port, click "Open Serial Port" status to display "Connected", and check whether the device status at the bottom of the page is normal (GPS positioned, 3G/4G connected, SIM connected, network signal intensity, etc.). When the lower status prompts normal, it is green.

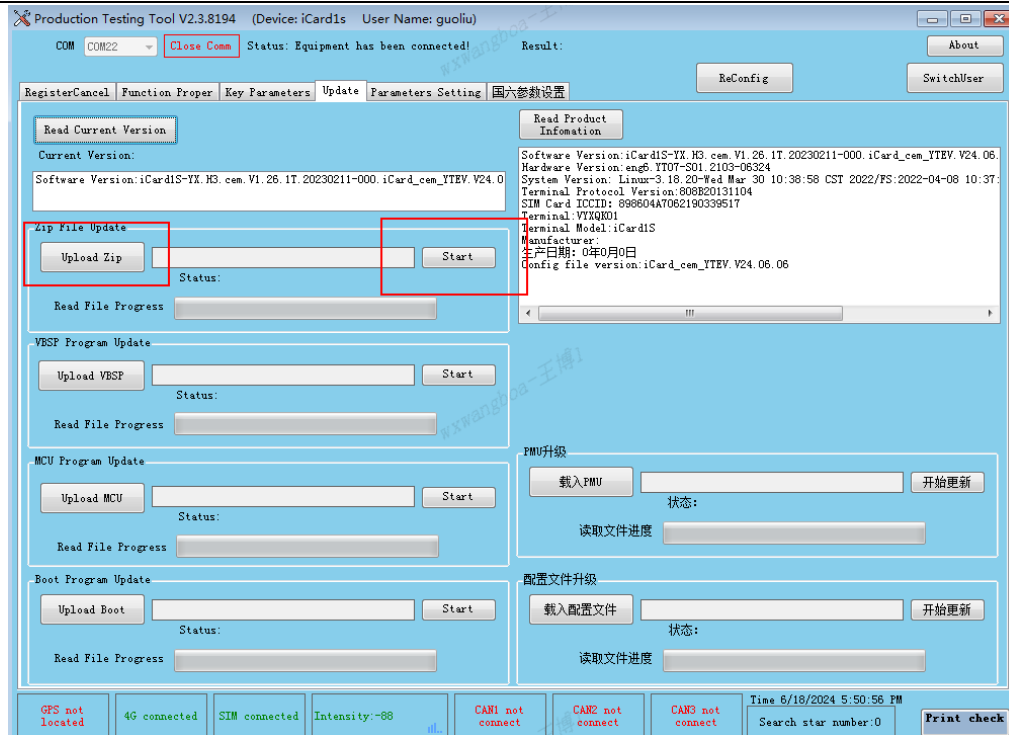
Step 2: Click "Read Parameters", and then fill in the required information, such as VIN number, license plate number, server platform IP, etc. After inputting, be sure to click "Save Parameters", and for verification, click "Read Parameters" again to ensure the parameters are saved in the device.

Step 3: After the parameters are saved, click "Register". The operation result prompts "Registration Succeeded" or "No Vehicle in Database". "No Vehicle in Database" means that there is no vehicle information on the platform or the information is inconsistent. You need to log in to the backstage software, confirm the vehicle information and change accordingly, then click "Forcible Cancellation" after changing the information. Click "Register" again after successful cancellation to view the operation result. It is normal when "Registration Succeeded" appears.

2.7 Update local program of vehicle + monitoring host

If the vehicle + device has a program fault, it is necessary to update the program with the methods as follows:

Step 1: log in to the debugging software and click the local program update page.



Step 2: use RAR update mode, place the program compression package on the computer desktop, click to load rar file, and select the program package file through the check box.

Step 3: Click "Open" to select, and click "Upgrade" to wait directly. When the progress bar shows that the upgrade is finished, it means that the upgrade is successful.

Step 4: Click to obtain the current product version number, check whether the product version number is consistent with the upgrade program version. If they are consistent, the upgrade is completed.

3. Handle common problems in vehicle + monitoring host

3.1 Handle vehicle + monitoring host fault

Vehicle + monitoring host troubleshooting steps: Please follow the following methods.

① Push information of service order corresponding to fault classification

Fault classification	Description of service order push information
Disconnection fault	Check whether the monitoring host fails
Charging power supply fault	In the charging state, check and handle the problem of monitoring host power supply

Driving power supply fault	When the vehicle is not charged and powered on normally, check and handle the problem of monitoring host power supply.
Positioning fault	Check and handle the fault of positioning antenna or monitoring host
Bus fault	Check and handle the fault of CAN bus or monitoring host

② Remote preliminary confirmation method for various faults

Fault classification	Backstage performance	Remote preliminary confirmation method
Disconnection fault	No data for more than 7 days	Open the "Yutong NEV App" or NEV monitoring platform, input the vehicle production number to enter the monitoring interface. The gray icon of the vehicle indicates offline. Click the icon, and more vehicle information will be displayed on the page. Judge whether the GPS time and CAN time of the vehicle are within seven days. If the standstill time is longer than 7 days, please contact the customer to confirm whether the vehicle is in operation. If so, prepare tools for on-site repair. If the report time is less than seven days or the current time, it will not be processed temporarily.
Charging power supply fault	No data during charging	Open the "Yutong NEV App" or NEV monitoring platform, and input the vehicle production number to enter the monitoring interface. The faulty vehicle is displayed as offline when it is charged, and normally monitored when it is running. There is no backstage data or track during charging
Driving power supply fault	No data during driving	Open the "Yutong NEV App" or NEV monitoring platform, and input the vehicle production number to enter the monitoring interface. The faulty vehicle is displayed as offline when it is running, and normally monitored when it is charged. There is no backstage data or track during driving
Positioning fault	Can data is normal, no track in the backstage	Open the "Yutong NEV App" or NEV monitoring platform, input the vehicle production number to enter the monitoring interface, and observe whether the GPS time and CAN time of the vehicle are consistent with the current time. If the CAN time is less than 7 days and the GPS time stagnation time is more than 7 days, please observe whether the vehicle position changes when the speed information displayed on the vehicle changes. If the position does not change for more than 10 minutes after normal operation of

		the vehicle, or enter the interface to open the "Track", Check whether the current vehicle has a running track. If no track is displayed, prepare tools for on-site repair. If the GPS reporting time is within seven days or the backstage track is normal, it will not be processed temporarily.
Bus fault	Vehicle online, but no CAN data or large amount of missing	Open the "Yutong NEV App" or NEV monitoring platform, input the vehicle production number to enter the monitoring interface, and judge whether the GPS time and CAN time of the vehicle are the current time. If the GPS time is within 7 days, CAN time is more than 7 days, and CAN time is less than GPS time, it is a fault; If the time can be consistent with GPS time, please enter the interface to open "Track" and check whether there is a running track of the current vehicle. If the track is normal, check whether there is energy consumption or battery data. If the battery data is empty or largely missing, it is judged as the bus fault

③. On-site repair methods for various faults

Fault type	Fault symptom	Cause of fault	Troubleshooting
Disconnection fault	The indicator is not on	The power supply cable does not work	1. Check whether the 24-hole white connector of the monitoring host is well connected; 2. Check whether the vehicle power supply wiring harness connector and the monitoring host power supply cable connector are in good condition, and whether there is terminal breakage or wiring harness breakage; 3. Check whether the vehicle power supply wiring harness connector is live;
		The equipment is not powered on	Check whether the power supply voltage of red wire jack (power positive), orange wire jack (power positive) and black wire jack (power negative) on the 24PIN connector of the monitoring host is 24V; if they are normal but the indicator is not on, the inside of the equipment is damaged. Please replace the equipment
	The equipment flashes red slowly (flashing evenly at 1.5S)	The equipment cannot be started	Power off and disassemble the equipment, remove the SIM card, and check the indicator of the equipment. If the indicator flashes red evenly at a frequency of 1.5S for more than three minutes, it indicates that the equipment cannot be started and needs to be replaced; if the indicator circulates flashing (four times as a group), the

			SIM card fails. Please contact the SIM card supplier to replace the SIM card
	The third flash of the indicator is red	Network communication failure	Power off and disassemble the equipment, check the installation of SIM card, reinstall it, and verify the status of the indicator. If the third flash of the indicator turns green, the SIM card is loose; Add a foam pad or reinforce the SIM card slot at the position corresponding to the battery; Otherwise, exchange the SIM card of a normal vehicle to the equipment for confirmation, and check whether the third flash of the indicator turns green. If it is green, the SIM card fails. Please contact the SIM card supplier to replace the SIM card; If the indicator still flashes red, the equipment is damaged and should be replaced.
	The fourth flash of the indicator is red	No data uploaded at the terminal	Connect the debugging cable, read the parameters in the equipment with a debugging tool, and check them against platform information (VIN, terminal number, mobile phone number, domain name of main server, TCP port). If there is any error, modify the parameters, save the parameters, and then register again.
	The indicator circulates flashing in green (four times as a group), the platform shows that the vehicle is not online	The internal information of the equipment is inconsistent with the actual vehicle information	Connect the debugging cable, read the parameters in the equipment with a debugging tool, and check them against the VIN information of the real vehicle. If there is any error, check the registration information of the operation platform, modify and save the parameters according to the registration information of the platform, and register again after forced cancellation.
Positioning fault	The first flash of the indicator is red	GPS positioning failed	Check the blue GPS connector, power on the monitoring host after complete power off (the lithium battery needs to be removed for complete power off), and check whether the first flash of the indicator turns green. If it still does not change, replace the GPS antenna; after replacing the GPS antenna, place it in an open area outside the vehicle. Check again whether the terminal

			indicator turns green. If it turns green, the GPS antenna is faulty. Reinstall the new antenna to the roof of the vehicle or place it between the front windshield and the dashboard. If the indicator still flashes red, the equipment is damaged and should be replaced.
Bus fault	The second flash of the indicator is red	Power supply cable fault	Please check the power supply cable for disconnection, wiring harness breakage, poor contact of wiring harness and other problems. If the CAN wire interface is not connected, reconnect it; if the wiring harness has obvious faults, replace the power supply cable; if there is no obvious fault in the wiring harness, it is suspected that the connection is poor. Please re-tie the power supply cable and plug and unplug the 24-pin connector (white connector at a separate end). After the monitoring host is powered on again, observe whether the second flash of the indicator turns green;
		Vehicle CAN bus fault	If there is no problem with the power supply cable, use the universal CAN bus detection method to detect whether the communication between the vehicle CAN bus and the monitoring host CAN cable interface is normal. If not, please repair the vehicle CAN bus;
		Monitoring host fault	If the fault is still not eliminated after ensuring that there is no problem with the CAN bus and power supply cable and completing the above maintenance, please replace the monitoring host.
Charging power supply fault, driving power supply fault	The indicator is not on during charging or driving	Vehicle power supply problem	Check whether the power supply of the monitoring host is normal with a multimeter, and check the vehicle fuse;
		Power supply cable fault	Please check the power supply cable for disconnection, wiring harness breakage, poor wiring harness contact and other problems. Try to replace the power supply cable to see if the fault is removed;
		Monitoring host fault	If the above inspections are normal, but the fault is still not eliminated, please replace the monitoring host.

④ Confirm the method after problem solving

After the indicator of the equipment flashes green four times, log in "Yutong NEV APP" to verify whether the repair is successful. Check the monitor, select the corresponding vehicle number, check the data reported by the vehicle, confirm whether the vehicle position is consistent with the actual parking position, and whether the reported mileage and SOC are consistent with the instrument mileage and SOC. If the data are consistent, it means that the repair is successful.

3.2 Repair requirements

① On-site repair requirements

- (1) Identify the cause of the problem. If it is not caused by fault, there is no need to replace the kit. If the monitoring host is faulty, there is no need to replace the SIM card. If the SIM card is faulty, there is no need to replace the monitoring host;
- (2) For all settlement forms of faulty old parts, it is required to return the old parts. In addition to the complete machine, accessories (power supply cable, antenna and SIM card) shall also be returned;
- (3) Clear photos are required for the settlement statement without old parts, and EVA pad must be added if the SIM card is loose. Photos of the pad battery and parameter configuration interface shall be taken.

② Repair information maintenance

Maintain the repair information as required when logging in to Yutong after-sales service website for settlement information maintenance:

Fault description: Please fill in the fault description according to the guide of "Fault Symptom" in the table. The working state of the indicator must be described. If other faults occur, please maintain the detailed fault symptom.

Cause analysis: If it is consistent with the information described in the table, please fill in the fault cause according to the guidance of "Fault Cause" in the table. If the fault cause is not consistent with that in the list, please maintain detailed fault causes.

Handling result: Please handle the repair result according to the actual situation.

Fault description	Cause analysis	Handling result
After power on, the indicator flashes red slowly	Module fault	Normal after re-registration by replacing the terminal
After powering on, the indicator cannot light up and the wiring harness is normal without breakage (wiring harness photos before and after maintenance)	Terminal hardware fault	Normal after re-registration by replacing the terminal
It can be seen that the SIM card slot is damaged, the indicator flashes green for the first two times and red	SIM card slot damaged	Normal after repairing the slot/normal after

for the subsequent two times		replacement of the equipment and re-registration
The indicator flashes green twice at the front, and then flashes red twice at the back. It returns to normal after re-plugging the SIM card	Poor contact of SIM card	After the SIM card is reinstalled and an EVA pad is attached on the back of the battery, it works normally
The indicator flashes green for the first two times, and red for the last two times. It cannot return to normal after re-plugging the SIM card, but it can return to normal after replacing the SIM card	SIM card damaged	Normal after re-registration
The terminal works abnormally, the terminal or wire on the power supply wiring harness is broken, and the wiring harness is tied normally (photos of wiring harness before and after maintenance)	Power wiring harness damaged	It is normal after replacing the power supply cable
The terminal works abnormally (the terminal is not started after being powered on, CAN data reporting abnormality, etc.), and the power wiring harness has no obvious abnormality. It can be restored to normal state by re-plugging or shaking the wiring harness	Poor contact of power wiring harness	It is normal after replacing the power supply cable
The terminal flashes red light for the first time and green light for the last three times. After replacing GPS antenna, it returns to normal (4 green lights), and the antenna is not broken	GPS antenna damaged	Positioning is normal after replacement of GPS antenna
The indicator flashes green for the first two times, and red for the last two times. It returns to normal after replacing the 4G antenna (4 green lights), and the antenna is not broken	4G antenna damaged	The vehicle monitoring is normal after the 4G antenna is replaced
The indicator flashes green for the first two times, and red for the last two times. It cannot return to normal after re-plugging or replacing the SIM card	Terminal communication module fault	Normal after replacement of the equipment and re-registration
The terminal flashes red light for the first time and green light for the last three times. It cannot return to normal even after replacing GPS antenna	Terminal positioning fault	Normal after replacement of the equipment and re-registration
The indicator is normal, the data is not uploaded, and it returns to normal after reconfiguration of parameters	Platform parameter configuration fault	Normal after reconfiguration of parameters
The indicator flashes green for the first two times, and red for the last two times. It returns to normal after reconfiguration of parameters	Terminal ID parameter lost	Normal after reconfiguration of parameters

Product Description and Repair Manual of IOV Terminal

The indicator flashes red slowly and flashes red-green-red-red. The system restarts repeatedly	SOC system fault	Normal after replacement of the equipment and re-registration
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Repair Manual

Battery

9332-00834

Yutong Bus Co., Ltd. China

Foreword

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Yutong Bus Co., Ltd. China

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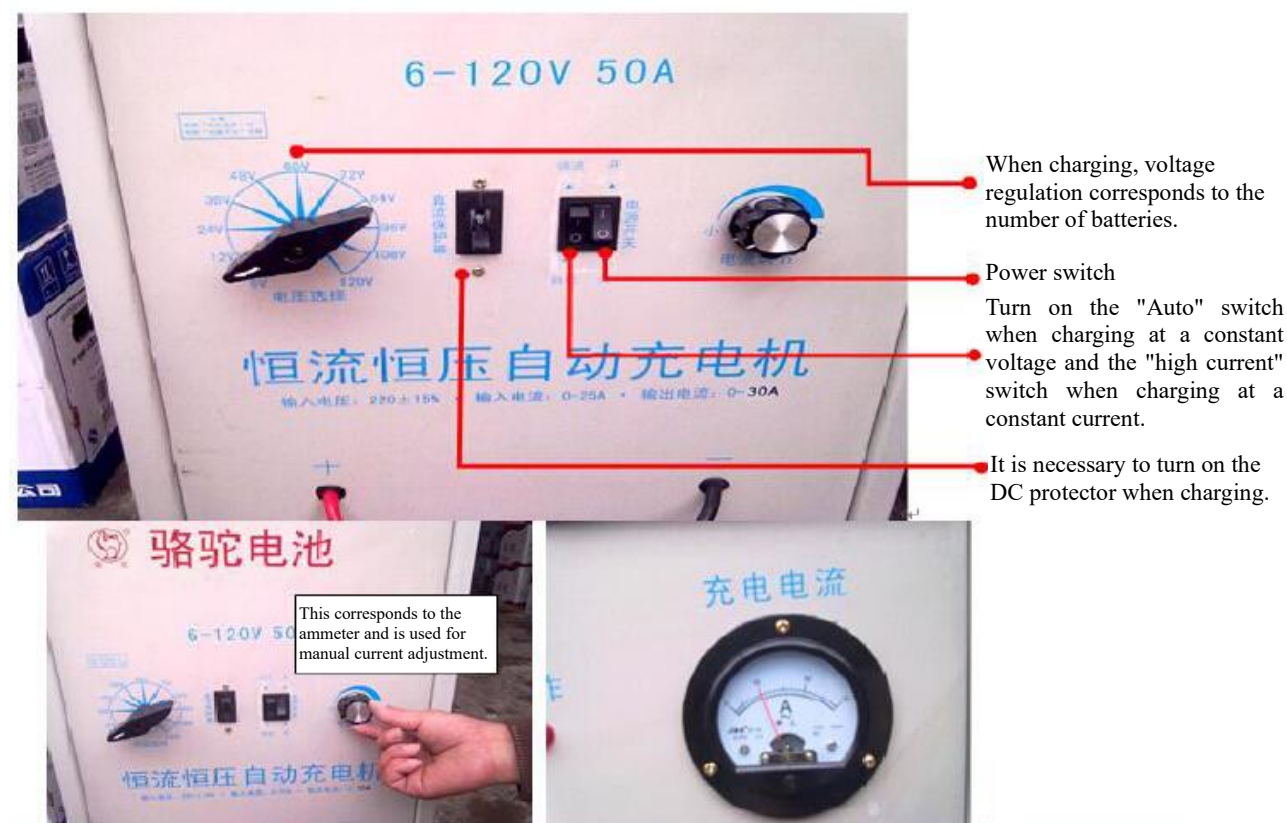
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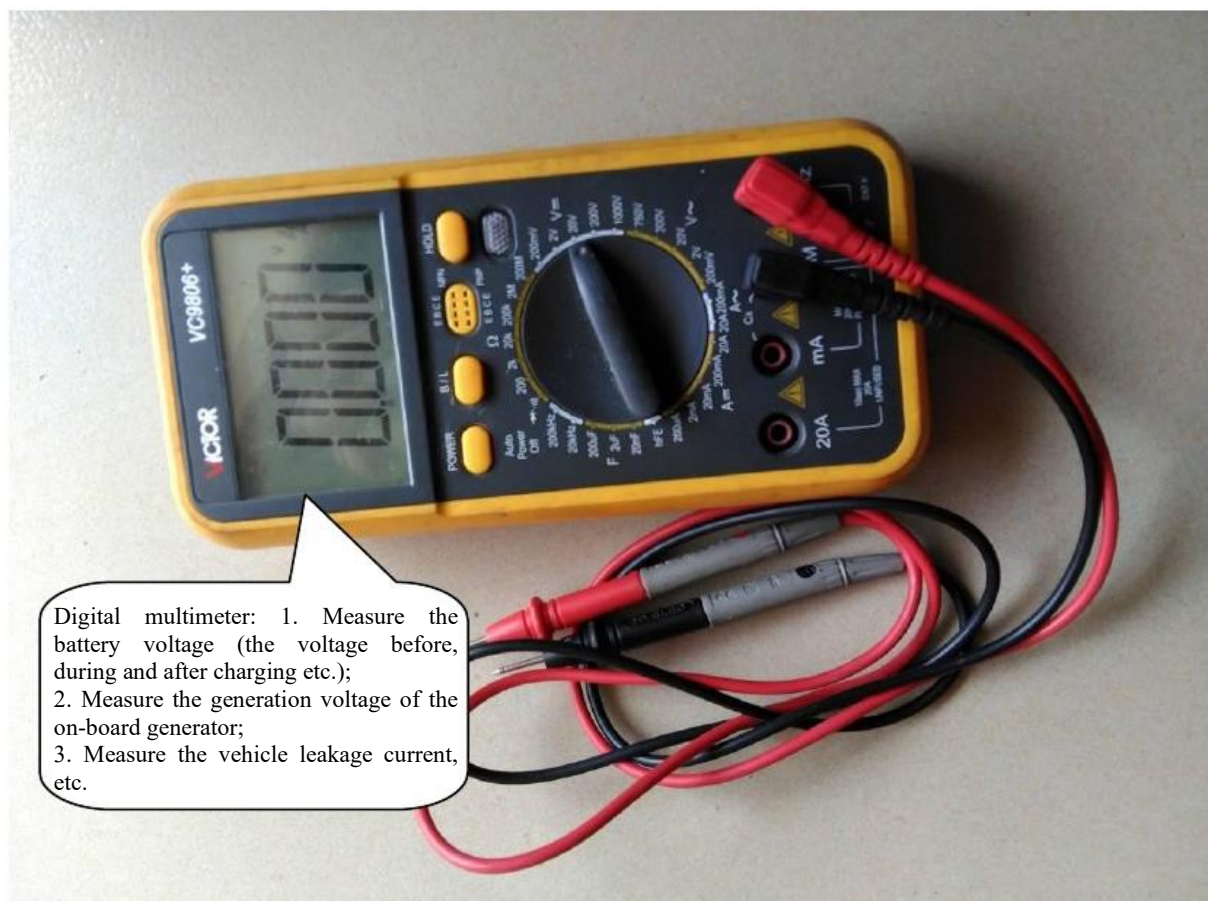
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1. Technical Parameters of Battery

Product model	Battery supplier	Structure of binding post	Low-temperature startup current (A) (-18°C)	Battery capacity (AH)	Weight (kg)
Battery, 6-QW-120MF	Camel	Cylindrical	480	120	32.5
Battery, 6-QW-150MF	Camel	Cylindrical	780	150	38.5
Battery, 6-QW-120MF	Camel	Flat	480	120	32.5
Battery, 6-QW-195MF	Camel	Cylindrical	1000	195	49.5
Battery, 6-QW-225MF	Camel	Cylindrical	680	225	56
Battery, 6-QW-225MF	Camel	Flat	680	225	56
Battery, 6-QW-40MF	Camel	Cylindrical	300	40	11.8
Battery, 6-QW-195MF	Camel	Flat	1000	195	49.5
Battery, 6-QW-150MF	Camel	Flat	780	150	38.5
Battery, 6-QW-90MF	Camel	Cylindrical	450	90	21.5

2. Introduction to Special Tools







3. Composition, Function and Working Principle

3.1 Battery composition

Terminal: A port that provides power output

Busbar: A connection bar connecting the terminals of the same polarity

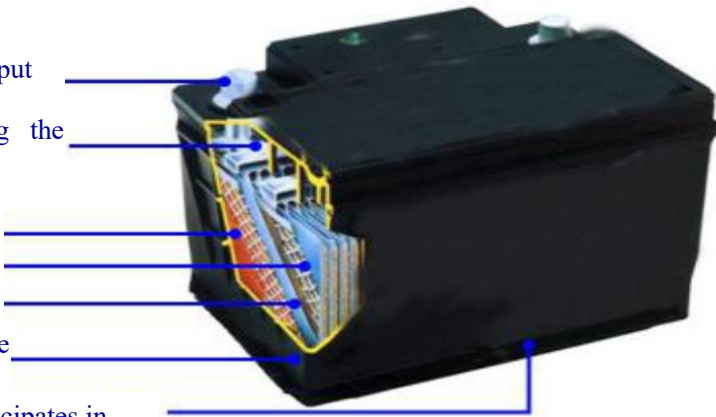
Positive plate: Energy storage material

Negative plate: Energy storage material

Separator: To cover the negative plate

Housing: A container that encloses the internal structure

Electrolyte: Dilute sulfuric acid that participates in chemical reactions and conducts electrical current

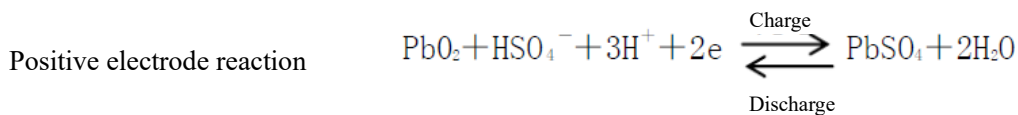
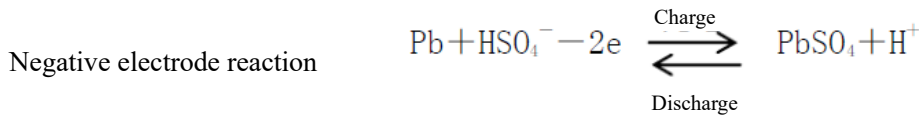


3.2 Battery function

- 1) Start the vehicle;
- 2) Provide power for on-board electrical appliances after the engine flames out.

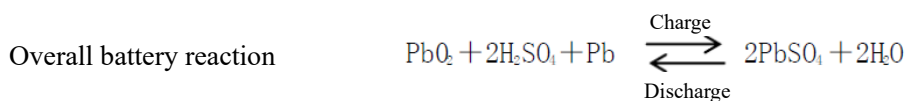
3.3 Battery principle

For lead-acid batteries, the positive active material is lead dioxide (PbO_2), the negative active material is sponge lead (Pb), and the electrolyte is dilute sulphuric acid.



When discharge: The concentration of H_2SO_4 decreases, PbSO_4 on the positive and negative poles increases, the internal resistance increases, the electrolyte concentration decreases, and the electromotive force of the battery decreases.

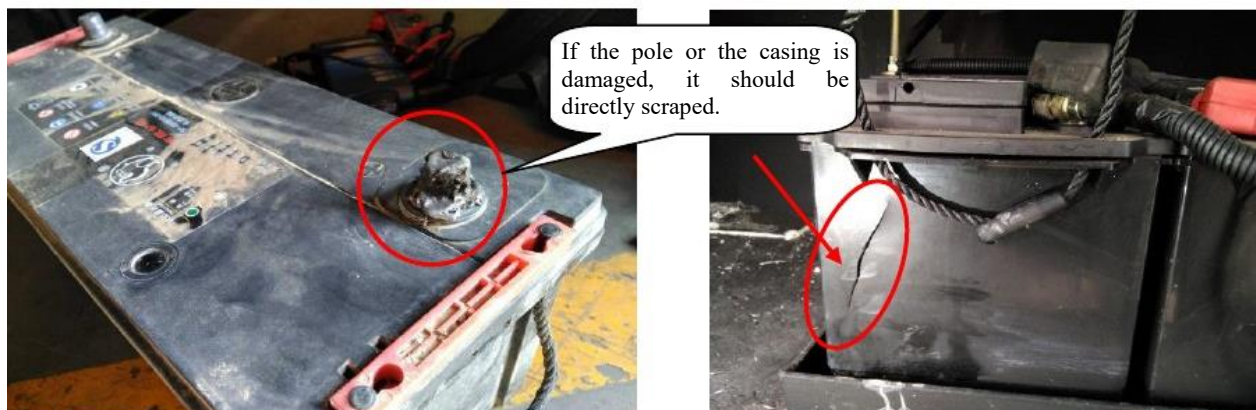
When charge: The electrolyte concentration increases, the internal resistance decreases, and the electromotive force of the battery increases; a large number of bubbles will appear in the later period of charging due to water electrolysis.



After discharging, the active materials on both poles of the battery will be converted into lead sulfate. This theory is called the "double sulphuric acid sulfation" theory, which explains the current generation reaction of the lead-acid battery.

4. Repair Procedure (or Troubleshooting)

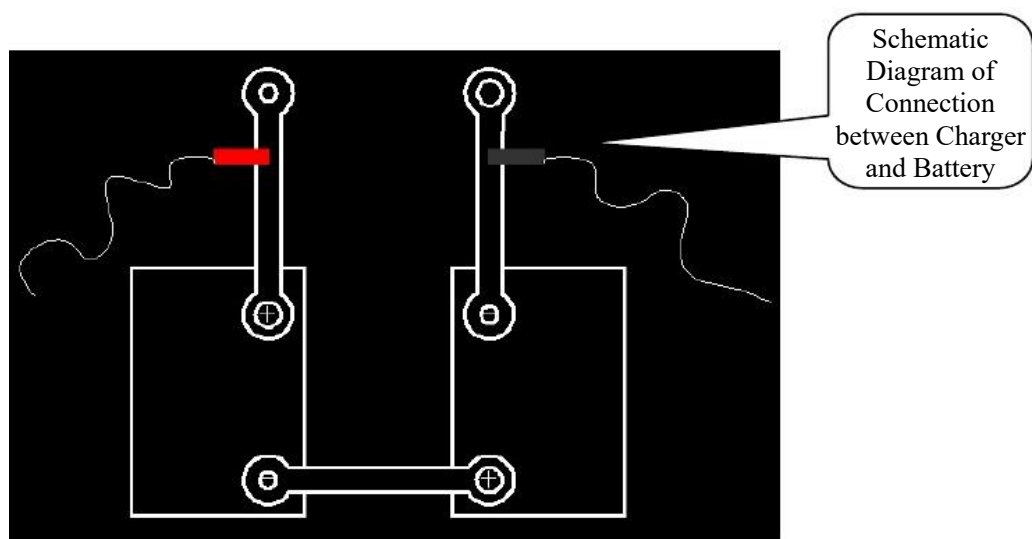
4.1 Appearance inspection



4.2 Measure the battery voltage and condition



4.3 Charge the battery according to the measured battery voltage and condition.



Charging process (as shown in table below)

Battery grouping status	Charging process parameter setting
Above 12.5 V	Charge with 0.1C20 constant current for 3 h
12.0 V to 12.5 V	Charge with 0.1C20 constant current for 6 to 8 h
10 V to 12.0 V	Charge with 0.1C20 constant current for 8 to 10 h
8 V to 10.0 V	Charge with 0.1C20 constant current for 12 to 14 h
Below 8 V	1. First charge with 0.05C20 constant current for 8 h; 2. Charge with 0.1C20 constant current for 12 to 14 h; 3. Charge with 0.05C20 constant current for 3 h.

Note: C20 stands for the rated battery capacity, for example 100 MF battery charge (i.e. to be charged with $0.1C20 \times 100 = 10$ A current)

4.4 Battery Detection

After charging, measure the battery after it is kept stationary for over 12 h.

- Detect with a capacity tester.



b. Test with a conductometer.



4.5 Determine whether to replace the battery according to the detection result from the instrument

5. Precautions for Charging Detection

5.1 After the battery and charger are connected and it is checked and confirmed the connection is correct, turn on the charger to charge the battery; after charging is completed, first turn off the charger and then disconnect the connected cable;

5.2 During charging, check whether the charger is in normal condition, whether charging current is consistent with the set current and whether the battery is over heated;

5.3 If any abnormal condition is found, stop immediately and inform the relevant personnel for treatment;

5.4 The battery must be charged in a well-ventilated area without any open fire;

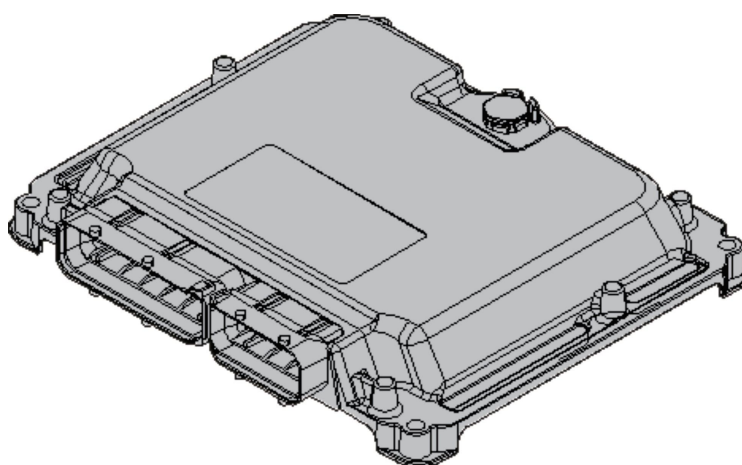
5.5 During charging, if the battery temperature exceeds 45°C, appropriately decrease the charging current or stop charging; if acid fluid ejects from the battery vent or the magic eye gets white, immediately stop charging and scrap the battery.

5.6 After charging is completed, first turn off the charger and then disconnect the charging cable.



Repair Manual

Vehicle Control Unit (VCU)



Yutong Bus Co., Ltd. · China

Foreword

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1. Concepts and Introduction to Functions

1.1 Definition and composition of vehicle control unit

Vehicle control unit, namely the powertrain controller, is the core control component of the vehicle. It collects the accelerator pedal signal, brake pedal signal and other component signals, and after making corresponding judgments, it controls the actions of each component controller at the lower level to drive the vehicle to run normally. As the command and management center of the vehicle, the main functions of the vehicle control unit include driving torque control, optimization control of brake energy, energy management of the vehicle, maintenance and management of the CAN network, troubleshooting and handling, vehicle status monitoring, etc.

The vehicle control unit mainly consists of: Circuit board, electronic components, upper housing, lower housing, exhaust valve, screws, plug-in male connector. The vehicle control unit has two connectors (CON1 81 Pin + CON2 40 Pin), as shown below.

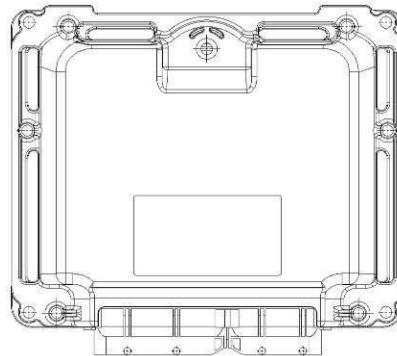


Figure 1 Vehicle control unit

1.2 Main functions

- Vehicle drive control: According to the driver's driving intention, vehicle status, working conditions and other factors, it sends commands to the engine ECU, motor controller and other drive components to drive the vehicle after the control strategy calculation, including starting, going forward, reversing, creeping and so on.
- Vehicle energy management: To obtain the best energy utilization rate with the coordination and management of the vehicle's motor drive system, engine system, battery management system, drive train, and other on-board power systems.
- Network management: As the information control center, the vehicle control unit is responsible for organizing information transmission, network status monitoring, network node management, etc.
- Brake energy recovery: According to the brake pedal opening, vehicle speed, battery SOC, etc., it sends brake commands to the motor controller to recover partial energy without affecting the braking performance of the original vehicle.
- Troubleshooting and handling: It monitors the status of the vehicle electronic control system in an uninterrupted way. After a problem occurs, it creates corresponding fault code and sends to the

instrument for display, performing appropriate safety measures according to the grade of a fault. In case of a fault not serious, it can ensure driving in limp home mode (LHM).

- Vehicle status monitoring and displaying: It monitors the vehicle's real-time operating status. With the combination instrument, the new energy important information is displayed to facilitate driver's monitoring, troubleshooting and handling, etc.

1.3 Performance parameters

- Range of operating voltage: DC18V-32V
- Maximum operating current: 20A;
- Operating temperature range: -40°C~70°C
- Storage temperature range: -40°C~85°C
- Communication protocol: SAE J1939, independently developed protocol
- Maintenance type: Maintenance-free
- Overall dimensions (in mm): 220 × 195 × 39.8

2. Requirements on Repair Personnel

- (1) The repair personnel shall be trained and approved by the installation contractor.
- (2) The repair personnel shall comply with the safety code and observe the requirements for the proper and safe use of tools.
- (3) The repair personnel shall be familiar with interior electrical environment.

3. Repair Process Flow

3.1 Basic repair process flow

- (1) Understand the basic types of faults

Different types of faults have different features. Based on the different types of faults, determine the means and methods of inspection and repair to help quickly solve the faults. Fault types may be divided into a fault before power-on commissioning, a fault after normal operation or human-made fault. Usually, the last two types of fault need to be solved on site by maintenance personnel.

- (2) Inquire

By inquiring, maintenance personnel can understand some circumstances before and after the vehicle control unit has a fault, for example, whether the vehicle is abnormal, whether its function is abnormal, whether the driving feel is abnormal or whether the vehicle control unit was repaired by others. By inquiring, maintenance personnel can understand the fault type and perform fault diagnosis according to the features of the fault type for time-saving and cost-effective repair.

(3) Inspect the vehicle control unit

For the faulty vehicle control unit, try to understand deeply the fault by checking, trial run, etc. Repair personnel shall switch on the power supply, and observe carefully the fault symptom and working conditions. During trial run, repair personnel shall observe possible serious damages. If the vehicle control unit or other related electrical module has striking or burning odor, switch off the power supply immediately and further find causes.

(4) Prepare repair tools

Commonly used inspection and repair tools include wrench, multimeter, etc. For some more complicate faults, corresponding monitoring instruments shall be used, for example, CANoe, ZLG interface card, etc. And, necessary common spare parts shall be prepared.

(5) Inspect and repair the fault

A fault may be a module-level fault, a circuit board-level fault or a component-level fault according to the fault symptom. For the vehicle control unit, it is not allowed to repair a circuit board-level fault or a component-level fault on site due to the strict requirements of housing protection grade. If it is confirmed that the fault is caused by the damage to the vehicle control unit itself, contact the after-sale technical personnel for module replacement.

(6) Repair records

Upon completion of repair, record the repair process according to the 5W1H principle and report it to the responsible department for filing.

3.2 Procedure of removing and installing

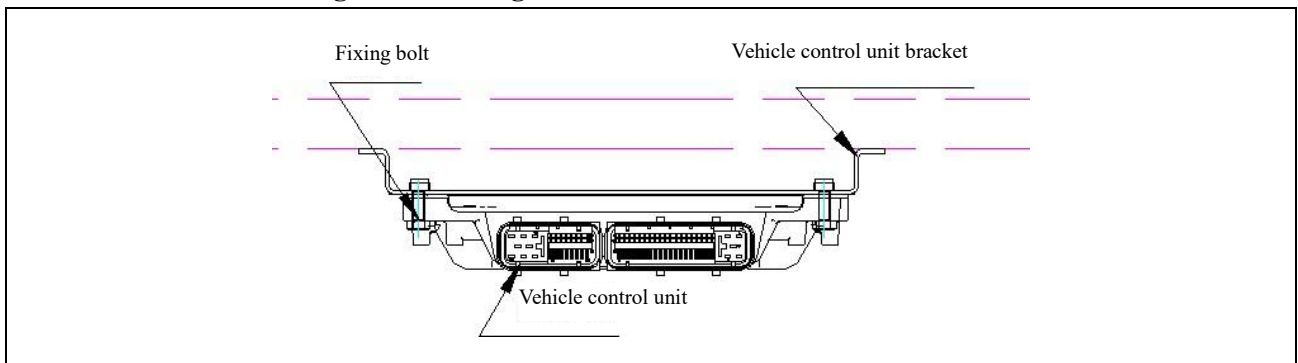


Figure 2 Installation of vehicle control unit and bracket

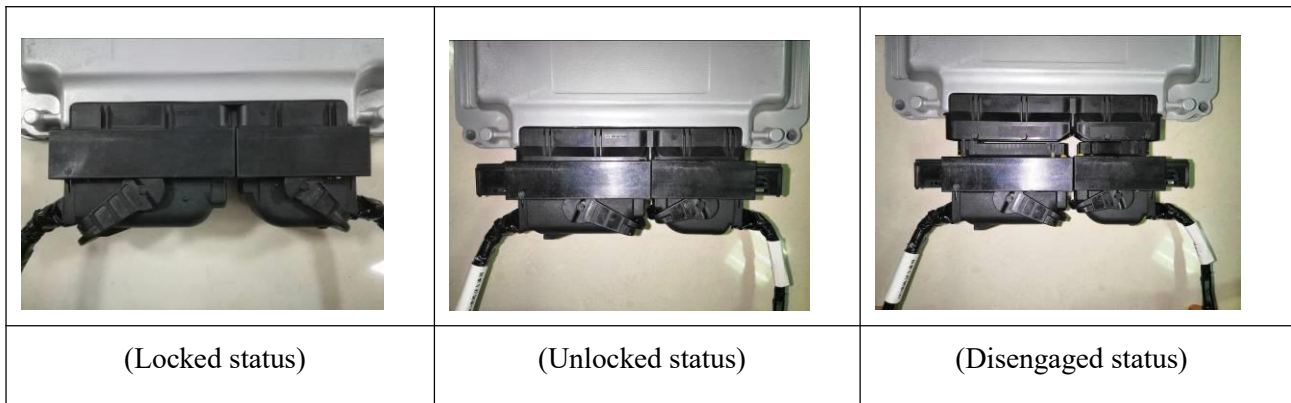


Figure 3 Connectors of vehicle control unit

- Tools

2 10mm wrenches.

- Remove

- (1) Power off the vehicle control unit, and remove the 2 wiring harness terminal connectors that are connected with the control unit (press the connector buckle down during the unplugging process);
- (2) Fix the bolt with one wrench and unscrew the tightened nut with another wrench along the pushing-out direction;
- (3) According to Step 2, unscrew the remaining three M6 bolts in turn, and remove the vehicle control unit from its bracket or gasket.

- Install

- (1) During the installation of the vehicle control unit, the working environment must be clean, the conductive substances must not touch the pins, and collision and scratches are prohibited;
- (2) The vehicle control unit is fixed with 4 M6 bolts by a tightening torque of the bolts subject to the flattening of the spring.
- (3) When installing the 6 wiring harness connectors, please pop up the connector buckle and insert it into the corresponding port of the vehicle control unit. A “click” sound indicates that it is installed in place.

4. Common Fault Symptoms, Reasons and Troubleshooting Methods

4.1 The instrument reports “vehicle control unit communication fault”

Fault cause:

1. CAN network wire is faulty;
2. The vehicle control unit power supply is faulty.

Troubleshooting:

Step 1: Power off the vehicle, set the multimeter to the resistance position and measure the network resistance between CN1.53 and CN1.54, and observe whether it is about 60 ohms, and check whether the CAN branch wiring harness of the instrument is faulty;

Step 2: Power on the vehicle, set the multimeter to the voltage position and measure the voltage between CN1.4 and CN1.5 to observe whether it is about 24V. If not, please check

the wiring harness and fuse;

Step 3: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.2 Vehicle speed fluctuates seriously when the vehicle is stationary

Fault cause: The main motor speed is not measured correctly and fluctuates seriously.

Troubleshooting: Step 1: Set the vehicle to the ON position, the instrument comes on, and observe whether the main motor speed fluctuates seriously on the instrument;

Step 2: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.3 The vehicle cannot run by shifting gear, releasing handbrake and depressing the accelerator

Fault causes:

1. The vehicle reports a serious fault;
2. The handbrake is not released;
3. The passenger door is not closed;
4. The air pressure of the vehicle is too low;
5. The battery SOC is too low;
6. The accelerator or brake is faulty.

Troubleshooting: Step 1: Set the vehicle to the ON position, observe whether the instrument position is correct, whether the vehicle state is "GO" and whether the system reports a serious fault;

Step 2: Check whether the handbrake is released. If released, observe whether the instrument P light comes on. If it comes on, check the air pressure, air pipeline, etc.;

Step 3: Check whether the passenger door is closed and confirm the door status from the instrument display;

Step 4: Observe whether the battery SOC of the instrument is too low and whether the air pressure of the vehicle is too low;

Step 5: Use a multimeter to measure the voltage of CN1.22 to check whether it is greater than the voltage when the accelerator pedal is not depressed, and whether the voltage of CN1.40 is equal to the voltage when the brake pedal is not depressed;

Step 6: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.4 The steering is not powered when releasing handbrake and shifting gear

Fault causes:

1. The steering system is faulty;
2. The battery SOC is too low;
3. The handbrake is not released;
4. The gear is in neutral.

Troubleshooting: Step 1: Observe whether the instrument position is not in neutral, whether the vehicle status is "GO", whether the battery SOC is too low, or whether the steering system reports a fault;

Step 2: Check whether the handbrake is released. If released, observe whether the instrument P light comes on. If it comes on, check the air pressure, air pipeline, etc.;

Step 3: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.5 Motor cooling water pump does not work

Fault cause: The wire is faulty.

Troubleshooting: Step 1: Check whether the water pump control wire is faulty or whether the corresponding fuse is blown;

Step 2: If the wire is not faulty, but the motor system is still hot because the water pump does not work, please contact the local after-sales service personnel or the manufacturer.

4.6 No electrical feedback occurs when depressing the brake

Fault causes: 1. The battery SOC is too high;

2. The ice and snow mode switch is pressed;

3. The system reports fault related to the high-voltage.

Troubleshooting: Step 1: Observe whether the instrument reports fault related to the high-voltage;

Step 2: Check whether the snow and ice mode switch is pressed. If pressed, the brake power feedback will be canceled;

Step 3: Observe whether the battery SOC of the instrument is too high;

Step 4: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.7 The vehicle can not enter the “READY” “GO” status after the vehicle is powered on

Fault causes: 1. High-voltage fault;

2. Rear compartment door is open;

3. The vehicle control unit power supply is faulty.

Troubleshooting: Step 1: Power on the master power of the vehicle, set the multimeter to the voltage position and measure the voltage between CN1.4 and CN1.5 to observe whether it is about 24V. If not, please check the wiring harness and fuse;

Step 2: Check whether the rear compartment door is in open status;

Step 3: Power the vehicle to the ON position. Observe whether the instrument reports fault related to the high-voltage;

Step 4: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.8 Vehicle acceleration performance decreased significantly

Fault cause: A serious fault occurs on the power system of the vehicle, causing reduced power.

Troubleshooting: Step 1: Observe whether the instrument reports fault related to the high-voltage;

Step 2: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.9 Vehicle accelerates when the shifting gear, the handbrake is released and accelerator pedal is not depressed

- Fault causes:
1. The vehicle has creeping function;
 2. The accelerator pedal is always effective;
 3. The electric angle of motor is biased.
- Troubleshooting:
- Step 1: Check whether the vehicle has creeping function or whether the vehicle program has been updated;
- Step 2: Use a multimeter to measure the voltage of CN1.22 to check whether it is greater than the voltage when the accelerator pedal of the normal vehicle is not depressed;
- Step 3: Contact the motor controller manufacturer to check whether the motor electric angle is biased;
- Step 4: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

4.10 The hill assist function is triggered when the vehicle runs on a flat road or downhill or the brake pedal is released

- Fault causes:
1. The hill assist function is not calibrated after the vehicle control unit is replaced;
 2. The hill assist function is not correctly calibrated after the vehicle control unit is replaced.
- Troubleshooting:
- Step 1: Check whether the vehicle control unit is replaced or the program is updated;
- Step 2: Re-confirm whether the fault symptom on the physical vehicle is consistent with that mentioned here;
- Step 3: Contact the local after-sales service personnel for function check and calibration;
- Step 4: If other situations different from the above occur, please contact the local after-sales service personnel or the manufacturer.

5. Accessories

Safety Precautions

The repair of new energy high-voltage circuit must be performed by a qualified professional repairing personnel. Anyone other than professional repairing personnel must not touch the high-voltage electrical components. Ensure that at least two people are involved during repairing.

Before repairing the vehicle, repairing personnel must proceed as follows in turn:

- Turn off the key switch. Remove the key, which shall be kept by an exclusively designated person (for a vehicle with one button start function, depress the brake and press and hold the button for 3 seconds to shut down the vehicle);
- Turn off the master power switch;
- Turn off the low-voltage switch of the vehicle, and turn the power handle switch to “OFF”;
- Disconnect the high-voltage box and the battery pack service disconnect;
- After the power supply is cut off for 15 minutes, use a multimeter to measure positive and negative voltage of the high voltage input of the assembly to be maintained is less than 36V. After that, hang a warning sign that says “Repairing. Do not start!” Go to further operations.

Notice: Be sure to perform the above operations before repair. Otherwise, there is a risk of electric shock due to high voltage.

Safety Operation Requirements

- a) During repair, do not wear metal trimmings such as gold and silver jewelry and watches; otherwise it may cause a risk of electric shock under high-voltage.
- b) For repair, please use professional tools, wear insulating gloves and insulating shoes. It is strictly forbidden to operate without wearing protective equipment with bare hands, otherwise there is the risk of high-voltage electric shock.
- c) Upon completion of repair, clean up tools and materials and don't remain the metal items inside or over the equipment. Otherwise, it may cause easily the short circuit of components and therefore the ablation.
- d) After the HV cable is removed, it is necessary to wrap the line terminal, avoiding earthing to the vehicle and therefore electric leakage
- e) During operation, the operators must use the correct tools and PPEs, otherwise it is easy to cause damage to the components.
- f) All connections must be performed with clear guidelines. Never attempt to operate in a conjecture or blur way, otherwise it is easy to cause incorrect connection, resulting in damage to machine.
- g) The key points of the connection are to make sure the connection is correct and reliable (not loosening), good contact (without contact resistance) and not short-circuited. After the connection is finished, you must measure and confirm point by point.
- h) Ensure that all the connecting points must not be in contact with the outer pack or other components.
- i) If there are other uncertain factors, please ask the professionals to confirm before implementation.
- j) Failure to comply with the above warnings may cause a variety of catastrophes.