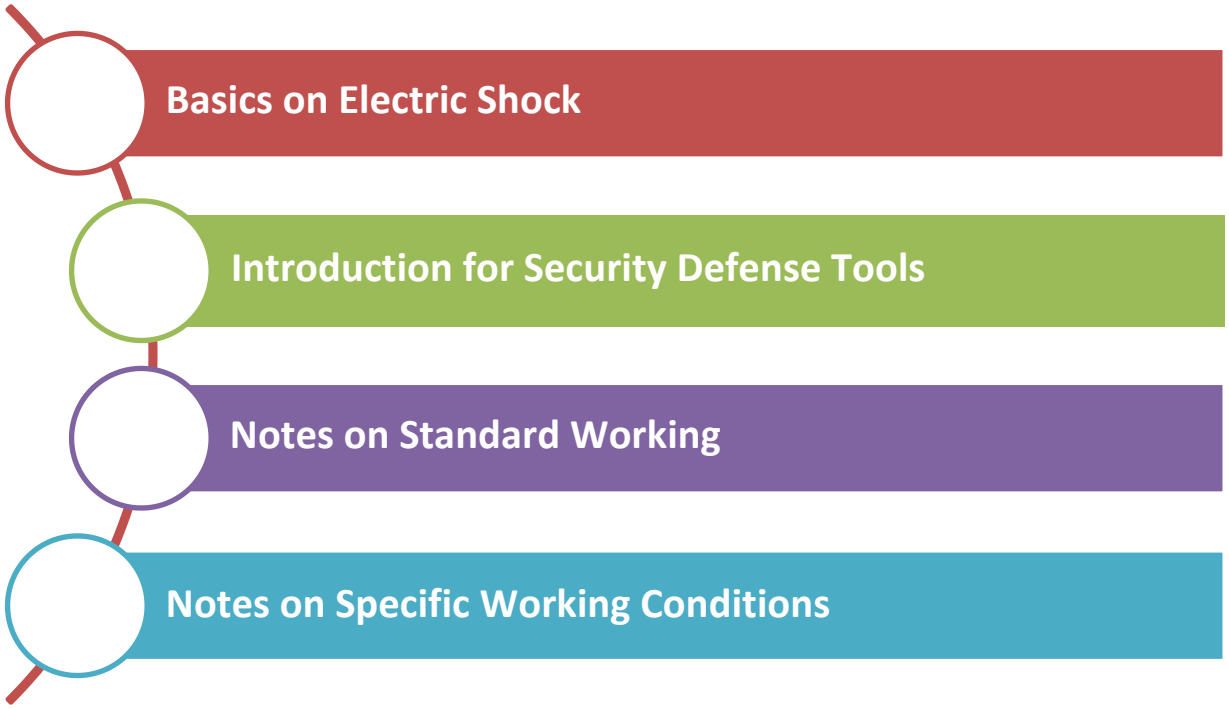
Service Training Materials

EVO 3 electric
Safety Rules

Catalog


Basics on Electric Shock
Introduction for Security Defense Tools
Notes on Standard Working
Notes on Specific Working Conditions

1 Basics on Electric Shock

1 Basics on Electric Shock

- Types

Based on the different ways of touching, it can be divided into double phase electric shock, single phase electric shock and step-between electric shock.

Single hand get an electric shock

Two hands get an electric shock

Electric shock on step voltage

1 Basics on Electric Shock

- Electric Shock's Influence on Human Body

Current's Influence on Human Body

1. When the current goes through human body, it makes the muscle shrink, causing mechanical damage; the heat effeck and chemical effect it produces can cause a series of acute pathological changes, severely harming the body, especially when the current goes through the heart, it will bring on disastrous damage to the heart.

2. Even very low current can cause ventricle fibroid shake, causing death. The damage degree of electric shock on human body depends on the types of current, amount of electricity, touching method, touching point, duration, human body's health state

3. Larger the current ges through human body, larger the influence on human body. Higher the voltage you touch, larger the damage it causes. Normally voltage below 36V is safe voltage. But in humid environment even 36V is dangerous, in this case

4. AC harms more than DC human body, human body is more sensitive to 50Hz AC than DC, when touching DC, even 250mA may not cause specific damage, yet AC, 50mA going through for several dozens of seconds will cause ventricle fibroid shake and death.

1 Basics on Electric Shock

- Electric Shock's Influence on Human Body

5. Duration of current is closely related to the damage degree. Longer the duration, larger the damage and the danger, especially when the duration of current going through human body is more than human's heart beating period, it is very likely to cause ventricle fibroid shake.

6. Different current flowing routes cause different damage. Larger the current going through heart, lung and central nervous system, more serious the consequence.Different body part, different flowing route and different current harms differently.

1 Basics on Electric Shock

- Emergent Treatment on Electric Shock

1. First turn off the switch or pull out the plug, do not use hands to pull one who is electric shocked. Because he has current himself , treatment must be conducted after the switch is turned off.

2. To buy time, take dry bamboo pole, shoulder pole, wooden stick to get the electric shocked man rid of wire or electrical devices. Never use iron pieces or wet stick.

3. Rescuer can stand on dry wooden plate or wear insulating shoes, use one hand(no two hands at the same time) to pull the dry clothes of electric shocked man.

4. After getting rid of electric shock, if the man has no pulse, he should be moved to open places and receive cardiac resuscitation.

1 Basics on Electric Shock

- Conclusion

Safety comes first and be cautious when working

2 Introduction for Security Defense Tools

- Necessity

1. Compared to commonc veicle, electric vehicle's voltage is normally beolow 1000V, far more than the safe voltage 36V, so in case of casualty caused by electric shock during repairing process, security defense tools must be worn.

2. Misunderstanding
   - Can we operate whatever we want as long as we wear security defense tools?
   - It can only function as passive protection to cut down the degree of harm to human body.

Insulative helmet

1. IEC60903-2002，GB/17622-2008；

2.≥1000V。

1. Carried standard: IEC60903-2002, meeting GB/17622-2008 standard;
2. Insulation grade ≥ 1000V.

2 Introduction for Security Defense Tools

- Necessity

Goggles

1. Carried standard: GB14866-20063;
2. The lens are of PC material, in order to protect maintenance staff from harms caused by splashes, heat and ultraviolet rays;
3. The frame is of highly flexible PVC material, and closely attached to the face.

Insulative Gloves

1. Carried standard: IEC60903-2002, meeting GB/17622-2008 standard;
2. The order size is subject to a person's hand shape and size;
3. Insulation grade ≥ 1000V.
4. Thin version suitable for practical work convenience.

2 Introduction for Security Defense Tools

- Necessity

Insulative shoes

1. Carried standard: GB12011-2000 General Technical Conditions for Electrical Insulation Shoes for design and production;
2. Tearing strength ≧ 120 N;
3. Large double-density PU-PU sole with wear-proof, anti-oil and anti-skid properties;
4. The size is subject to a person's foot sole size;
5. Anti-smash standard: LD50-1994AN-I grade;

Insualtive Mat

1. Carried standard: HG2949-1999;
2. Insulation grade ≥ 1000 V;
3. Environmentally certified upon the PONY Test;
4. The waterproof rating of the tool is similar to plastic or rubber material;
5. The overall covering size of the maintenance station: 7 m × 4 m;

2 Introduction for Security Defense Tools

- Necessity

Insulative Tools

1. Insulation grade ≥ 1000 V;
2. Certified upon VDE insulation test;
3. Certified upon GS、IEC60900: 2004;

Warning Sign

1. In case of work under a high voltage system, it shall be placed in or around the vehicle, with a note of: Warning of danger (in both English and Chinese).

3 Notes on Standard Working

- Charging

1. connect charging cable

stop the car, open the charging socket cover, connect charging cable, plug power end first and then plug charging end.

Notes: Make sure there is no water at the charging socket before charging.

2. begin and stop charging

The indicator lamp on dashboard and the battery charging indicator lamp are on, means the charging begins; the battery charging indicator lamp is off, battery is full.

3. two types of charging

If use the charging stack to charge the vehicle, you need swipe your card before and after charging. If use 220v household power to charge the vehicle, you need high power socket(current capacity 16A).

4. pull off charging cable

when charging ends, pull off charging plug first and then power plug.

3 Notes on Standard Working

Charging

- Charging station should be rainproof, snowproof and ventilated.
- Power-supply devices should has electricity leakage protection quipment.
- Charging staion should not have ponding. Do not use water-spraying extinguisher.
- There must not be any inflammable or explosive stuff in the charging station.
- When charging, make sure the driving system is shut down and charging devices are intact.
- When charging, there must not be any ponding around the vehicle, especially around the charging port.
- Plug and unplug the charging plug as required.
- After stopping the car steadily, the distance between the rear end of vehicle and the power-supply socket is normally less than 4 meter(the cable is 5 meter).
- Do not repair the vehicle when charging.

3 Notes on Standard Working

- Check&Repair

- The vehicle working voltage is 380V, the repairing staff should receive special training.
- Checking and repairing should be conducted by at least 2 persons.
- The checking environment should be dry, ventilated, no inflammable or explosive stuff or water and must have CO2 extinguisher.
- Do not check or repair electrical fault in wet or humid weather.
- The checking staff should have deep insight into the maintenance manual.
- Conduct the insulation resistance check before check the fault.

3 Notes on Standard Working

- Check&Repair

- Wear the insulative gloves when check the insulation resistance.
- Check if there is any abnormal burnt smell before checking, if so, pull off the high-voltage maintenance switch to shut down 12V battery, call technical staff asap.
- Do not disassemble battery package cover to check, if you are sure it is the battery that has fault, call technical staff.
- Plug and unplug the high-voltage connectors after you pull off high-voltage maintenance switch for 1 minute.
- When pluging or unpluging the high-voltage connectors and checking the voltage, 2 persons must cooperate. Make sure the test pen only touches the pins instead the shell.

3 Notes on Standard Working

- Check&Repair

- Do not do any melding to the vehicle. If the melding is a must, disassemble the battery first.
- Do not peel off, splice or cut any high-voltage cable.
- When repairing finishes, make sure all the high-volatge connectors connect firmly.
- When you need to move the vehicle, better use the trailer and lift up the driving wheels. If you use ropes, pull off the high-voltage maintenance switch, pull off the connectors between the electric motor and the motor controller.

3 Notes on Standard Working

- After Checking

- Check if all connectors connect firmly.
- Check if high-voltage wire harness has motion interference.
- Check vehicle insulation resistance.
- Resume the high-voltage maintenance switch.
- Start the vehicle mormally.
- Check if the dashboard information is normal.
- Check if the fault is removed when driving.

4 Notes on Specific Working Conditions

Treatment on Accidents

- When collision or turnover happens, checking staff should wear insulative gloves, press the high-voltage maintenance switch.
- If the vehicle catches fire, stay away from it and use the carbon dioxide extinguisher.
- The checking staff should make a judgement on the condition and evaluate the degree of seriousness. Check if the battery is damaged, if so, call the technical staff.
- If you need to cut the vehicle to save people, press the high-voltage maintenance switch first, and keep away from high-voltage cable.
- If you can't touch the high-voltage maintenance switch, you should wear insulative gloves, shoes etc, cut the vehicle, keep away from high-voltage cable.

4 Notes on Specific Working Conditions

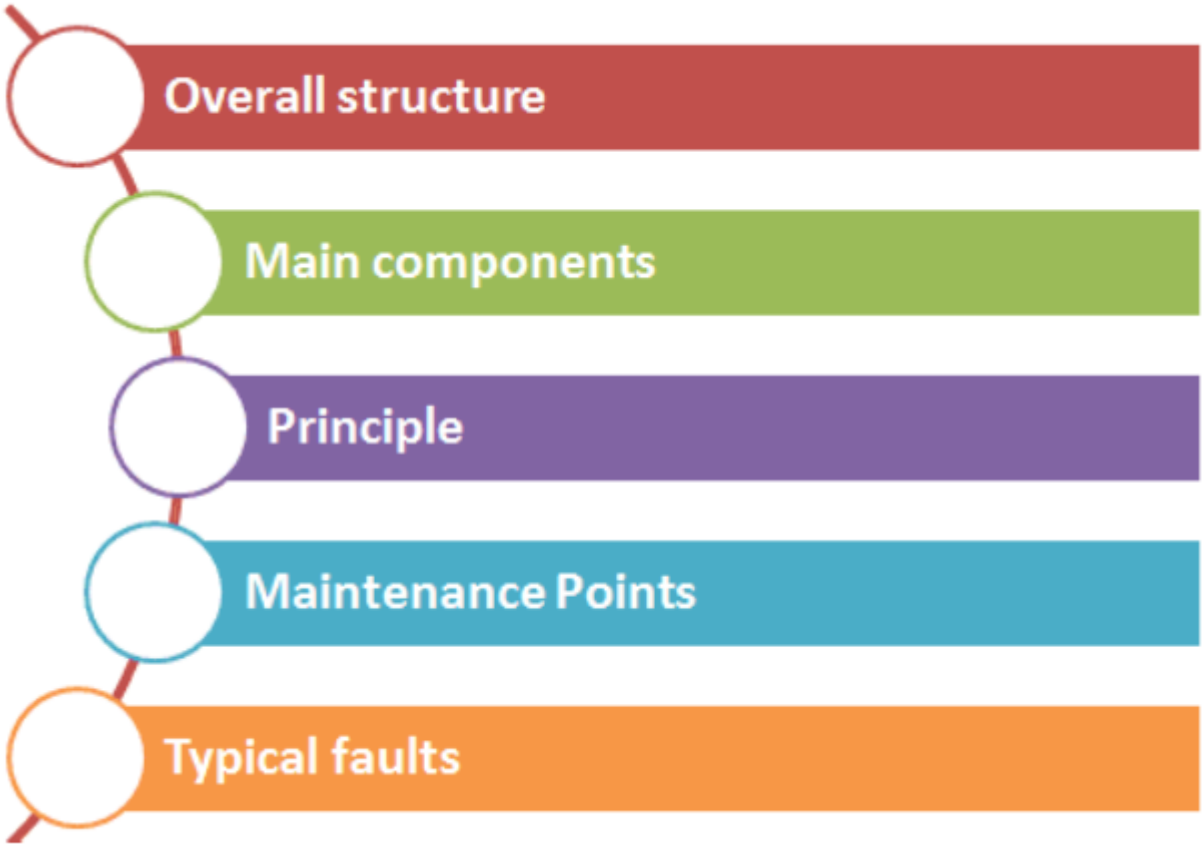
Notes on Maintenance on Rainy Days

- First drive the vehicle to somewhere rainproof before open the front cabin and the luggage cabin.
- If the vehicle can't run, turn the ignition lock to”OFF”, pull off the key, press high-voltage maintenance switch, shift the gear to the N, push or drag the vehicle to somewhere rainproof, the velocity should be less than 30km/h.
- Wipe the rain around the vehicle, especially the crevice and the charging socket.
- Open the front cabin, if the surface of the high-voltage parts and connectors inside the front cabin have ponding, wipe it, and blow it dry, the temperature of the wind should be less than 80℃.
- Open the luggage cabin, check if there is ponding around the battery, if so, wipe it.
- Open the charging socket cover, check if there is ponding, if so, wipe it with absorbent paper or sponge.
- If the condition permits, wait until the vehicle dry itself and then repair it.

Service Training Materials

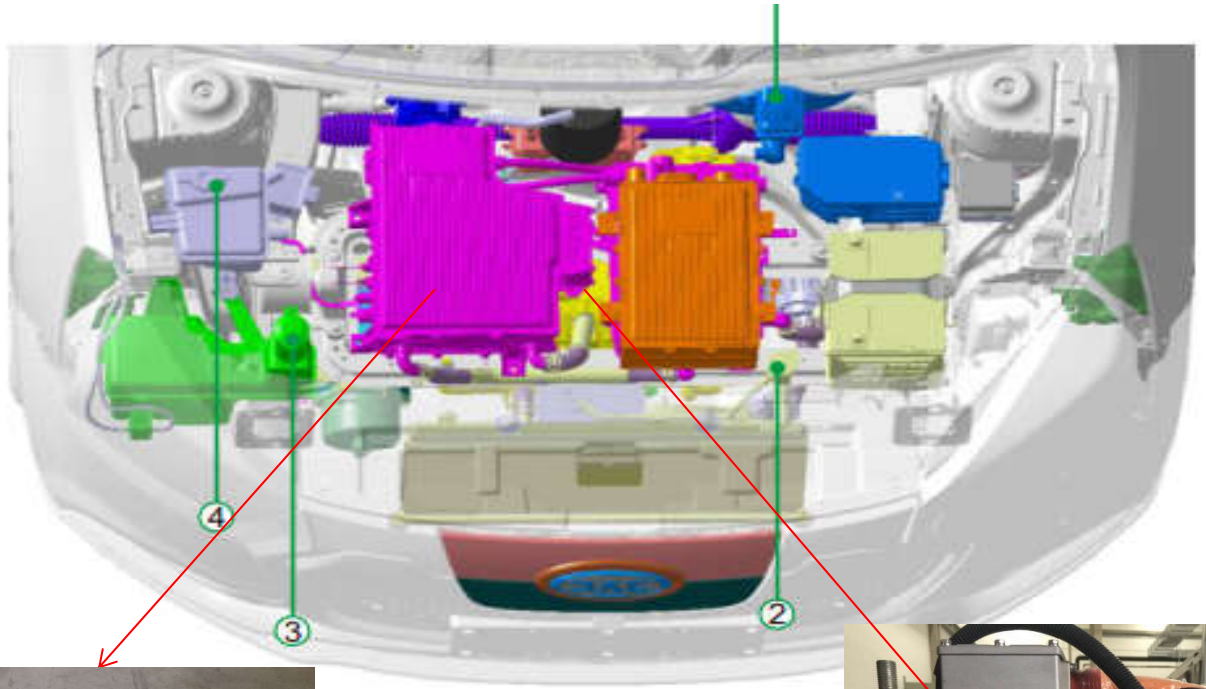
EVO 3 electric
Electric Drive System

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

- Structure

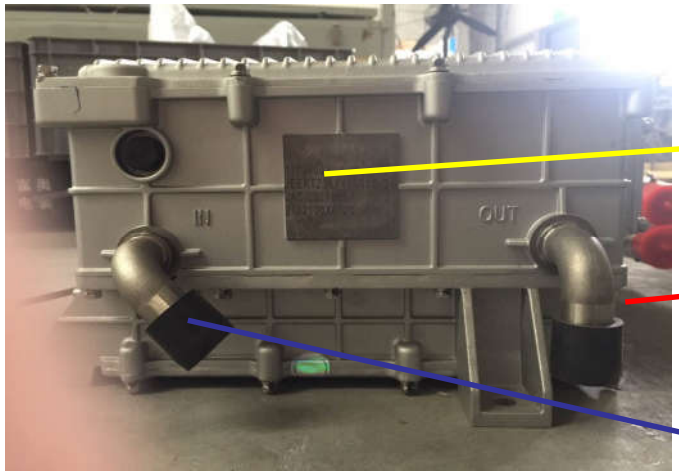


Drive Motor Controller

Drive Motor

2 Main components

● Driv Motor Controller



Motor Controller ID

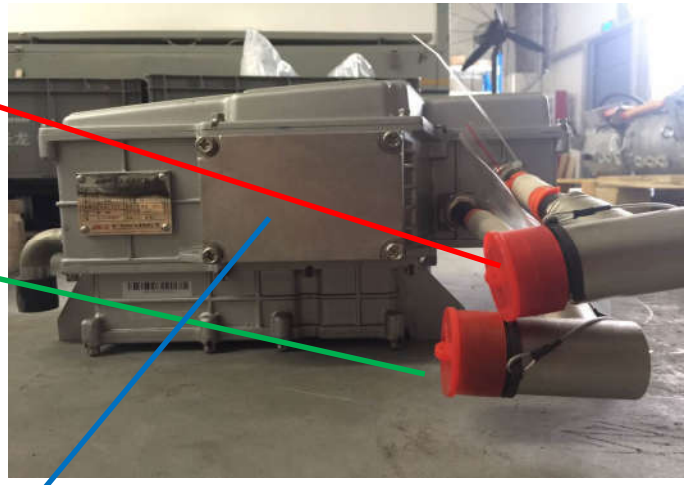
water outlet

water inlet

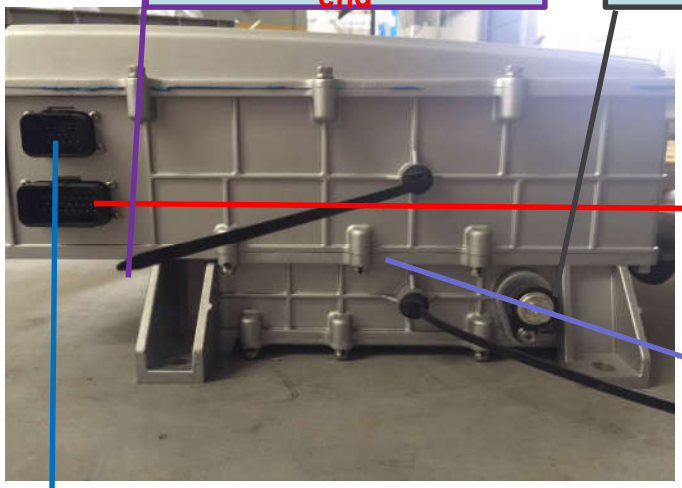
Motor Controller DC positive end(red)

Motor Controller DC negative end(black)

3 wire AC output end connecting Controller and Motor(UVW)



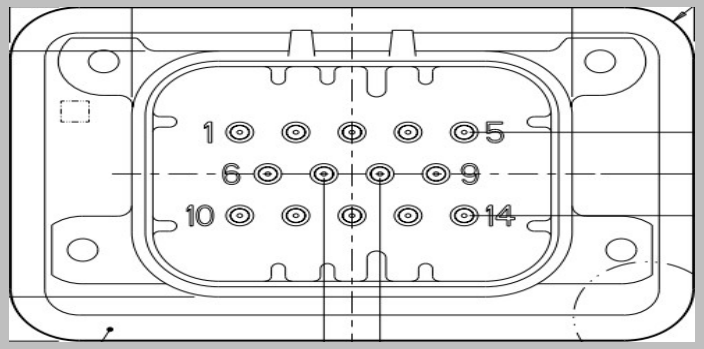
2 Main components



2 Main components

14-pin connector

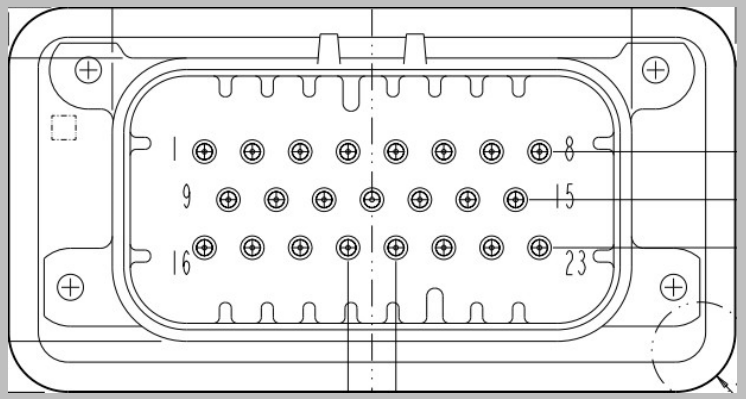
pin	definition	note	color	pin	definition	note	color
S4		resolver signal	blue	10	BOOTEN	programming port	
2	NTC_GND	motor temperature	purple	11			
3	S2	resolver signal	yellow	12	CAN_GND	programming	
4	NTC	motor temperature	Orange	13	R1	resolver signal	white
5	S1	resolver signal	Red	14	R2	resolver signal	yellow
6	232IN	programming port					
7	S3	resolver signal					
8	232OUT	programming port					
9							



2 Main components

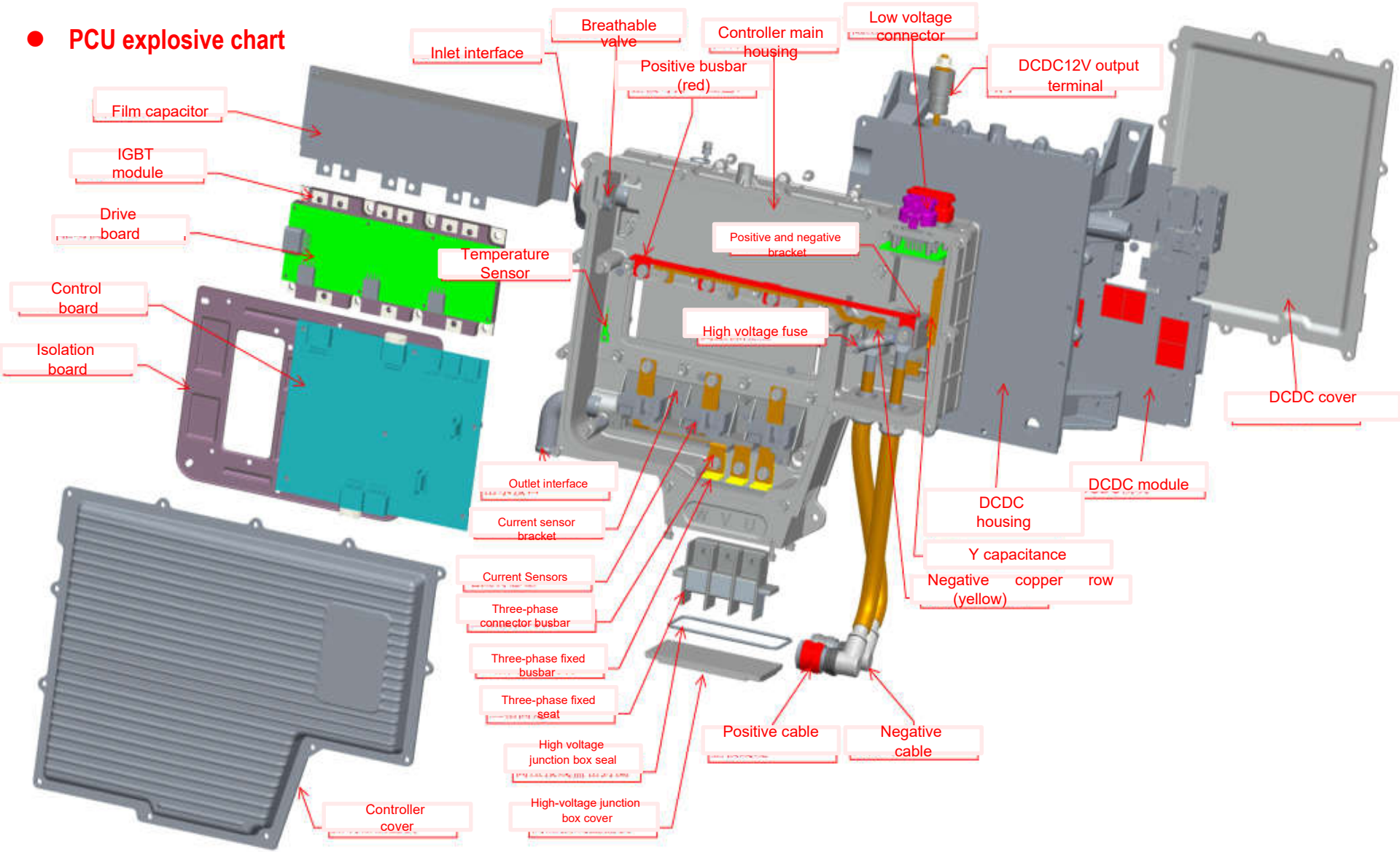
● 23-pin connector

pin	definition	note	pin	definition	note
1	12V	12Vpower	16	GND_12V	12V
2	12V	12V	17	GND_12V	12V
3			18		
4			19		
5			20		
6			21	CANL	PCU CANL
7			22	CNAH	PCU CANH
8			23	CANshield	CAN CAN shield ground
9					
10	DCDC_EN	DCDC enabling signal			
11	DCDC_FB	DCDC fault signal			
12	DCDC_RT1	DCDC thermistor			
13	DCDC_RT2				



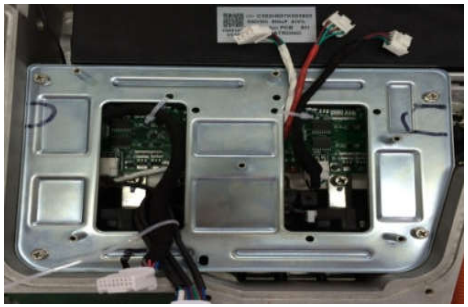
2 Main components

- **PCU explosive chart**

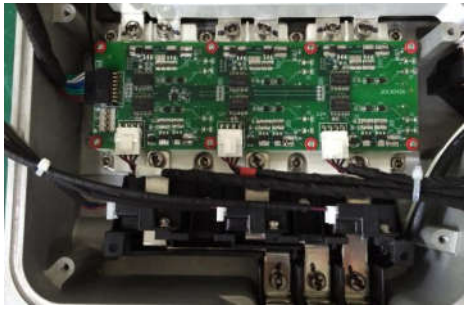


2 Main components

ideal PWM wave sent to driving panel, meanwhile collects resolver signal, protects driving panel and IGBT.



Isolation Panel:isolates the control panel and the driving panel to get rid of electromagnetic interference.

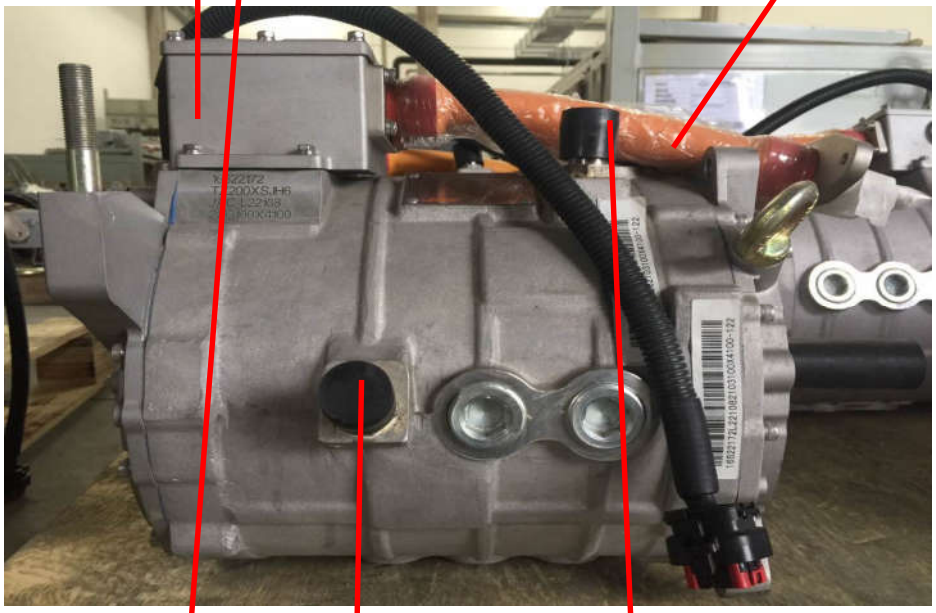


Driving Panel;includes driving chip etc. According to the PWM wave input by control panel, it controls the on and off of the IGBT, to makes IGBT invert ideal voltage wave form and protects IGBT.

Power Module:IGBT--Insulated Gate Bipolar Transistor, it inverts the DC offered by battery to the 3-phase AC, to drive the permanent magnet synchronous motor.

2 Main components

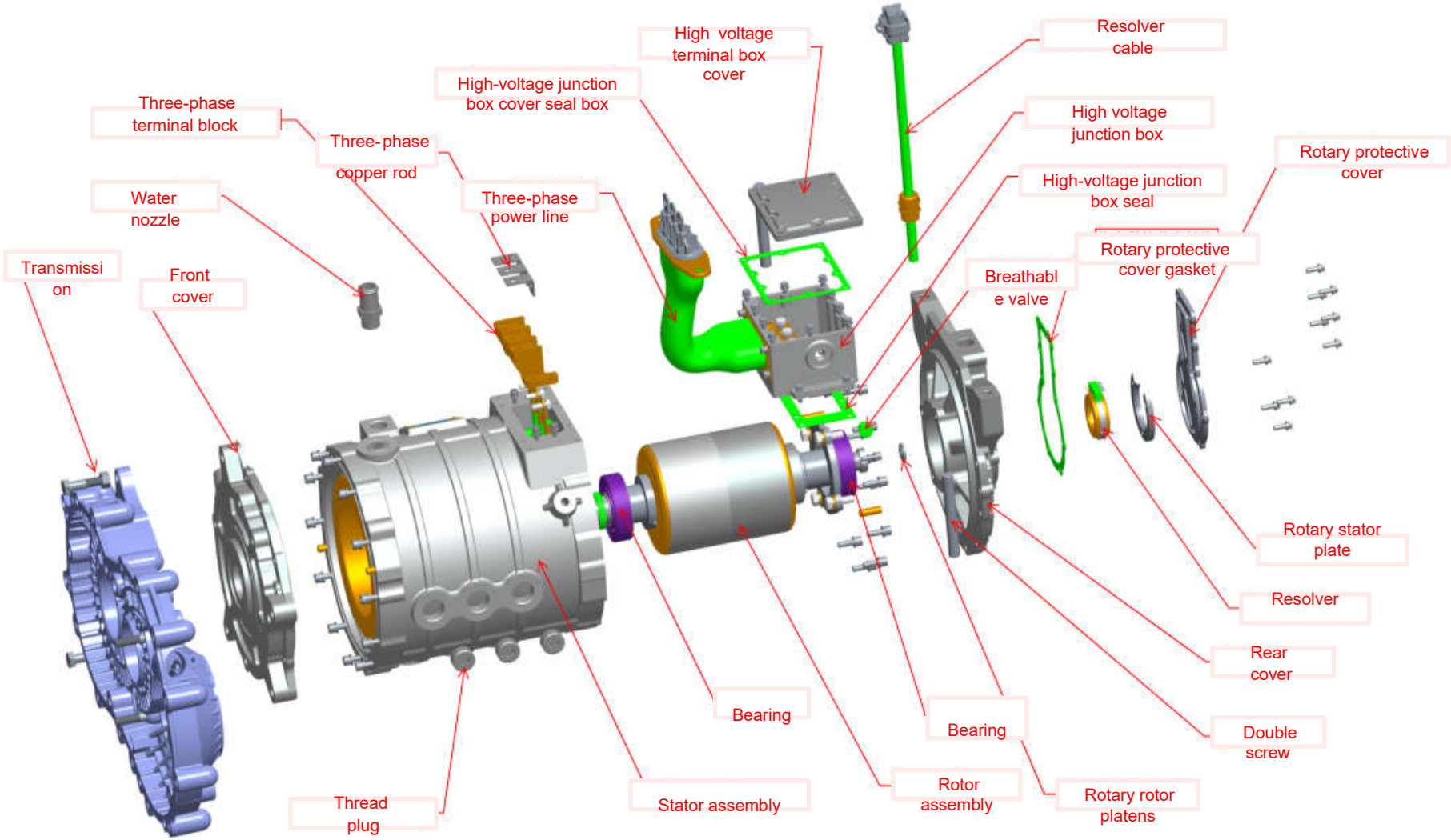
driving motor



technical parameter	
peak torque	270 Nm
max rotationalspeed	9500 rpm
peak power	85 Kw
cooling	liquid-cooled
max vehicle speed	D： 105 Km/h S： 130 Km/h

2 Main components

Driving Motor Explosive Chart



2 Main components

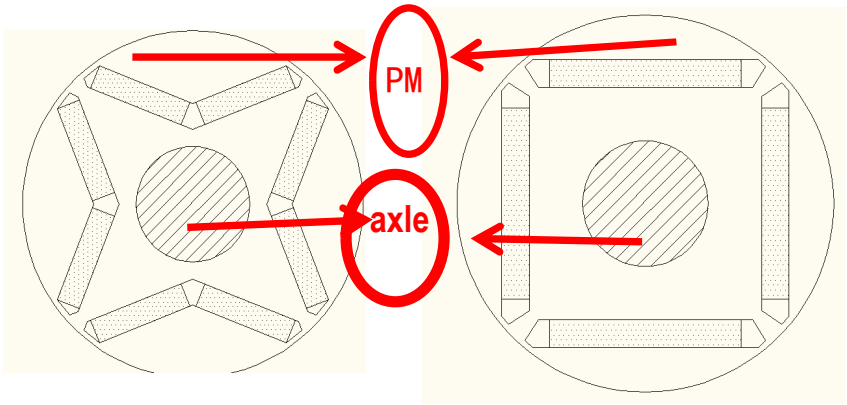
Permanent Magnet Synchronous Motor Structure

The stator is similar yet the rotor differs. The rotor structure of permanent magnet synchronous motor can be divided into hidden-pole and salient-pole. Because the salient-pole rotor can use the magnetic resistance produced by the salient pole effect, it can improve motor peak torque and power density. Here are 2 commonly used rotor structure. The V-shape is replacing the line-shape. Only in limited rotor space will the line-shape be taken into consideration.

2 Main components

3 phase AC stator assembly

PMSM rotor



V-shape line-shape

Advantages of PMSM

- high efficiency

Because the magnetic field of PMSM is produced by permanent magnet, it can reduce the waste of excitation current.

The power coefficient of PMSM is high.

- Motor Structure

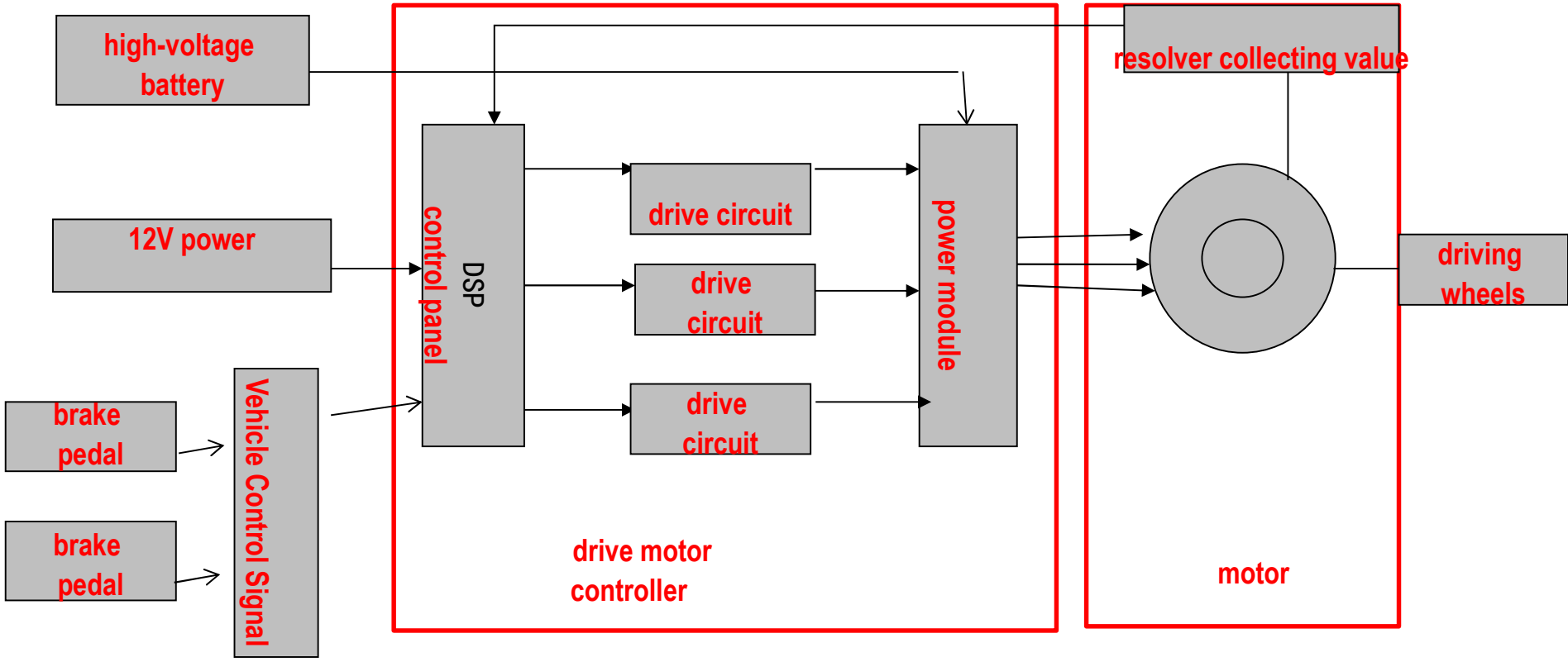
Compared to classical motor, it reduces the complexity of motor structure to a great degree.

3 Principle

- Based on the torque requiring signal sent by VCU through CAN, the motor controller controls the motor.

- Motor controller converts the DC of battery to the AC, meanwhile collects motor position signal and 3-phase current testing signal, to drive motor precisely.
- During speed-reducing stage, motor is used as generator. It can convert the kinetic energy produced by rotational wheels to electric energy, to charge the battery.
- If fault happens, the system will enter fail-safe mode.

3 Principle


high-voltage battery
12V power
brake pedal
brake pedal
Vehicle Control Signal
DSP control panel
drive circuit
drive circuit
drive circuit
power module
drive motor controller
resolver collecting value
driving wheels
motor

3 Principle

failure mode

drive motor over-velocity warning	9500rpm-10000rpm Torque 100% -0% Linear load shedding
drive motor over-current warning	Torque reduced to 70% after 550A and 0% after 570A
high-voltage over-voltage warning	400V-420V Torque 100% -0% Linear load shedding
high-voltage under-voltage warning	240V-220V Torque 100% -0% Linear load shedding
drive motor over-temperature warning	170℃-180℃ Torque 100% -0% Linear load shedding
motor controller over-temperature warning	85℃-95℃ Torque 100% -0% Linear load shedding
IDBT over-temperature warning	95℃-115℃ Torque 100% -0% Linear load shedding
motor controller temperature sensor fault	Speed less than 50rpm, torque greater than 100Nm, Reduce the IGBT switching frequency to 5KHz

3 Principle

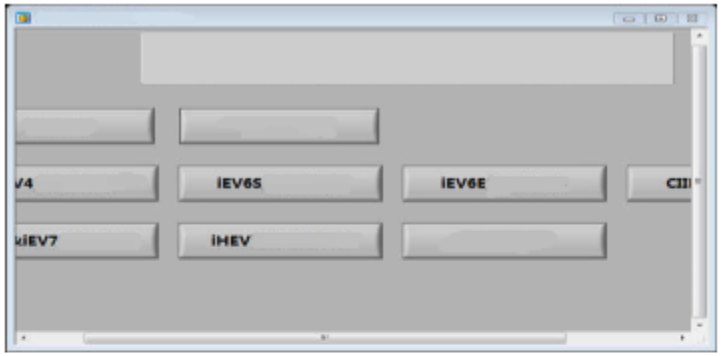
Protection control

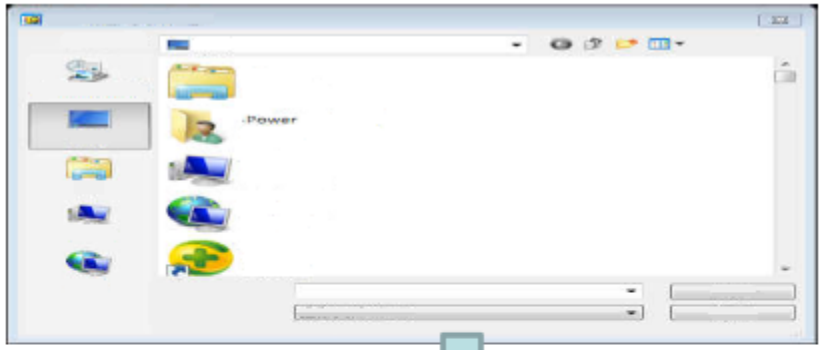
◆When the motor controller or motor temperature rises, in order to protect the system, the motor controller will temporarily enter the protection state. When the temperature returns to normal, the protection is automatically released.

condition	control	resume condition
electric motor over-temperature	limit the torque output based on the electric motor temperature	the electric motor temperature reduces
motor controller over-temperature	limit the torque output based on the motor controller temperature	the motor controller temperature reduces
IGBT over-temperature	limit the torque output based on the IGBT temperature	the IGBT temperature reduces
extremely low rotation velocity,IGBT over-temperature	reduce the IGBT switch frequency,notes:the motor noise rises	the rotation torque reduces;the rotation velocity rises

4 Maintenance Points

Step 1: open computer, connect USBCAN with computer, OBD port of whole vehicle
Step 2: Select the EVO 3 pure electric car. Click to find a dialog box popping up. Enter "frame number.asc" in the file name and click OK.
Step 3: Select Device Type inside USBCAN1 or USBCAN2. After selecting, click Open Device, then select “0” channel inside CAN Channel. After selecting, click Start CAN to connect successfully. Note: When selecting the CAN channel, it must be a “0” channel, and at the same time, the wiring on the CAN box is also connected to the “0” channel. Otherwise it can not read failures
Step 4: Select VCU diagnosis a, see if any fault is reported, and check the fault code to see if it is an electrical drive system fault.
Step 5: Select the PCU diagnosis to see what the failure is reported. Check the fault code to see if it is an electrical drive system fault.





4 Maintenance Points

The history fault of motor controller shows in diagnostic sytem. Detailed steps are: First “read fault code”, read history fault type from the DTC column; Second “read frozen frame”, read all the information when fault happens. Click”clear fault code” to clear the history fault.

4 Maintenance Points

Fault Code

Connectting to vehicle diagnostic interface, offering power to controller, read the master computer's monitored data(as below) to identify the cause of fault.
The third level is serious fault, which is dangerous to human body and high-voltage must be cut down.
The second level is medium fault, protection must be taken and vehicle can still be driving.
The first level is common fault, just read it and don't need to take any actions.
Fault codes:

4 Maintenance Points

No.	Fault level	DTC（DEC）	DTC（HEX）	Failure Name	Fault description
1	Level 3 failure	244	F4	The motor input is missing	Phase current detection does not match the calculated value
2	Level 3 failure	243	F3	Drive low voltage power supply failure	Drive chip power supply voltage is lower than 15V
3	Level 3 failure	238	EE	PCU temperature sensor fault	Exceeds normal (0.065V-3.3V) range
4	Level 3 failure	237	ED	U phase current sensor self-testing fault	Zero drift is over large (1.65V ± 0.1V)
5	Level 3 failure	236	EC	V phase current sensor self-testing fault	Zero drift is over large (1.65V ± 0.1V)
6	Level 3 failure	235	EB	W phase current sensor self-testing fault	Zero drift is over large (1.65V ± 0.1V)
7	Level 3 failure	234	EA	U phase current sensor circuit fault	Open or short circuit
8	Level 3 failure	233	E9	V phase current sensor circuit fault	Open or short circuit
9	Level 3 failure	232	E8	W phase current sensor circuit fault	Open or short circuit
10	Level 3 failure	162	A2	TM Drive motor over speed fault	Motor speed> 10000 rev / min
11	Level 3 failure	163	A3	TM Over-current fault	Motor three-phase phase current ≥570A
12	Level 3 failure	164	A4	TM motor over-voltage	voltage≥ 420V Level 3 failure

4 Maintenance Points

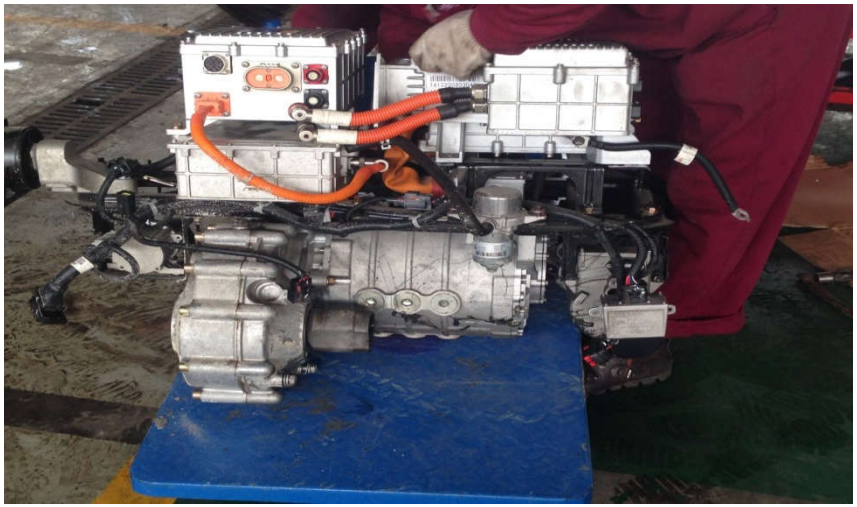
13	Level 3 failure	165	A5	TM motor under-voltage	The female line voltage≤220V
14	Level 3 failure	166	A6	TM motor over heated	Motor temperature≥180℃
15	Level 3 failure	167	A7	PCU over heated	PCU temperature≥95℃
16	Level 3 failure	168	A8	PCU power supply module failure	Low voltage supply is less than 9V
17	Level 3 failure	169	A9	TM IGBT failure	Drive chip reported over voltage / over current
18	Level 3 failure	170	AA	TM Motor rotor position sensor fault	Rotary decoder chip failure
19	Level 3 failure	176	B0	Current sensor self-test failure	Test only when with power supply
20	Level 3 failure	177	B1	12V voltage is too low	GATE ON starts detection and GATE OFF stops detecting
21	Level 3 failure	178	B2	CAN communication fault	1.2s can not receive the signal
22	Level 3 failure	179	B3	IGBT over heated	IGBT temperature≥115℃
23	Level 2 failure	81	51	TM over speed warning fault	Linearly loaded by 100% -0%
24	Level 2 failure	82	52	PCU Over-current warning fault	Torque dreased to 70% after 550A

4 Maintenance Points

25	Level 2 failure	83	53	PCU over voltage warning	400V-420V Linearly loaded by 100%
26	Level 2 failure	84	54	PCU under voltage warning	-0% 170℃-180℃ Linearly loaded by 100% -0%
27	Level 2 failure	85	55	TM over heat warning	170℃-180℃ Linearly loaded by 100% -0%
28	Level 2 failure	86	56	PCU over heat warning	85℃-95℃ Linearly loaded by 100% -0%
29	Level 2 failure	89	59	IGBT over heat warning	95℃-115℃ Linearly loaded by 100% -0%
30	Level 1 failure	50	32	IGBT temperature detection circuit failure	Open or short circuit
31	Level 1 failure	49	31	Data storage exception	Data can not be read / written
32	Level 1 failure	48	30	Voltage detection circuit failure	Exceeds normal（0-3.3V）range
33	Level 1 failure	47	2F	Blocking fault	5KHzSpeedless than 50rpm, torque greater than 100Nm, Reduce the switching frequency to 5KHz

5 Typical Faults

Strange Noises



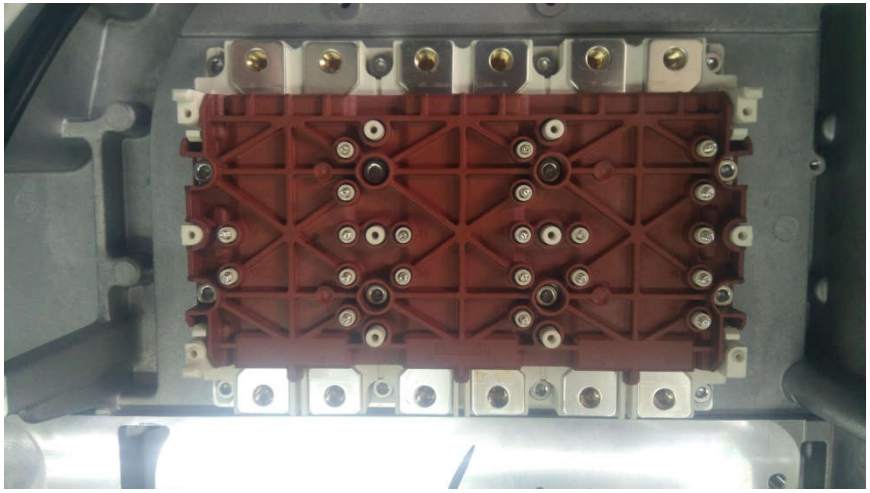
Judging Methods

- When driving or lifting up the vehicle and start running, listen carefully to the running electric motor to see if there is any strange noises(high-frequency noise is produced normally by electromagnetic device), decide whether the strange noises are coming from the electric motor or the reducer according to the frequency.

Phenomenon	Solutions
Strange noises during running	Replace reducer or electric motor

5 Typical Faults

IGBT Fault



Judging Methods

- Make sure it is the fault inside the controller.
- Check if there is any broken pins inside wire harness.
- Check if there is badly melding at the control panel.
- Check if IGBT itself has fault.

Phenomenon

Vehicle reports IGBT fault code 163.

Solutions

Replace wire harness.

Replace control panel.

Replace controller assembly.

5 Typical faults

Low-voltage Power Module Fault

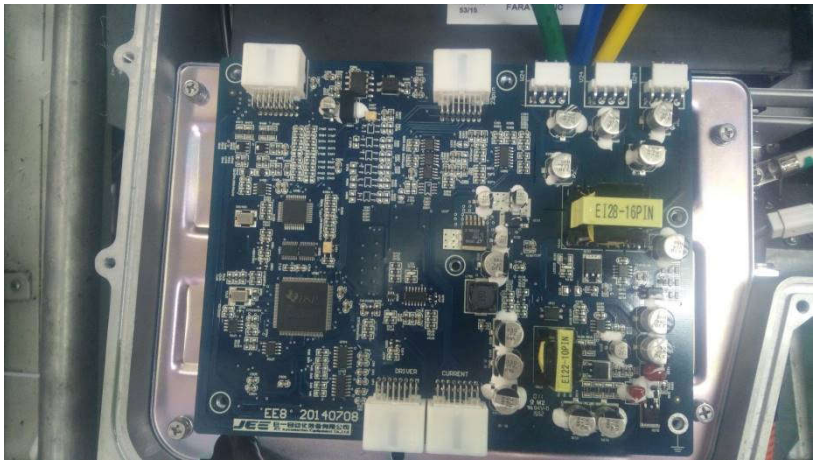
Phenomenon	Solutions
Vehicle can't run, driving low-voltage power module has fault.	Fix the battery's problems. Replace DCDC. Replace control panel.

Judging Method

- Check the voltage and the positive and negative ends of the battery.
- Check if DCDC has output voltage.
- Measure the 1st and 2nd pins of the 23pin controller to see if there is 12V voltage.

5 Typical faults

Drive Motor Overcurrent Fault



Judging Methods

- Phase current of motor is beyond 570A.
- Pull off low-voltage 14pin connectors to check the resolver resistance.
- Check the current sensor wire harness inside the controller.
- Check the control panel inside the controller.
- Check the drive panel inside the controller.

Phenomenon

Vehicle can't running, diagnostic tools report drive motor overcurrent fault A3.

Solutions

Fix the wire harness.

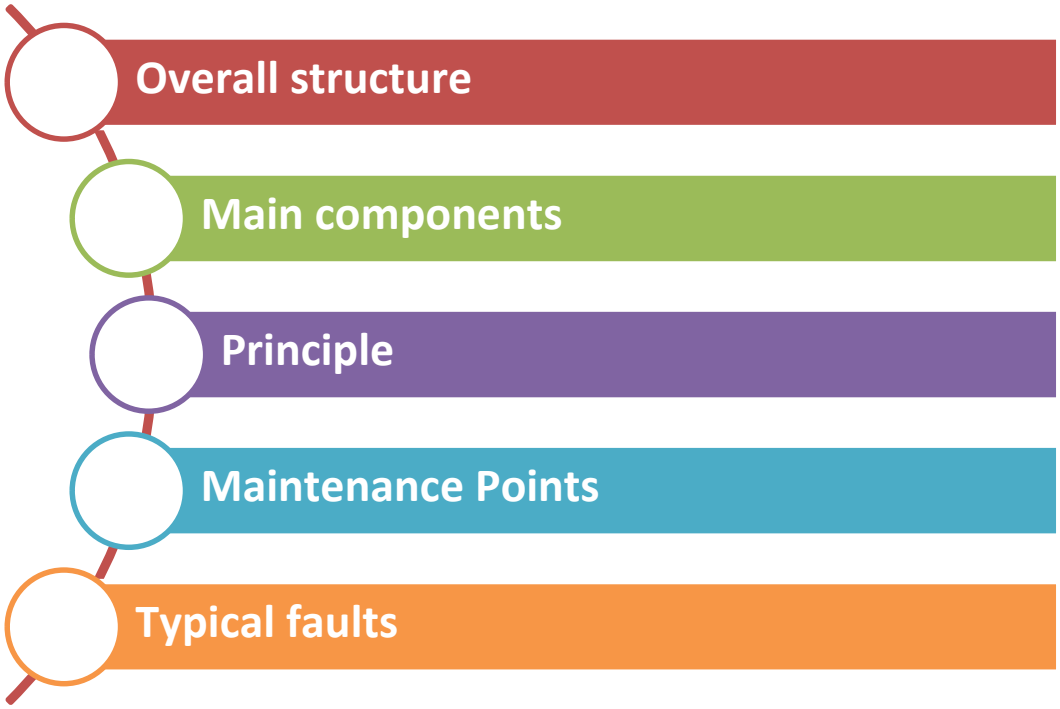
Replace the control panel.

Replace the controller.

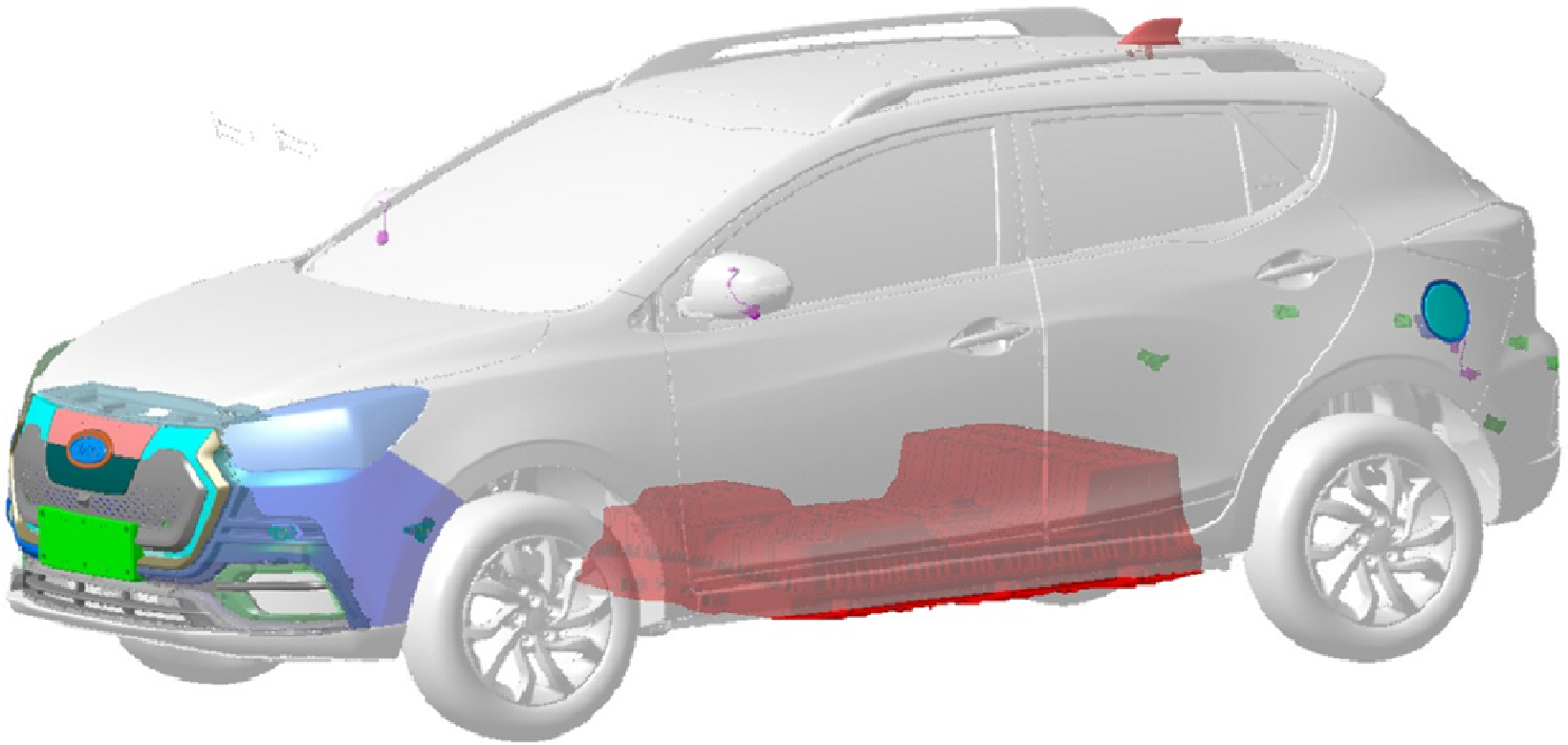
Service Training Materials

EVO 3 electric
Battery System

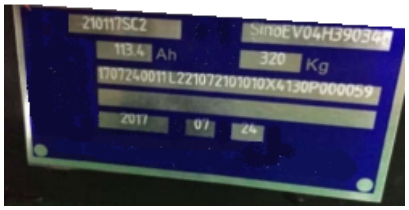
Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

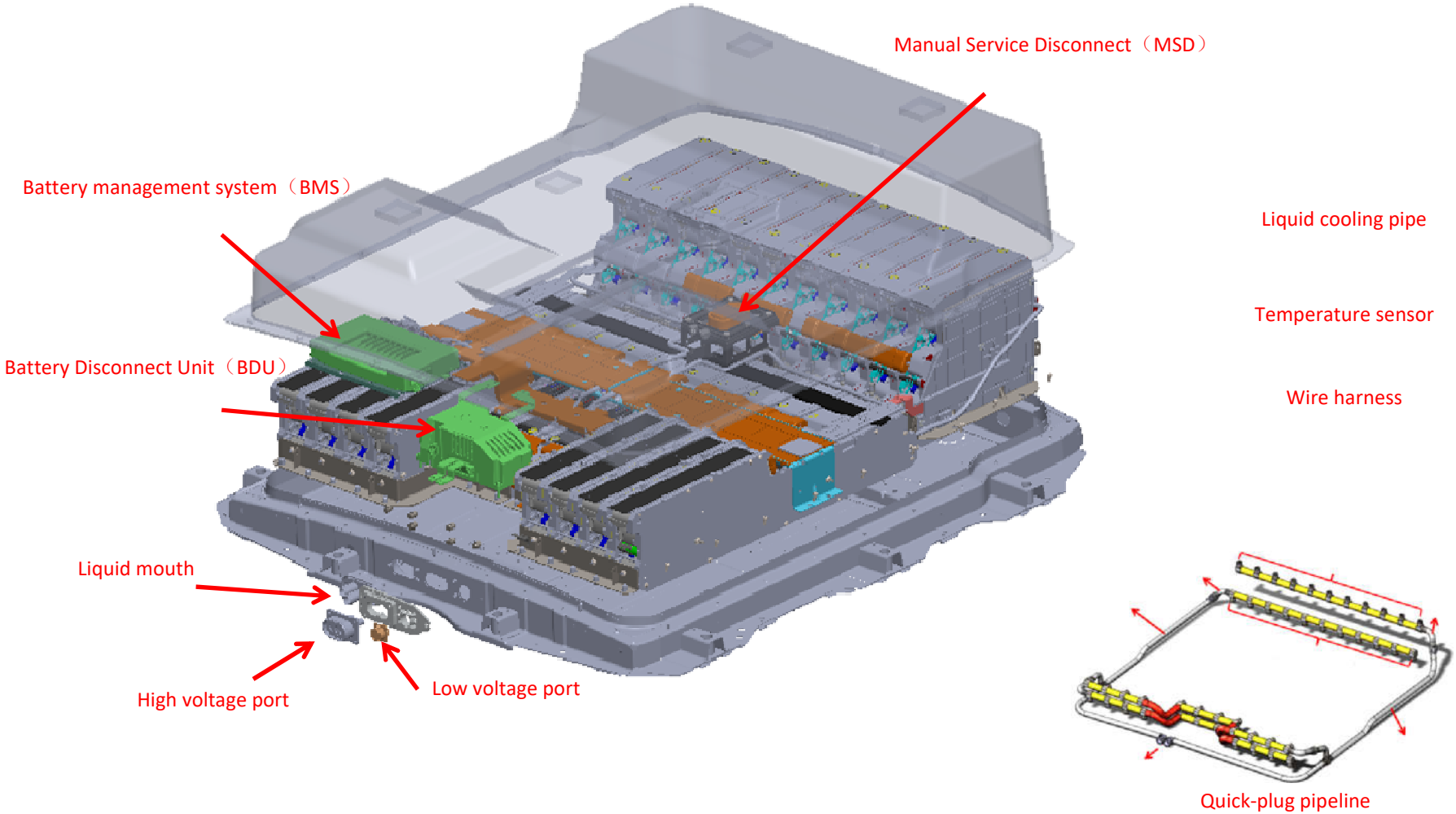
1 Overall structure



1 Overall structure



1 Overall structure



1 Overall structure

- Safety precautions

➢ Electric vehicle has a high voltage battery, if the vehicle or high voltage parts are dealt with in a wrong way, you will take a risk of electricity leakage, electric shock, or something like that. Do chec

➢ Before you check or maintain the high-voltage system, you must turn the key to the "lock" or pull out the key, disconnect the negative pole of the battery, disconnect the maintenance switch(after you disconnect the maintenance switch for 10 minutes, and before you check and repair the high-voltage system, meaure the high-voltage circuit with multimeter to make sure it is safe) and wear insulation protecting equipments including gloves, shoes and glasses.

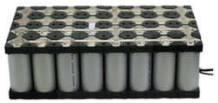




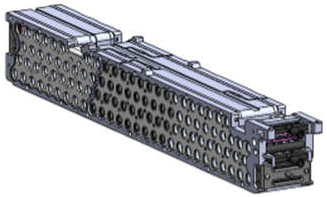

2 Main components

- Battery

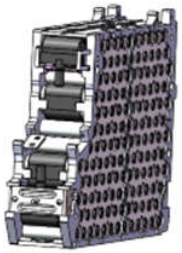
1P



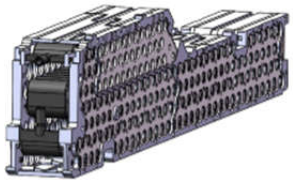
42P=1S



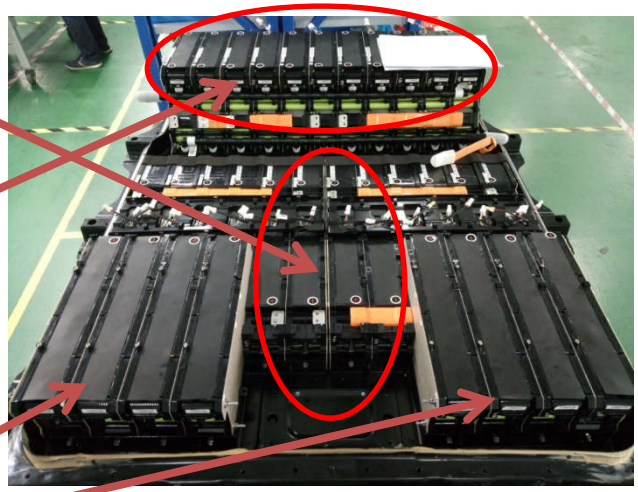
3S



4S



5S



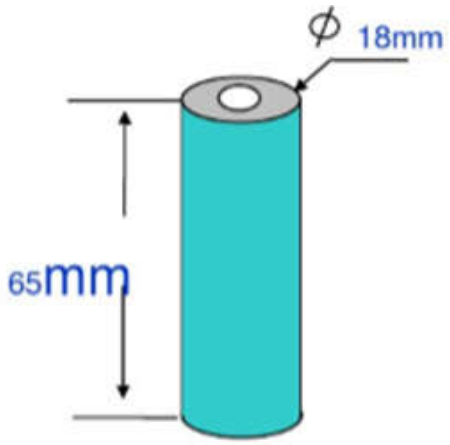
4*3S + 11*4S + 8*5S

Electric core→Cell →Module→Battery

2 Main components

- Battery

➢ Electric core



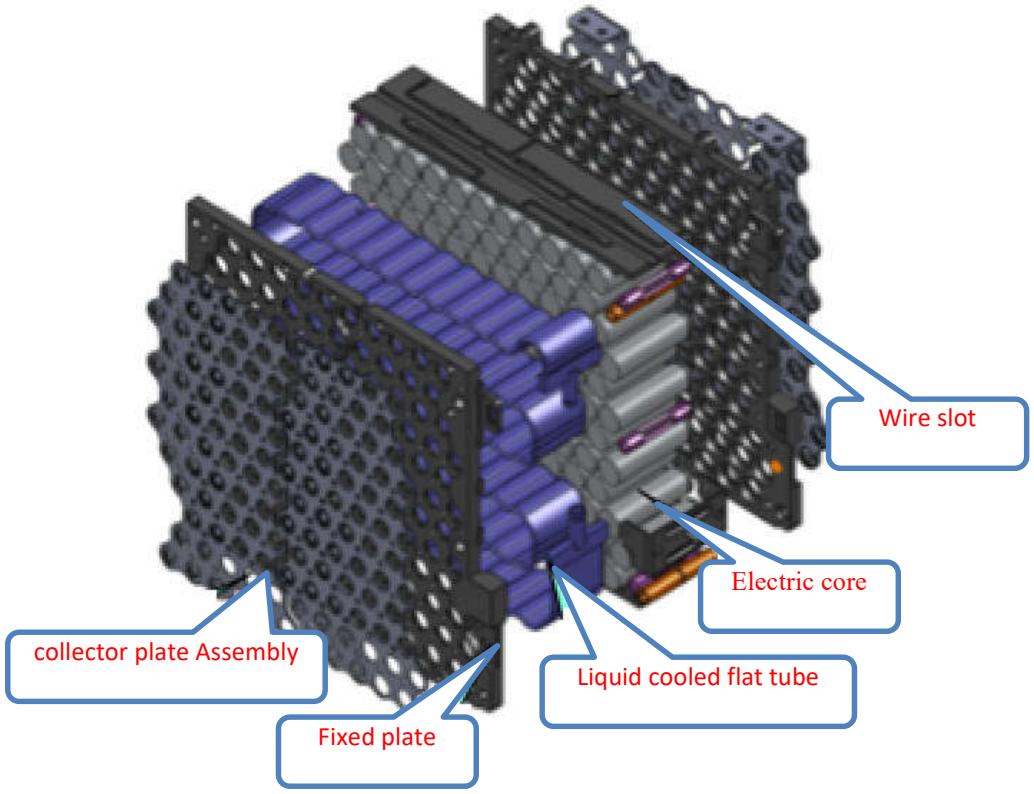
Model 18650
working voltage 3.6V capacity 2.75AH

- Battery capacity: Ah , it shows how much electric quantity the battery can store, it is determined by the active substance of the battery
- Battery Power: Wh , it shows how much energy the battery can store.
- Internal resistance: mΩ , the resistance to the flow of current through the battery while battery is working. The internal resistance is mainly affected by battery material, manufacturing technology, battery structure and other factors.
- Self-discharge rate: %/Month , the capacity of the battery gradually decreases during storage,it is the ratio of reduced capacity to battery capacity.

2 Main components

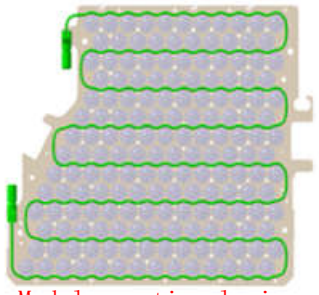
- Battery

➢ Module

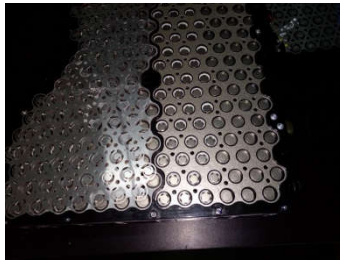


collector plate Assembly= Mica tablets+collector plate+Electrode sheet+ Mica tablets

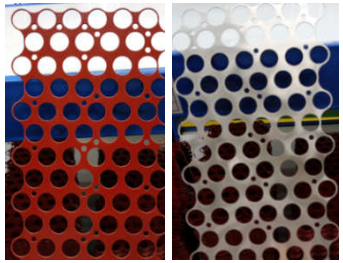
Liquid cooled flat tube



Module sectional view



collector plate Assembly



collector plate Assembly

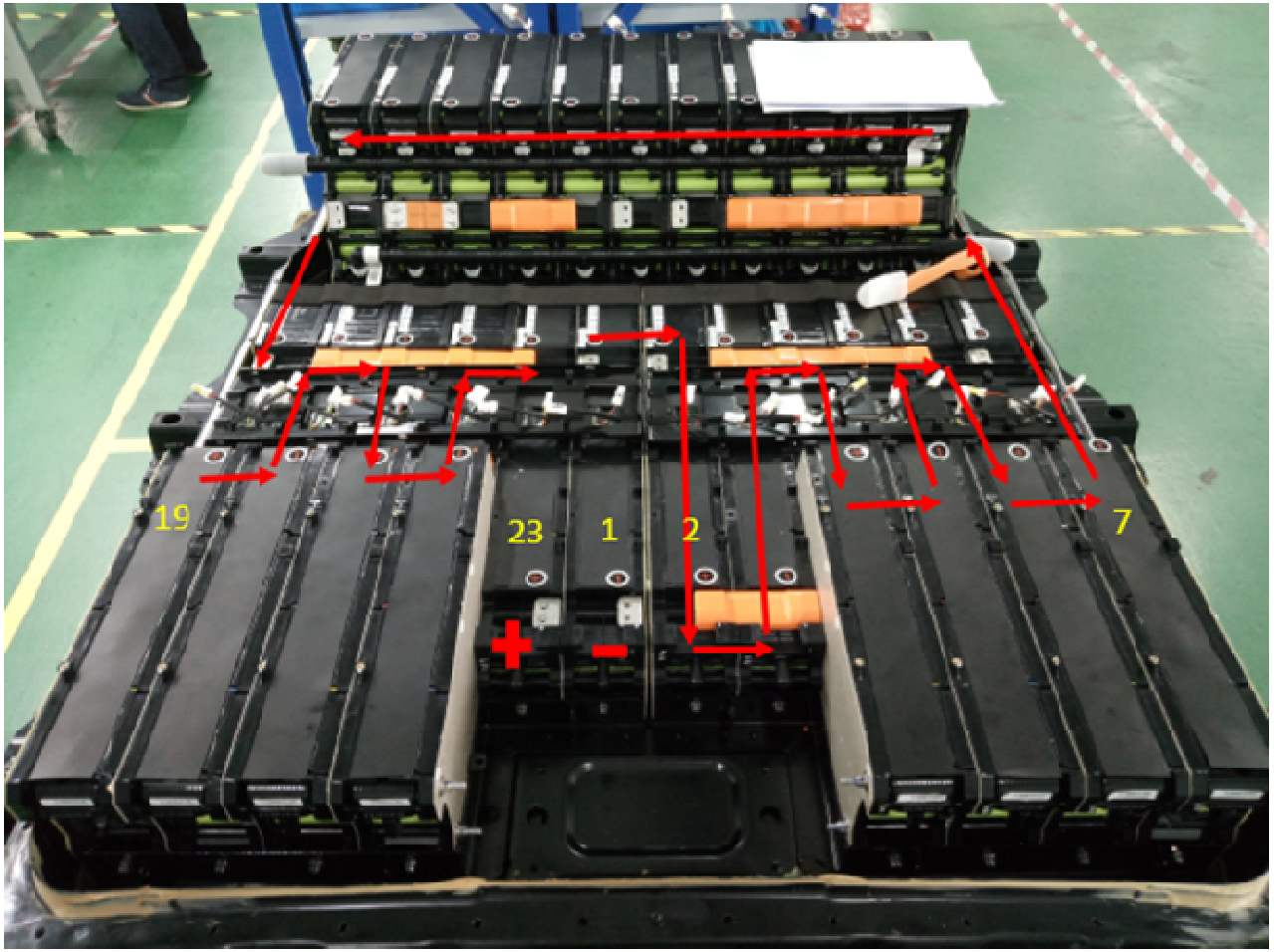
Detection board

Detection board

2 Main components

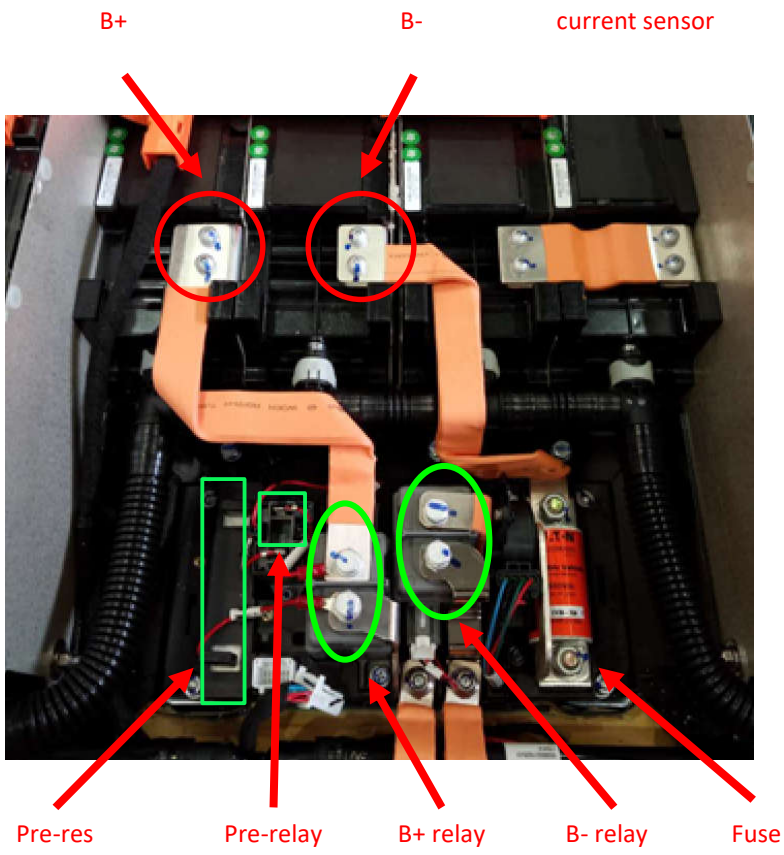
- Battery

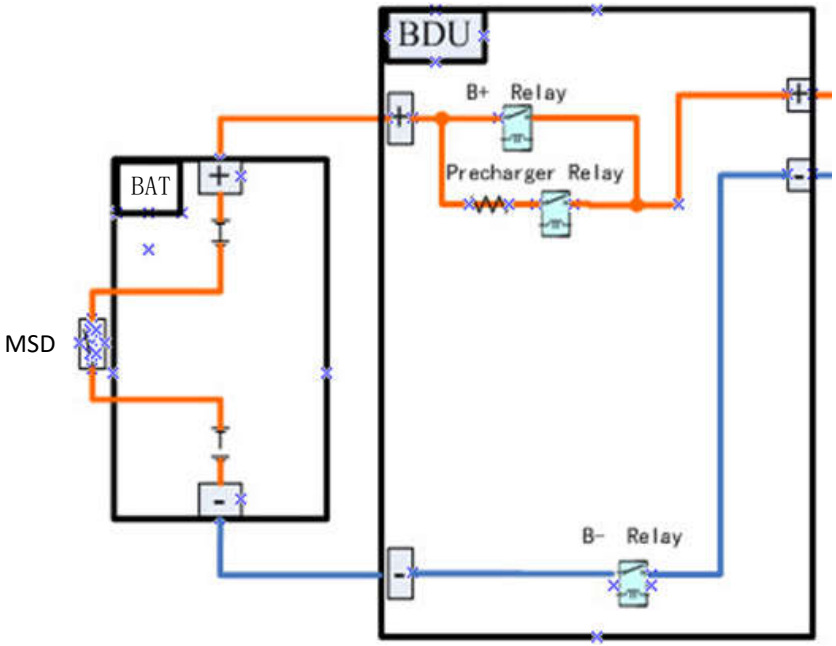
Module connection



2 Main components

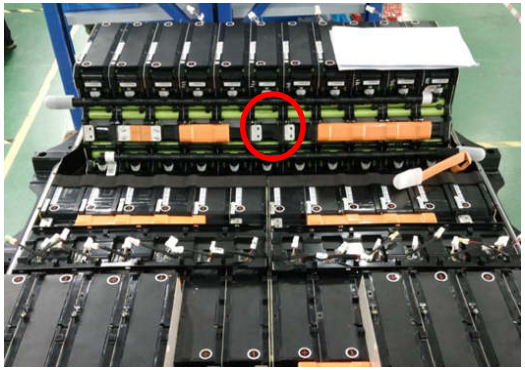
- Battery Disconnect Unit（BDU）

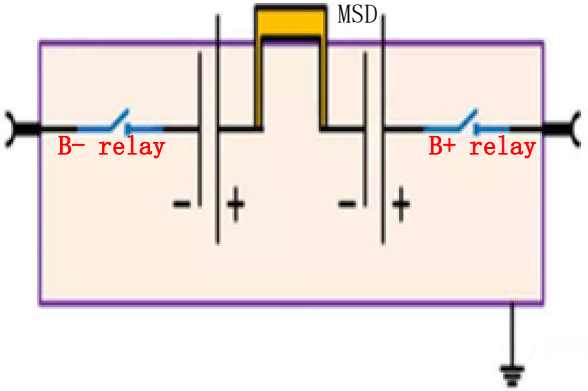


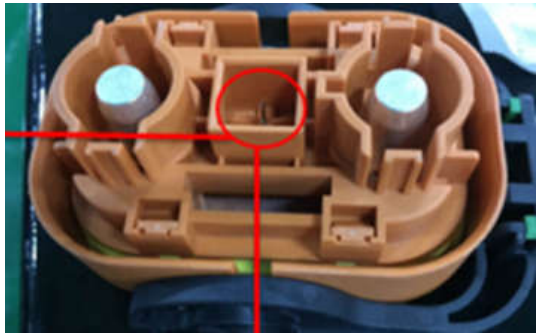


2 Main components

- Manual Service Disconnect（MSD）



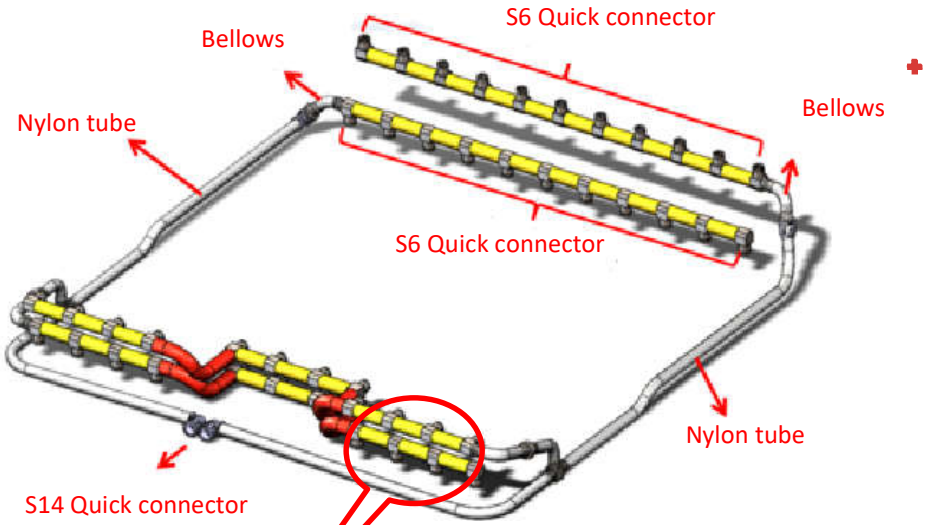


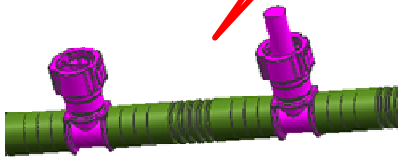


2 Main components

- Cooling Pipeline

Quick-plug pipeline

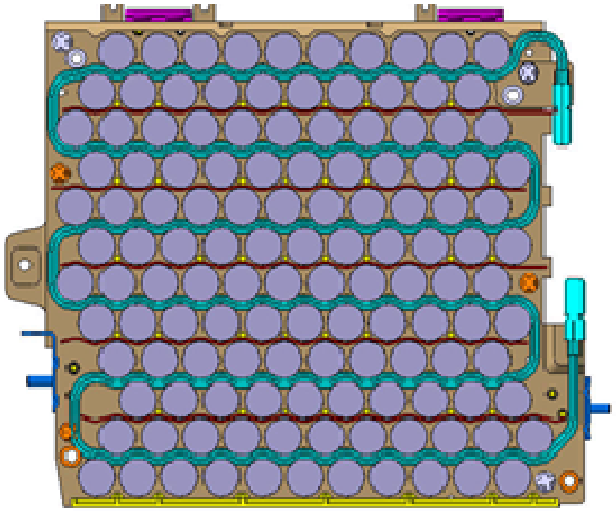




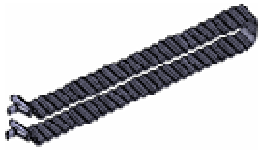
Quick connector

Temperature sensor

Liquid cooling pipe



Module sectional view



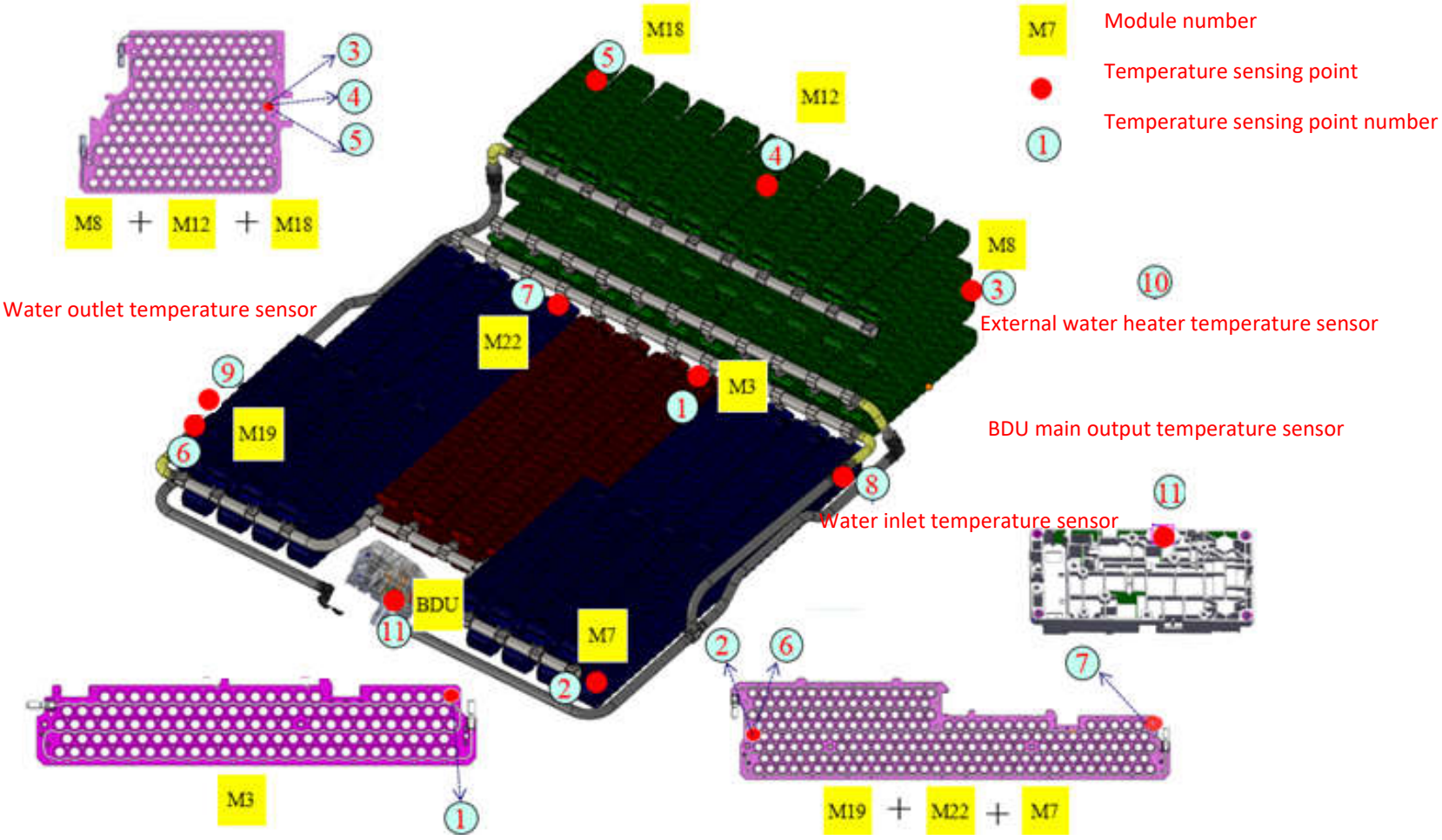
3S liquid cooling pipe

4S square liquid cooling pipe

5S enlongated liquid cooling pipe

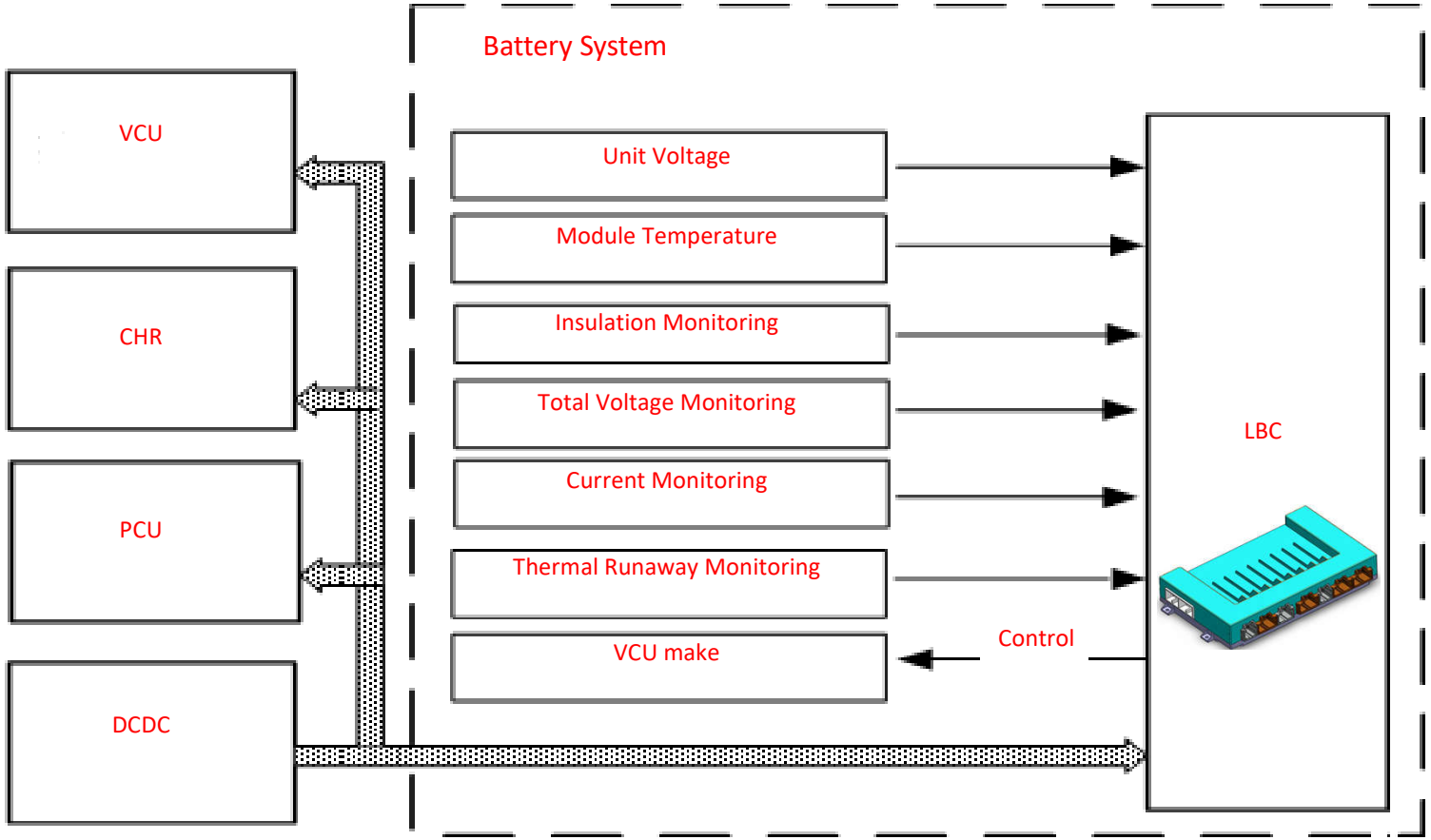
2 Main components

- Temperature sensor



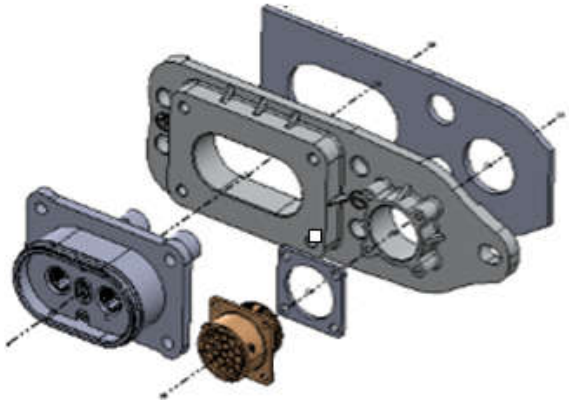
2 Main components

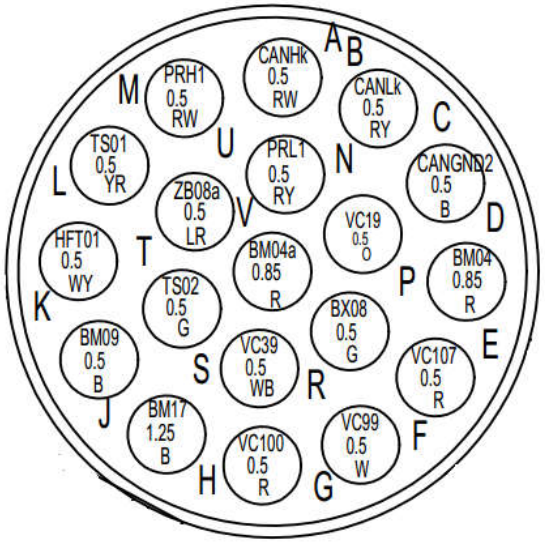
- Battery management system（BMS/LBC）



2 Main components

- High voltage output and low voltage communication interface





1	B+	
2	B-	

1(A)	V_CAN-H	V_CAN-H
2(B)	V_CAN-L	V_CAN-L
3(C)	V_CAN Shield	V_CAN
4(D)	KEY	KEY
5(E)	B+ relay	B+
6(F)	B- relay	B-
7(G)	Pre relay	
8(H)	relay GND	
9(J)	LBC GND	LBC
10(K)	HWFLT	
11(L)	Tensor+	
12(M)	B_CAN-H	B_CAN-H
13(N)	B_CAN-L	B_CAN-L
14(P)	VCU Wake	VCU
15(R)	HVIL 1	1
16(S)	HVIL 2	2
17(T)	Tensor-	
18(U)	12V	
19(V)	LBC Power	LBC

3 Principle

- Electrical schematic diagram

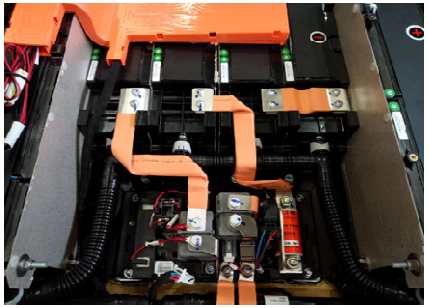
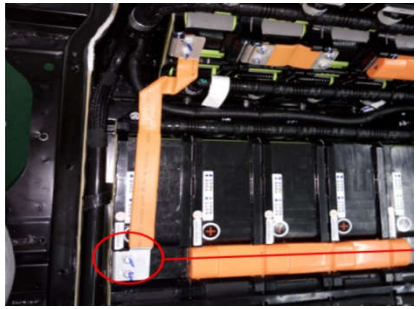
see attached 1

4 Maintenance Points

Spontaneous Liquid Discharging&Compulsory Liquid Discharging: Compulsory Liquid Discharging means using the appropriative equipme nts to access compressed air of 0.3~0.4 Mpa for 15minutes.

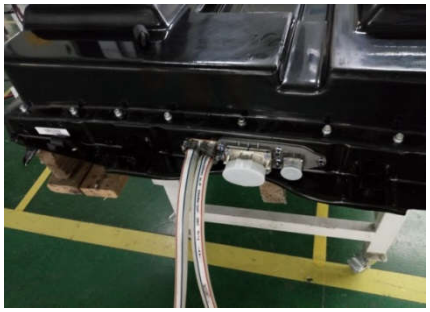



High-voltage Connectors Protection: In case of electric shock, cover the high-voltage connectors with insulational tape after you pull it out.

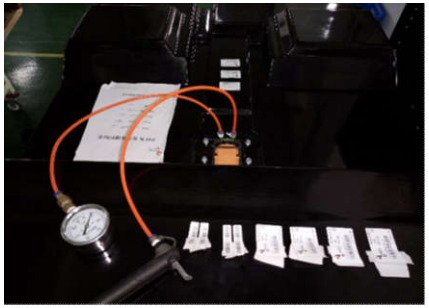




4 Maintenance Points

Air Tightness Test on the Cooling Pipes inside the Battery Package: to measure the air flow amount, install a barometer at the water outle t, fill 250kpa air in the water inlet, stay for 5 minutes, if the reduction of pressure is within 0.5kpa, it is normal.



Air Tightness Test on the Battery Package: to measure the air flow amount, use approprative quipment to block the high-voltage connector and the low-voltage connector(for some new type of vehicle, needn't block the high-voltage one), install a barometer at the maintenance switch and fill 1.6kpa compressed air, stay for 1 minutes, if the reduction of pressure is within 0.2kpa, it is normal.

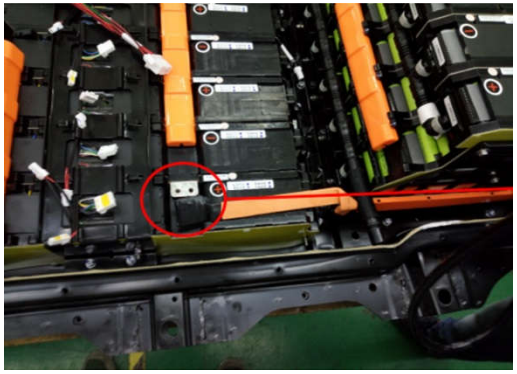


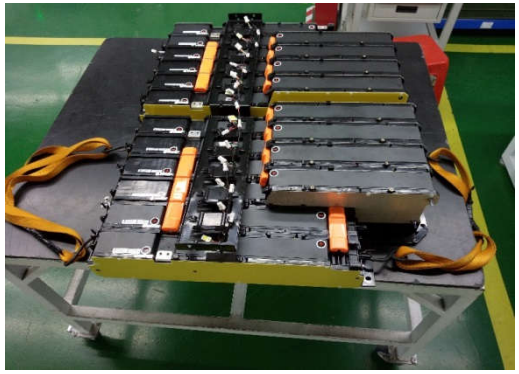
4 Maintenance Points

Assembly Order of LBC: Pull out low-voltage wire harness from the top to the bottom; put back from the bottom to the top

Conductive Paste Daubing: Daub the conductive paste on the connectors between modules in case of high resistance.

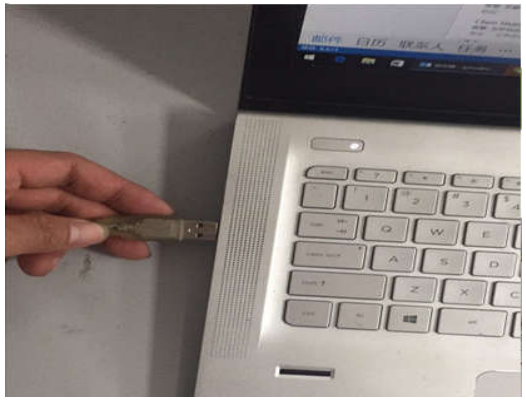
Module Re-charge: When a module needs to be changed, to make sure the new module's voltage is same with the other module's voltage, you need to re-charge the new one.

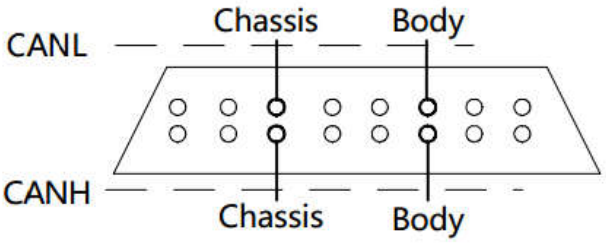




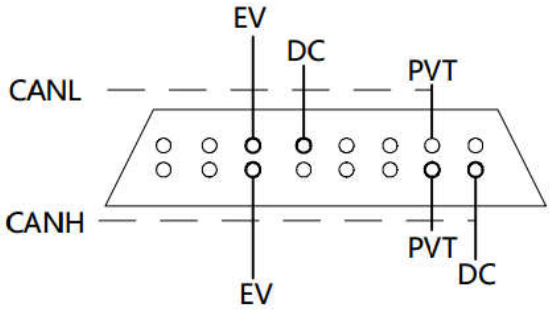
4 Maintenance Points

- Diagnostic tools





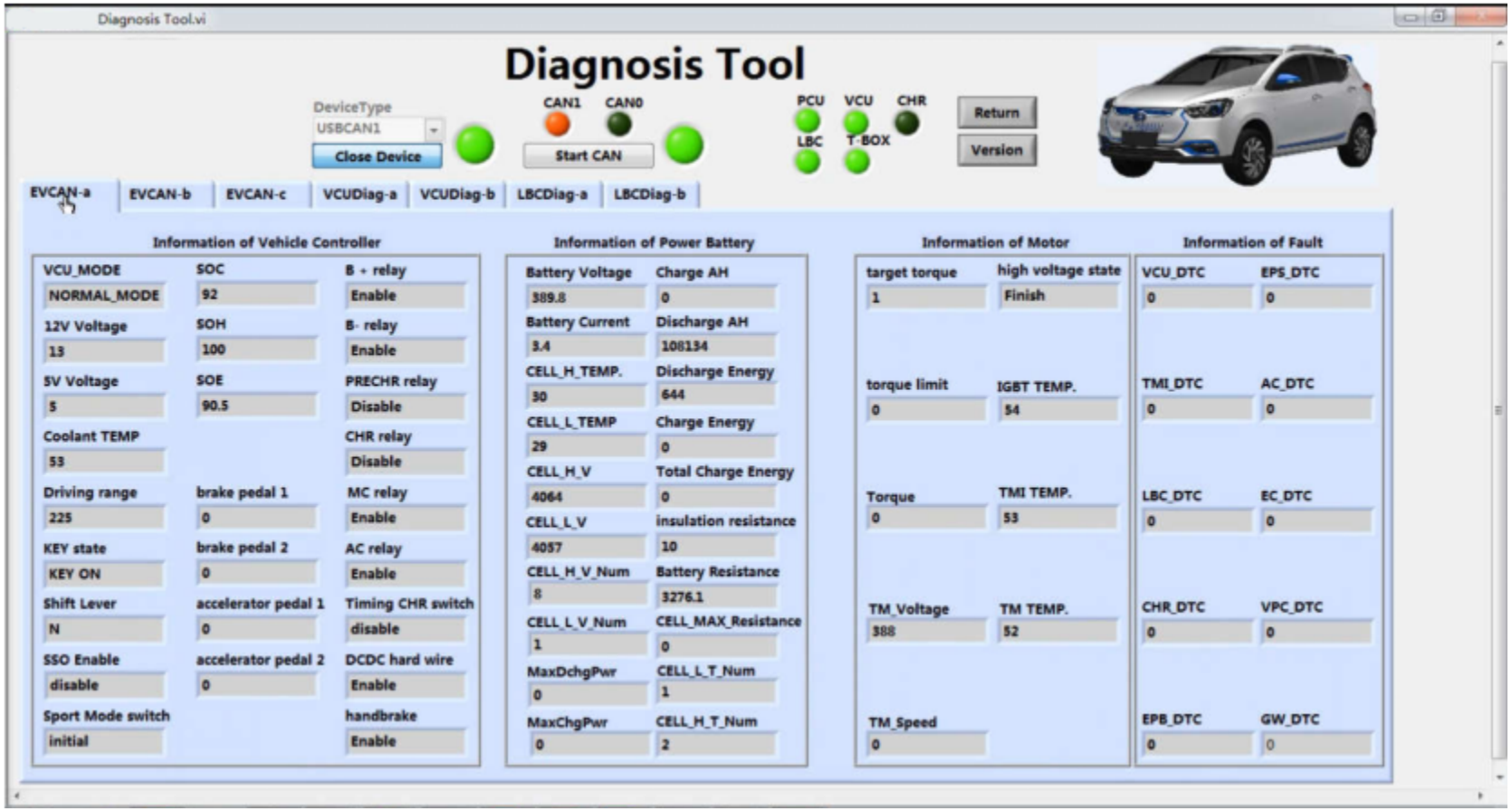
Black OBD



White OBD

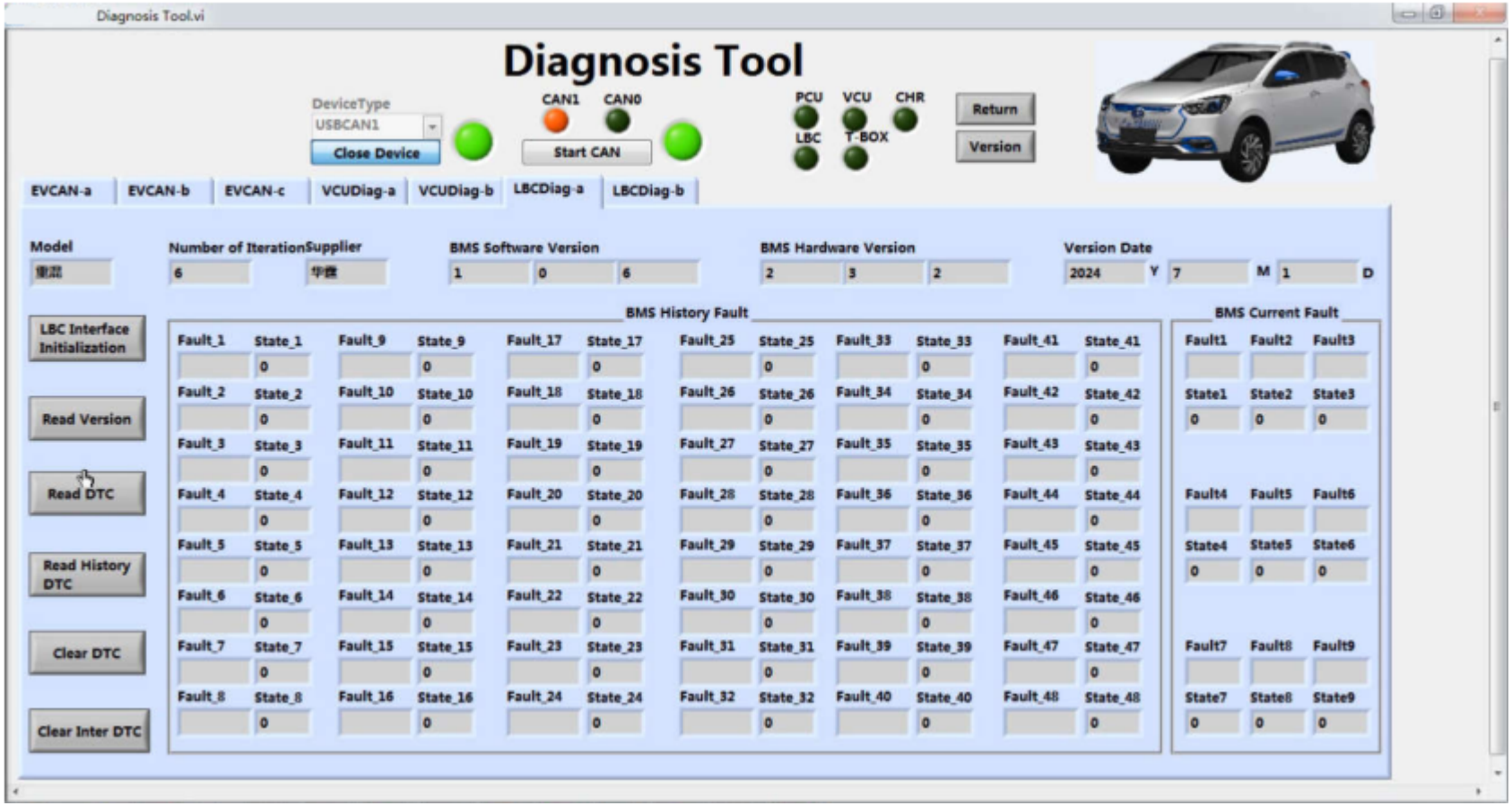
4 Maintenance Points

- new energy specific module diagnostic tools



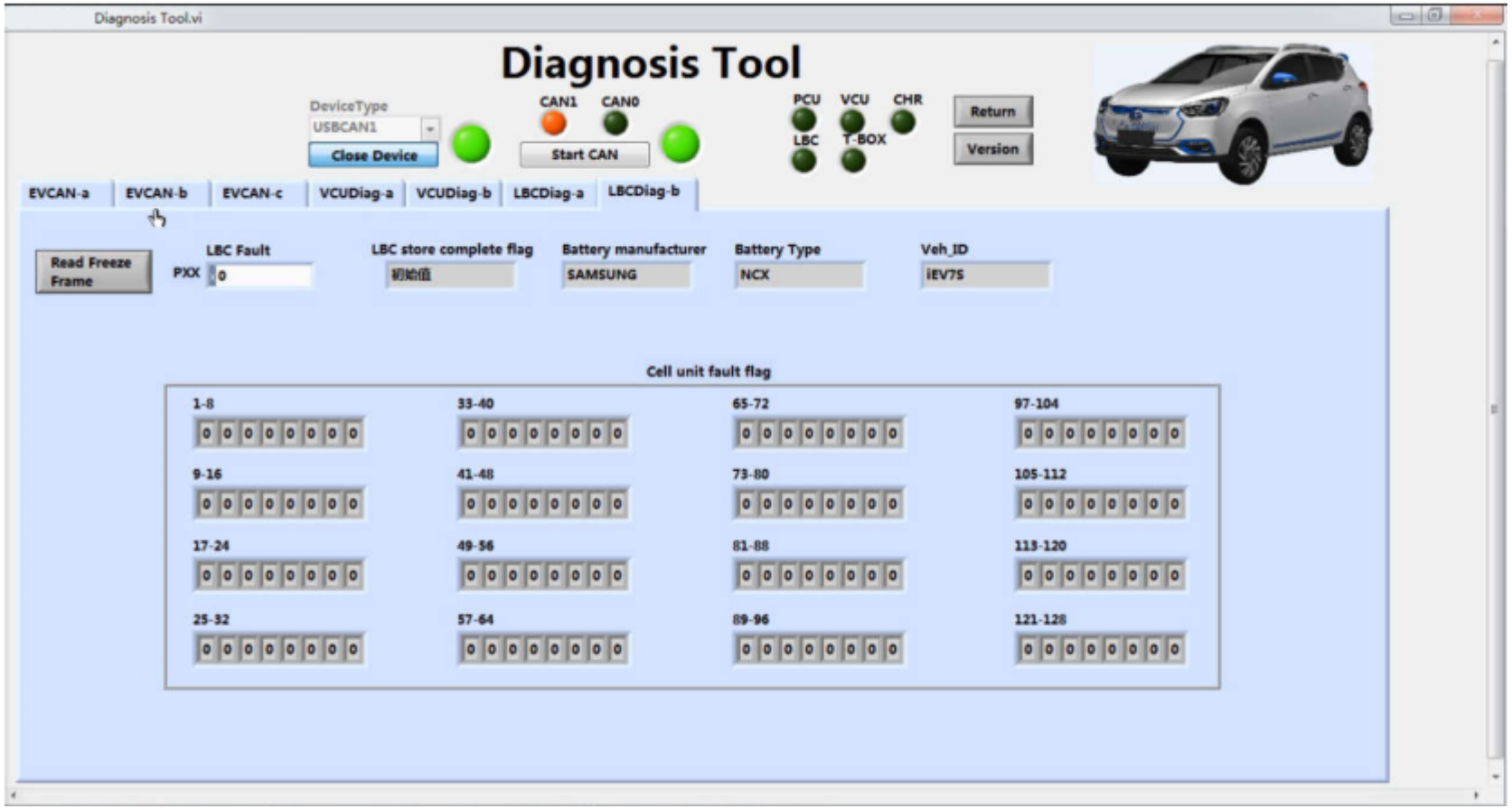
4 Maintenance Points

- new energy specific module diagnostic tools

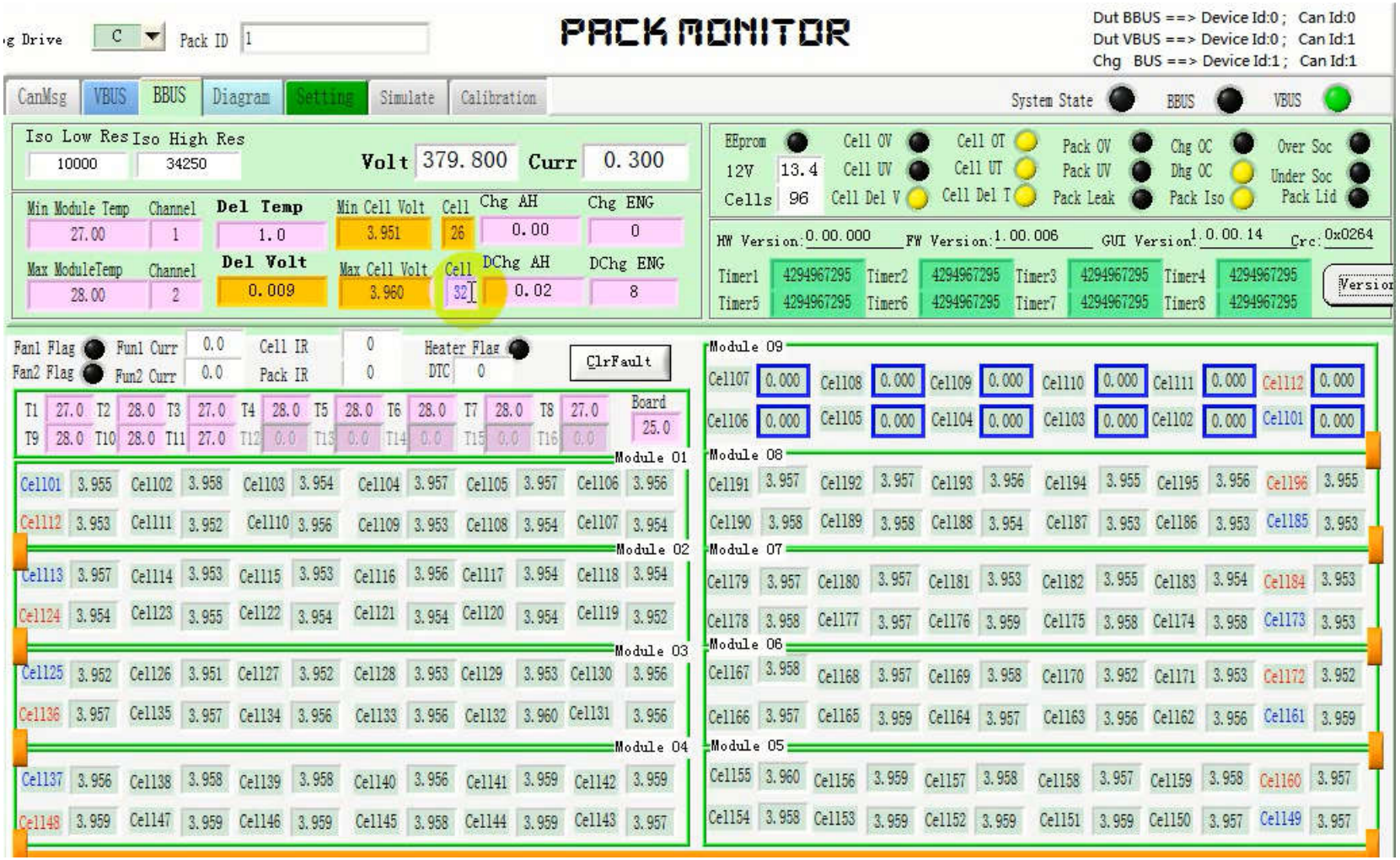


4 Maintenance Points

- new energy specific module diagnostic tools



4 Maintenance Points



5 Typical faults

- Fault Code

Type	Type	DTC		Fault name
Safety failure	Cell voltage	174		Power battery single cell voltage is too high
		173		Power battery single cell voltage is too high
		163		Power battery single cell voltage is too low
		70		Battery cell dynamic voltage difference is excessively high
		71		Static voltage difference of cell is too large
	Total voltage	166		Malfunction of excessively high total voltage
		167		Malfunction of total voltage severe under-voltage
	Temperature	170		The battery temperature is too high
		171		Battery cell temperature is excessively low
		96		Battery temperature imbalance
	Current	169		Battery discharge current is too large
		168		Malfunction of Battery Charging Over-current
	Insulation	93		Insulation malfunction
		178		Critical insulation malfunction
	Hardware fault	110		The high voltage interlock failure
	Thermal instability	121		Secondary malfunction of thermal instability

5 Typical faults

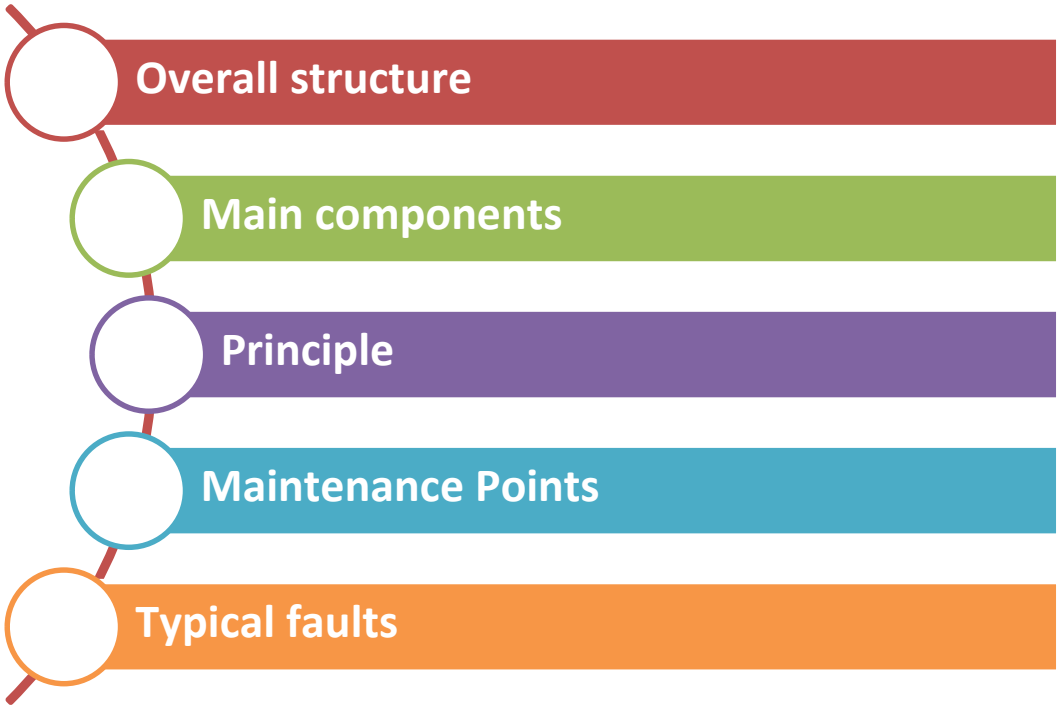
- Fault Code

Type	Type	DTC		Fault name
Hardware fault	Current Sensors	40	VCC	Short circuit error of current sensor and VCC
		41	GND	Short circuit error of current sensor and GND
		42		Two-path inconsistence error of current sensor
	Temperature collection	43	VCC	Short circuit error of temperature sensor and VCC
		44	GND	Short circuit error of temperature sensor and GND
	Insulation collection	45	VCC	Insulation check system short-circuit VCC
		46	GND	Insulation check system short-circuit GND
		47	PWM	No PWM signal change during insulation check
	Cell voltage detect	51	AD	Battery cell voltage inspection error - AD transfer error
		52		Loosening of cell voltage acquisition cable
	Balancing	56		Mis-opening of balance
		57		Mis-closing of balance
	storage	189	EEPROM	EEPROM Malfunction
	12V power supply	118	12V	12V power supply is excessively low
		119	12V	12V power supply is excessively high
Functionality fault		55		~~Mismatching Error of cell voltage and total voltage~~

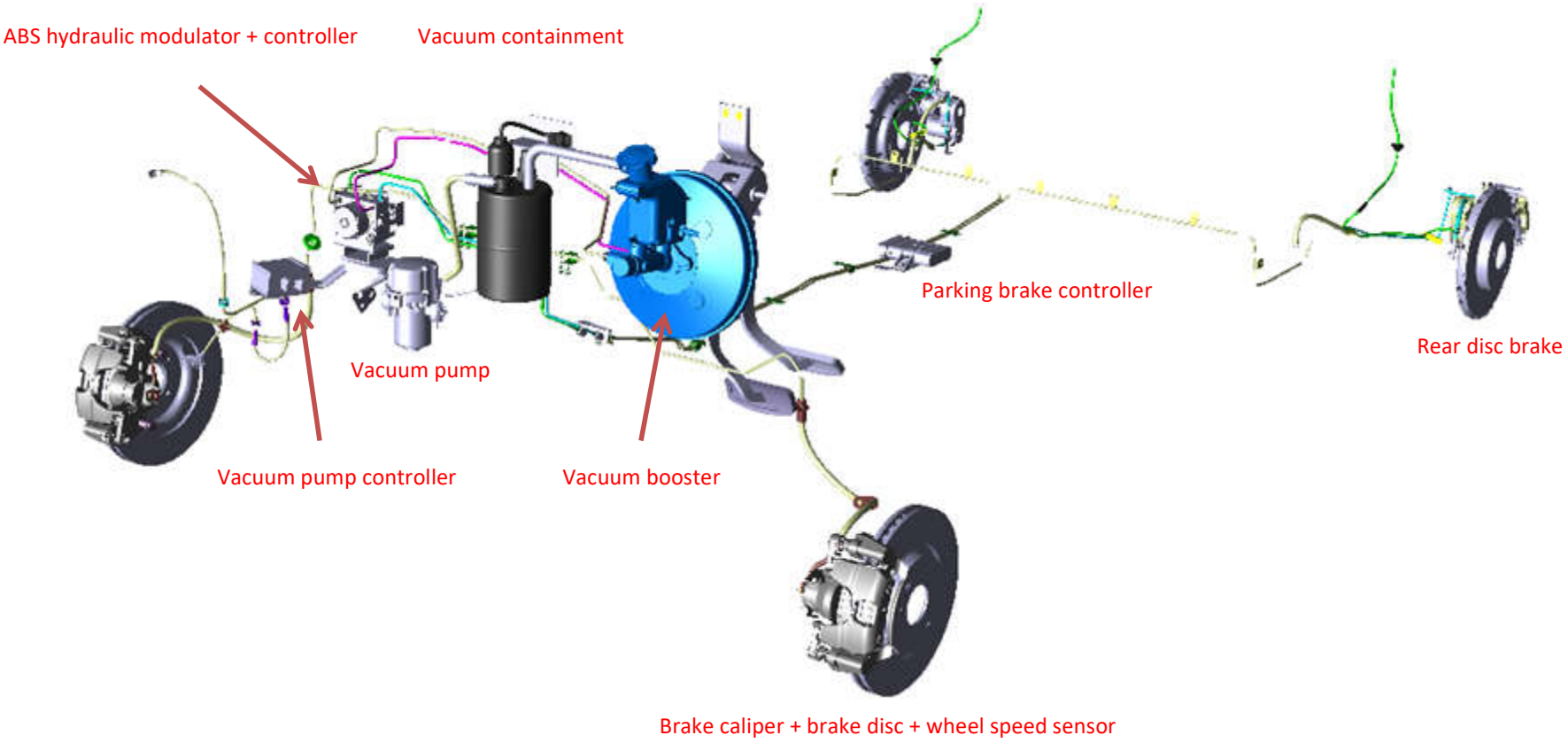
Service Training Materials

EVO 3 electric
Brake System

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

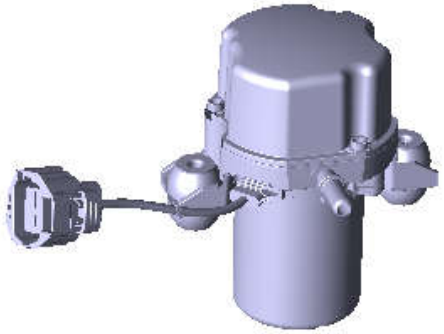
1 Overall structure

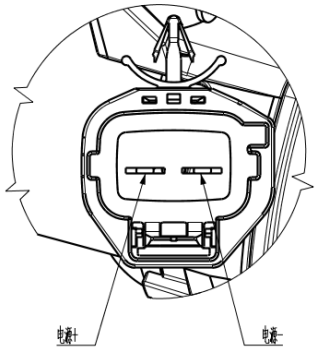


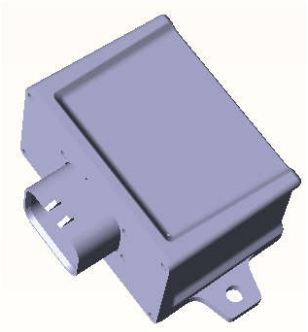
2 Main components

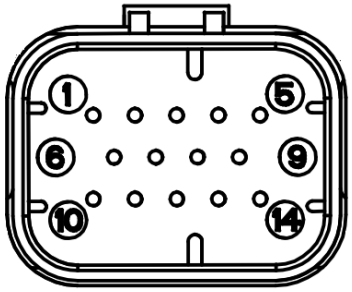
- Vacuum pump and Vacuum pump controller

Vacuum pump : Controlled by vacuum pump controller, the function is to extract the vacuum.
Vacuum pump controller : Receiving vacuum signal, control the opening and closing of vacuum pump







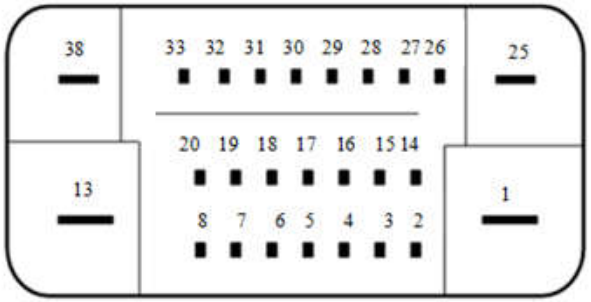


1~5#pin	TS	TP	C	B+	B+
6~9#pin	ON	B-	M-	M-	
10~14#pin	CANL	CANH	B-	M+	M+

2 Main components

- Electronic braking force assign controller

Receive brake light switch and wheel speed sensor signal through hard wire. Output the following signals to VCU through CAN communication: ABS operative mode, speed, speed of four wheels

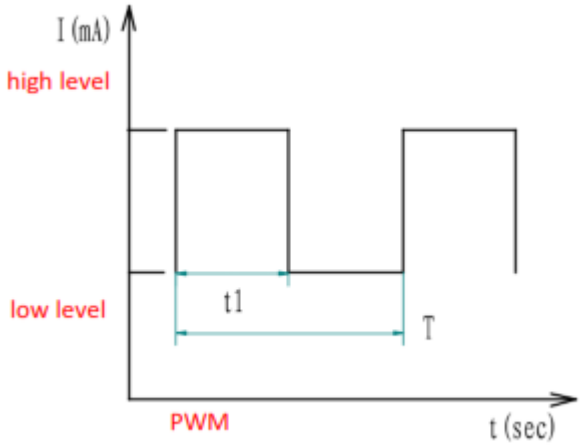


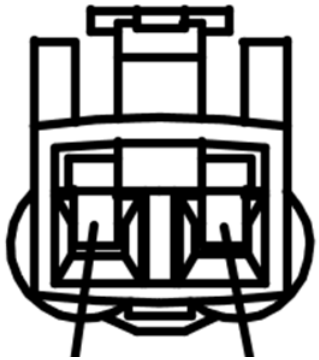
PIN	Definition	PIN	Definition
1	motor power(positive pole)	19	Wheel speed sensor power (LF)
2	Wheel speed sensor output (RF)	25	valve relay power
4	Wheel speed sensor signal (RF)	26	CAN-H
8	Wheel speed sensor signal (LF)	28	ECU power (ignition power supply cord)
13	motor GND	29	Wheel speed sensor signal (RR)
14	CAN-L	30	
16	Wheel speed sensor power(RF)	31	
17	Wheel speed sensor powe(RR)	38	ECU GND
18	Wheel speed sensor signal (LR)		

2 Main components

- wheel speed sensor

Testing wheel speed and transmitting speed signal to ABS controller

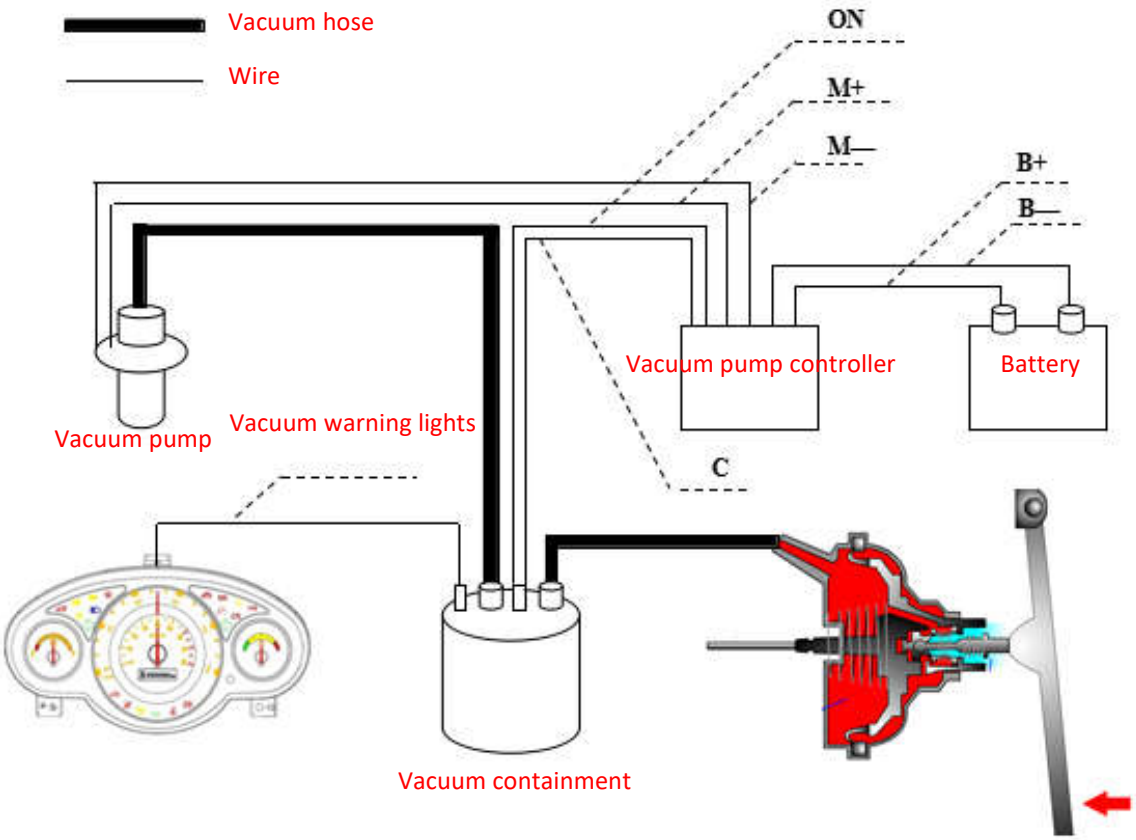




Power, white Signal, blacK

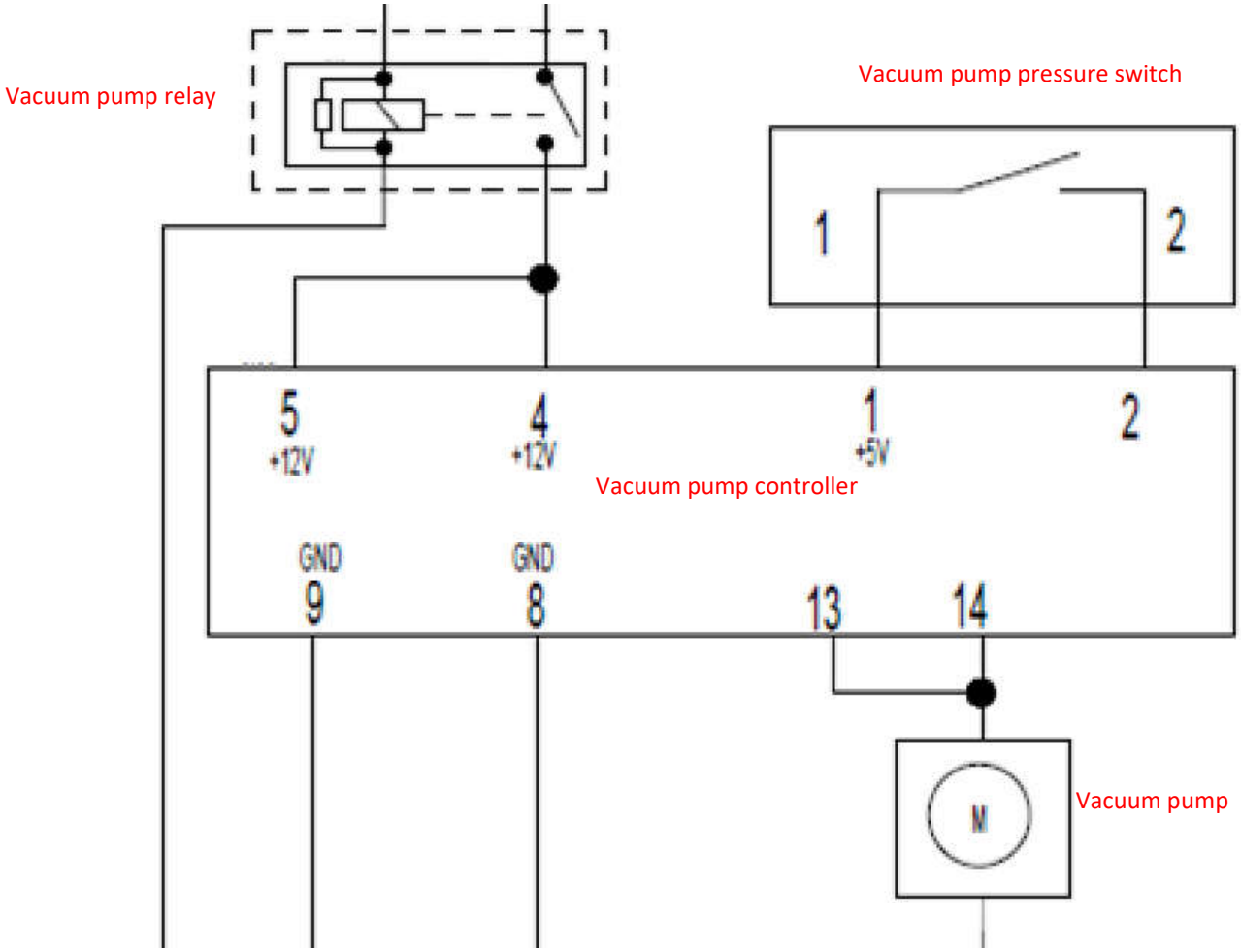
3 Principle

- Principle of vacuum booster system



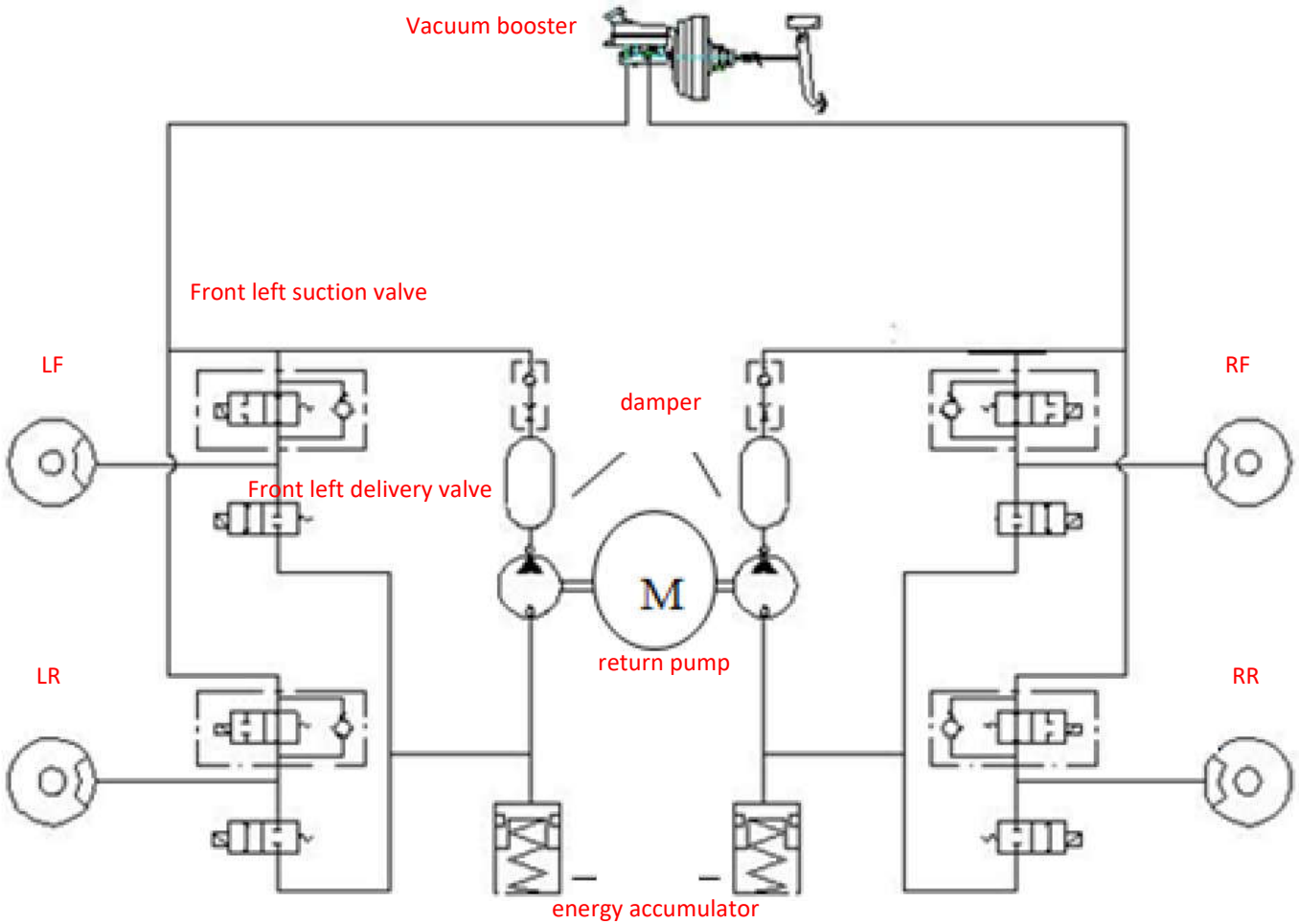
3 Principle

- Principle of vacuum booster system



3 Principle

- Principle of service brake system



4 Maintenance Points

- DTC

DTC	Description	DTC	Description
C190004	CU over voltage	C003500	RF Wheel speed sensor：signal line short to ground/broken circuit,power line broken circuit
C190104	ECU low Voltage	C00A200	RF Wheel speed sensor：power line short to ground
C100004	ECU hardware failure	C004300	RF Wheel speed sensor：power line short to power
C101008	ECU software failure	C00AA00	RF Wheel speed sensor：Conventional failure
C006B06	ABS/ESP(if equipment)manage abnormality (overtime, etc)	C003708	LF Wheel speed sensor：out of range,lose,clutter
C003108	LR Wheel speed sensor：out of range,lose,clutter,	C003800	LR Wheel speed sensor：signal line short to ground/broken circuit,power line broken circuit
C003200	LR Wheel speed sensor：signal line short to ground/broken circuit,power line broken circuit	C00A400	LR Wheel speed sensor：power line short to ground
C00A000	LR Wheel speed sensor：power line short to ground	C00A500	LR Wheel speed sensor：power line short to power
C00A100	LR Wheel speed sensor：power line short to power	C00AB00	LR Wheel speed sensor：Conventional failure
C00A900	LR Wheel speed sensor：Conventional failure	C002004	return pump failure
C003408	RF Wheel speed sensor：out of range,lose,clutter		

4 Maintenance Points

- DTC

DTC	Description	DTC	Description
U000500	CAN over voltage	C001004	Valve failure,left front valve inlet
C000700	CAN low voltage	C001104	Valve failure,left front valve outlet
C100104	CAN hardware failure	C001404	Valve failure,right front valve inlet
C000104	CAN bus disconnection	C001504	Valve failure,right front valve outlet
C100104	CAN sassive failure	C001804	Valve failure,left rear valve inlet
C003A08	RF Wheel speed sensor：out of range,lose,clutter,	C001904	Valve failure,left rear valve outlet
C003B00	RR Wheel speed sensor：signal line short to ground/broken circuit,power line broken circuit	C001C04	Valve failure,right rear valve inlet
C00A600	RR Wheel speed sensor：power line short to ground	C001D04	Valve failure,right rear valve outlet
C00A700	RR Wheel speed sensor：power line short to power	C109504	valve relay failure
C00AC00	RR Wheel speed sensor：Conventional failure	C007208	valve relay conventional failure(Over Temperature Protection,Signal failure,hardware failure
C109904	Wheel speed sensor failure(sensor crossing,multisensor		

4 Maintenance Points

- ABS controller exhaus

Suitable circumstances

1. According to the requirements that ”Brake system exhaust” unable to meet footstep height or feeling
2. Change ABS controller
3. Excessive loss of brake fluid
4. Air may enter ABS controller

item on request:

1. Diagnostic instrument
2. brake fluid
3. Lifting machine
4. Exhaust cylinder with hose
5. Two maintenance person:One person step on the brake footsep and operate the diagnostic instrument,another person holds the brake level of the tank and Open and close exhaust bolts according to diagnostic instrument

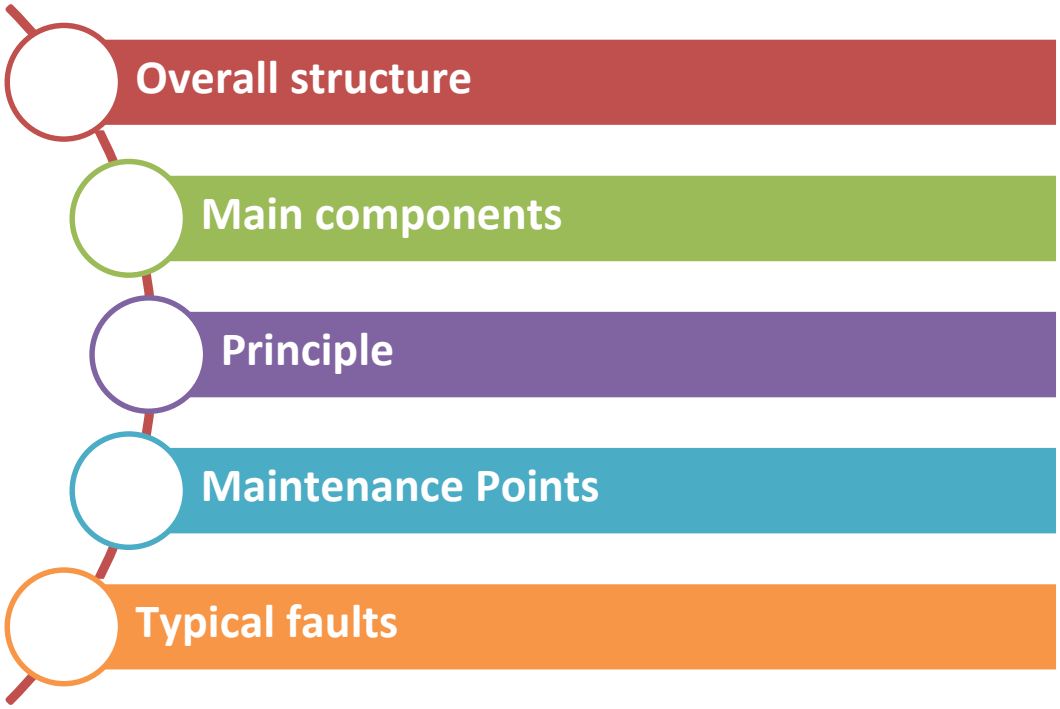
Exhaust process:

1. Operate according to diagnostic instrument

Service Training Materials

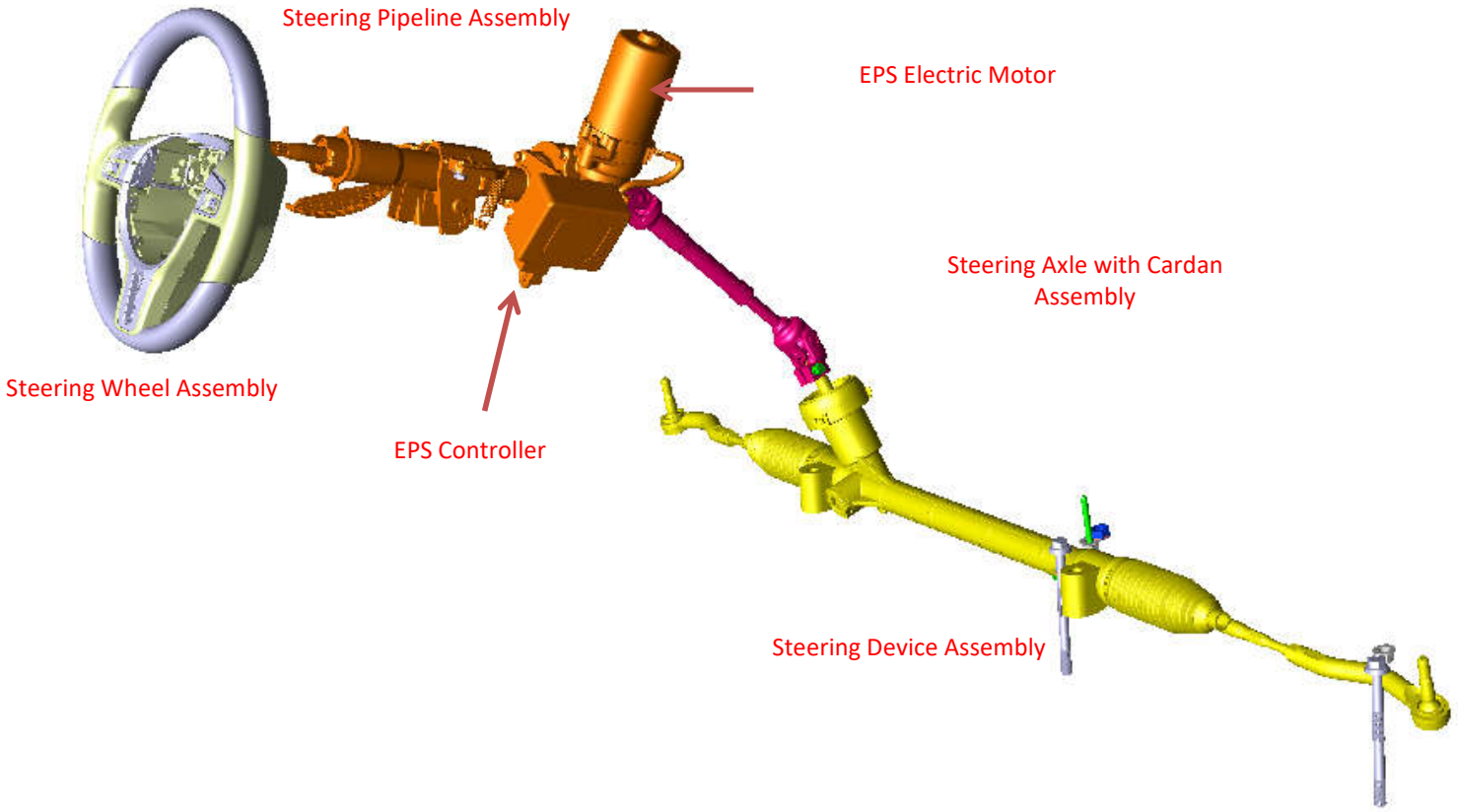
EVO 3 electric
Steering System

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

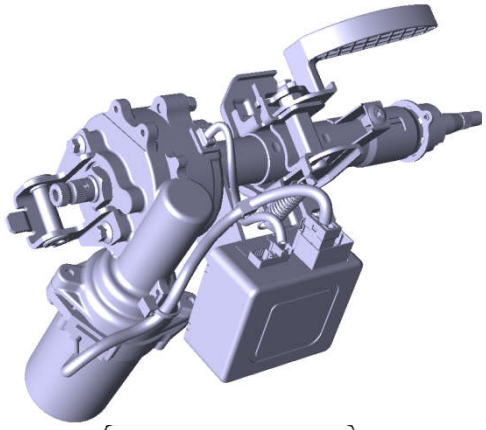
1 Overall structure

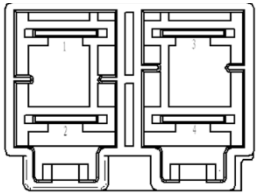
- System Structure



2 Main components

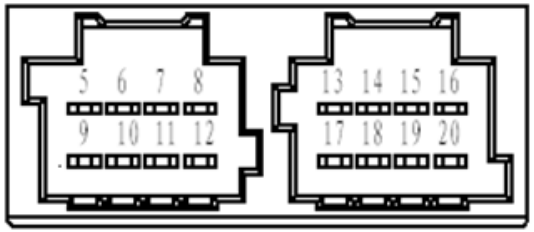
- EPS Controller





power interface

power interface



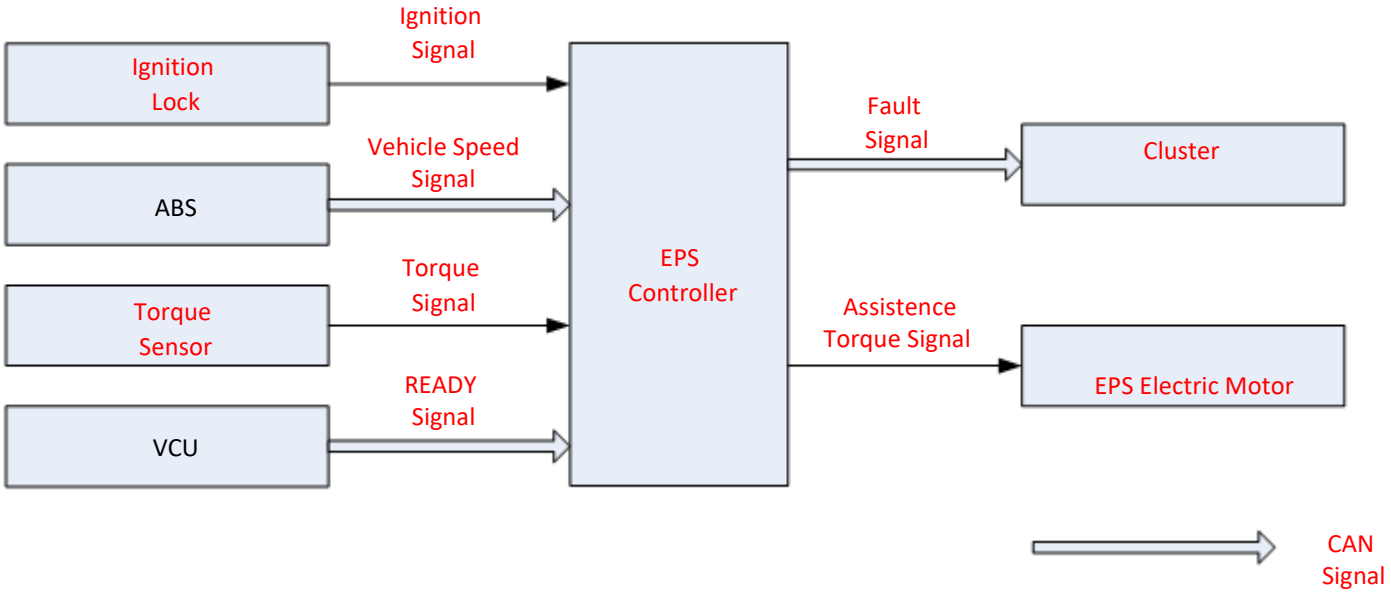
torque sensor interface

torque sensor interface

Pin		Definition
1	Power Signal(-),Ground	
2	Power Signal(+)	
3	Motor Output(-)	
4	Motor Output(+)	
5	Sensor Main Angle Signal	
6	Sensor Vice Angle Signal	
7	Sensor Torque PWM1	
8	Sensor Torque PWM2	
9	Power 1	
10	Ground 1	（GND1）
11	Power 2	（VCC2）
12	Ground 2	（GND2）
17	Ignition 1	IG1
19	CAN-L	CAN-L
20	CAN-H	CAN-H

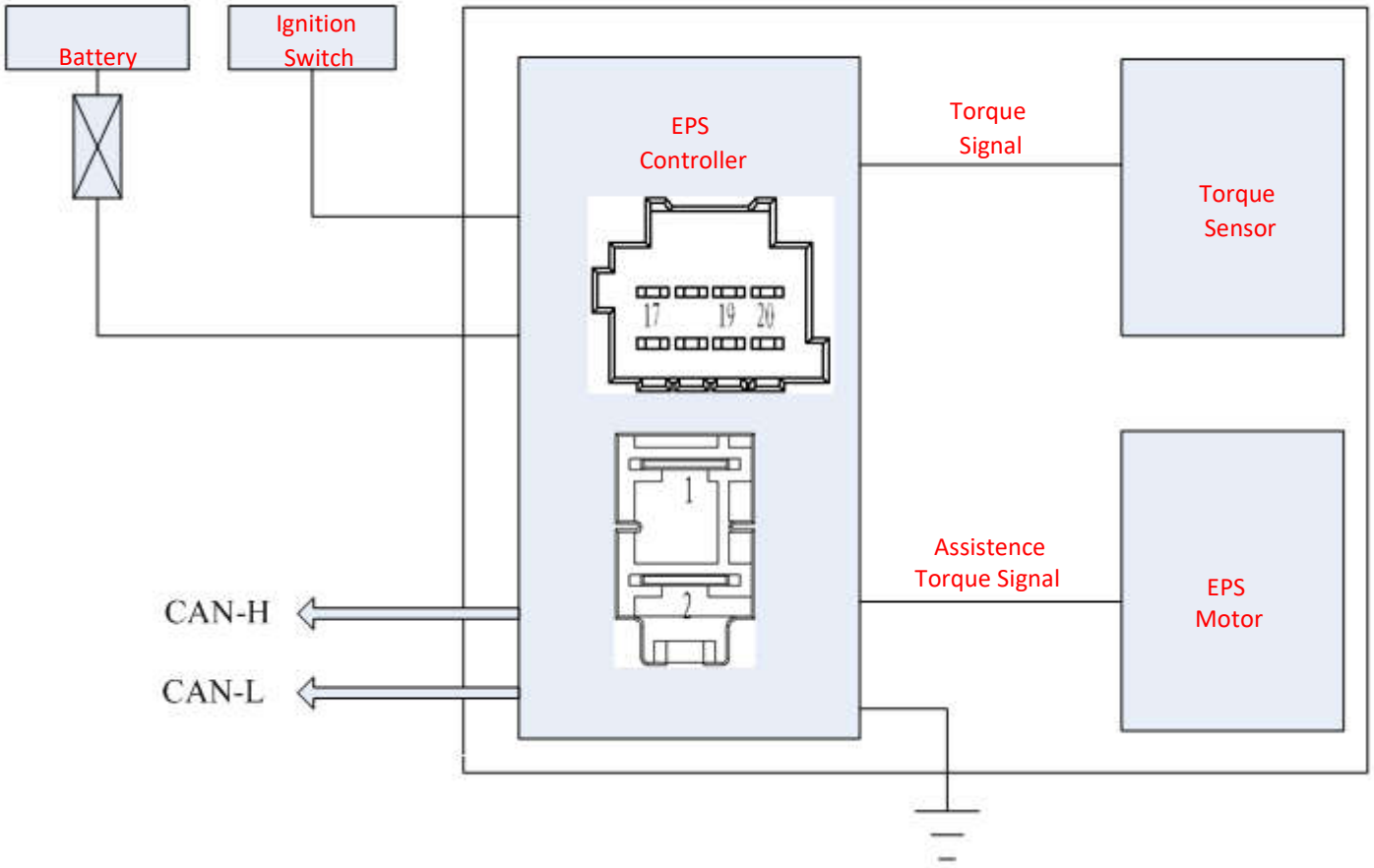
3 Principle

- System Principle



3 Principle

- Electrical Principle



4 Maintenance Points

- Fault Code

Fault Code	Description	Fault Code	Description
C1611	Torque Sensor Main Signal Overlimit	C1651	Motor Short-circuited
C1612	Torque Sensor Vice Signal Overlimit	C1661	Realy Open-circuited
C1613	Sum of Main and Vice Signal Overlimit	C1662	Current Mid-point Calibration Mistake
C1614	Torque Collecting Overtiming	C1663	Overcurrent
C1615	Angle Abnormality	C1664	+5VA Voltage Fault
C1317	Angle Zero-point un-studied	C1665	EPS Controller Inner Fault
C1621	Battery Overvoltage	C1667	MOSFET Overheat
C1622	Battery Undervoltage	U1000	CAN-BUSOFF Fault or Report Sending Overtime
C1632	EEPROM data Uniformity Fault	U1001	Ready Signal Report Overtime
C1641	Speed Invalidity	U1002	Speed Signal Report Receive Overtime
C1643	Ignition Signal Lost		

4 Maintenance Points

- Angle Zero-point Study Process

1. Put the vehicle on the Four Wheel Alignment quipment and make sure the Four Wheel Alignment parameters qualified.

2. Make the wheels towards the direction of forwards straightly and make sure the steering wheel is at the middle position(within 0.5° away from horizontalline).

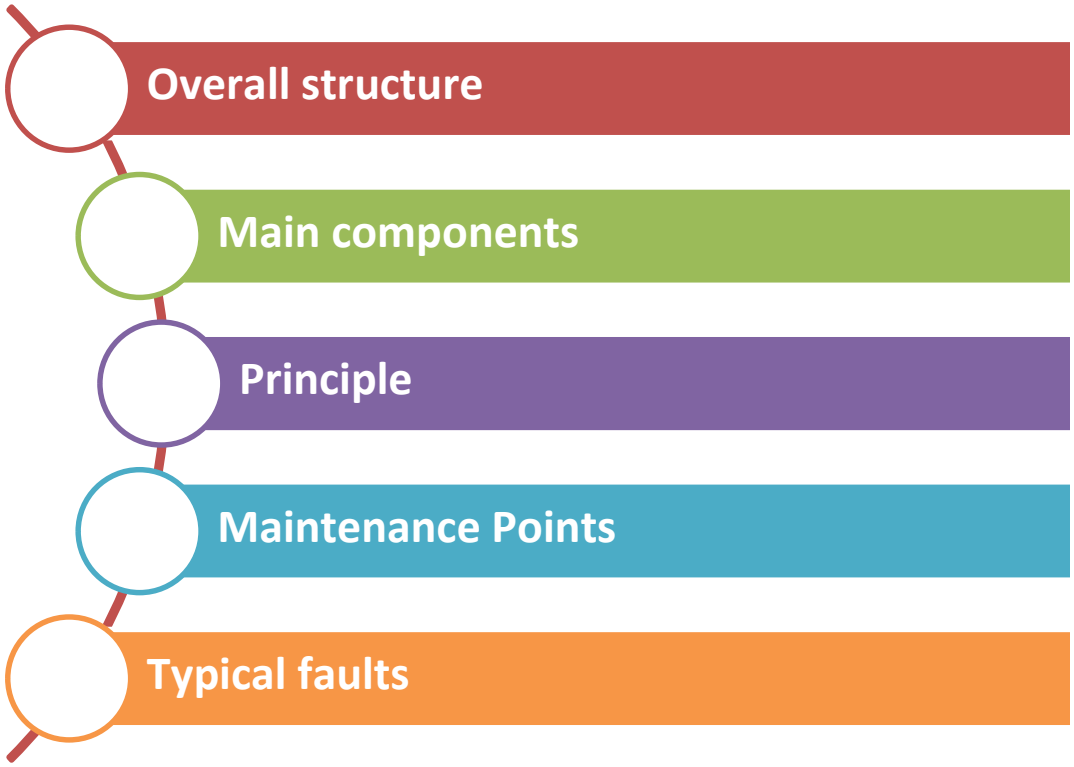
3. Connect the diagnostic tools to the OBD interface and turn the lkey to the “ON', choose the EPS calibration in diagnostic tools, zeroning vehicle steering system angle. Calibrate the middle position of steeing wheel as the zero-point of steering system of EPS Controller.

4. After zeroing angles, make a confirmation test drive. When you steering to the middle at a low speed(≥10km/h), the steering wheel can steer back to nearly the middle position. Meanwhile make sure when vehicle runs staightly, there is no active steering partially, otherwise recheck the steering system.

Service Training Materials

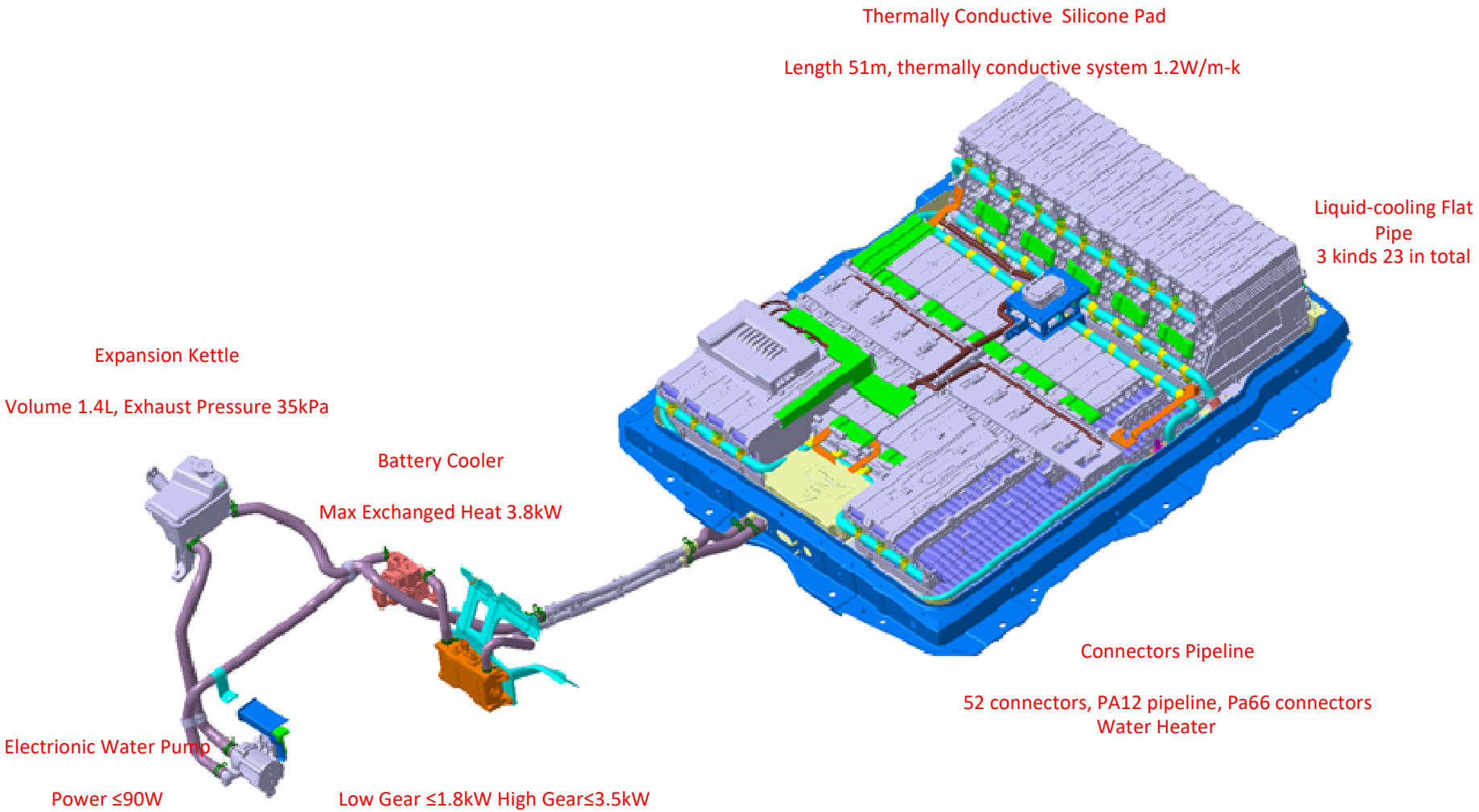
EVO 3 electric
Cooling System

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall Structure

- System Layout



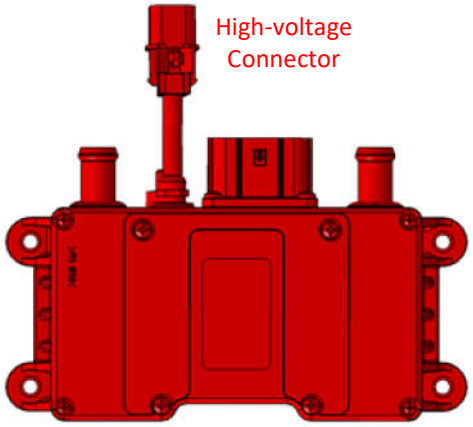
2 Main components

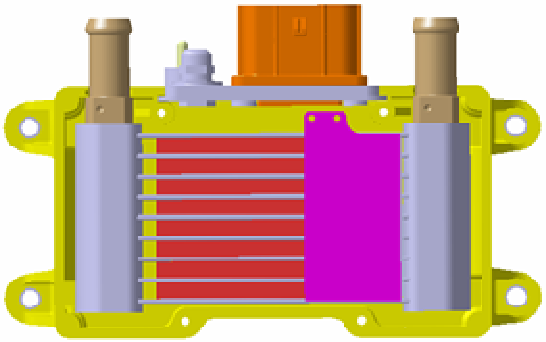
- Water Heater

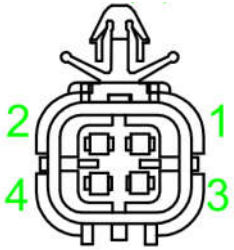
Water Heater: to realize the function of heating the coolant and monitoring the temperature.

Low-voltage Connector

High-voltage Connector

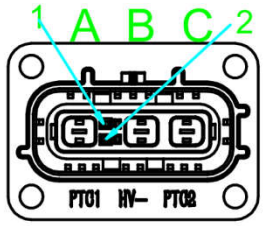






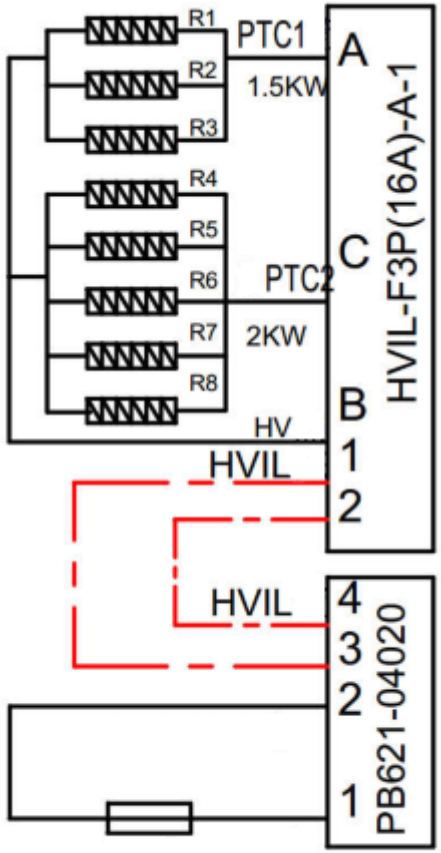
1：Sensor
2：Sensor
3：HVIL IN
4：HVIL OUT

Low-voltage Connector



A：PTC1
B：HV-
C：PTC2
1：HVIL IN
2：HVIL OUT

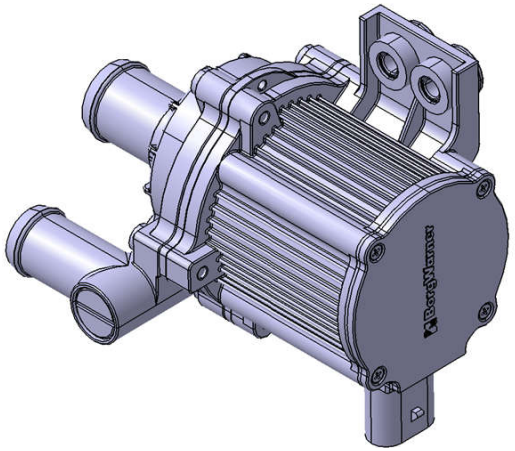
High-voltage Connector



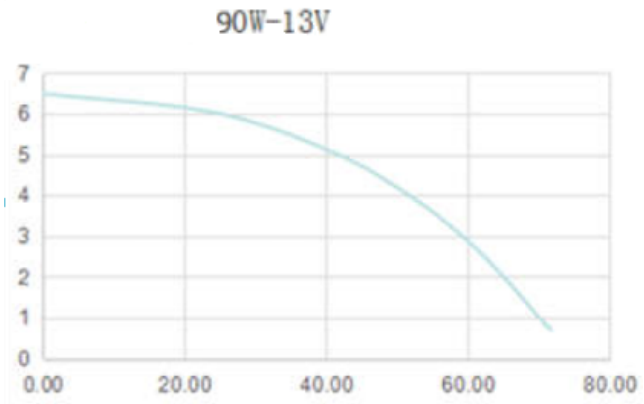
2 Main components

- Electronic Water Pump

Electronic Water Pump: the power source of the cooling recycle circuit of the battery, which promotes the flowing of the coolant.



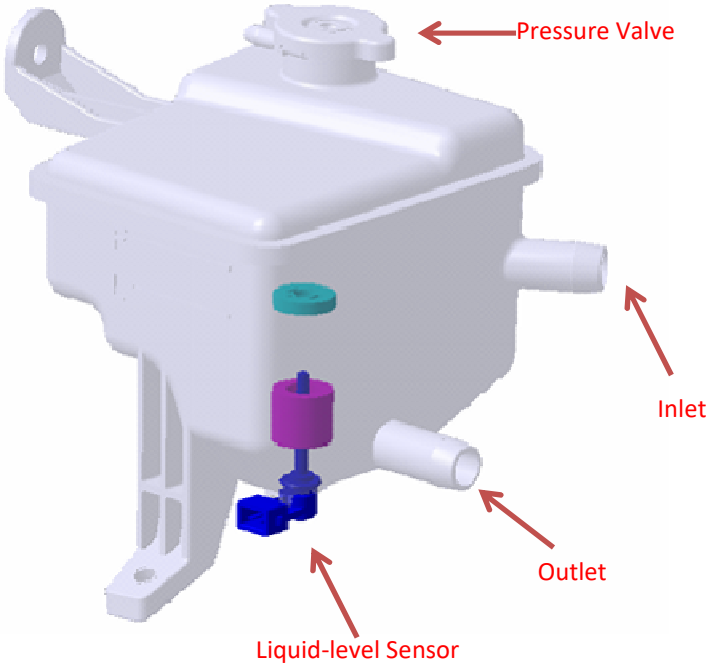
Item	Parameter
Size(mm)	125*147.3*110
Weigh(KG)	1.02
Rated Power(（W）	90
Feedback Function	No
Communication Method	PWM



2 Main components

- Expansion Kettle

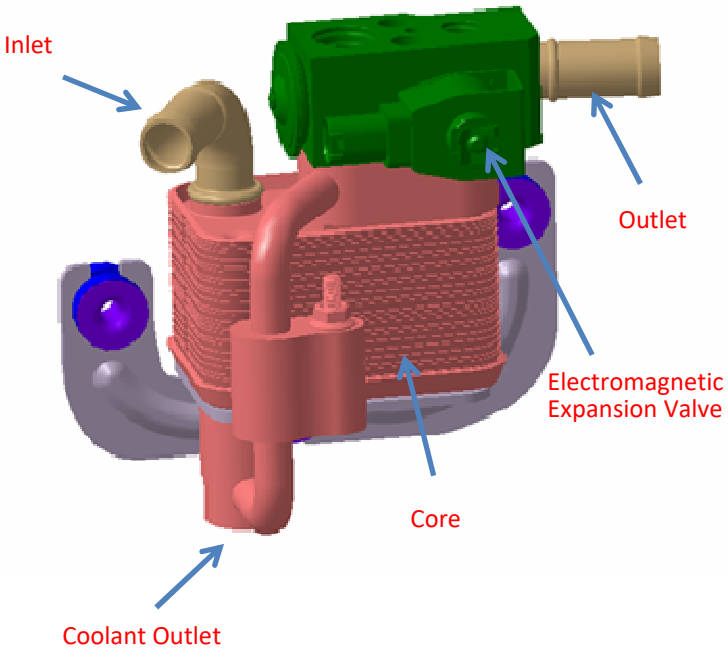
Expansion Kettle: When the pressure is excessive, the extra gas and coolant will flow out of the Expansion Kettle to prevent pipes explosion. It is the inlet of coolant. Its liqiud-level sensor monitors the leakage happens in the system.

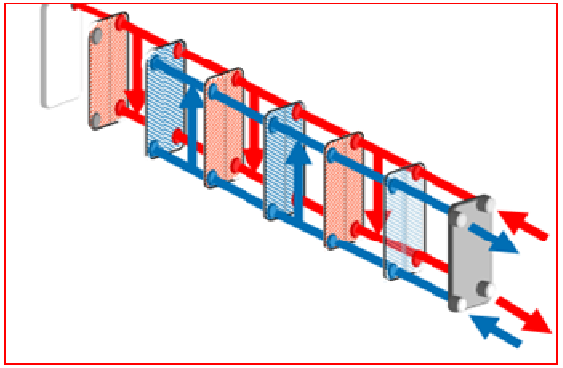


2 Main components

- Battery Cooler

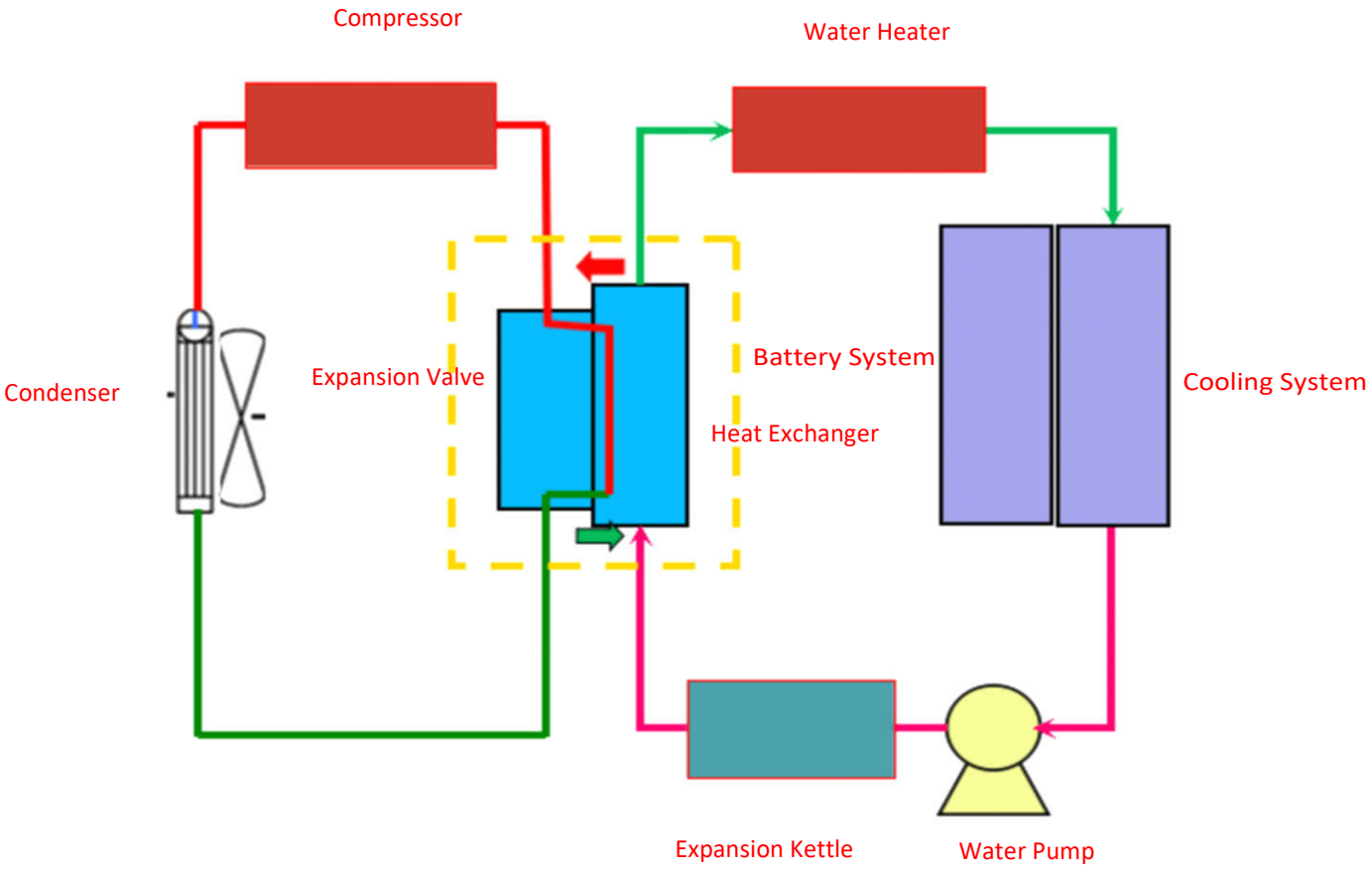
It absorbs in the coolant of A/C system, the coolant evaporates in the expansion valve and absorbs the heat of the cooling liquid in the battery cooling circuit to cool the battery. Its on and off is controlled by the electromagnetic expansion valve.





Number	Parameter
1	Max Cooling Power ＞3.5Kw
2	Flowing Resistance （10min/L）＜16Kpa
3	Explosion Pressure ≥3Mpa
4	Heat Exchange Efficiency ≥95%

3 Principle


Compressor
Water Heater
Condenser
Expansion Valve
Battery System
Heat Exchanger
Cooling System
Expansion Kettle
Water Pump

4 Maintenance Points

- DTC

DTC	Hexadecimal	Fault name
P3039	82	Heating System Fault
P303A	83	Cooling System Fault
P303B	84	Chiller Mis-open
P303C	85	Chiller Mis-close
P303D	86	Heater Mis-open
P303E	87	Heater Mis-close
P3040	89	Water Pump Fault
P3041	8A	Heating Wire Overheat
P3040	88	Low Liquid-level Fault

4 Maintenance Points

- System Structure

Phenomenon	Cause	DTC	Checking Methods
Vehicle can't be charged in low-temperature environment.	Water Heater Fault	82	Use a multimeter to measure the resistance of “A-B, B-C” of Water Heater.
	Water Heater Wire Harness/Fuses Fault	82	Check the working state of the relays/fuses inside the high-voltage box.
	Water Heater Mis-close	87	System reports DTC 87.
	System Coolant Shortage	88、8A、96	Check if the liquid-level inside the Expansion Kettle is below L Line.
	Water Pump Fault	8A、89	Connect to the PC and CAN Card, open the Water Pump, set PWM to 100%, check the flowing state of the coolant inside the Expansion Kettle.

4 Maintenance Points

- System Structure

Phenomenon	Cause	DTC	Checking Methods
1.Long charging time in high-temperature environment(current is limited) 2.The temperature of the battery is beyond 50℃ when using. 3.The difference of the temperature of the battery is beyond 10℃ during non-preheating stage.	System Coolant Shortage	88、83、96	Check if the liquid-level inuside the Expansion Kettle is below the L Line.
	Water Pump Fault	89	Connect to the PC and CAN Card, open the Water Pump, set PWM to 100%, check the flowing state of the coolant inside the Expansion Kettle.
	Expansion Valve Wire Harness Mis-connected	84、85	Turn on the A/C of the pilot cabin to check if it works.
	System Coolant Leakage	83	Connect the Pressure Gauge to A/C pipelines, turn on the vehicle A/C to check the the pressure of the coolant.
	Water Heater Mis-open	86	Check if the temperature of the battery is increased rapidly in ashort time.
	Blockage in the Battery Cooler		Check if the coolant inside the Battery Cooler/on the Expansion Surface has frosted.

4 Maintenance Points

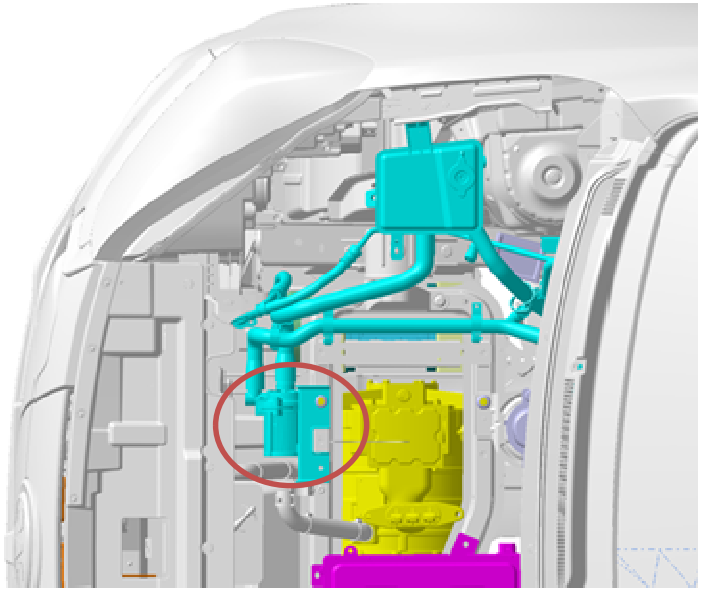
- system composition

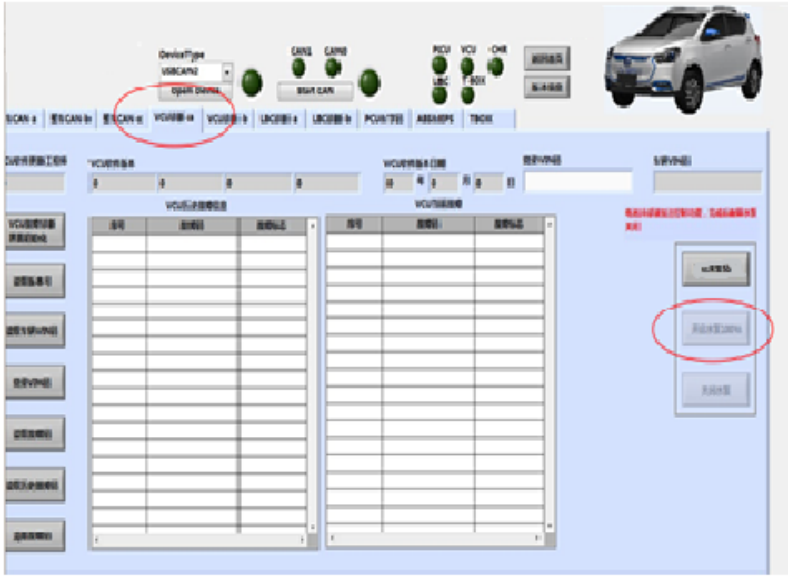
Phenomenon	Cause	DTC	Checking Methods
Temperature Collecting Fault	Battery Temperature Sensor is open- or short-circuited.	none	The sensor shows -40℃/200℃ and doesn't change,it is open-/short-circuited.
Serious Insulation Fault	Leakage of Coolant inside the Battery	178	The liquid-level inside the Expansion Kettle is low and the insulation value between the Maintenance Switch and the ground is low.

4 Maintenance Points

- Water Pump Recycle Fault Judging

Checking Method: Connect to the PC and CAN Card, open the Water Pump, set the PWM to 100％, check the flowing state of the coolant inside the system.
Solution: Replace the Water Pump.





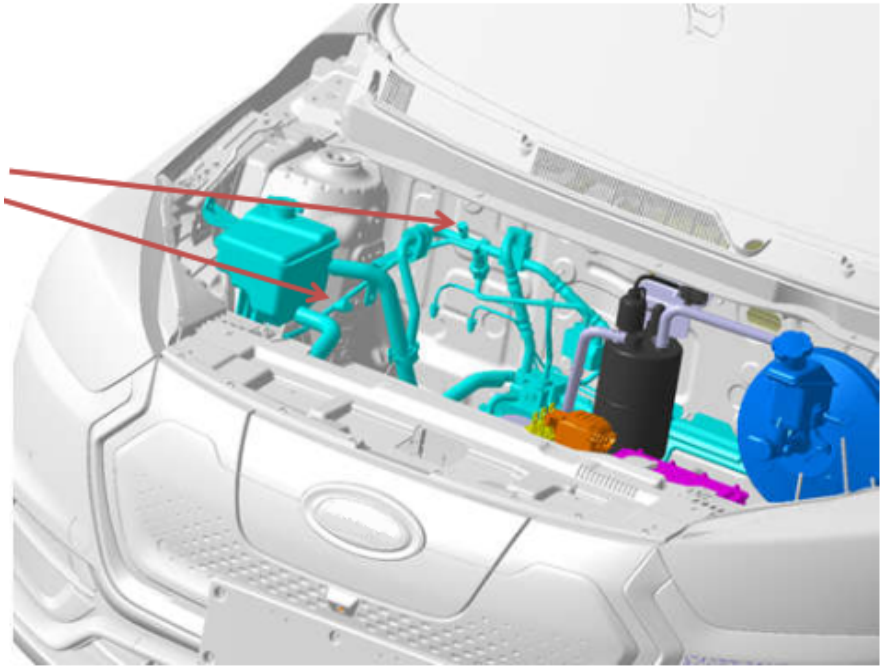
4 Maintenance Points

- System Coolant Shortage Judging

Checking Method: Connect the Pressure Gauge to the A/C pipelines, turn on the vehicle A/C, check the pressure of the coolant.

Solution: Find if there is a leaking port, if not, refill coolant as required; if so, replace the pipeline where leakage happens.

Testing Point of the Pressure Gauge

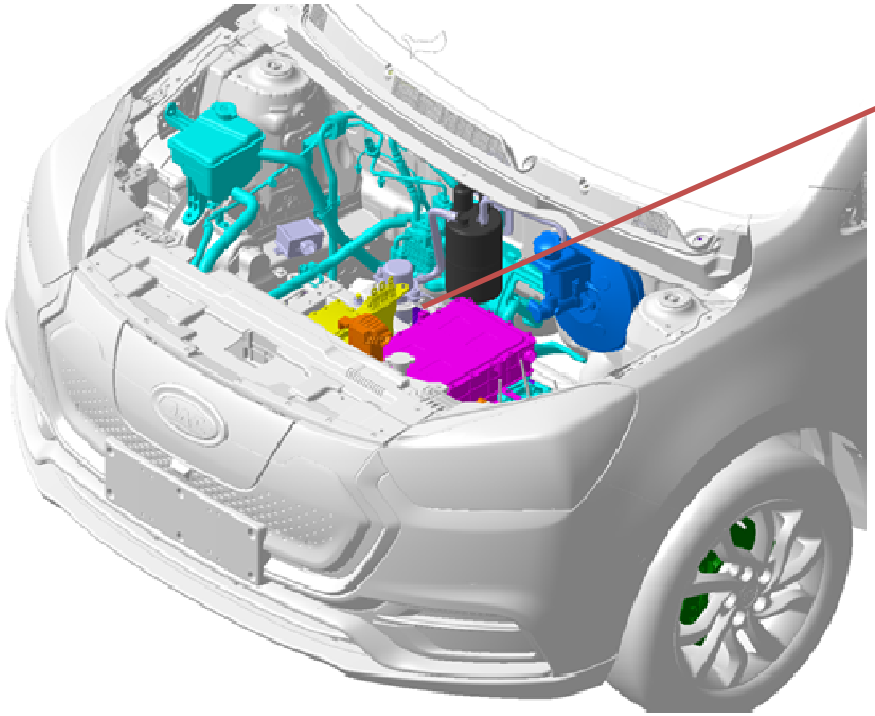


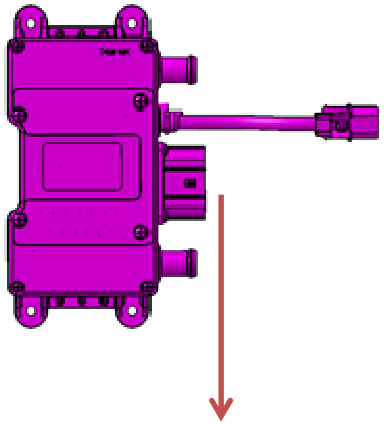
4 Maintenance Points

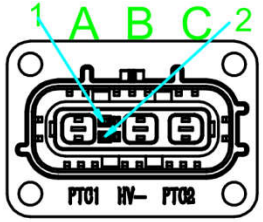
- Water Heater Fault Judging

Checking Method: Use a multimeter to check the resistance of “A-B, B-C” of the Water Heater.

Solution: Replace the Water Heater.







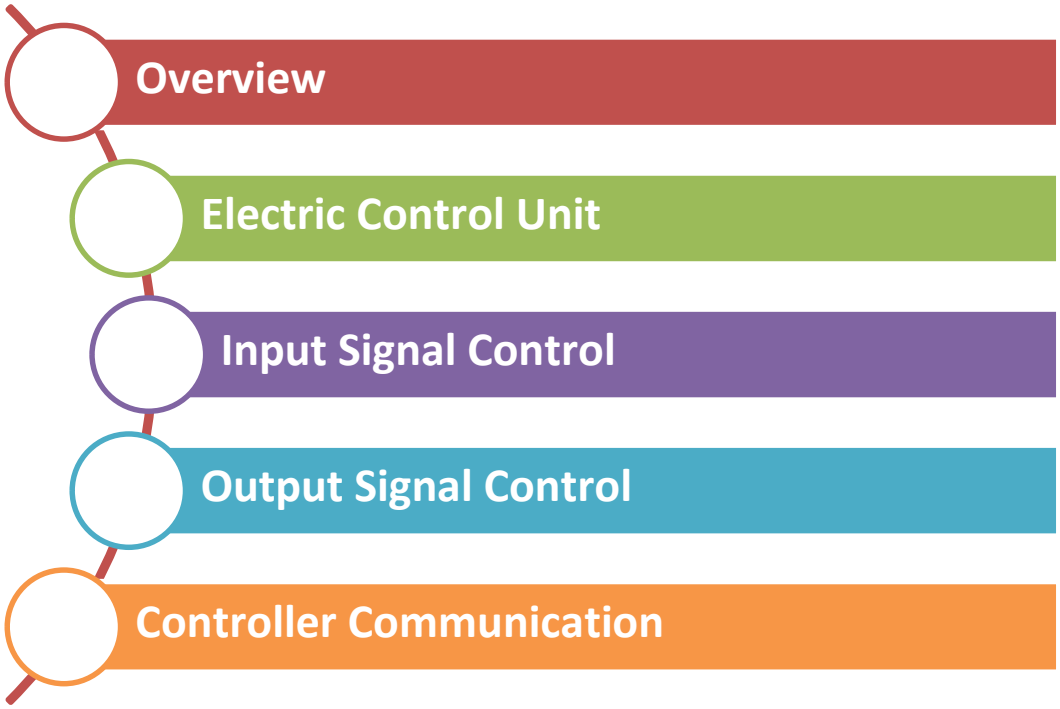
A：PTC1
B：High-voltage Negative End
C：PTC2
1：HVIL IN
2：HVIL OUT

High-voltage Connector

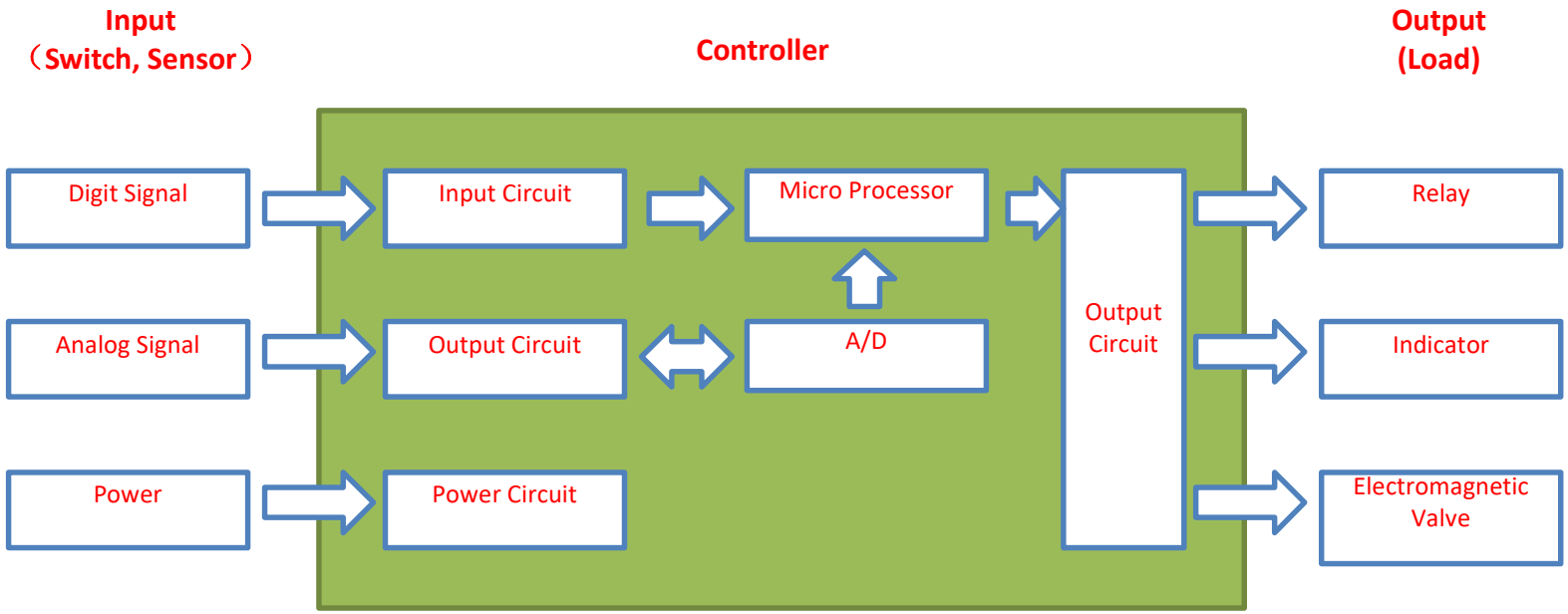
Service Training Materials

EVO 3 electric
Electronic Control Basis

Catalog


Overview
Electric Control Unit
Input Signal Control
Output Signal Control
Controller Communication

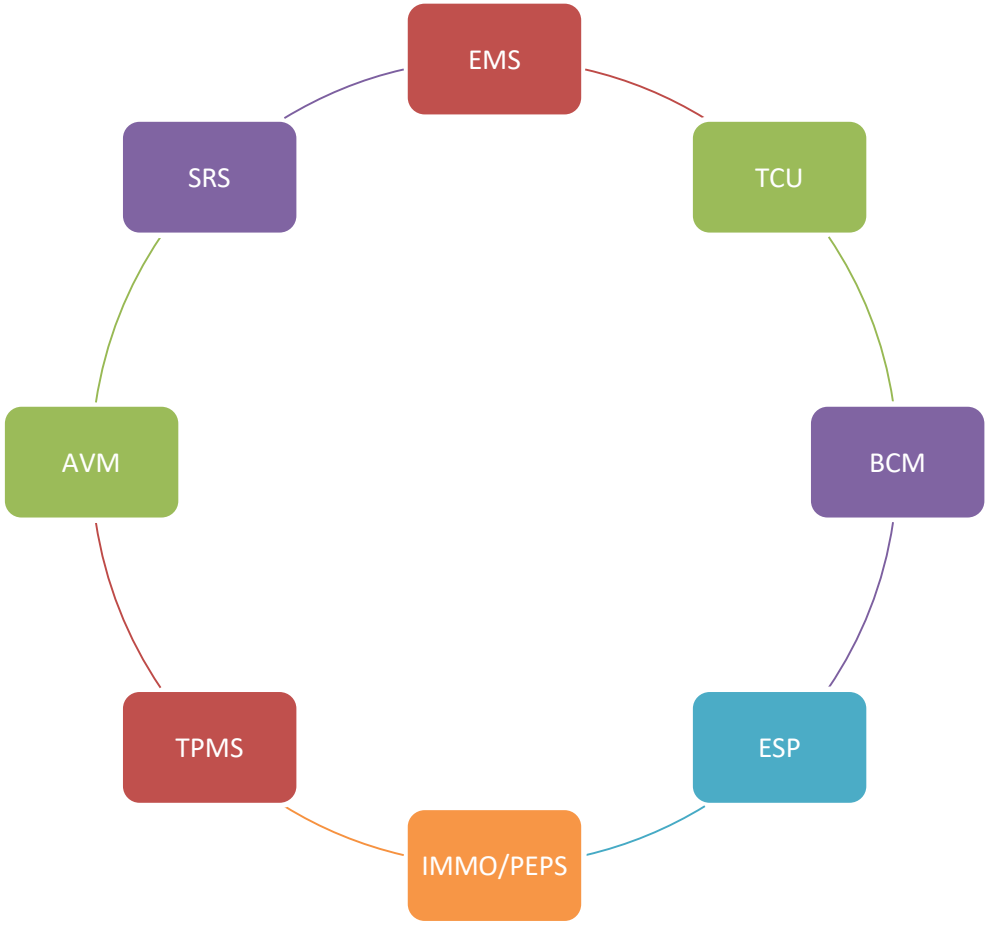
1 Overview



Switch Input Control
- Pull-up
- Pull-down
- Flash

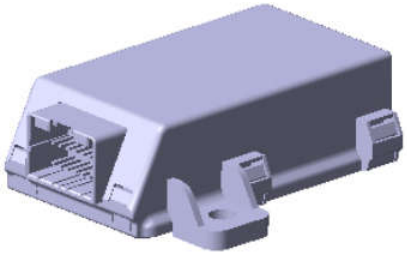
Output Control
- Power Control
- Ground Control
- Relay Control
- IPS Control
- PWM Control

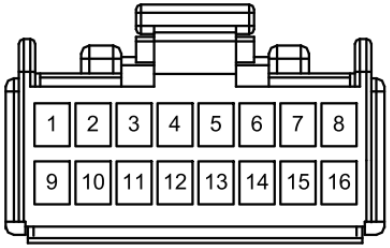
2 Electric Control Unit



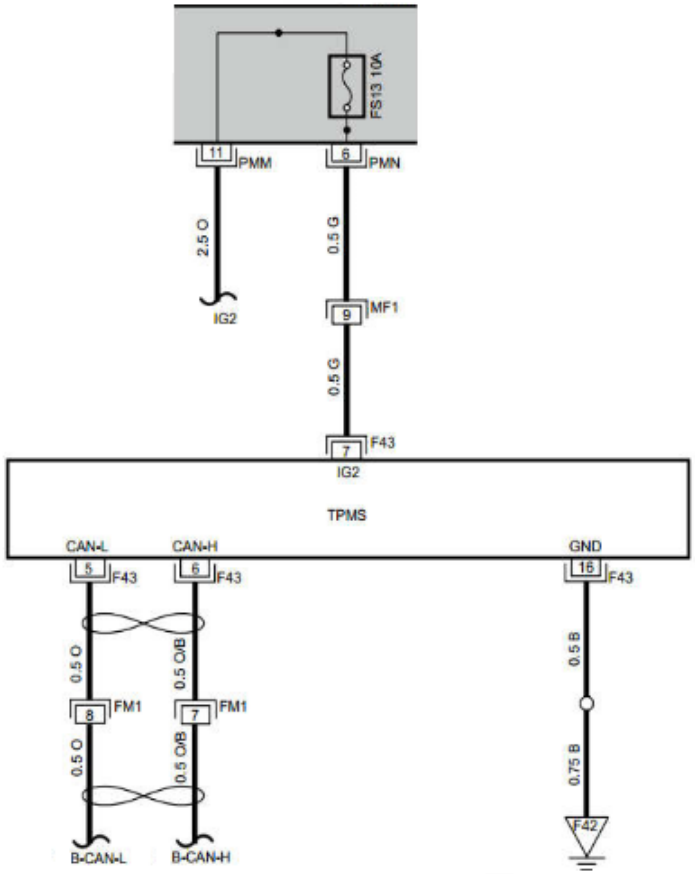
2 Electric Control Unit

- TPMS Controller



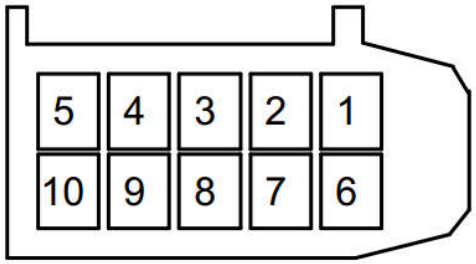


1	/	9	GND
2	IG1	10	/
3	CAN-H	11	/
4	CAN-L	12	/
5	/	13	/
6	/	14	/
7	/	15	/
8	/	16	/

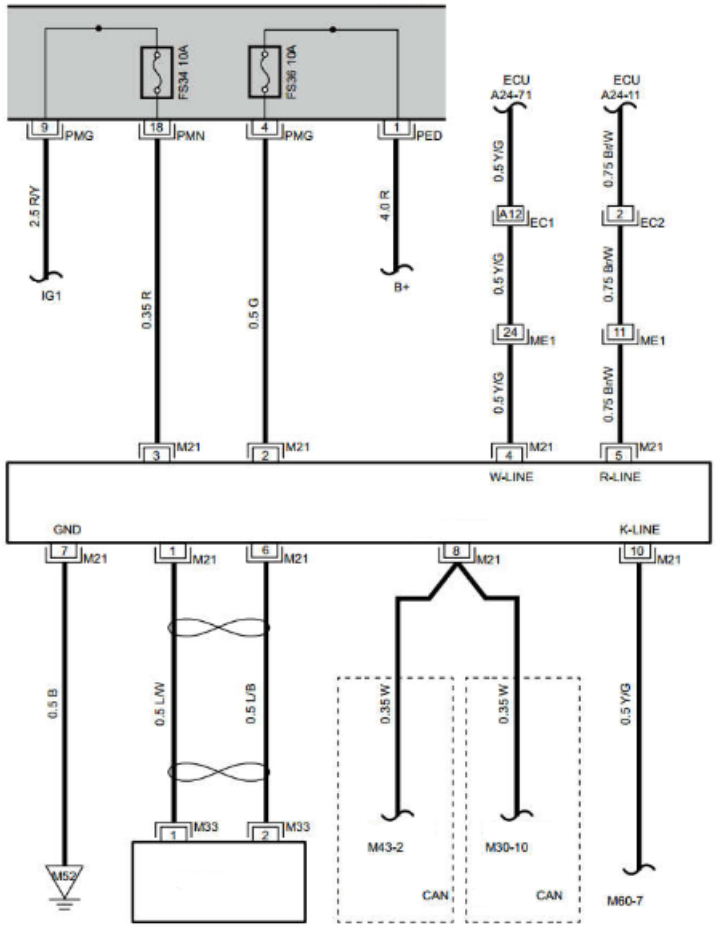


2 Electric Control Unit

- IMMO Controller

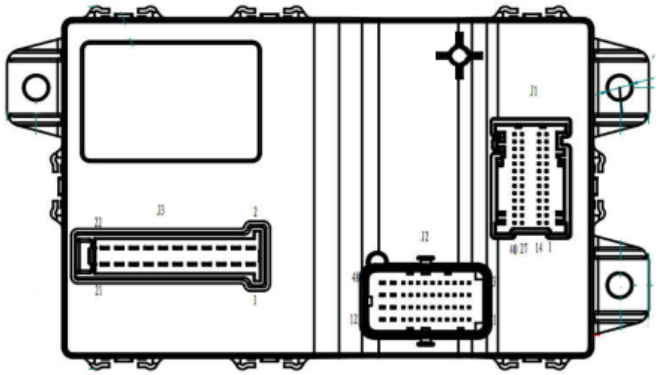


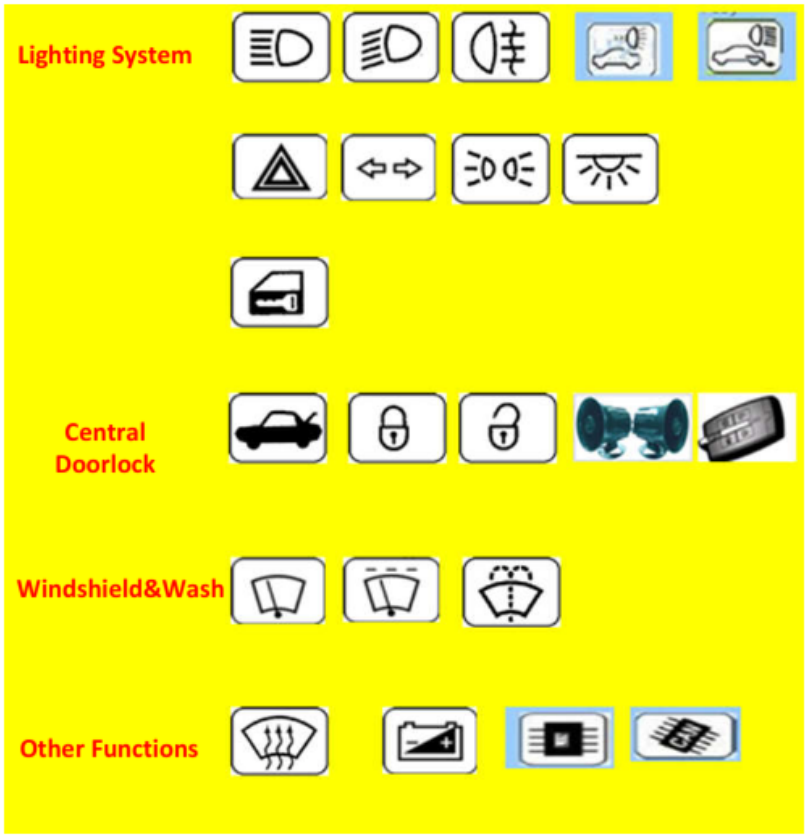
1		1
2		B+
3		IG1
4		W
5		R
6		2
7		GND
8		LED
9		/
10		K



2 Electric Control Unit

- BCM Controller



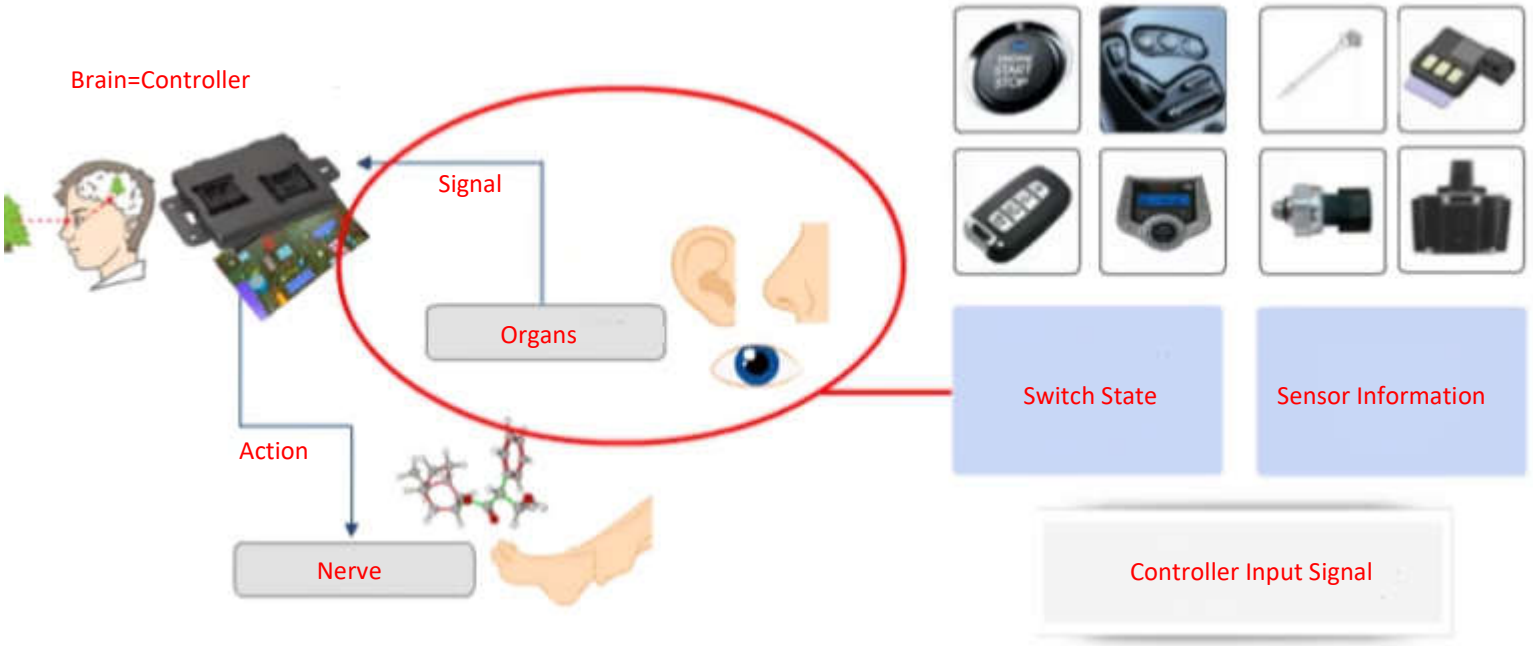


2 Electric Control Unit

- BCM Controller

Electrical Principle Diagram

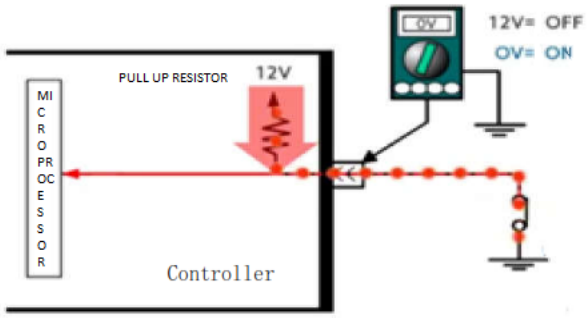
3 Input Signal Control



3 Input Signal Control

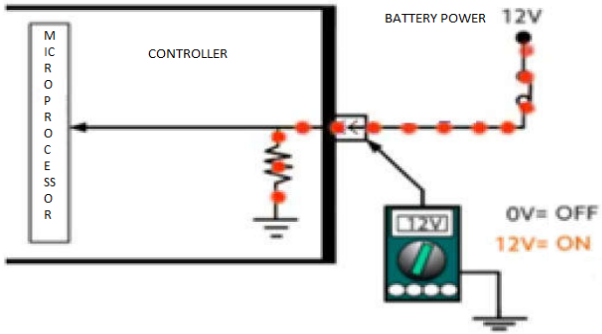
- Switch Input Signal Control

According to the voltage of the switch when working, the controller recognize the ON/OFF state of the switch. Three ways to recognize: Pull Up, Pull Down, Flashing.



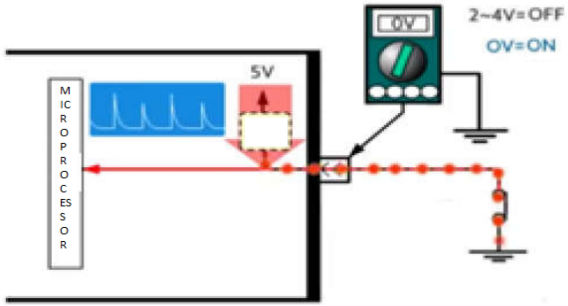
Pull Up

When the voltage changes from 12V to 0V, the switch state is ON.



Pull Down

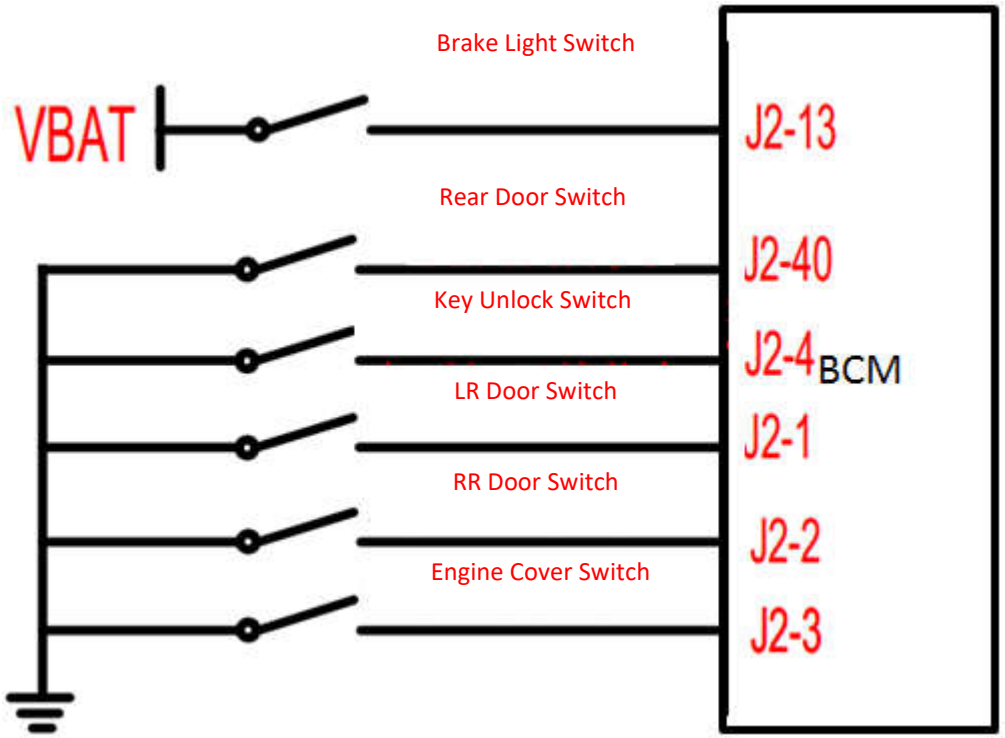
When the voltage changes from 0V to 12V, the switch state is ON.



Flashing

When the 0V lasts for over 400ms, the switch state is ON.

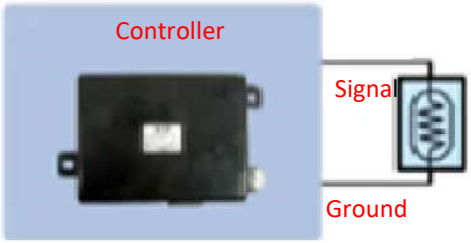
3 Input Signal Control



3 Input Signal Control

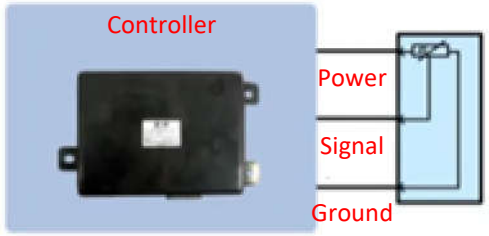
- Sensor Input Signal Control

It can be divided into 2 types according to whether the Sensor Power Circuit is same with the Sensor Signal Circuit.



Sensor Power Circuit=Sensor Signal Circuit

- Controller supplies power to the sensor.
- Voltage changes based on the principle.
- Test the change.



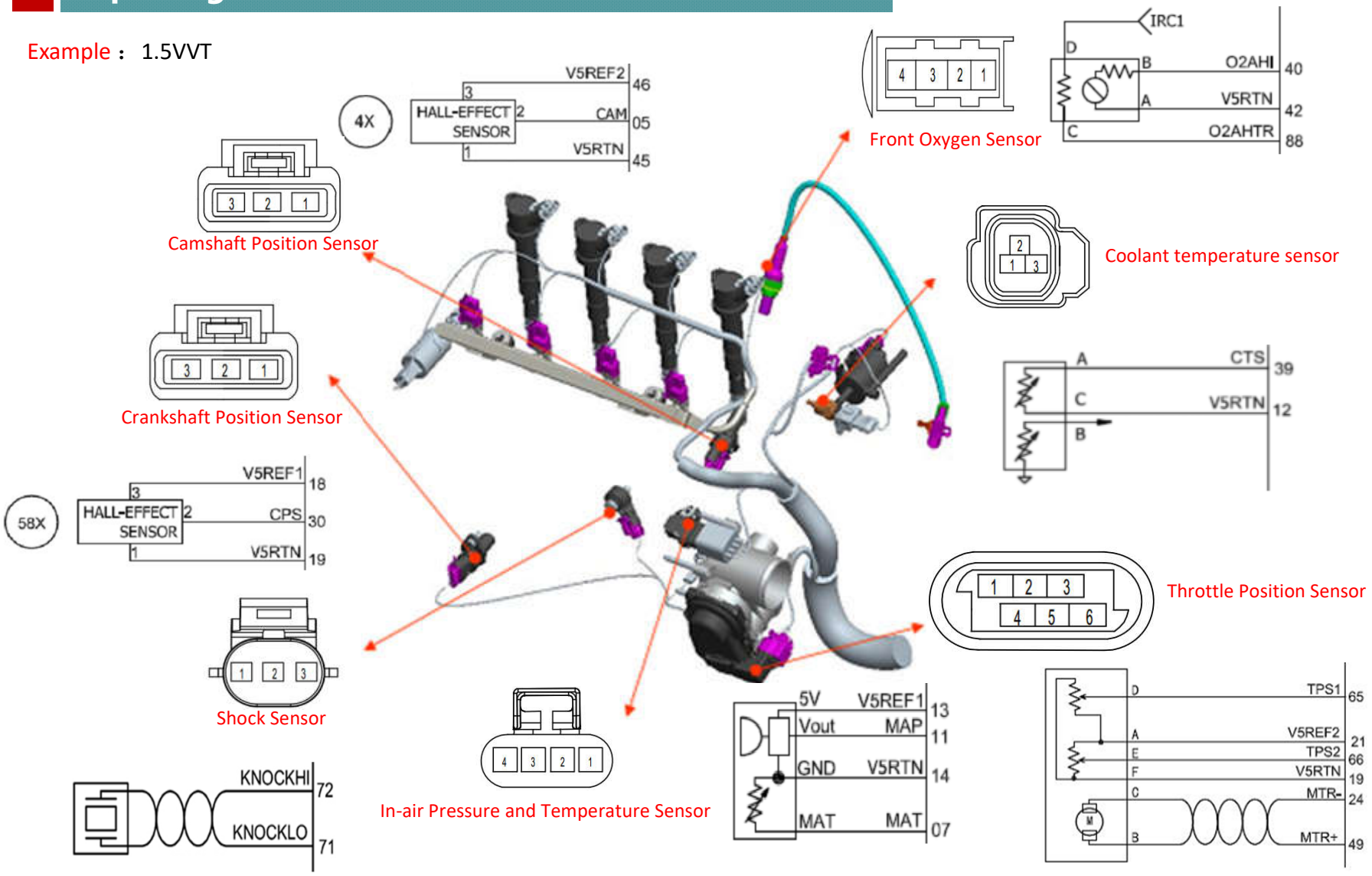
Sensor Power Circuit ≠Sensor Signal Circuit

- Controller or 12V battery supplies power.
- Signal changes based on the principle.
- Test the Signal Value through the signal line.

Also can be divided into different types according to the function, the principle

3 Input Signal Control

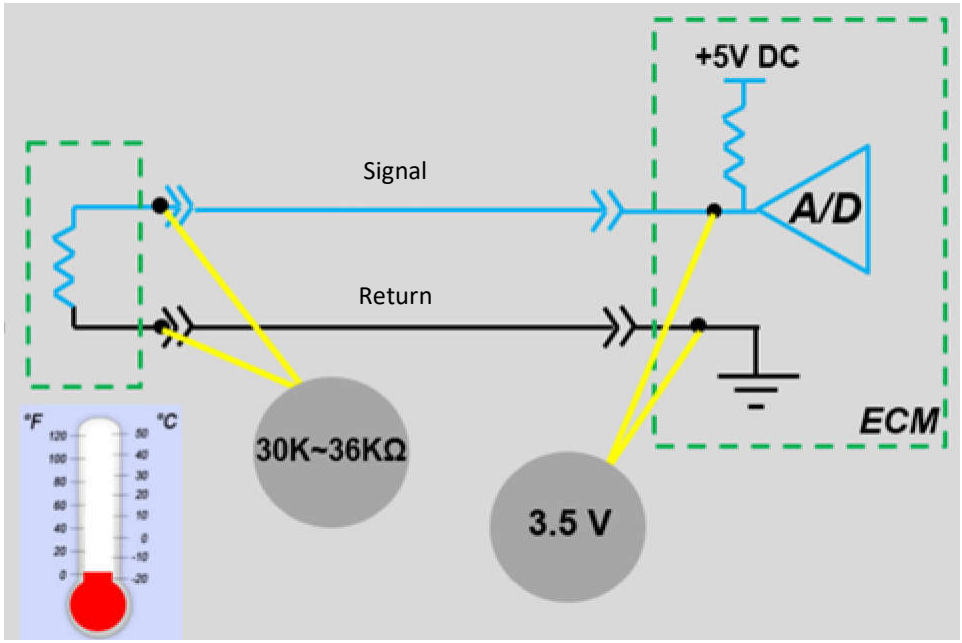
Example： 1.5VVT

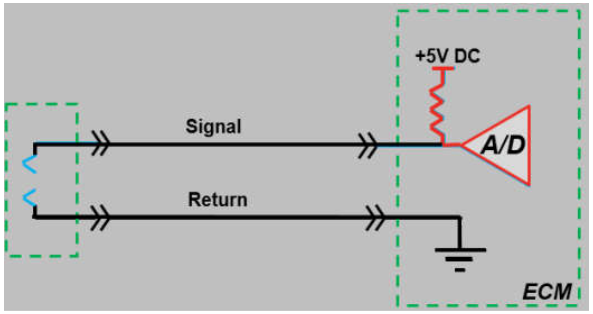


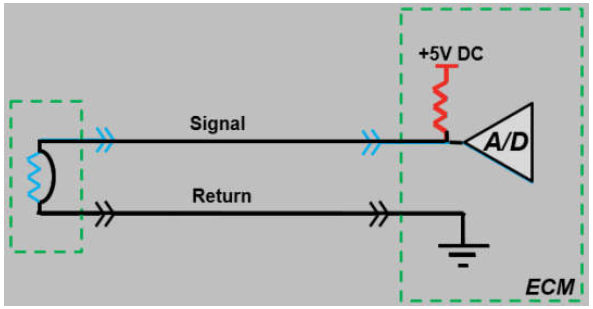
3 Input Signal Control

- Water Temperature Sensor

Voltage change caused by the resistance change, the cause of LV or HV fault, open-circuited HV fault, short-circuited LV fault, check if the sensor works(replace, measure, DTC)



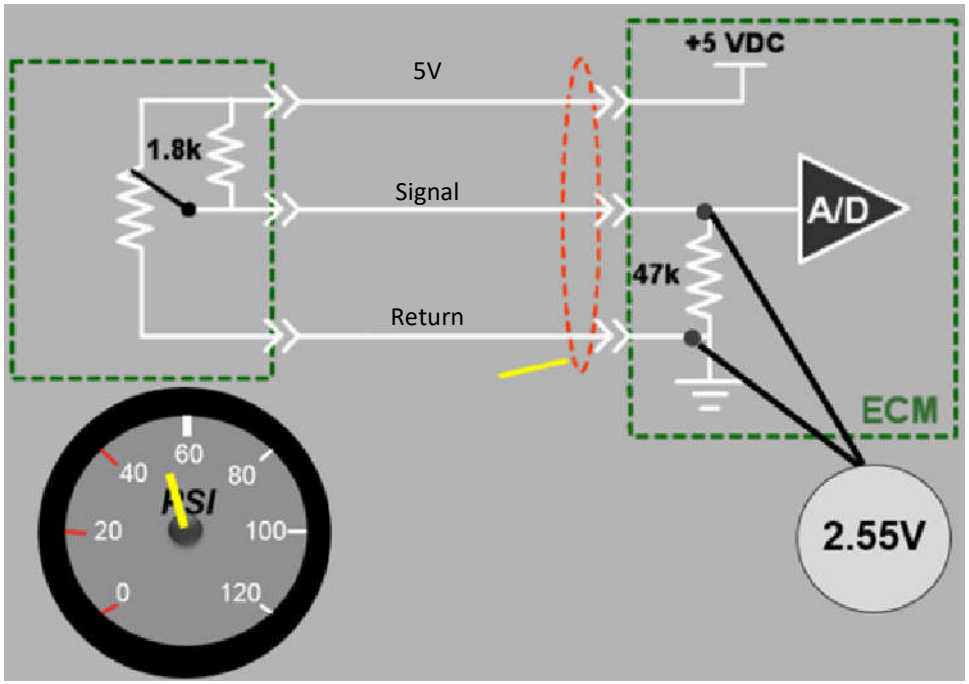


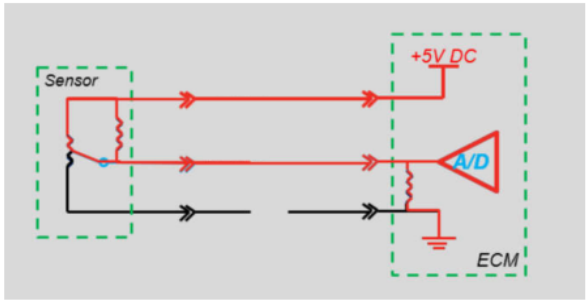


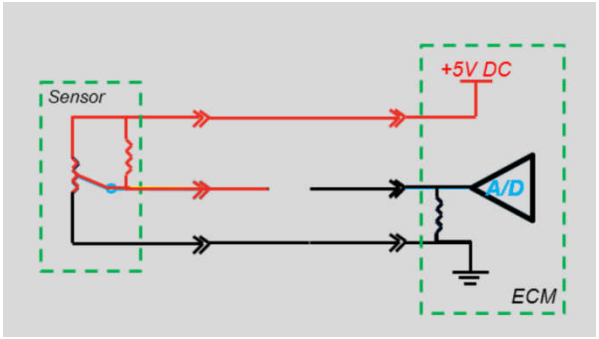
3 Input Signal Control

- Pressure Sensor

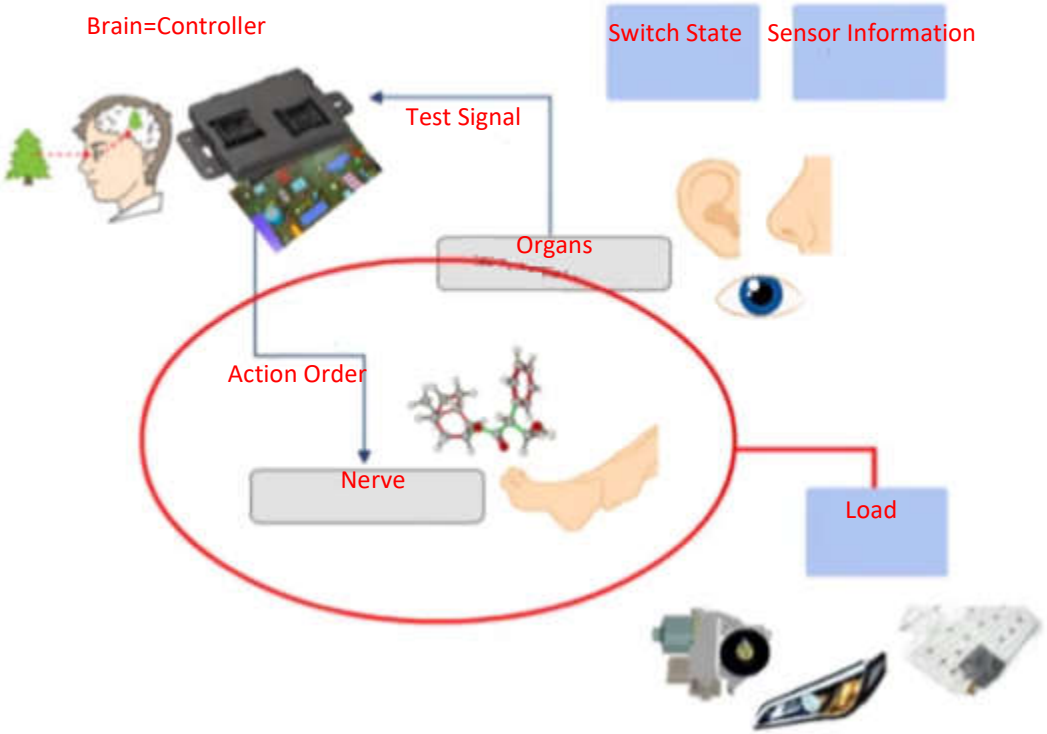
Voltage change caused by the pressure change(like the Slide Rheostat), the cause of the HV and LV, Open-circuited HV fault, Signal wire open-circuited fault, check if the sensor works(replace, measure, DTC)





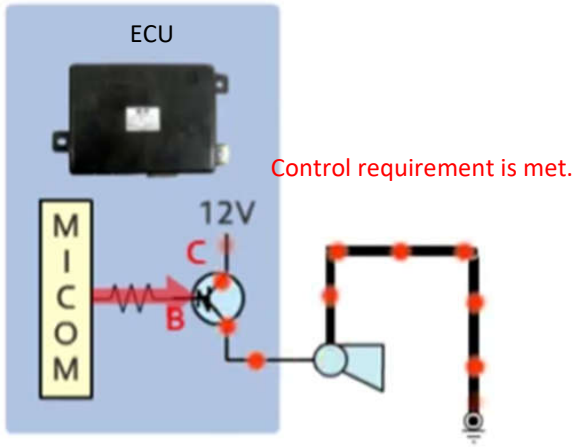


4 Output Signal Control

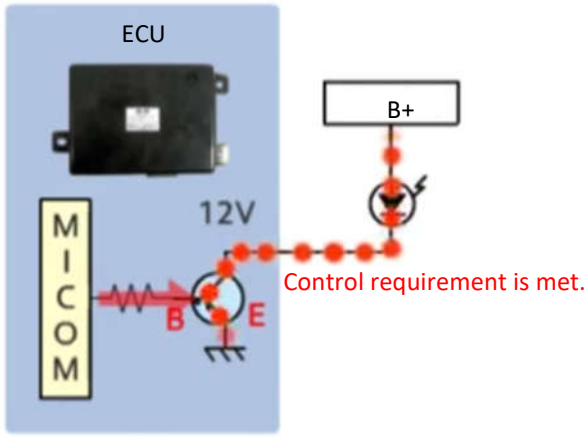


- Power Control
- Ground Control
- Relay
- IPS Control
- PWM Control

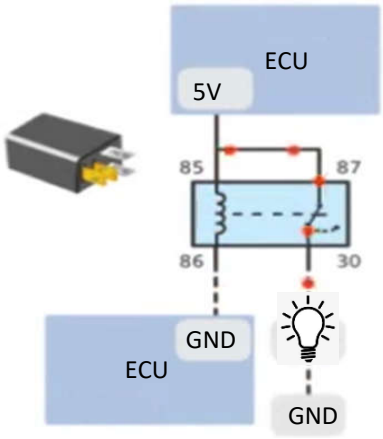
4 Output Signal Control



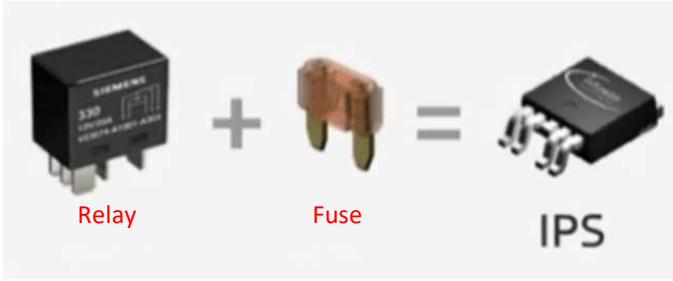
Power Control



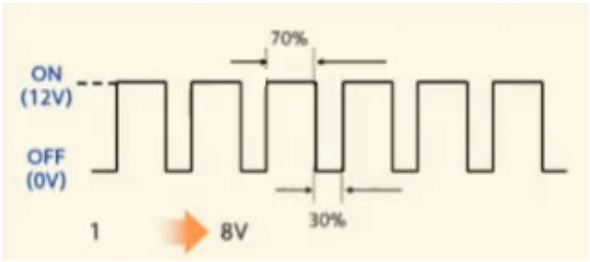
Ground Control



Relay Control

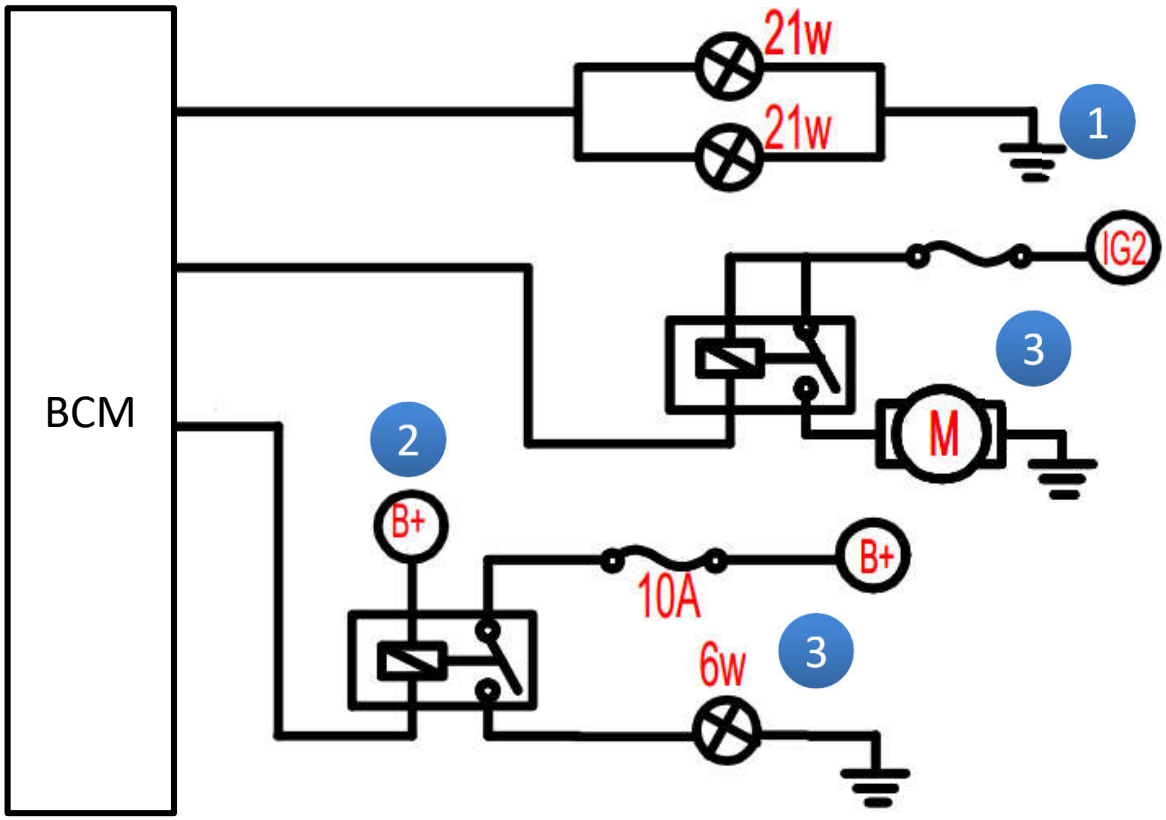


IPS Control



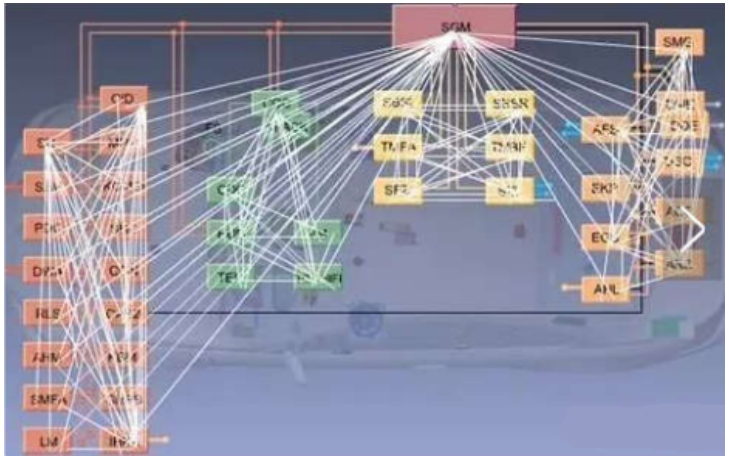
PWM Control

4 Output Signal Control



5 Controller Communication

Traditional point-to-point communication has been far from enough to meet the demand, increasing the wiring of cars, thus increasing the cost and weight. At the same time, make the fault search quite troublesome, not easy to repair. If you want to add new functions or update a lagging electrical accessory, it will complicate the wiring that is already messy



CAN BUS

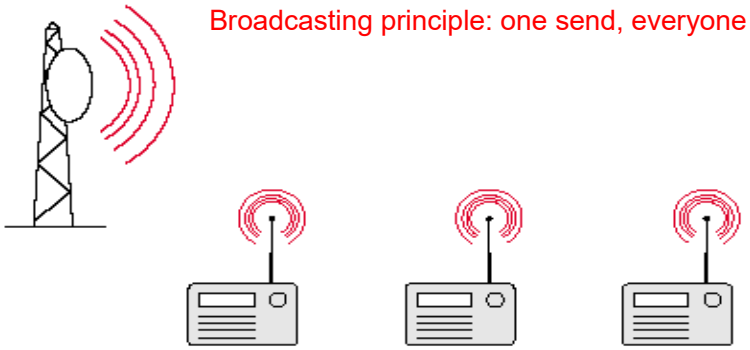
LIN BUS

KWP2000

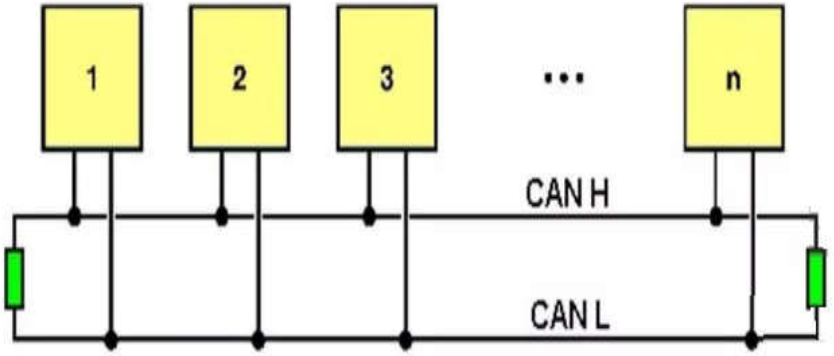
5 Controller Communication

- CAN BUS

CAN(Controller Area Network), is a serial communication network which can support distributed control and real-time control effectively. It connects each single control unit in some form to form a complete system, which can realize the effective sharing of data



Broadcasting principle: one send, everyone receive

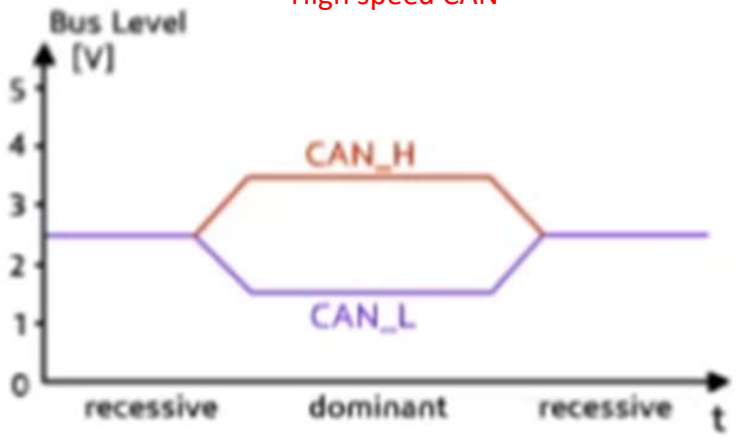


5 Controller Communication

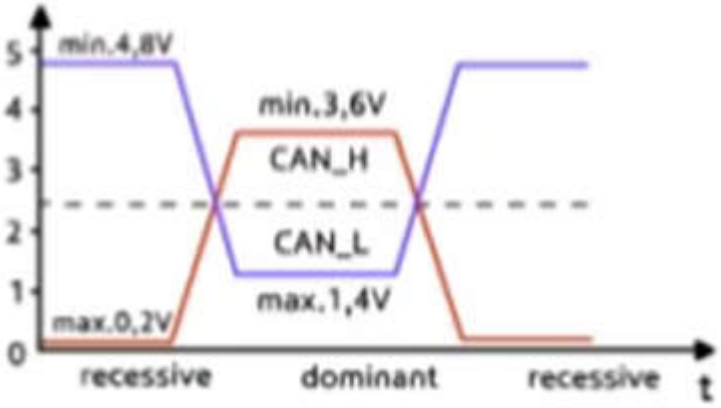
- CAN BUS

According to the communication speed, it can be divided into high speed CAN and low speed CAN. High speed CAN is generally used in the drive system, and low speed CAN is generally used in the comfort CAN

High speed CAN

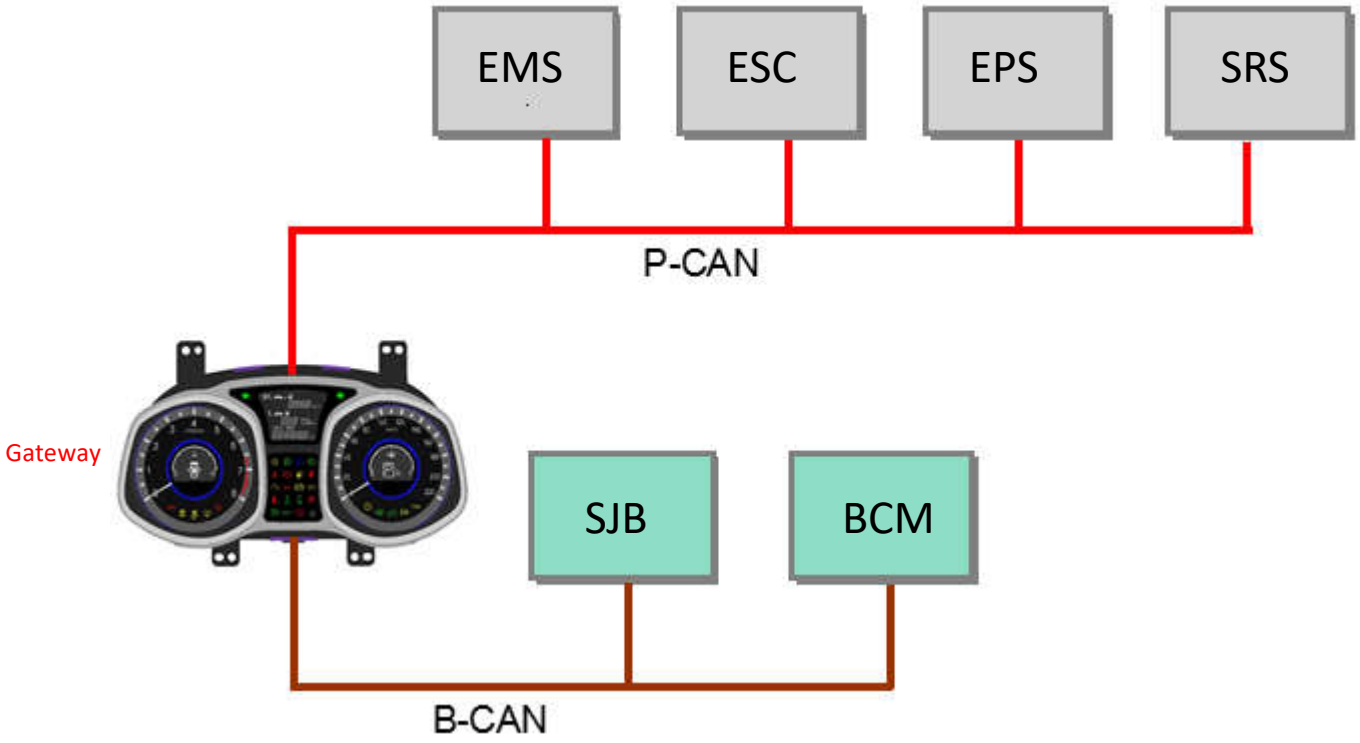


Low speed CAN



5 Controller Communication

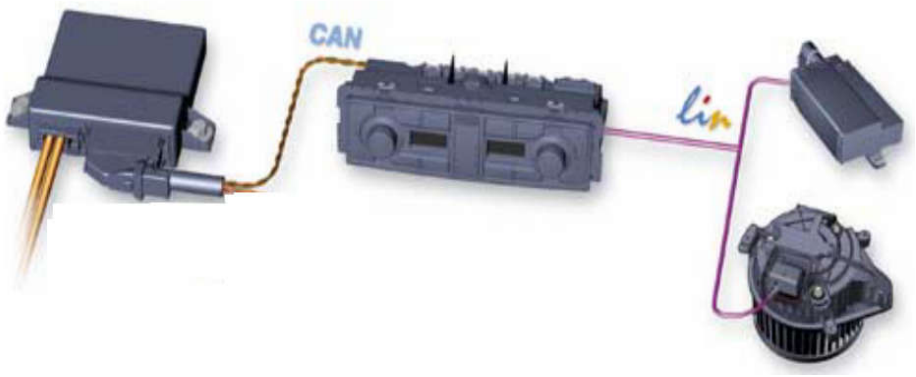
- CAN BUS

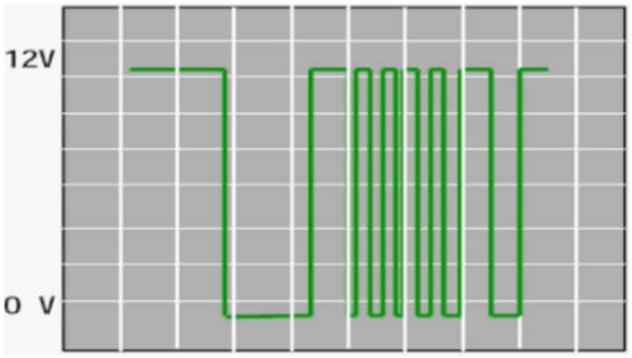


5 Controller Communication

- LIN BUS

LIN is a low-cost serial communication network, which adopts the mode of single master controller and multiple slave devices to realize the distributed electronic system control in the vehicle. LIN bus is generally used to assist CAN bus

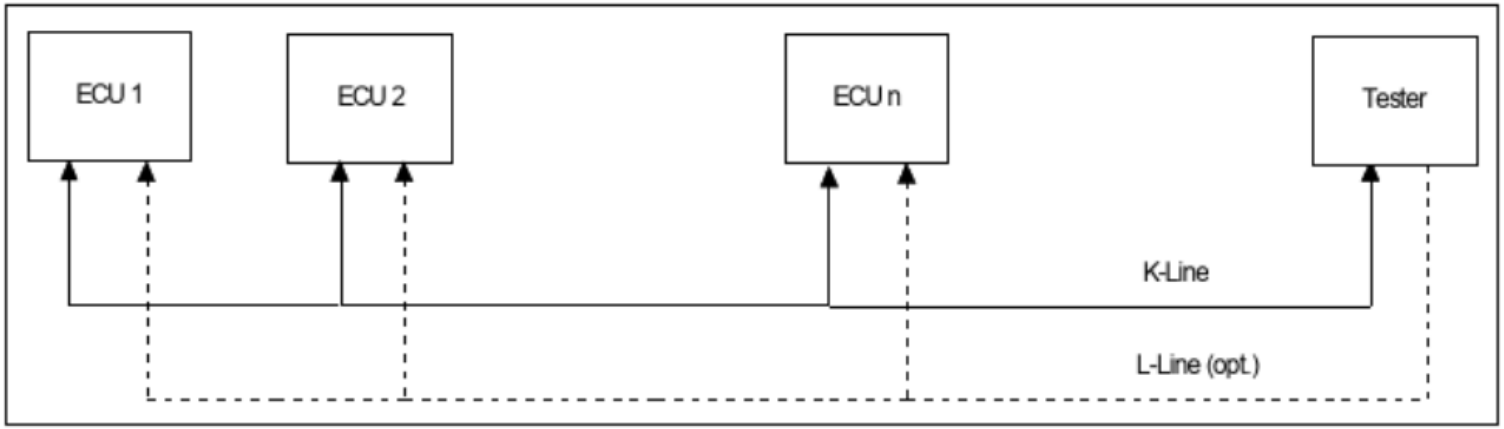




5 Controller Communication

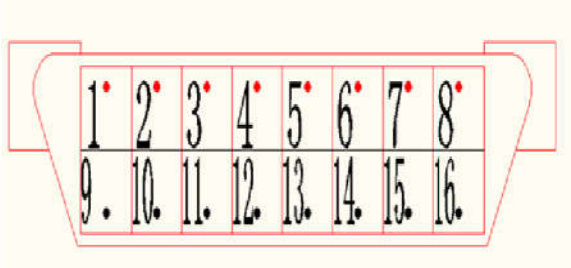
- Keyword Protocol 2000

KWP2000 diagnostic service CAN be implemented in two ways, based on K line (ISO14230) and CAN bus (ISO15765)



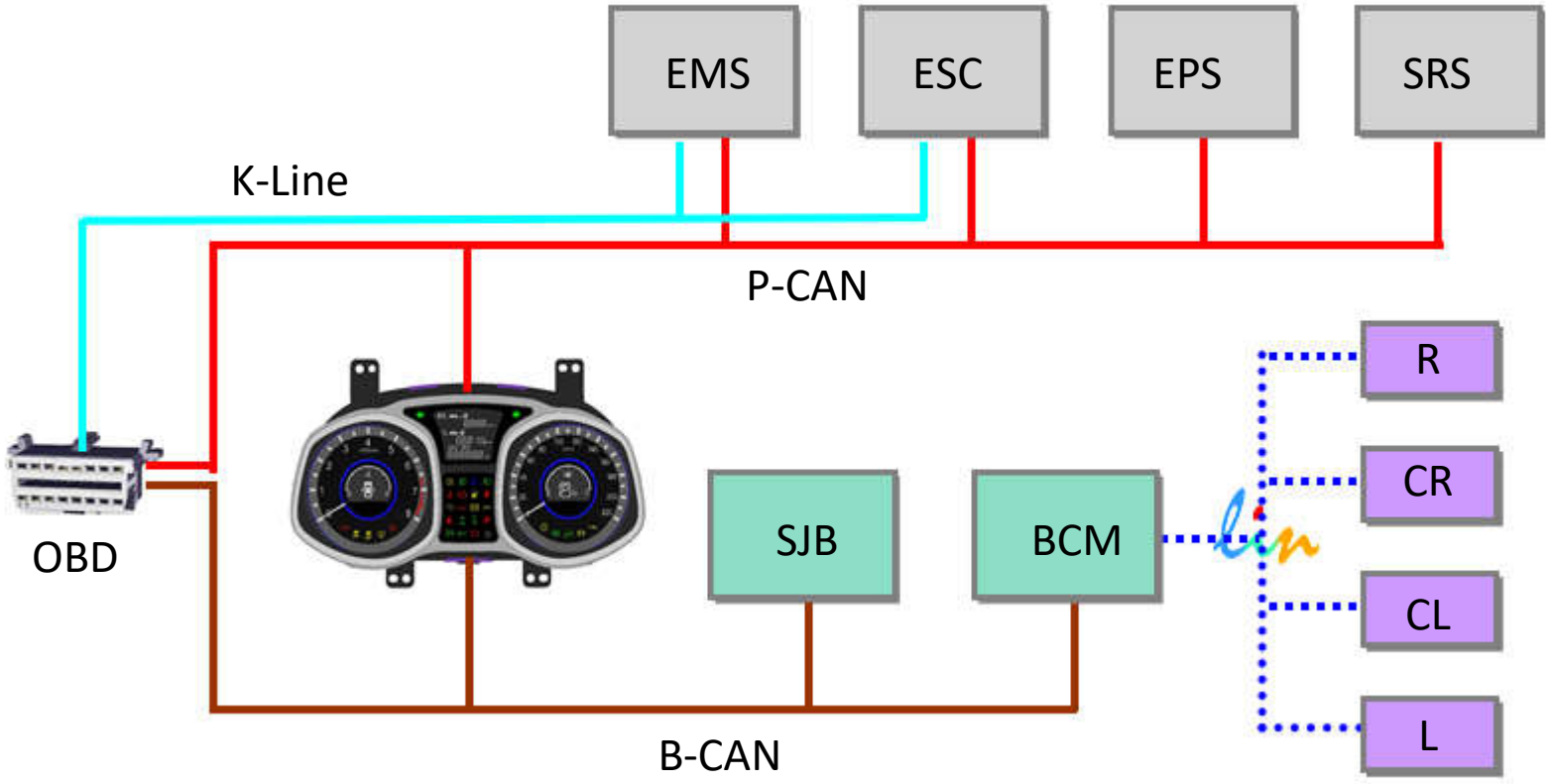
5 Controller Communication

- On-Board Diagnostic OBD



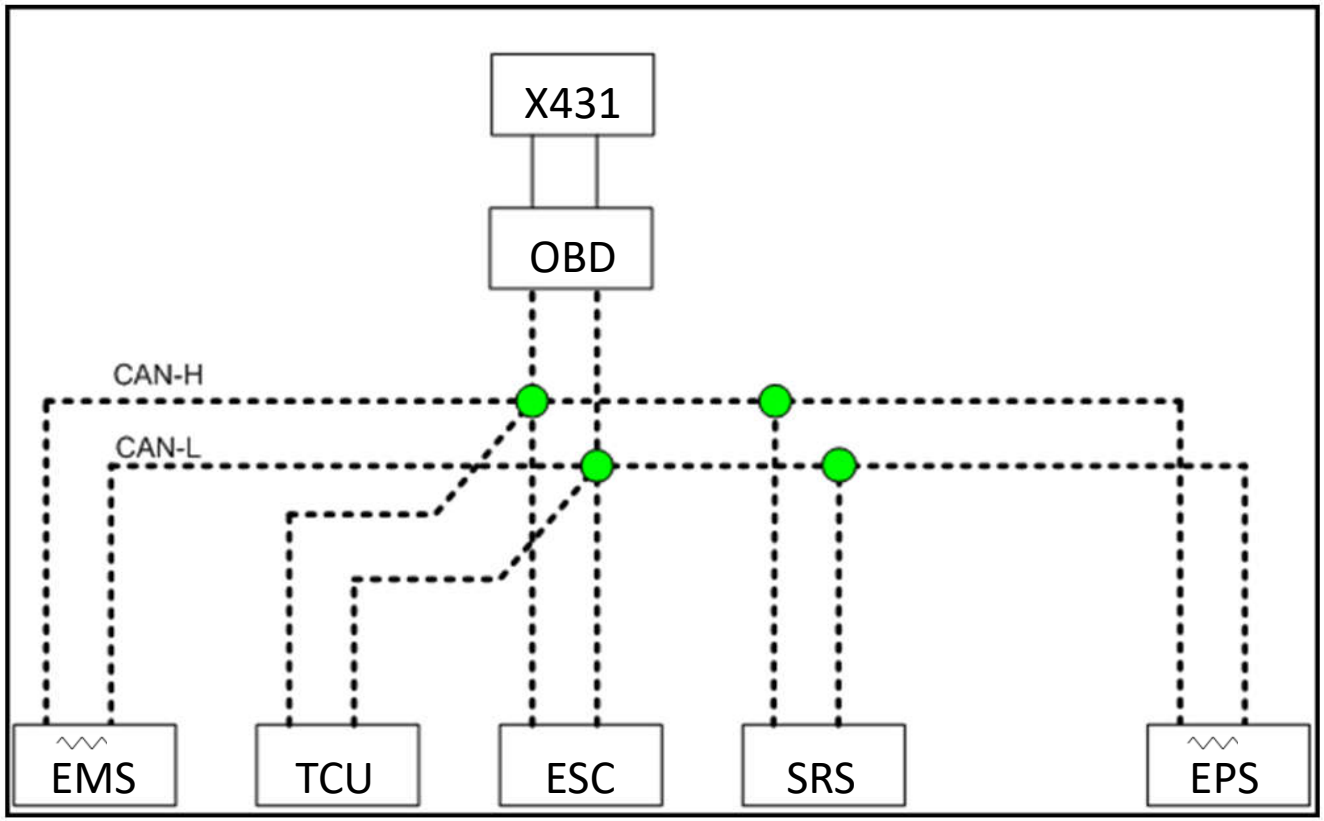
PIN	Function	PIN	Function
1		9	
2	+（SAE-J1850/SAE-1850 ）	10	-（SAE-J1850 ）
3		11	
4	Tierra del cuerpo	12	
5	Señal de tierra	13	
6	CAN-H（ISO 15765/SAE-J2284）	14	CAN-L（ISO 15765/SAE-J2284）
7	K（ISO 9141-2/14230-4 ）	15	L（ISO 9141-2/14230-4 ）
8		16	B+

5 Controller Communication



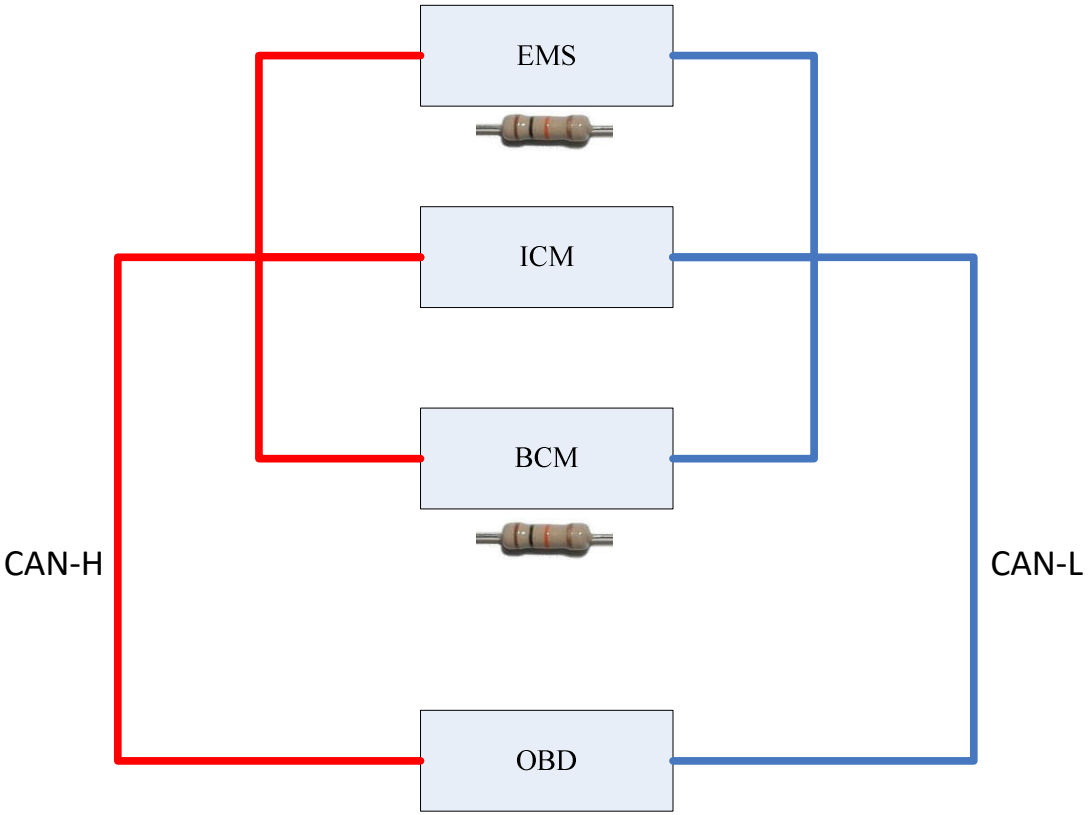
5 Controller Communication

- Failure type



5 Controller Communication

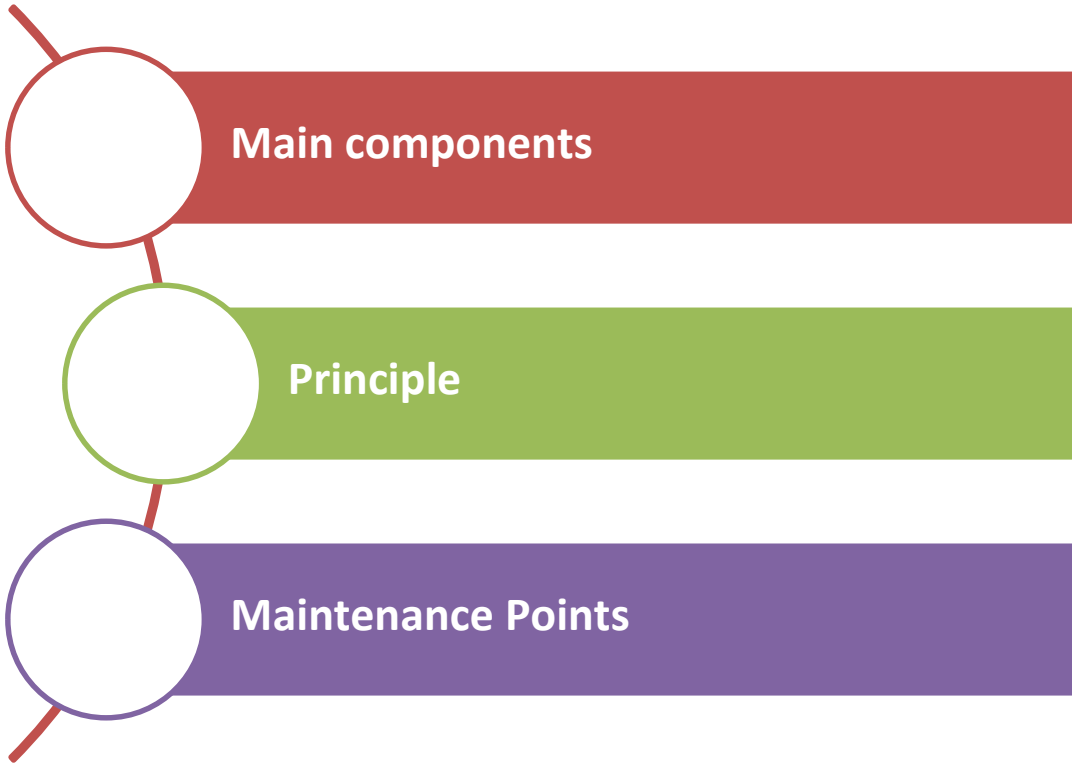
- Failure type



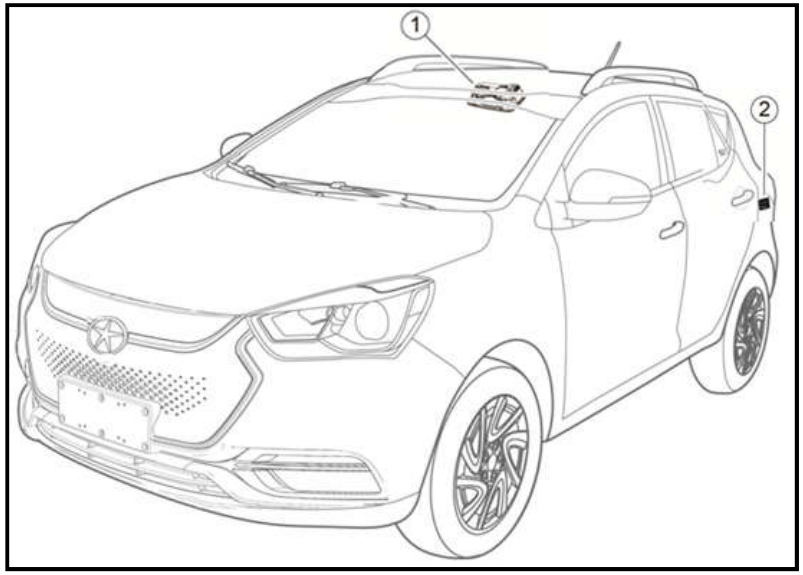
service training materials

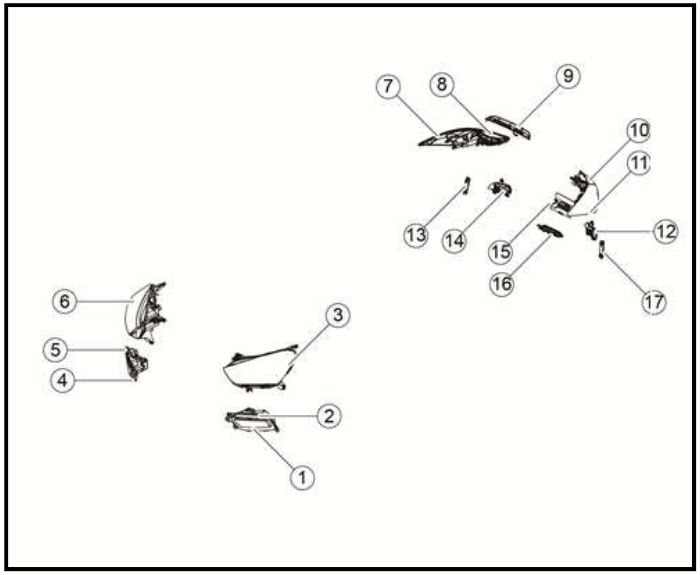
EVO 3 electric
Lighting system

Catalog



1 Main components

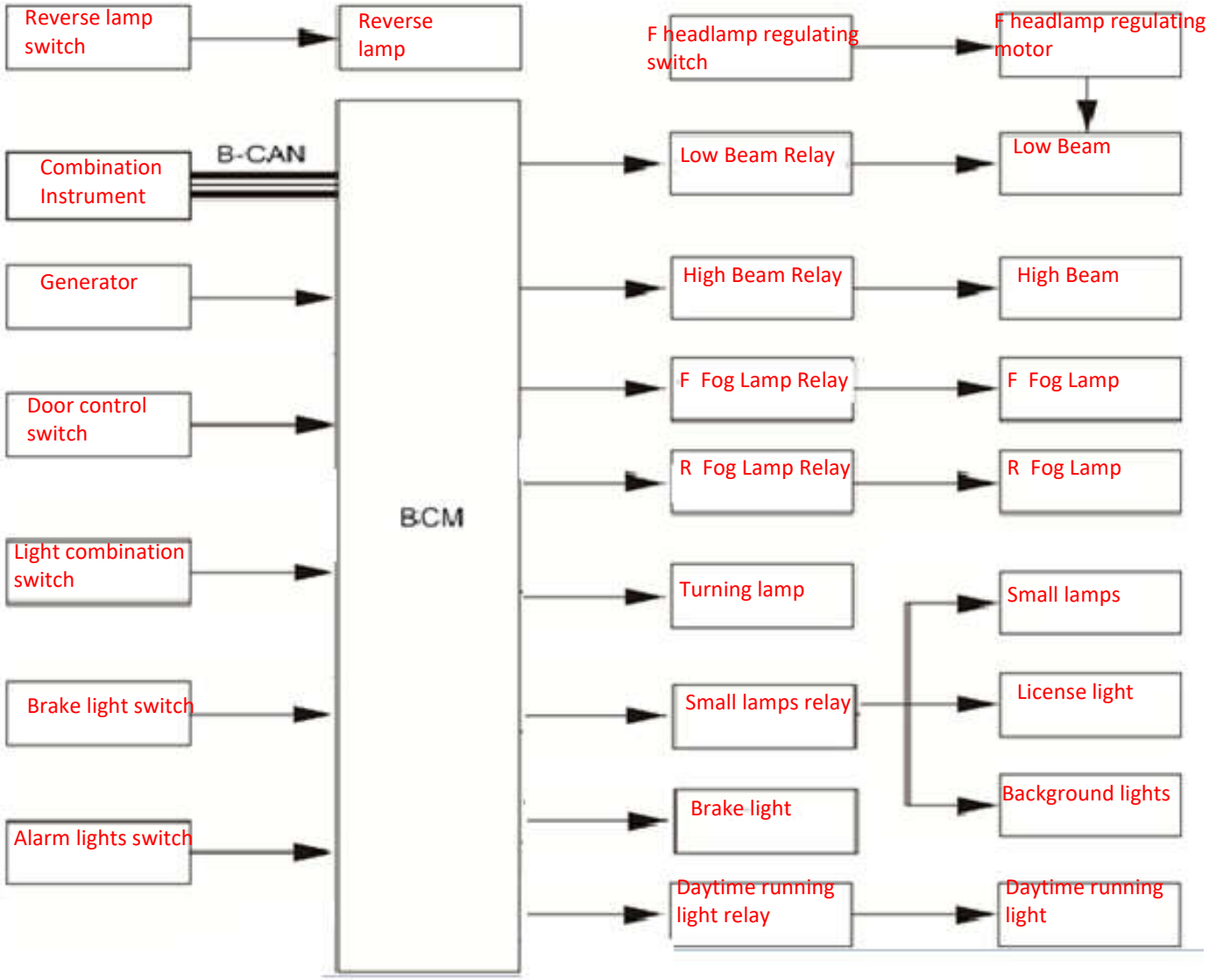




1. front roof lamp 2. Trunk lamp

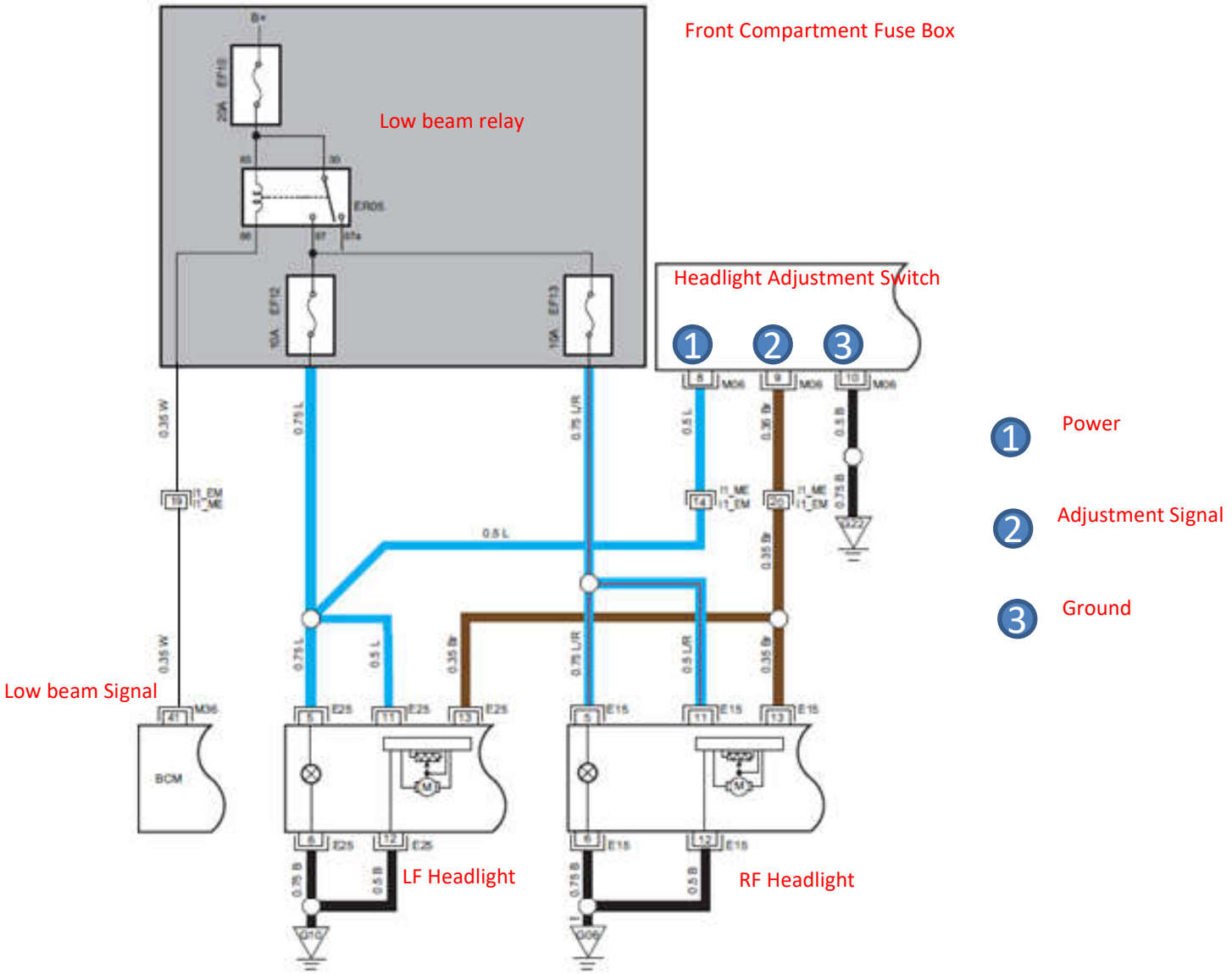
1.LF fog light	2.L daytime traffic light	3.LF combination lamp	4.RF fog light
5.R daytime traffic light	6.RF combination lamp	7.RR circumference combination lamp	8.RR door combination lamp
9.High position brake lamp	10.LR door combination lamp	11.LR door combination lamp	12.L reversing lamp
13.RR reflector	14.R reversing lamp	15.License plate lamp	16.R fog light
17.LR reflector			

2 Principle


Reverse lamp switch
Reverse lamp
F headlamp regulating switch
F headlamp regulating motor
Combination Instrument
B-CAN
Low Beam Relay
Low Beam
Generator
High Beam Relay
High Beam
Door control switch
F Fog Lamp Relay
F Fog Lamp
R Fog Lamp Relay
R Fog Lamp
BCM
Light combination switch
Turning lamp
Small lamps
Brake light switch
Small lamps relay
License light
Background lights
Brake light
Alarm lights switch
Daytime running light relay
Daytime running light

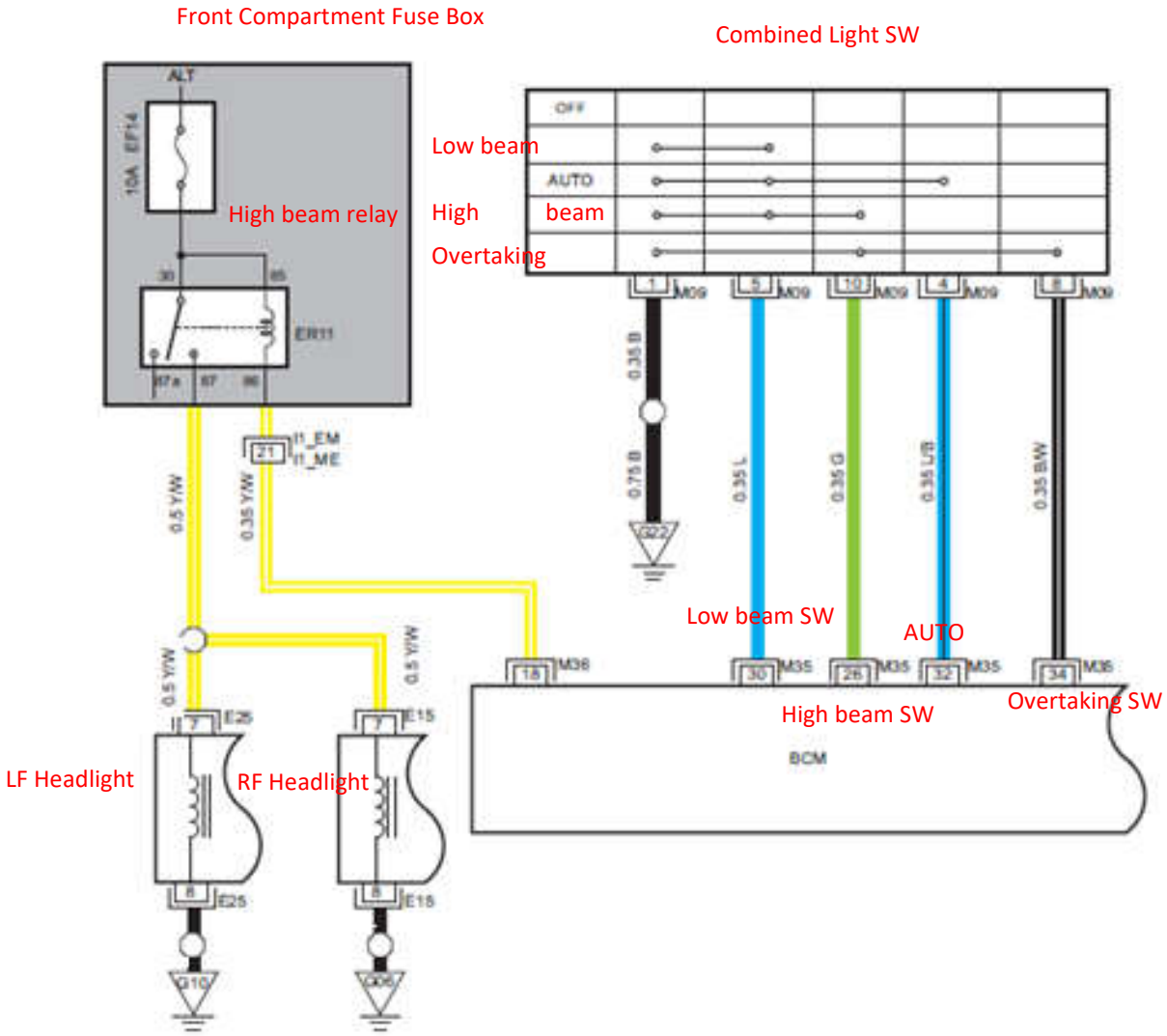
2 Principle

- Low beam



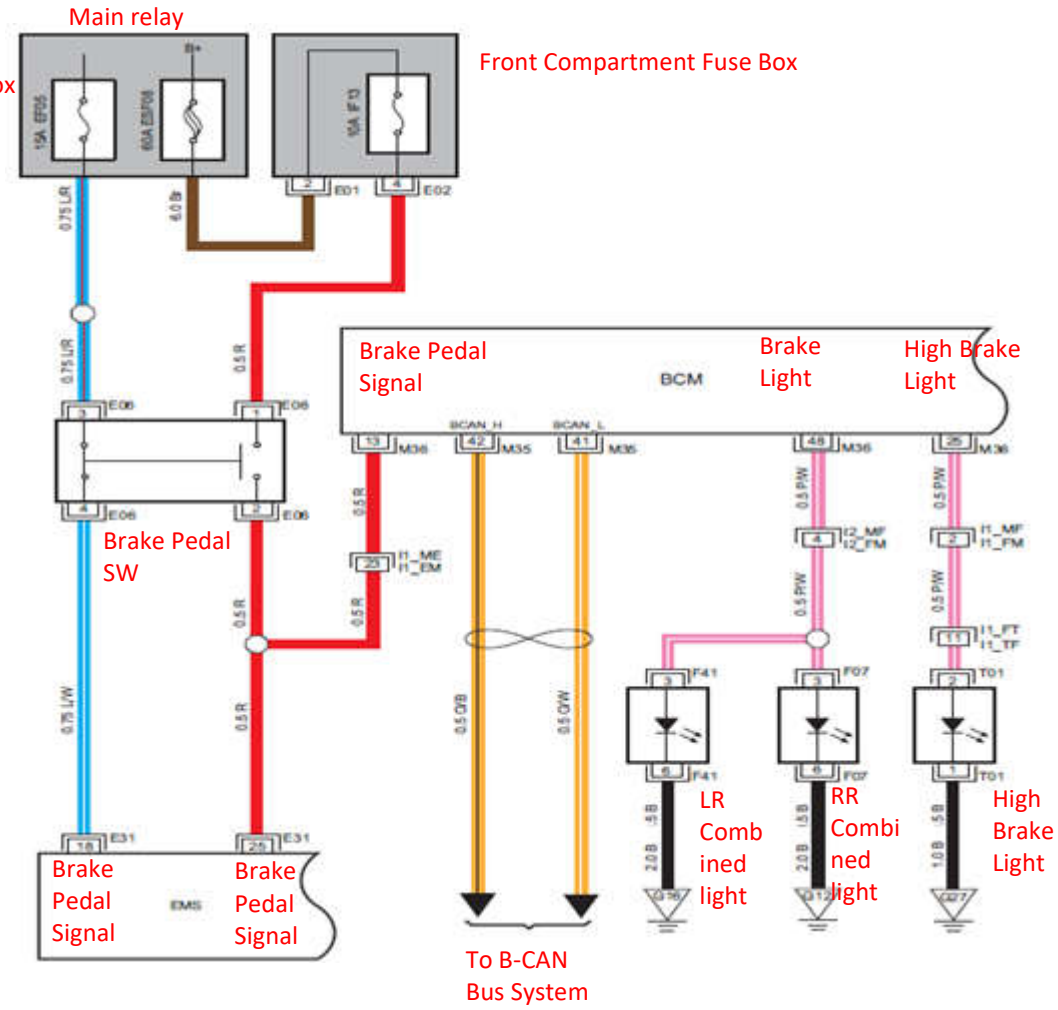
2 Principle

- High beam



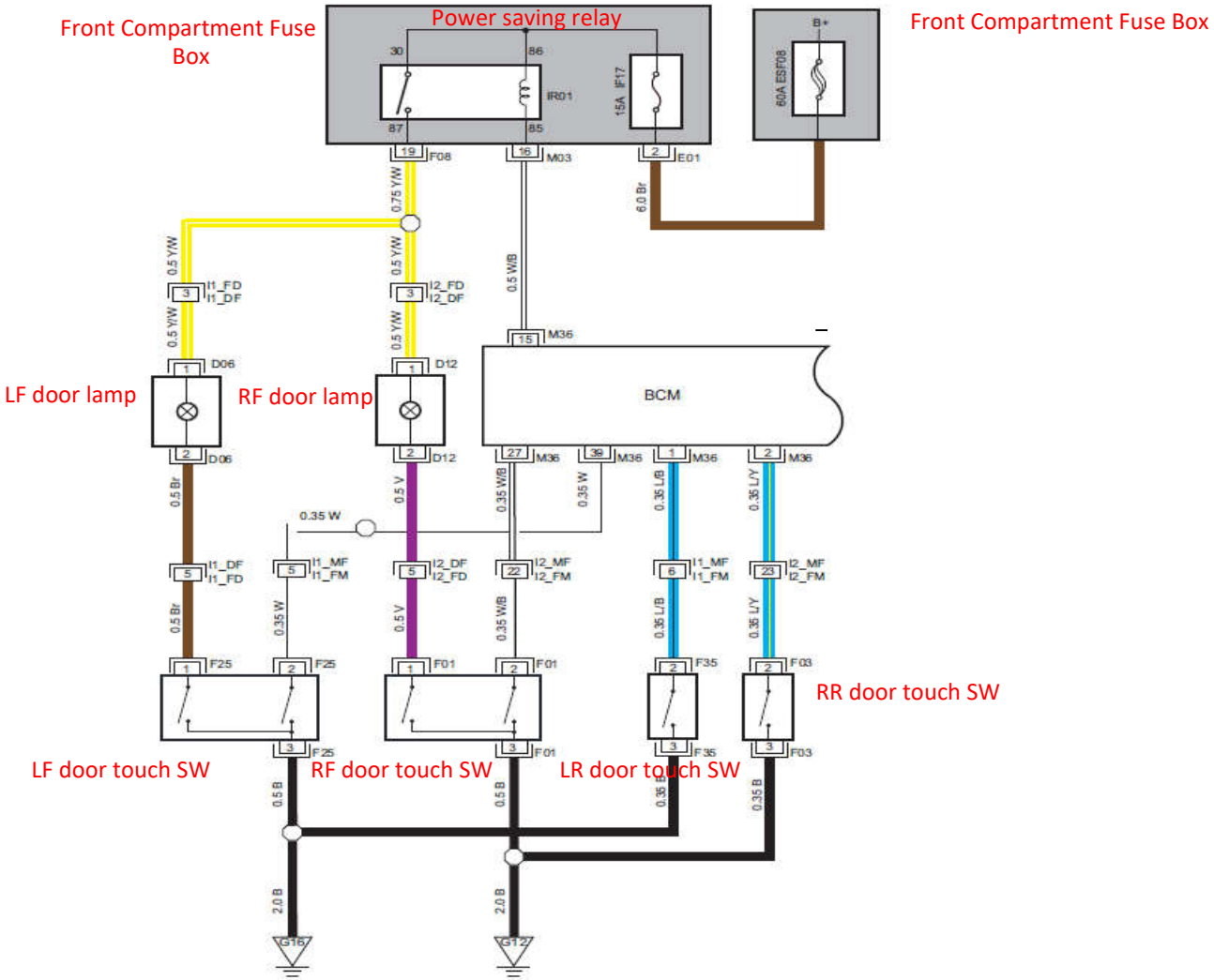
2 Principle

- Brake lamp



2 Principle

- Door lamp



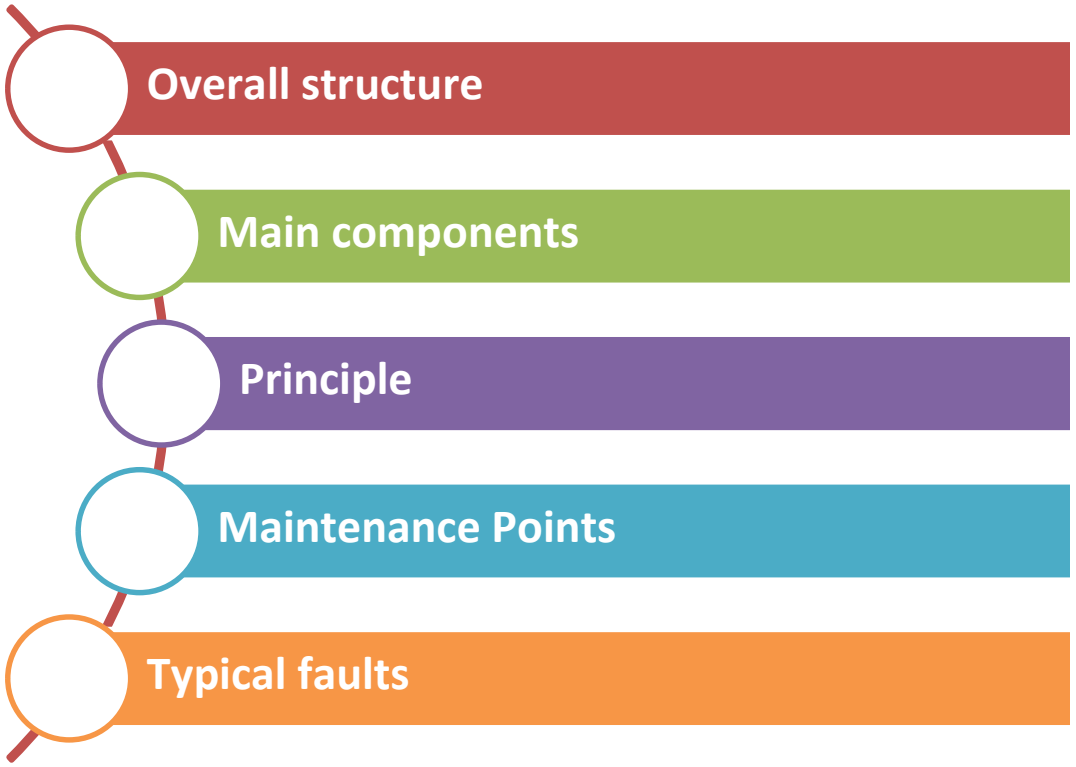
3 Maintenance Points

Num	Faults	Cause Analysis	Solution
1	Headlamps/Fog lights/Turning light not work	Bulb filament blown	Replace lamp
		Fuse blown	Replace fuse
		Power fails, harness	Repair circuit fault
		Relay not work	Replace the relay
		Light switch not work	Change the light switch
		Light switch circuit failure	Repair light switch circuit fault
		BCM fault	Replace the BCM
2	Reversing light not work	Reversing light fuse blown	Replace the fuse.
		Reversing light SW is wrong install	Adjust installation of reversing SW
		Reversing light switch broken	Replace the reversing lamp SW
		Reversing light lamp broken	Replace the reversing lamp
3	Brake light not work	Brake light fuse blown	Replace the brake light fuse
		Brake light SW wrong install	Adjust and install brake light SW
		Brake light SW broken	Replace the brake light SW
		Brake light S lamp broken	Replace brake light lamp

service training materials

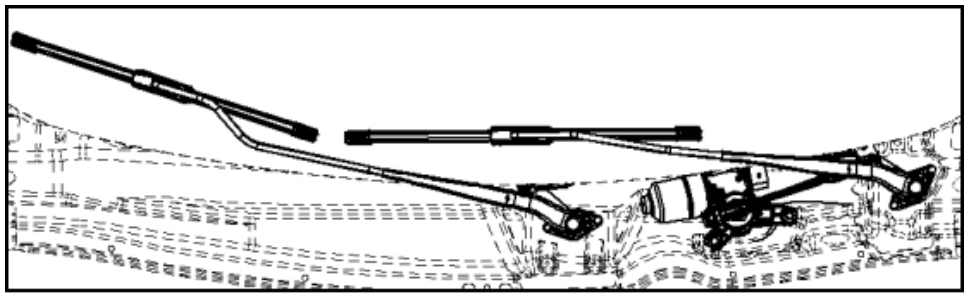
EVO 3 electric
Wiper and washer

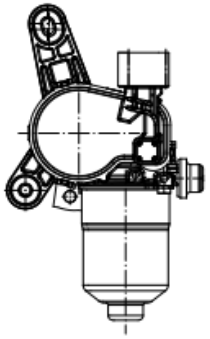
Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

- System composition





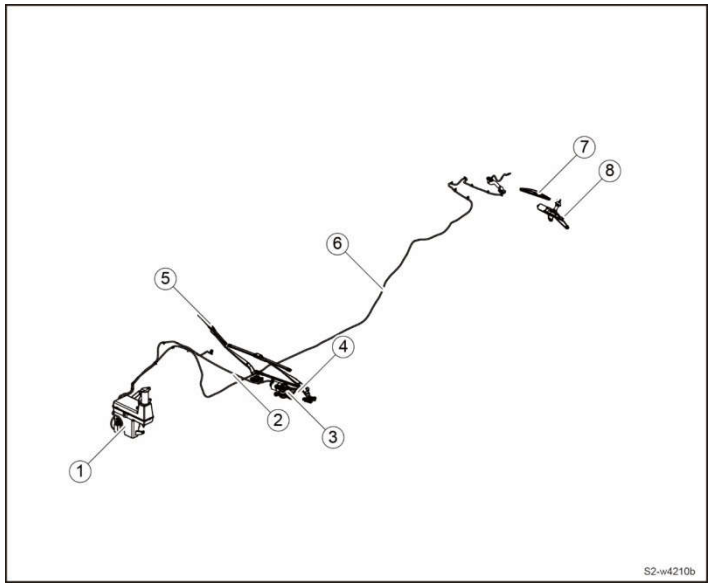
Wiper system

Wiper has four control mode: high speed, low speed, intermittent and inching. Wiper switch is on right side operating lever of turning column. Front wiper system consists of wiper switch, washing liquid pot and motor, front wiper connecting rod mechanism, front wiper motor, wiper arm and wiper blade. Rear wiper system consists of rear wiper switch, washing liquid pot and motor, rear wiper motor, wiper arm and wiper blade.

Washer System:

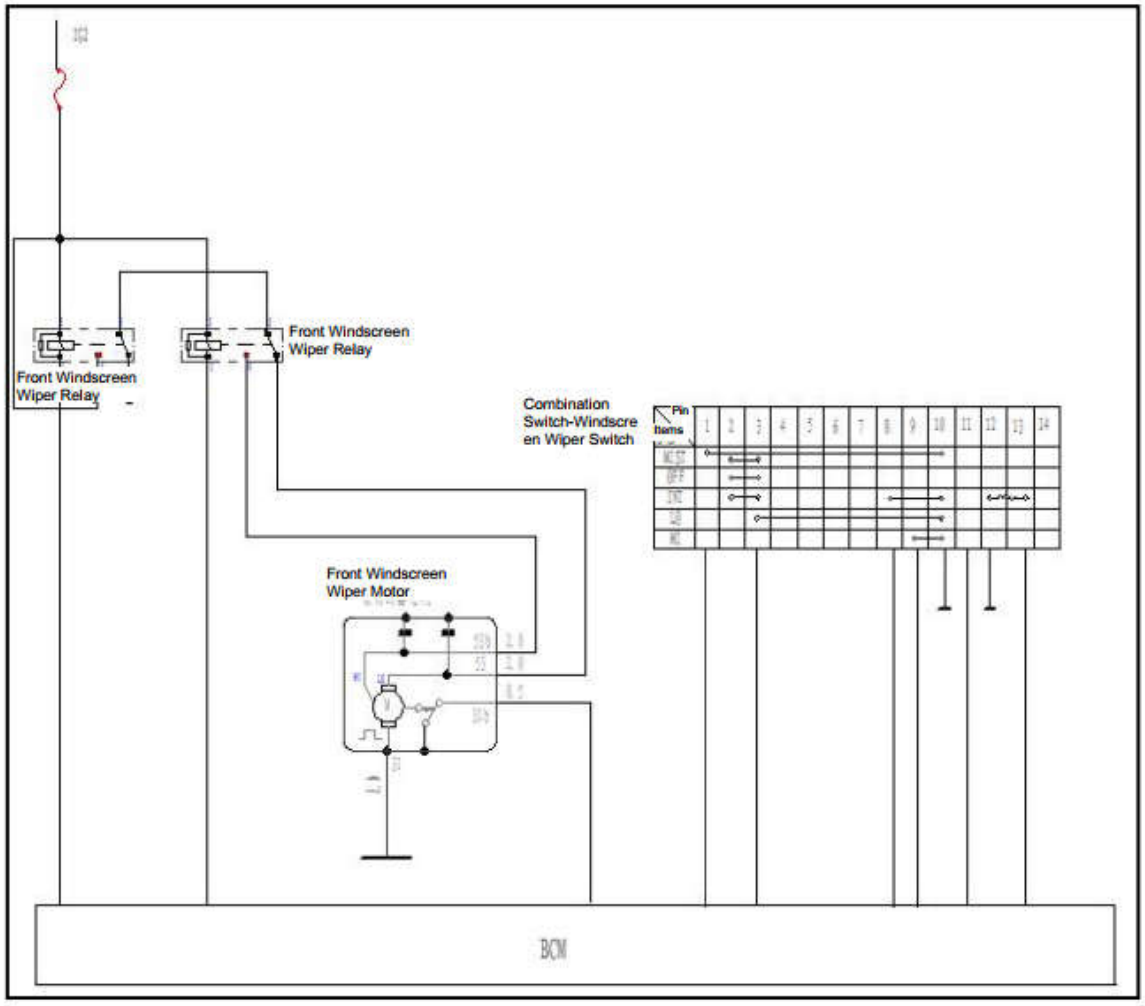
Washer system consists of window cleaner, washing pipe, washing liquid pot and washing motor assembly, front spraying nozzle, rear spraying nozzle and washing switch. Washing liquid pot is installed under right front headlight, wiper motor is fixed on washing liquid pot, washing motor sends washing liquid to front spray nozzle or rear spray nozzle through washing water pipe.

2 Main components



1.Washing liquid pot and motor assembly
2.Front washing water pipe assembly
3.Front wiper motor assembly
4.Front wiper connecting rode mechanism assembly
5. Front wiper arm, wiper blade
6. Rear wiper water pipe assembly
7. Rear wiper arm and blade
8. Rear wiper motor assembly

3 Principle

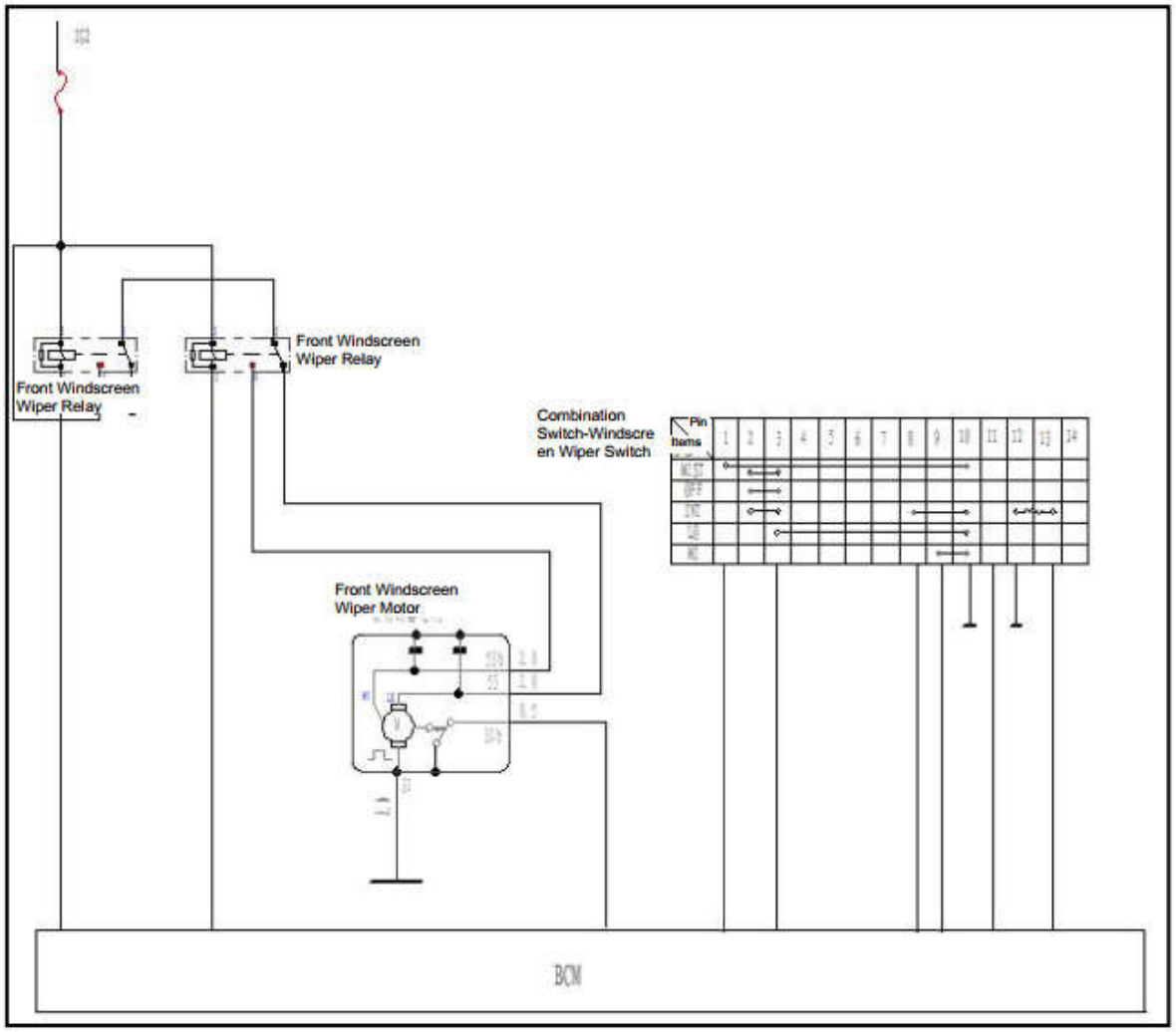


Front Wiper Control (Take front wiper control for example)

BCM controls wiper motor and water spraying pump by monitoring state of wiper switch and combination switch, and realizes all working mode of wiper system: front wiper low speed working, front wiper high speed working, front wiper intermittence working, front wiper closed, front windshield spraying water etc..

1) When ignition switch to “ON”, front wiper controlling switch connects to high speed/low speed/intermittence position, namely corresponding switch on, thus front wiper performs corresponding action.
2) When wiper switch is in intermittence position, Intermittence regulating time has 5 gears.
3) Wiper high/low speed control: when switch connects to low speed position, low speed relay actuated, motor works in low speed. If switch connects to high speed, high speed relay actuated, motor works in high speed.
4) When inching switch works, low speed always works.

3 Principle



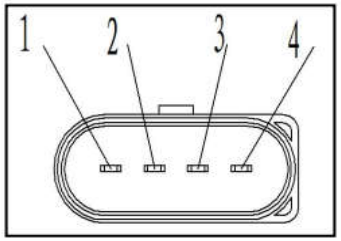
.5) Front spraying water is less than 400ms, wiper not works; when more than 400ms, wiper always work with spraying water, and then wiping three times after water spraying stopping.
6) Front wiper resetting control: After switch is off, when motor is not running to initial position, BCM not receives resetting position signal, high speed relay cut off, low speed relay not cut off, and motor continues to work; when motor runs to initial position, resetting switch is actuated, BCM receives resetting position signal, low speed relay cuts off, and motor stops running.
7) When in intermittence position, water spraying is prior.
8) Wiper high speed running period is 1s, and low speed running period is 4/3s.

4 Maintenance Points

1. Before disassembling wiper motor and connecting rod assembly, ensure connecting rod stop at autostop position.
2. Before installing wiper motor and connecting rod, ensure to connect wiper motor and wiring harness connector, when connecting you will hear “clatter” sound, it means good connect.
3. When installing wiper arm and blade assembly, it need to supply power to wiper motor, after wiper motor working for 10s, close wiper switch by operating combination switch rightly, to make wiper motor stop at autostop position.
4. Wiper blade is installed to window’s fixed position.
5. If wiper blade work not normally, use good cleaner or gentle cleaner cleaning door window and wiper blade, and thoroughly clean with clean water.
6. When maintaining washing pump, be careful not damage washing pump seal ring.
7. Before add water to storing box, check filter whether there is outside impurity or pollution. Clean filter if needed.
8. Before installing washing motor, check whether there is impurity or pollution, if needed, clean filter and wiper motor.

4 Maintenance Points

Inspection of Wiper motor function



NO	1	2	3	4
Definition	Grounding	Off-Position	Low Speed	High Speed

1.Terminal 3 、 4 is connected with the battery positive terminal(+), terminal 1 is connected with battery negative terminal(-).

2.Shown in the following diagram, check whether the motor is normal or not.

Position / Terminal	1	2	3	4
OFF	○	⊖		
LO	○		○	
HI	○			○

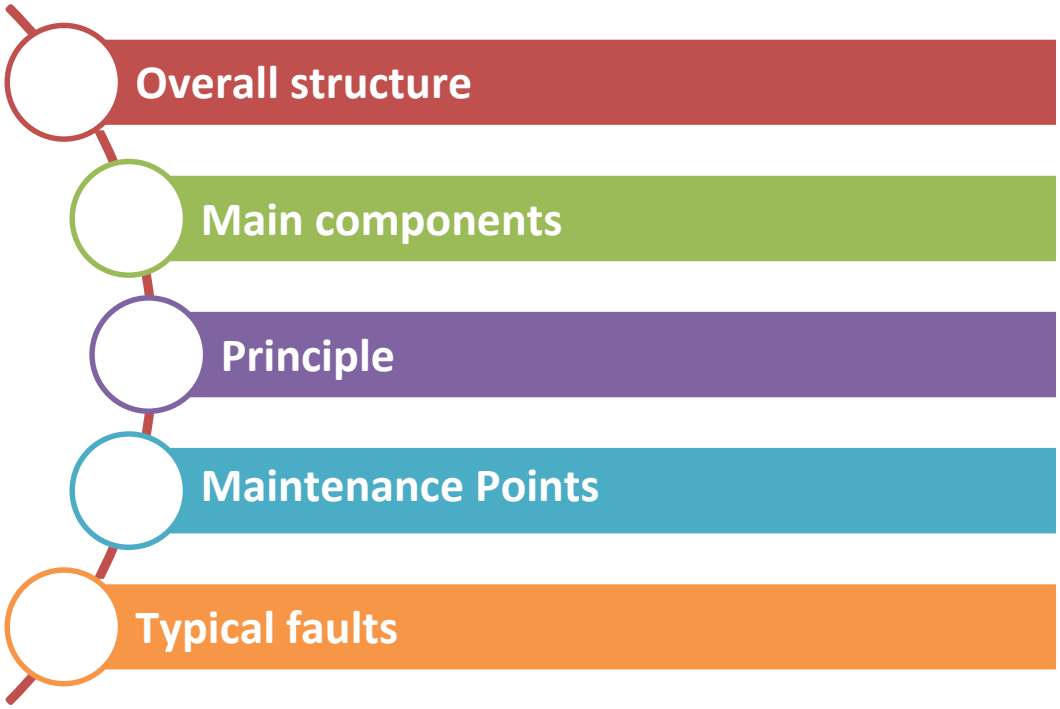
5 Typical faults

NO.	Fault phenomenon	Fault reason analysis	Solution
1	Abnormal sound, work abnormally	Motor interior abnormal sound happen	Replace motor
		Connecting rod has friction phenomenon when moving	Remove friction phenomenon
		Wiper blade and window has abnormal sound	Clean windsheild and wiper blade, or replace wiper
2	Wiper blade not horizontal when back to original position	Relative position of wiper blade changed	After motor back to original position, take down wiper arm and re-install, keep wiper blade horizontal
3	No matter what position wiper switch is, wiper and washer not work	Whether engine compartment electrical box fuse and indoor electrical box fuse is damaged	Replace fuse
		Other circuit fault	Remove fault that caused by other circuit
		Remove fault that caused by other circuit	Check whether pin and grounding pin voltage is normal
		Wiper motor and washer motor damaged	Replace wiper motor and washer motor
		Wiper switch damaged	Replace wiper switch

Service Training Materials

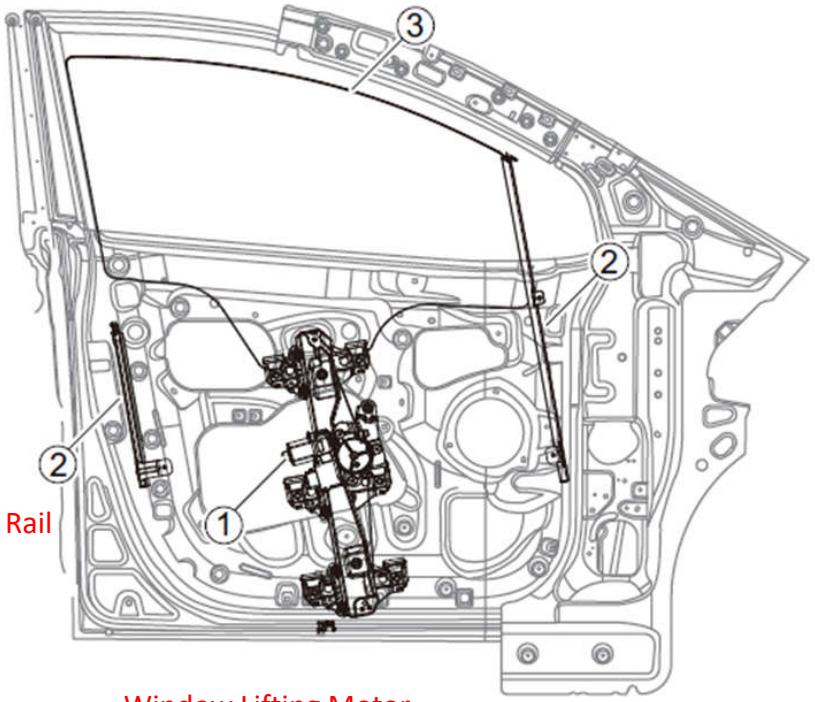
EVO 3 electric
Electronic Doors&Windows

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

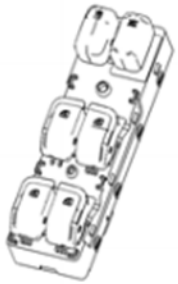
1 Overall structure

Window

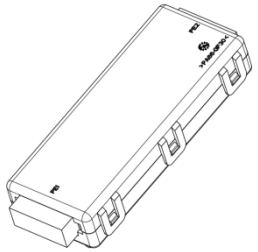


Window Lifting Rail

Window Lifting Motor



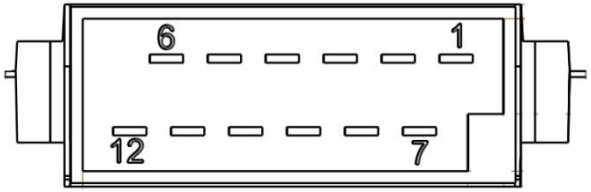
Window Control Switch

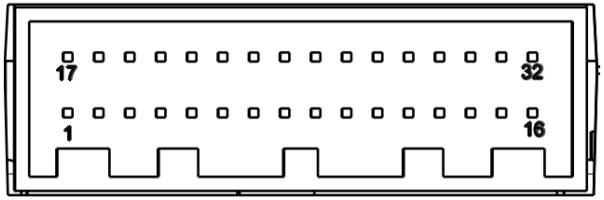


Anti-nip Controller

2 Main components

- Anti-nip Controller

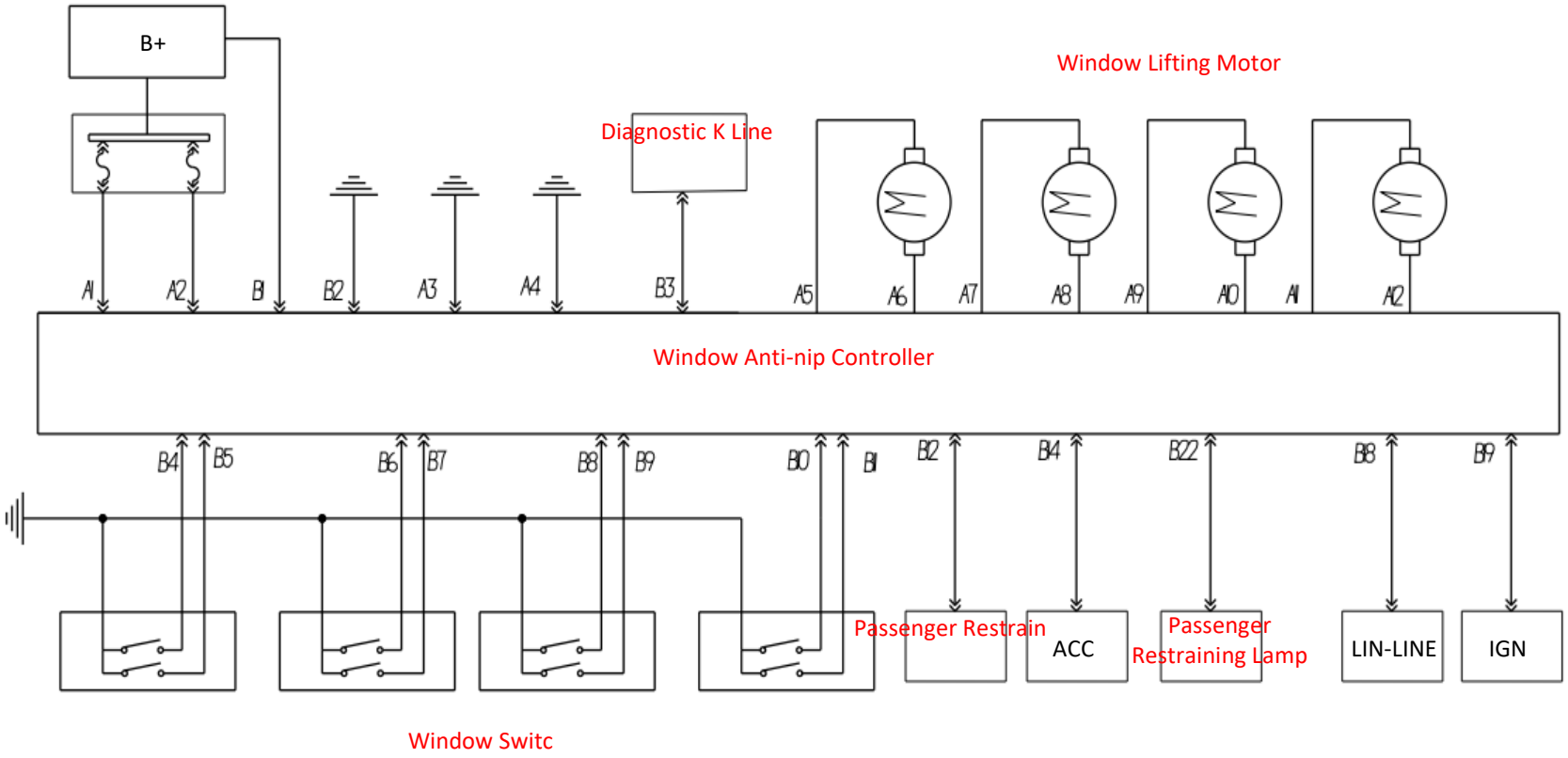




1	BAT	
2	BAT	
3	GND	
4	GND	
5	RR WIN DN	
6	RR WIN UP	
7	FL WIN UP	
8	FL WIN DN	
9	FR WIN UP	
10	FR WIN DN	
11	RL WIN UP	
12	RL WIN DN	

1	VBAT	
2	BGND	
3	K-LINE	K-LINE
4	D-FL WIN IN	
6	D-FR WIN IN	
7	FR WIN DN IN	
8	D-RL WIN UP IN	
9	RL WIN DN IN	
10	D-RR WIN UP IN	
11	RR WIN IN	
12	PASS-NO-ACT	
14	ACC	ACC
18	LIN-LINE	LIN-LINE
19	IGN ON	IGN
22	P WIN S-L	

3 Principle


B+
Window Lifting Motor
Diagnostic K Line
A1
A2
B1
B2
A3
A4
B3
A5
A6
A7
A8
A9
A10
A11
A12
Window Anti-nip Controller
B4
B5
B6
B7
B8
B9
B10
B11
B12
B14
B22
B8
B9
Passenger Restrain
ACC
Passenger
Restraining Lamp
LIN-LINE
IGN
Window Switc

4 Maintenance Points

- One-Key Lifting and Anti-nip

Condition

1. Driver anti-clip model: After power off of the anti-clip controller
2. Four-door anti-clip model: replace the anti-clamp controller

Requirements: The key should be at “ON” position.

Steps

1. Put down the window to the bottom and manually lift it up to the top

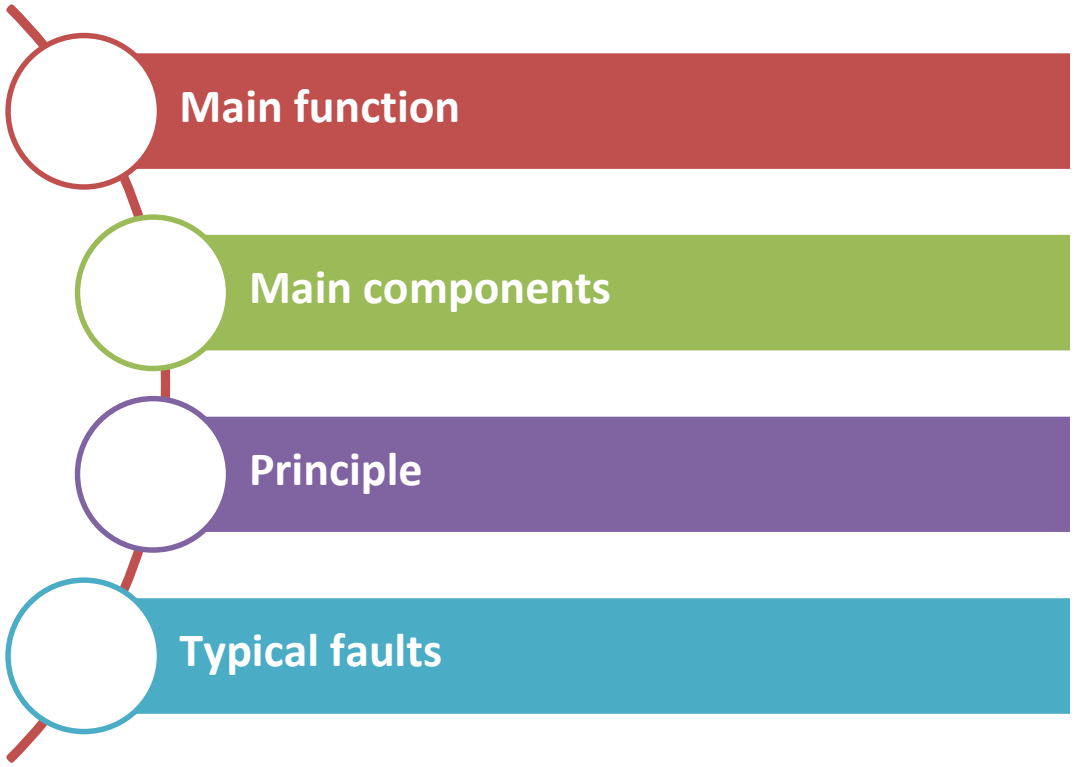
2.Press the manual lift-up switch and make the glass stuck at the top for 2~3 seconds

3. Press the switch to put down the glass to the bottom.

service training materials

EVO 3 electric
Central control door lock

Catalog



1 Main function

EVO 3 Electric is equipped with central control door lock system, can realize the following functions:

1. When the driver locks the door or the central control lock switch is pressed down, other doors and trunk can be automatically locked; If the door is locked with the key, other doors and trunk can be locked at the same time.

2. Pull up the lock switch or press the central control unlock switch, other doors and trunk locks can be opened at the same time; Using the key to open the door can also achieve the action.

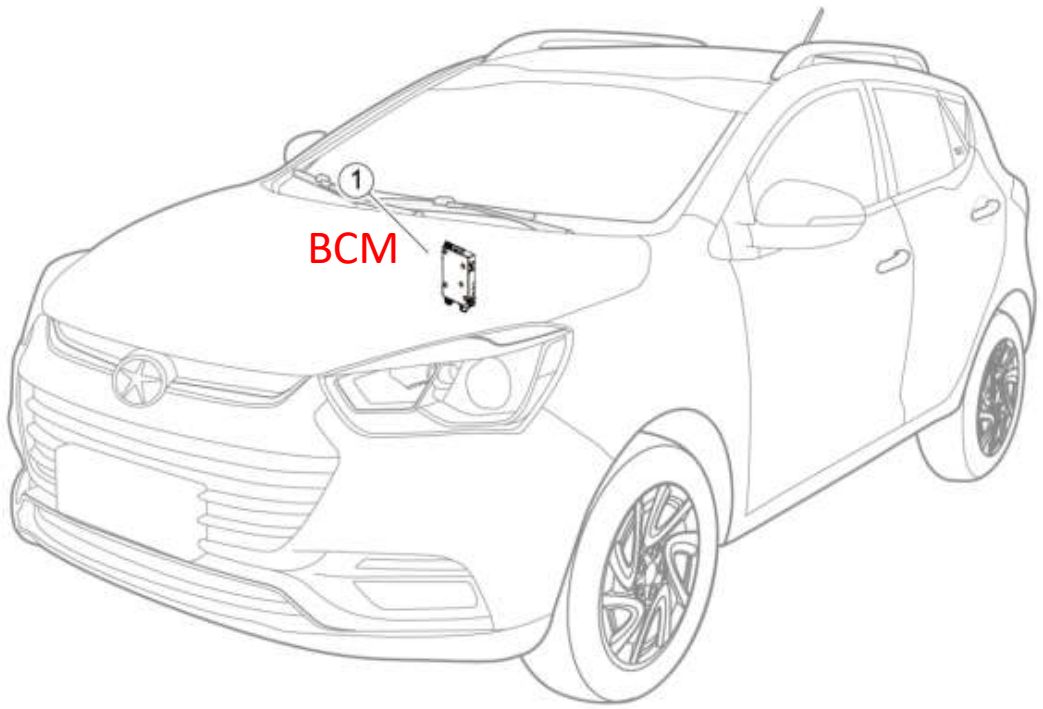
3. When some doors need to be opened inside the car, the locks can be opened separately.

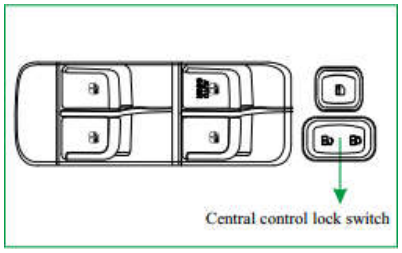
4.Anti-theft alarming function.

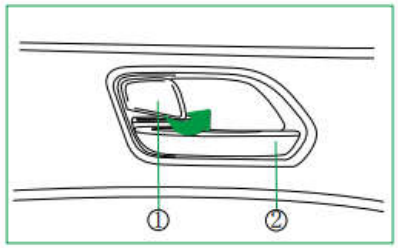
2 Main components

- system composition

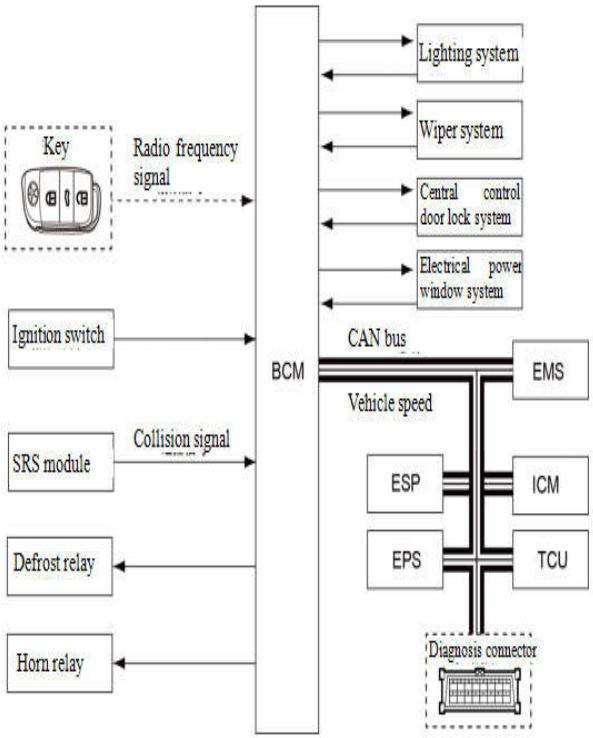
Lock system control door lock by interior relay of BCM. It is mainly composed of BCM controller, motors of four-door and trunk door, door lock switch ,door contact switch and remote control key,etc







3 Principle



Vehicle lock function description

Defended state: all vehicle doors close, use remote control to lock or BCM state after driver's side key lock successfully;
Undefended state: use remote control to unlock or driver's side key unlock or state after tail door remote control unlock;

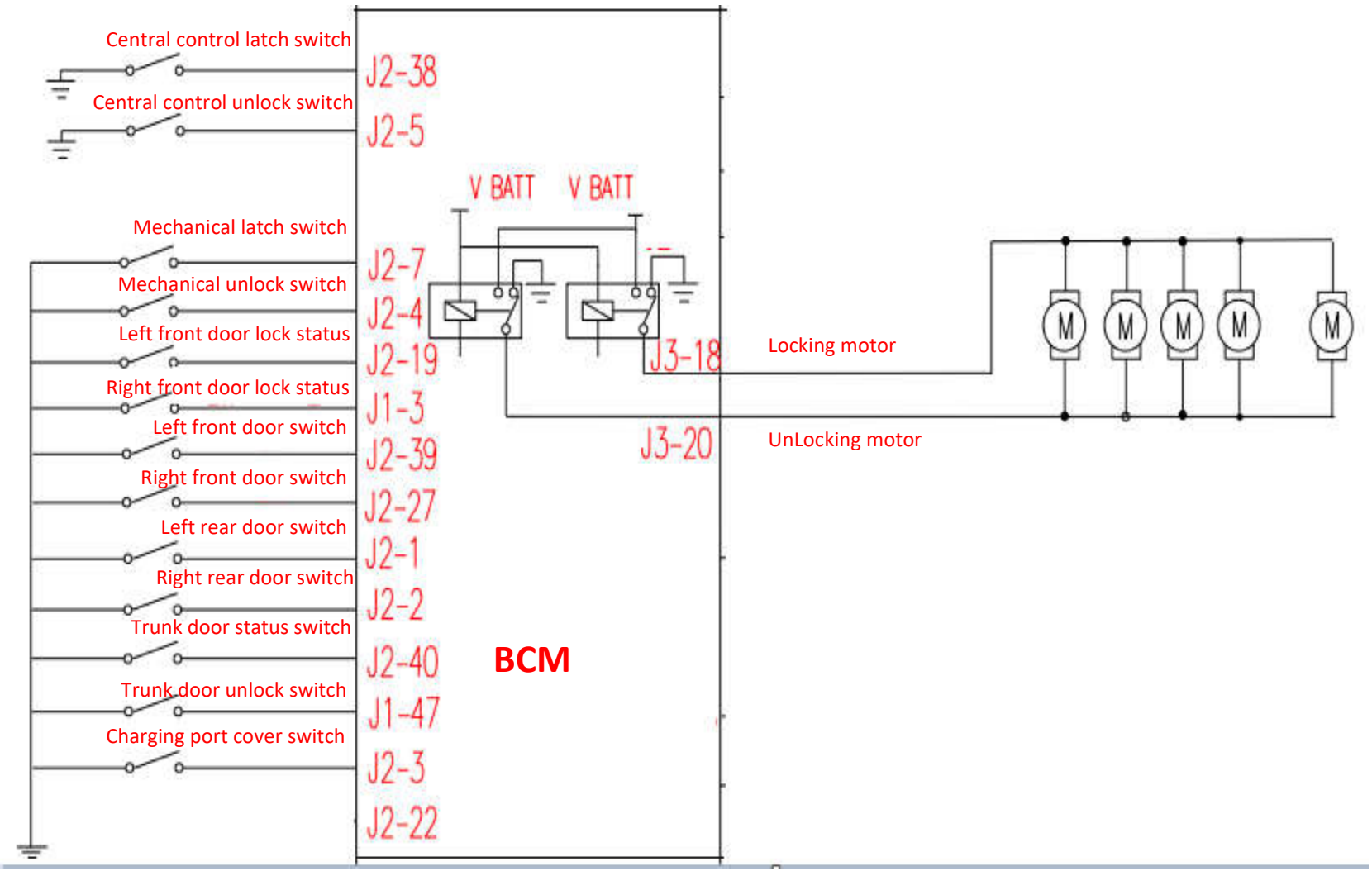
Remote control launcher function: Don't respond to remote control order in condition of key inserting signal is valid.

Door Lock Function

Door lock is controlled by BCM interior relay, BCM control door lock motor after receiving valid unlock signal, output time of four doors lock motor unlock and lock is 250ms, output time of tail door lock motor unlock. There is lock motor inside vehicle door lock, and there are 2 mechanism states:
Unlock state: vehicle door lock can open from exterior or interior.
Lock state: vehicle door lock only can open from interior.

1. Remote Control or Mechanism Key Lock
2. Remote Control or Mechanism Key Unlock
3. Automatic Lock Function (default value is 15km/h)
4. Re-defended Function
5. Remote Control Tail Door Unlock
6. Central Control Unlock/Lock Function
7. Pulling Key Unlock Function
8. Collision Force Unlock Function
9. Anti-mistaking Lock Function

3 Principle


Central control latch switch
Central control unlock switch
Mechanical latch switch
Mechanical unlock switch
Left front door lock status
Right front door lock status
Left front door switch
Right front door switch
Left rear door switch
Right rear door switch
Trunk door status switch
Trunk door unlock switch
Charging port cover switch
J2-38
J2-5
J2-7
J2-4
J2-19
J1-3
J2-39
J2-27
J2-1
J2-2
J2-40
J1-47
J2-3
J2-22
V BATT
V BATT
J3-18
J3-20
Locking motor
UnLocking motor
M
M
M
M
M
BCM

4 Typical faults

Common faults and solutions of central control door locks

1. All four door lock devices do not work

First, check whether the installation of all parts and connecting wires is correct, and then check whether the connection between the B+ wire and the grounding wire and the battery is firm. If there is no abnormal situation, it means that BCM has a fault, the lock switch is damaged or the circuit has a fault, which requires careful inspection.

2. Only one or two door locks do not work

The reason for this kind of fault is that the door lock motor of one or two doors is damaged ,the circuit is open, or a mechanical failure

3. Four door locks can only be opened or locked

The reasons for this fault are damage of door lock switch ,wrong output signal of BCM controller

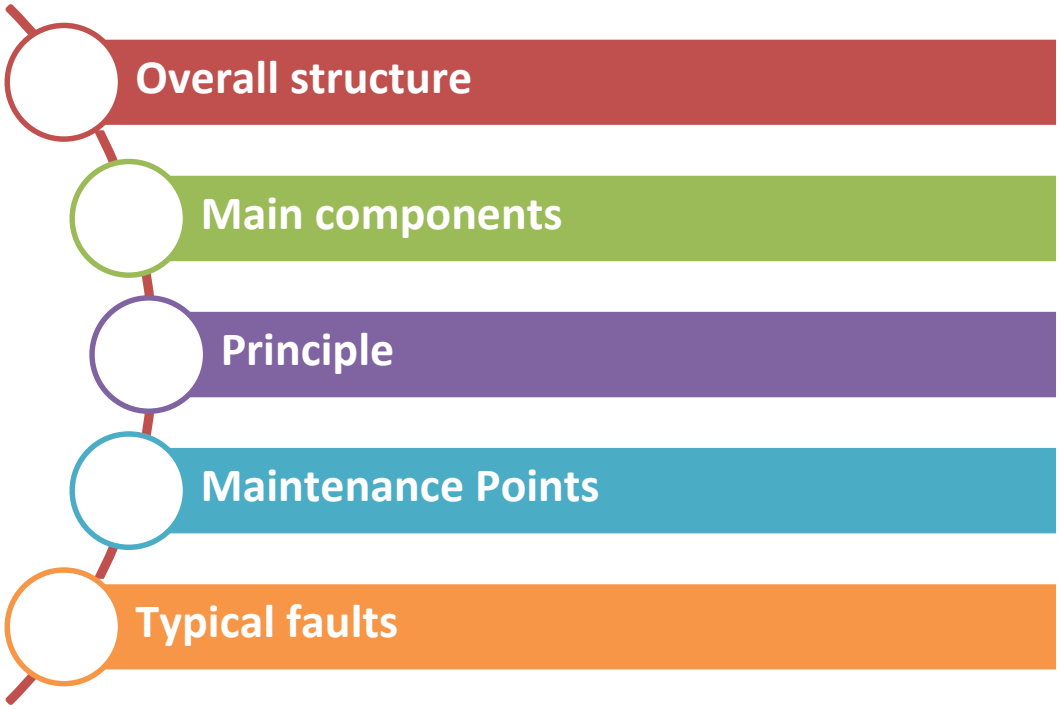
4. Four door locks automatically lock after unlocking or automatically unlock after locking

This fault is caused by faulty door switches or faulty wiring harness

service training materials

EVO 3 electric
SRS

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

- System Introduction

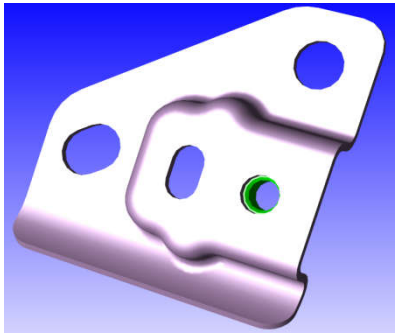
➢ General auxiliary restraint system refers to the whole airbag system, and there will be "SRS" mark on the decorative cover of airbag or where airbag exists.

➢ Airbags are divided into Driver airbag-DAB, Passenger airbag-PAB and Side airbag-SAB.

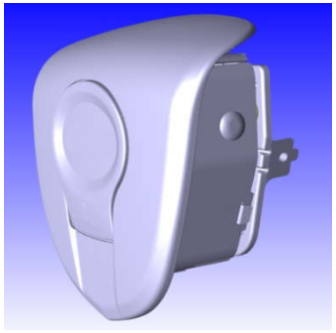
➢ DAB is installed inside the steering wheel, and DAB's decoration cover is the horn cover above the steering wheel. The PAB is installed in the dashboard on the side of passenger, divided into visible type and hidden type; The SAB is installed on the upper part of the driver and passenger door frame.

2 Main components

➢ The controller of airbag collects collision signals of vehicles through acceleration sensor, including front collision, side collision and rear collision, etc., and controls the deployment of corresponding airbags and lights fault warning lights in case of vehicle collision according to pre-calibrated parameters and set algorithm.



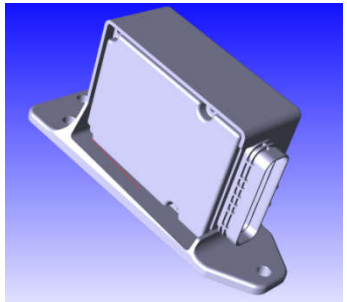
Acceleration sensor bracket



Driver airbag-DAB

Passenger airbag-PAB

Acceleration sensor

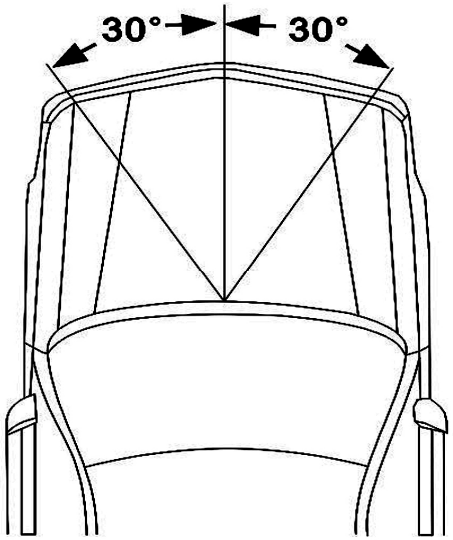


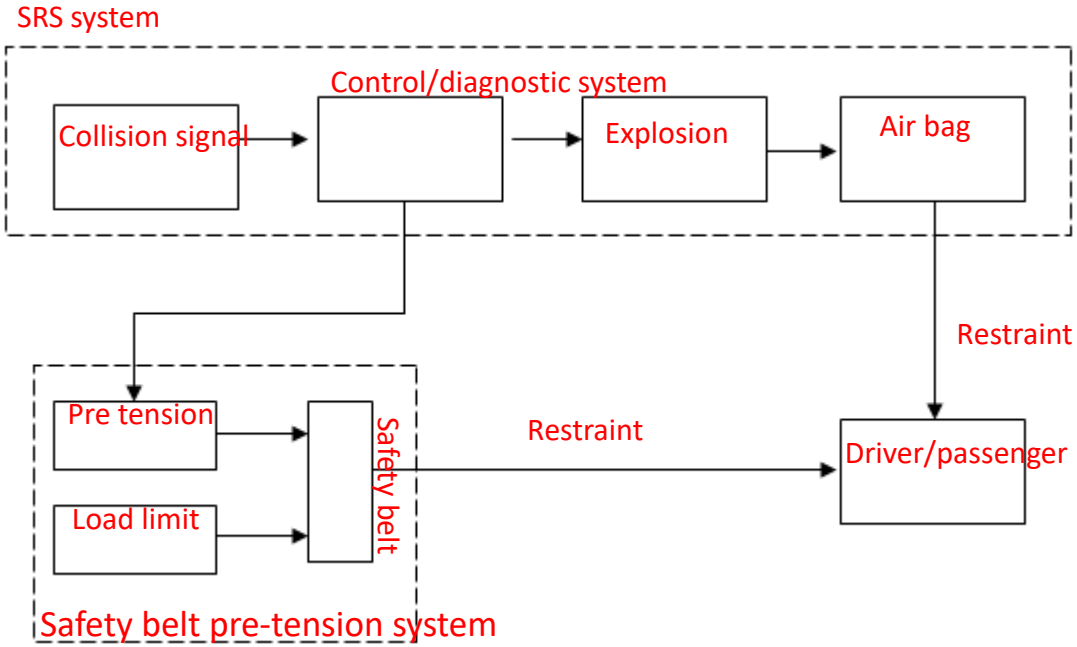
Airbag control unit

3 Principle

- System Principle

➢ Conditions for airbag to open: front impact occurs within 30 degrees from the center line of the vehicle and enough impact force can make airbag open.

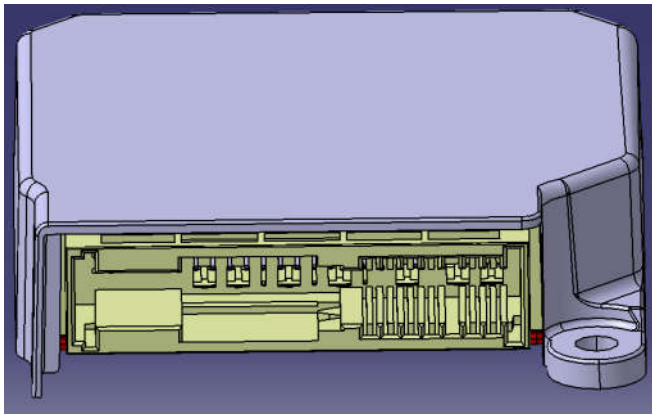


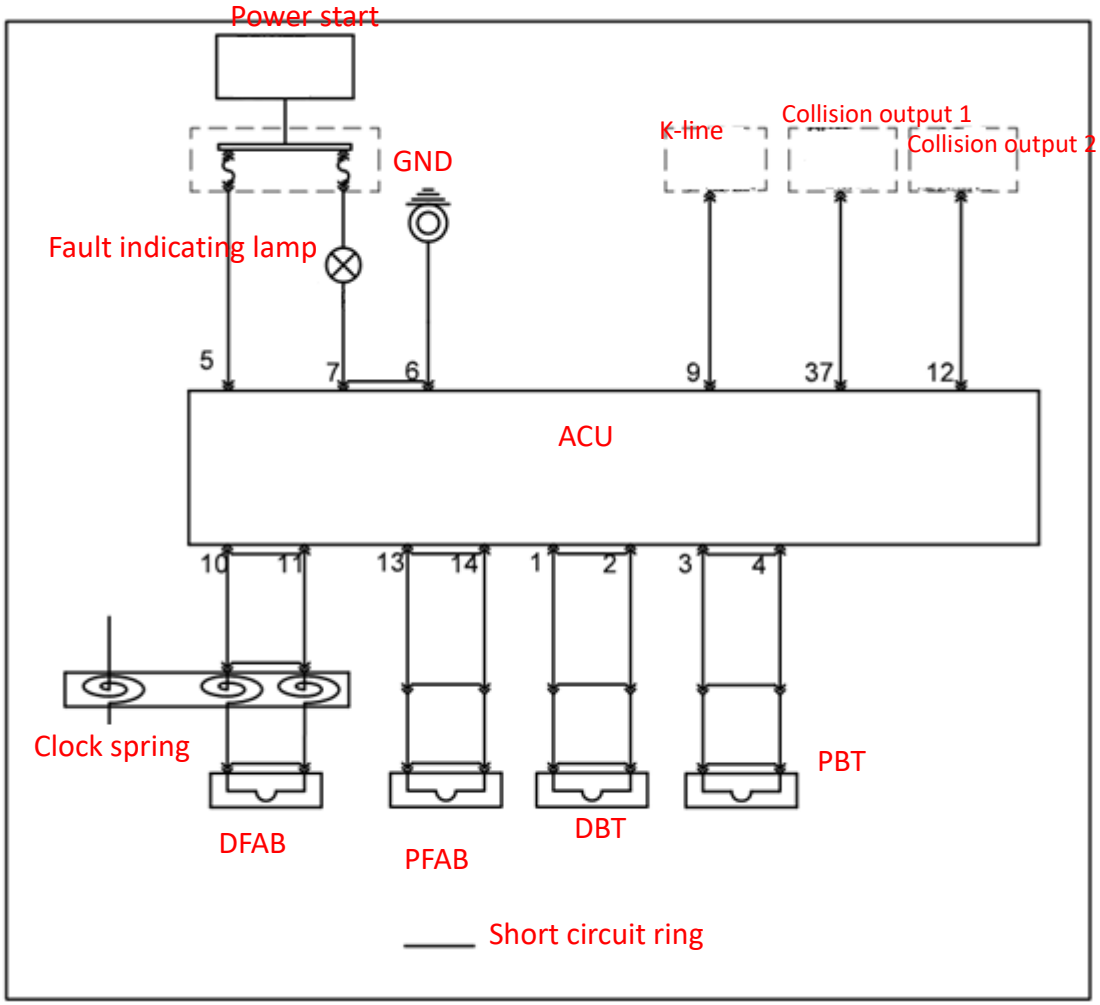


3 Principle

- Electrical Principle

➢ Airbag control module (ACU) pin





3 Principle

- Electrical Principle

➢ Airbag control module (ACU) pin

Pin No.	Pin Definitions	
1	DBT+	
2	DBT-	
3	PBT+	
4	PBT-	
5	Vbat	
6	GND	
7	W/L	
8	NA	
9	K-Line	
10	DFAB+	
11	DFAB-	
12	CRO2	
13	PFAB+	
14	PFAB-	

Pin No.	Pin Definitions	
15~25	NA	
26~27	SBO	
28~29	SBO	
30	NA	
31~32	SBO	
33~34	NA	
35~36	SBO	
37	CRO1	
38~39	SBO	
40	NA	
41~42	SBO	
43~44	SBO	
45~50	NA	

4 Maintenance Points

➢ Notes for diagnosis and maintenance

1）Using a special fault diagnosis instrument to read the fault code for diagnosis;

2）Do not use electrical test equipment to test any circuit of SRS system;

3）Do not attempt to repair, connect or modify the SRS harness. If the harness is damaged, replace it;

4）The site of GND should be kept clean;

5）ACU must be replaced rather than repaired when ACU has faults;

6）Before abandoning the airbag or the car equipped with airbag, the airbag shall be detonated. Individuals shall not detonate the airbag without permission. Please give it to a professional to detonate.

5 Typical faults

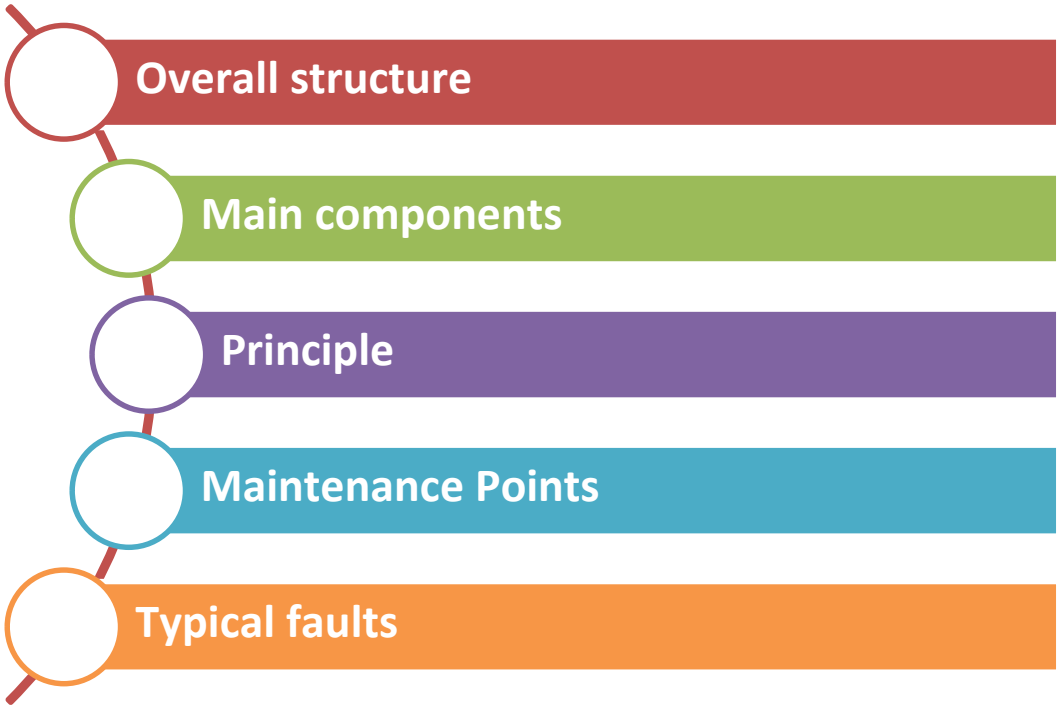
Faults	Causes	Solutions
Driver Fault Airbag Fault	Driver front airbag resistance too high or open circuit	1、Examine whether airbag module connector and the wiring harness connector are properly connected 2、Examine whether the airbag wiring harness connector is connected properly 3、Examine whether the spiral cable is properly connected to the airbag wiring harness 4、Examine whether the spiral cable itself is disconnected, having poor connection or short circuit 5、Examine whether the wiring harness of the driver airbag module firing loop is disconnected, having poor connection or short circuit 6、Check the air bag module connector pins and short circuit ring are in good condition Note: The above short circuit condition includes loop short circuit, short to GND, short to power and short to other loops. The repair person can perform examination based on the fault condition
	Driver front airbag resistance too low or short circuit	
	Driver front airbag connected to GND	
	Driver front airbag connected to battery	
	Driver front airbag short to other loops	

For other typical faults, please refer to the workshop manual “Body structure & electrical”

service training materials

EVO 3 electric
CCS

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

- System Introduction

CCS (Cruise Control System) can let driver drive in a setted speed without stepping accelerator pedal by regulating motor output power and torque according to driving resistance force.

EVO 3 Electric cruise control system automatically controls the vehicle through the VCU, greatly improving the user's convenience.

2 Main components

- CCS consists of CCS switch, CCS control unit, CCS indicator light.

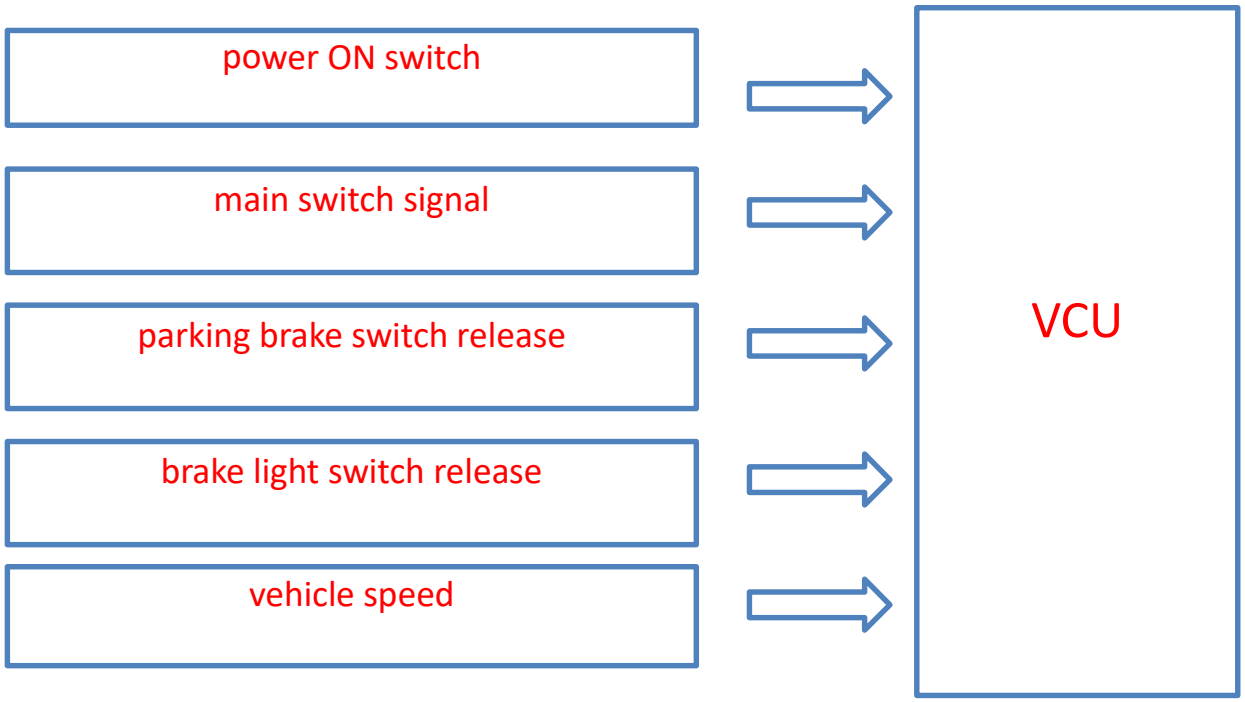
CCS switch

SET/- switch

CCS indicator light

3 Principle

- System Principle



3 Principle

- Working process

➢ Working conditions: in smooth road conditions, when the speed is above 30km/h and below 120km/h, the brake pedal shall not be pressed down.

➢ Operating method: after the cruise control switch is pressed down, inching SET/- switch (for activation), the cruise function is turned on. At this time, the cruise indicator light on the meter is on, and the color is green. When cruising at the selected speed, the driver can use the accelerator pedal to temporarily increase the speed above the selected speed.

➢ Adjustment of cruising speed: when the vehicle enters the cruising speed (such as 60km/h), press SET/- (inching) or RES/+, and the vehicle speed will increase or decrease at a certain speed (1 km/h). When long press SET/- or RES/+, the vehicle speed will continue to increase or decrease until the highest or lowest cruising speed.

➢ Relieve methods of cruise control (Any one will do)

✓ Step on the brake pedal, brake work, cruise function is removed; The cruise function does not resume after releasing the brake pedal.

✓ Turn off the cruise control switch.

✓ The vehicle speed is below 30km/h.

➢ Resume cancelled cruise: when the vehicle speed reaches more than 30km/h, click SET/-, and the cruise will be activated and restored to the last cruise speed in the memory of the vehicle.

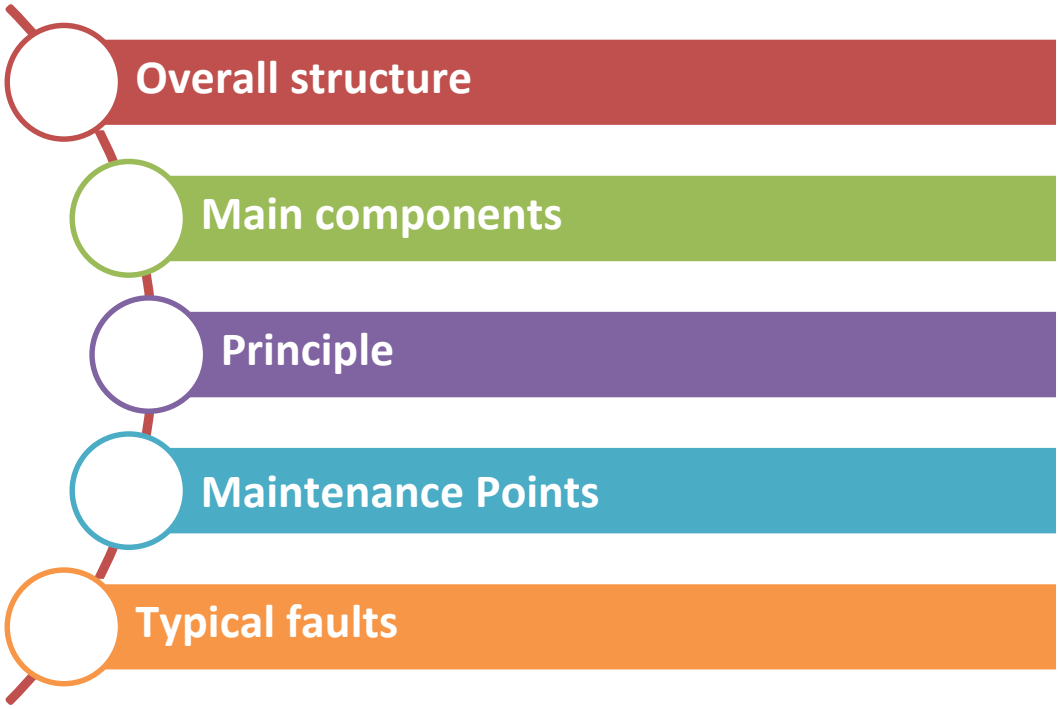
4 Typical faults

Failure	Possible Reason		Confirm Method	Possible Solution
CCS not work or work abnormally	Wire fault	vehicle speed signal fault	read vehicle speed by diagnostic scanner	repair circuit by DTC
		CCS wire fault	check wire conductive and voltage by multimeter	repair circuit
		CAN communication	refer to CAN-bus diagnosis	refer to CAN-bus diagnosis
	CCS switch fault		replacement check	replace CCS switch
	VCU data fault		whether it is VCU data fault	re-write data to VCU

Service Training Materials

EVO 3 electric
Tire Pressure Monitoring System

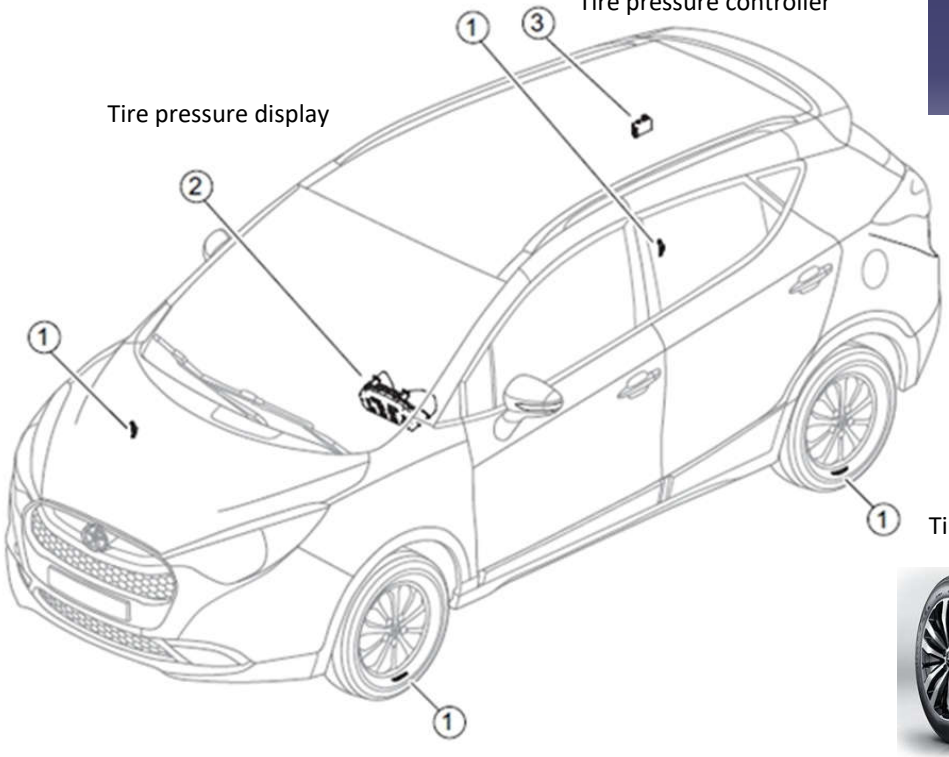
Catalog

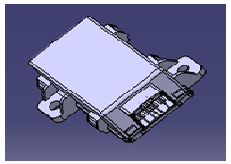

Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

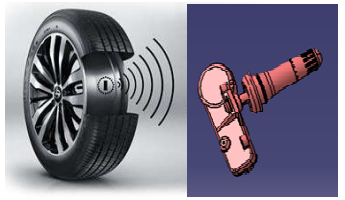
The main cause of vehicle traffic accident is flat tire, and the main cause of flat tire is insufficient air pressure. In order to monitor the tire pressure and temperature, the vehicle is equipped with a tire pressure monitoring system

TPMS



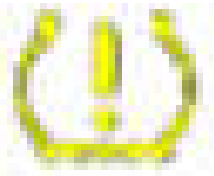


Tire pressure sensor



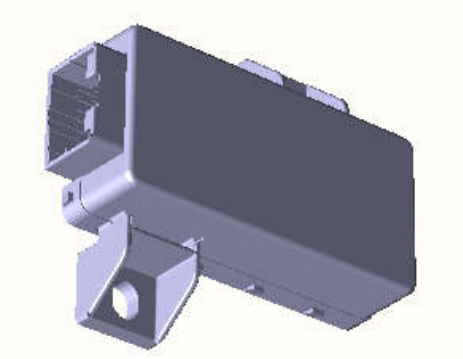
1 Overall structure

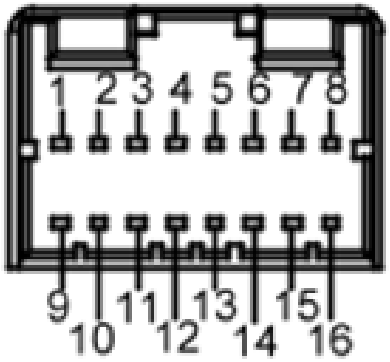
The tire pressure alarm indicator indicates abnormal tire pressure. TPMS system alarm indicator indicates system failure

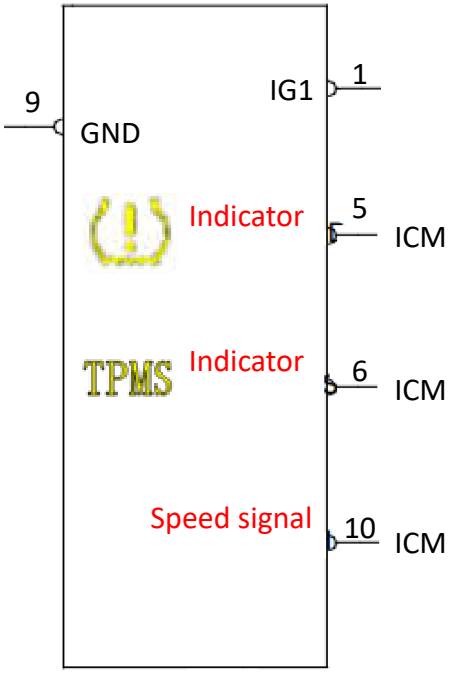
	Rapid air leakage: flahsing	
	Low pressure: always on	
	High pressure: always on	
	High temperature: always on	
	Sensor battery low power: always on	
	Sensor failure: always on	
	High frequency reception failure: always on	
	Communication disconnect between controller and instrument: always on	

2 Main components

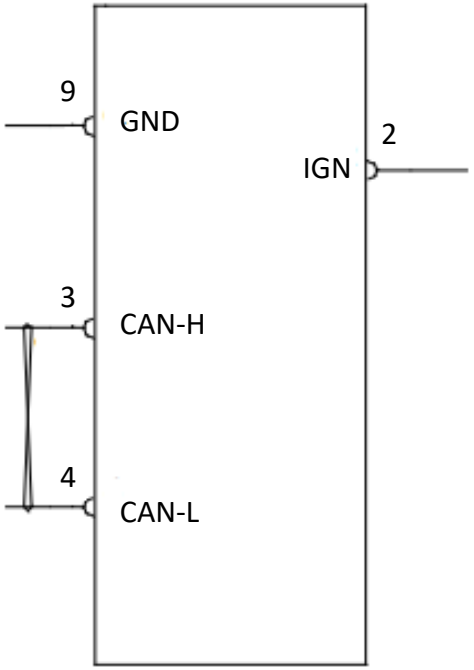
- TPMS controller







TPMS （Non-CAN）



TPMS（CAN）

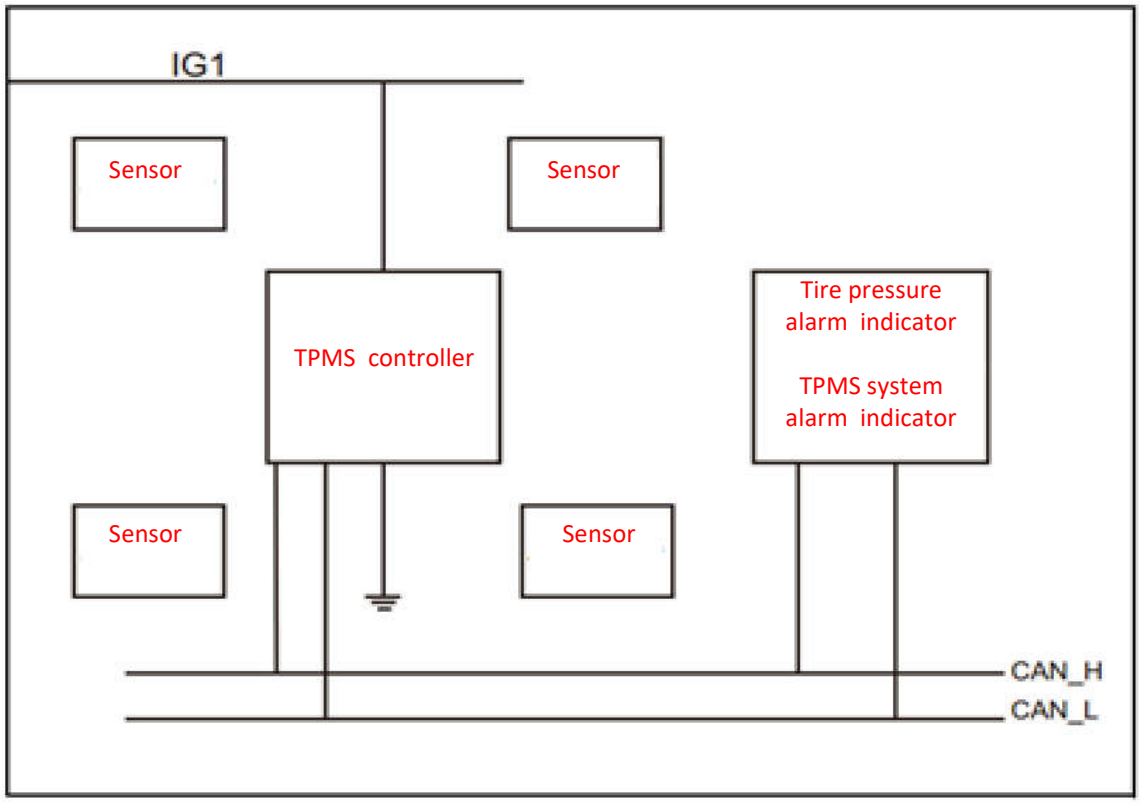
2 Main components

- TPMS sensors

The sensor module replaces the original valve nozzle of the tire and is installed inside the tire. It is powered by built-in lithium battery. The internal acceleration sensor determines the running state of the vehicle and automatically switches the data collection and launch cycle. Real-time collect the tire internal pressure, temperature and other parameters, then transmits them to the TPMS controller through radio frequency after processing.

3 Principle

The tire pressure sensor collects tire pressure, temperature and other information, and then transmits it to the tire pressure monitoring controller through radio frequency, and then transmits the information to the display. When the monitored parameters exceed the set value, give an alarm in time. The alarm status is indicated by the instrument indicator.



4 Maintenance Points

- Tire pressure monitoring system matching

Matching reason: there is an emitter inside each tire pressure sensor, and each emitter has a fixed ID. Each emitter contains the ID code in the sent signal. If the ID number matches the ID information in the controller, the information will be processed, otherwise it will not be processed. Therefore, it is necessary to match the tire pressure sensor ID to the controller.

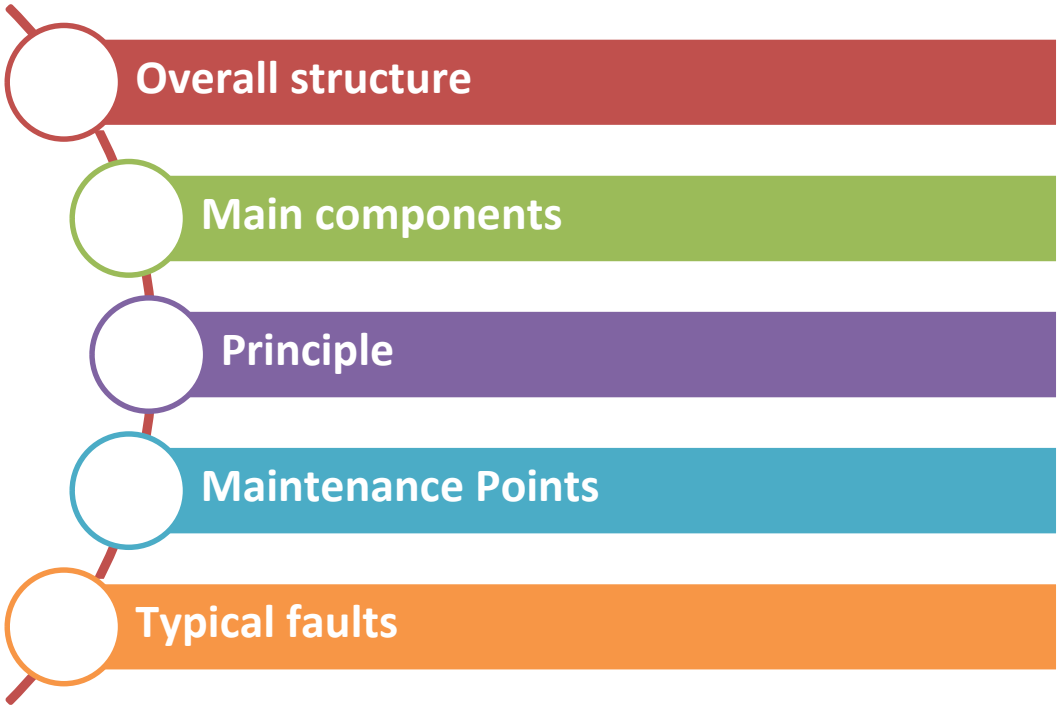
Adaptation: Matching is required after replacing TPMS controller or replacing all (or single) tire pressure sensors.

Matching method: Trigger sensor one by one → All learn → verification

Service Training Materials

EVO 3 electric
Passive Entry & Passive Start

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

Passive Entry & Passive Start (PEPS) means a keyless entry and keyless entry system that uses state-of-the-art RFID radio frequency technology and a vehicle identification code recognition system to provide a comfortable and completely new driving experience with user-friendly convenience.


PE


PS


RKE

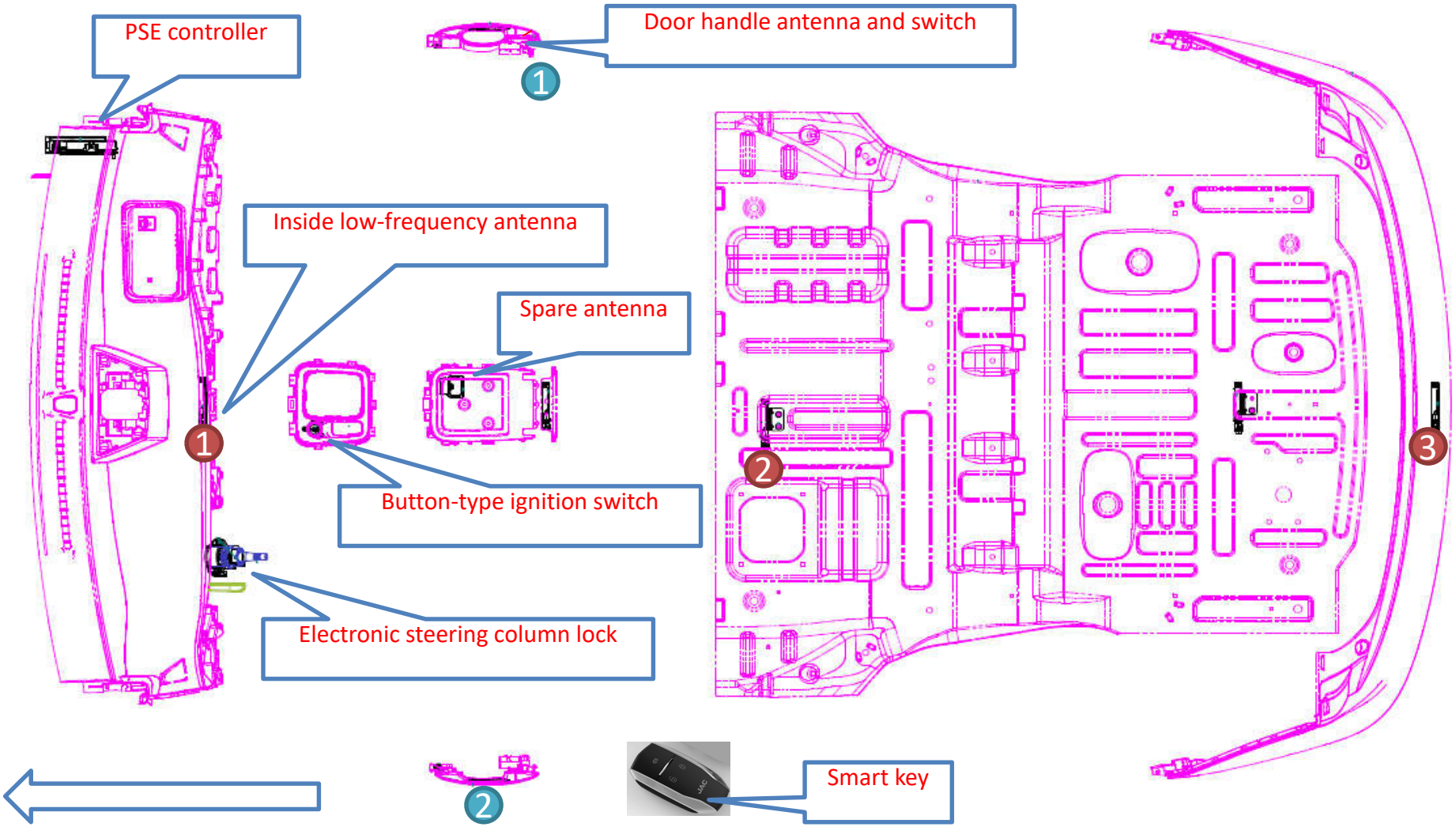

Spare enter and start


Welcome function


Remote PEPS

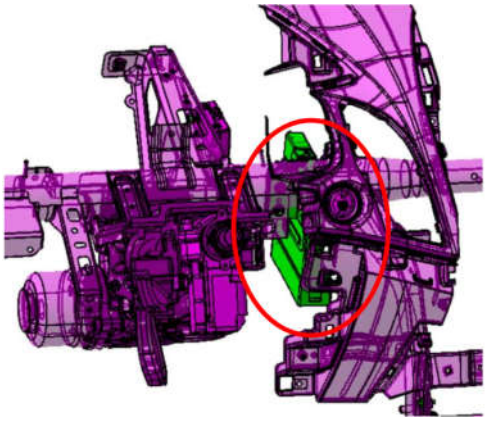

Phone Bluetooth virtual key

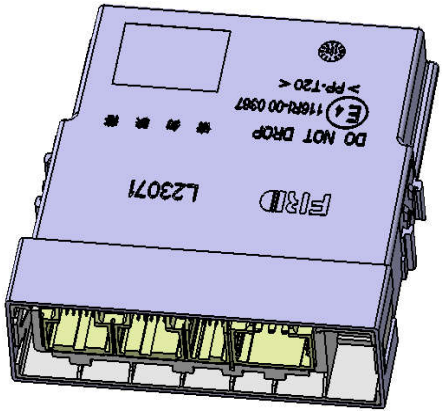
1 Overall structure

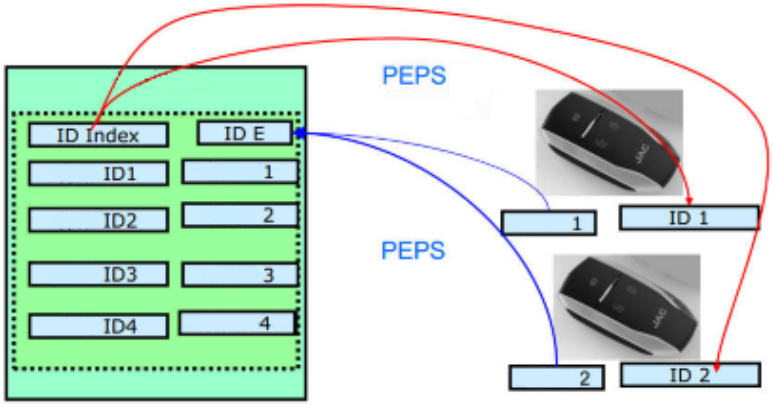


2 Main components

- PSE controller



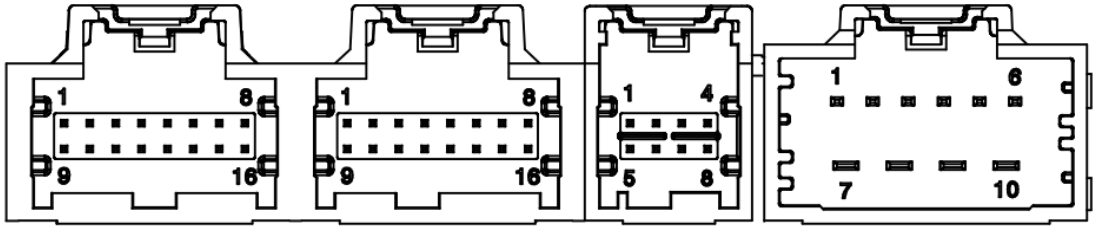




In right side of dashboard beam, is heart of PSE system, responsible for information interaction with other systems, and perform relative actions; PES controller is also power management system, in charge of vehicle power supply state management。 ACC/ON power both from PSE

2 Main components

- PSE controller

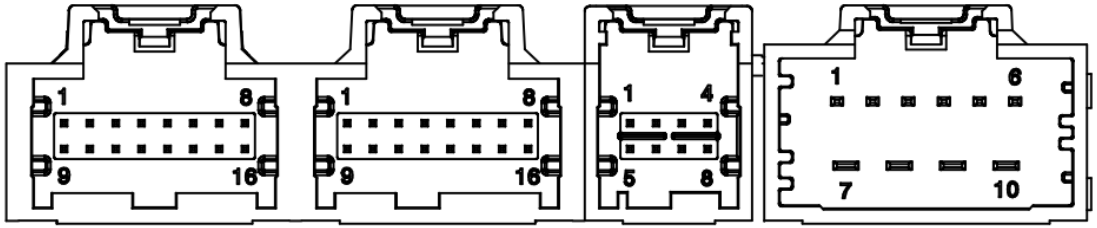


PIN	Function definition
J1-1	Connect positive pole of battery
J1-2	IG1 relay drive - high
J1-3	ACC relay drive - high
J1-4	IG2 relay drive - high
J1-5	High CAN - L
J1-6	High CAN - H
J1-7	Right front wheel speed signal
J1-8	NC
J1-9	NC
J1-10	NC
J1-11	IG1 signal detection
J1-12	Brake pedal signal
J1-13	Start signal output
J1-14	NC
J1-15	NC
J1-16	Vehicle GND

PIN	Function definition
J2-1	Spare antenna -LIN
J2-2	NC
J2-3	Start switch backlight (green)
J2-4	Start switch backlight (white)
J2-5	Start switch backlight (amber)
J2-6	Front internal antenna -
J2-7	NC
J2-8	NC
J2-9	NC
J2-10	Start switch GND (simulate GND)
J2-11	Start switch (SW1)
J2-12	NC
J2-13	Start switch (SW2)
J2-14	Front internal antenna +
J2-15	Rear internal antenna -
J2-16	Rear internal antenna +

2 Main components

- PSE controller

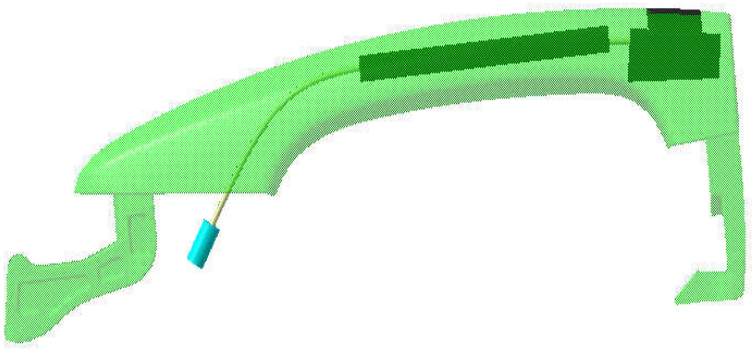


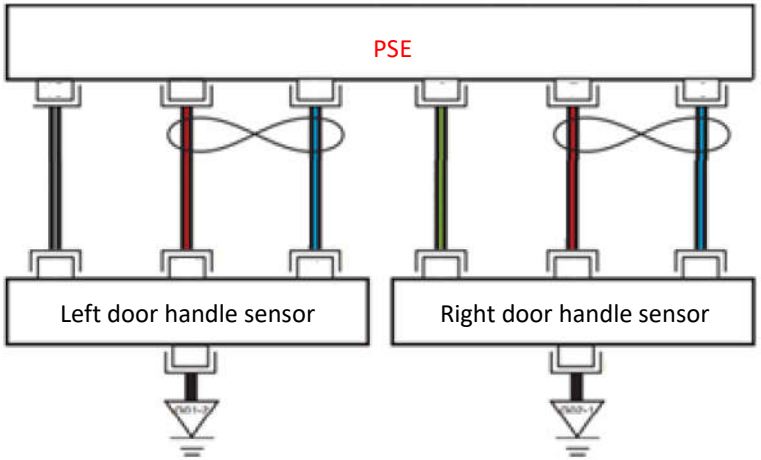
PIN	Function definition
J3-1	Tail door passive entry unlock switch
J3-2	Front left door handle antenna -
J3-3	Front left door handle antenna +
J3-4	Rear bumper low frequency antenna -
J3-5	NC
J3-6	NC
J3-7	NC
J3-8	Rear bumper low frequency antenna +

PIN	Function definition
J4-1	Electronic steering column lock (lock GND)
J4-2	NC
J4-3	Electronic steering column lock (power GND)
J4-4	Electronic steering column lock (LIN communication line)
J4-5	NC
J4-6	Electronic steering column lock (power supply)
J4-7	NC
J4-8	Vehicle GND
J4-9	NC
J4-10	Non-IG1 power input

2 Main components

- Door handle antenna and switch

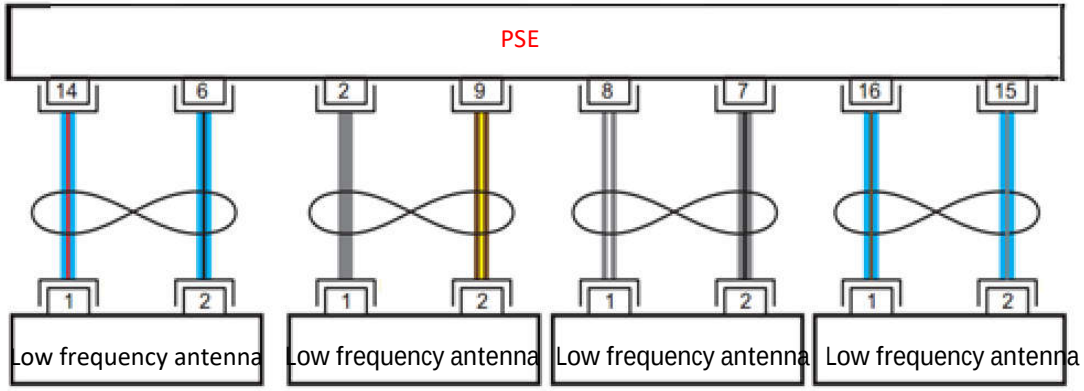




In left and right front door handle, used to low-frequency research for smart key outside vehicle

2 Main components

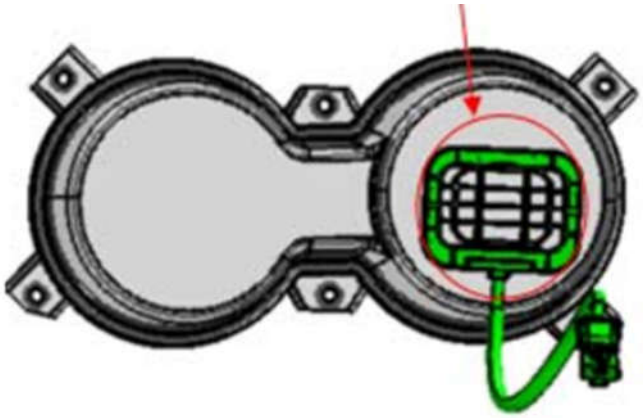
- Inside low-frequency antenna

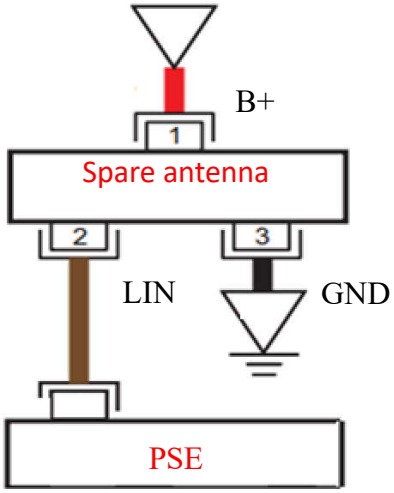


The front low-frequency antenna is located in the middle of the instrument platform pipe beam, the middle low-frequency antenna is located under the rear seat, and the tail door low-frequency antenna is located in the rear bumper. Used to search function of smart keys in the car and behind the car

2 Main components

- Spare antenna

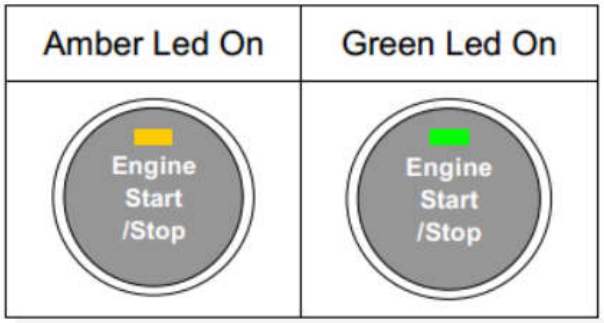


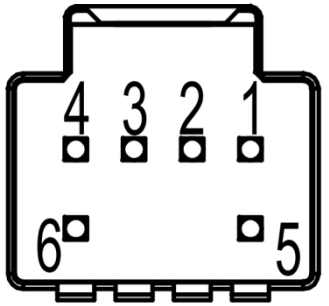


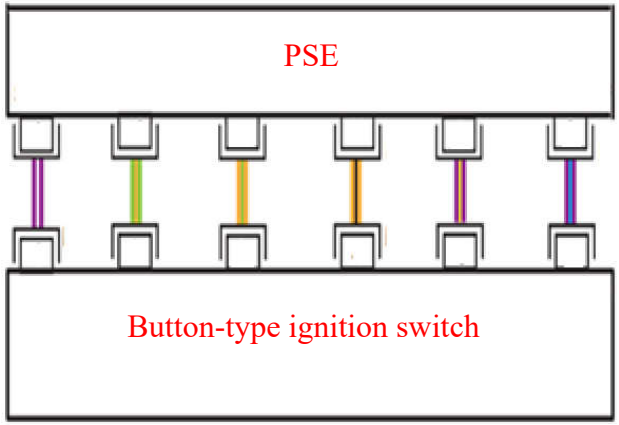
In auxiliary dashboard, used to emergency start when key battery has no power, and matching learning of smart key

2 Main components

- Button-type ignition switch





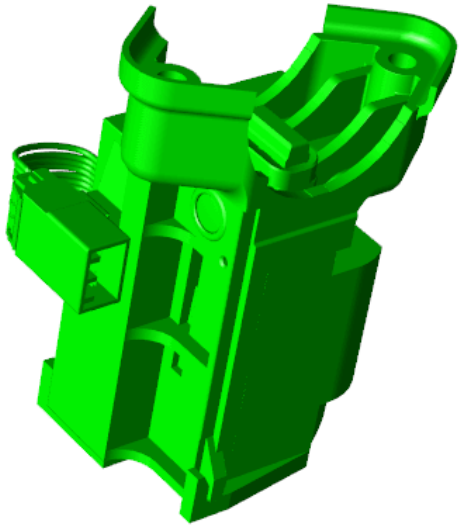


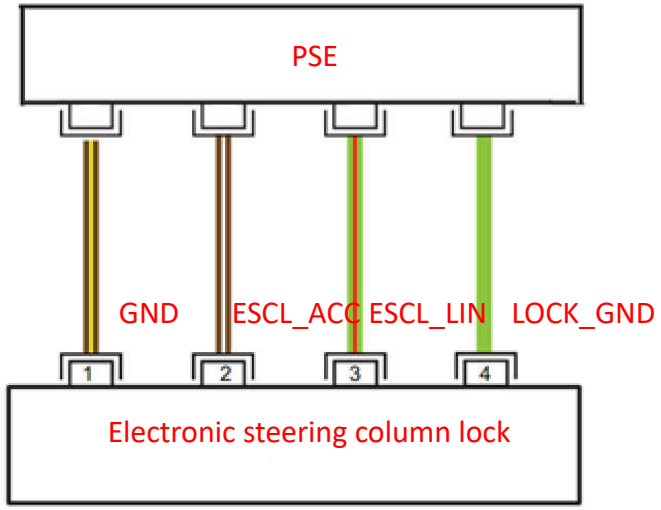
PIN	Function definition
1	SS1
2	GND
3	SS2
4	SWIL
5	INDG
6	INDA

In front part of auxiliary dashboard, is HMI tool of PSE, used to start and stop of vehicle and power state switching

2 Main components

- Electronic steering column lock

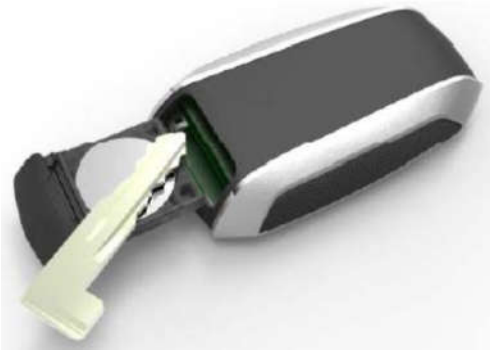


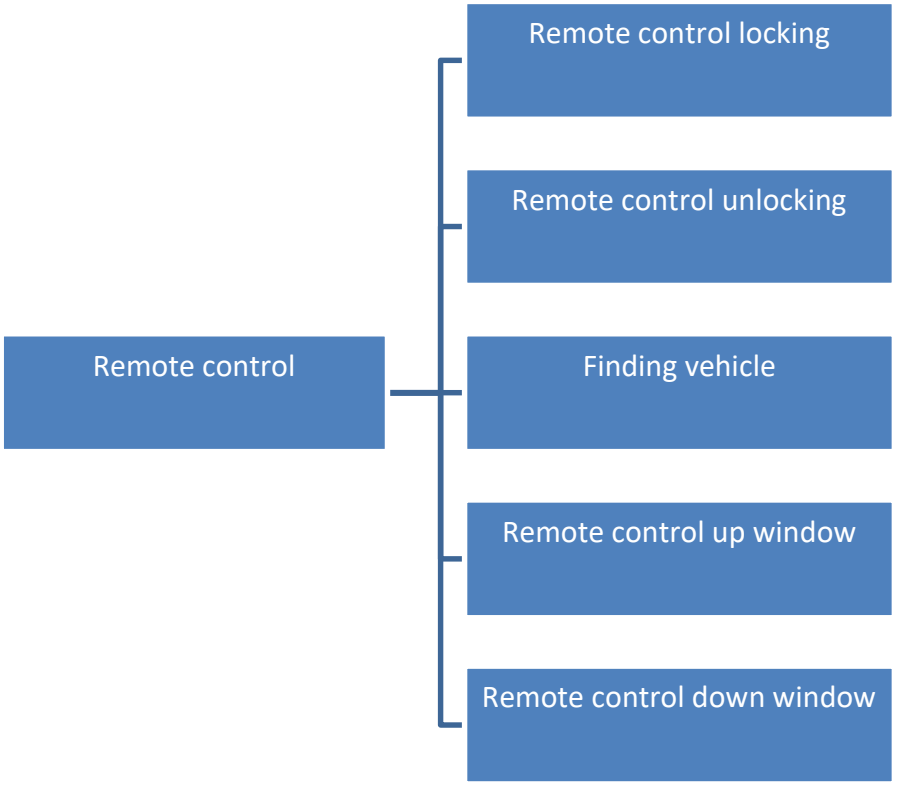


In steering column, similar with common ignition switch lock function, lock steering column after stopping vehicle, improve anti-theft function

2 Main components

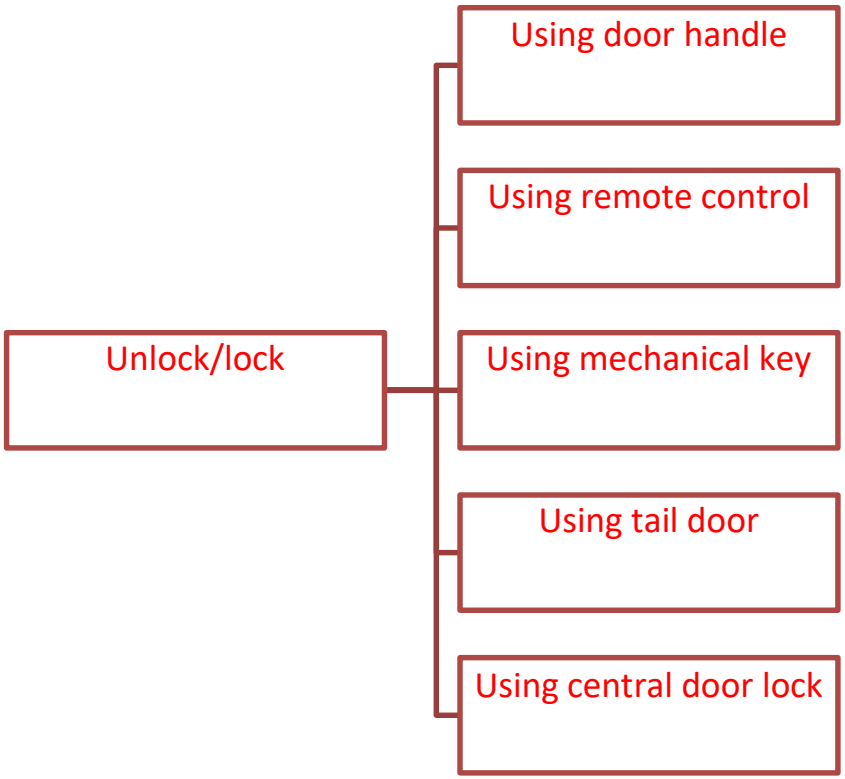
- Smart key

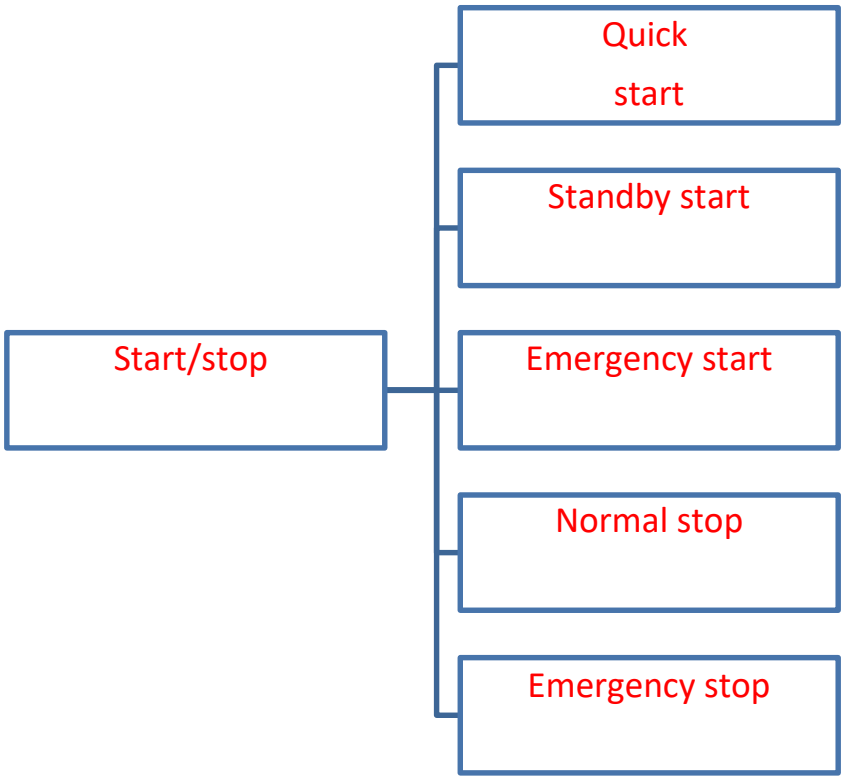




HMI tool of PEPS system

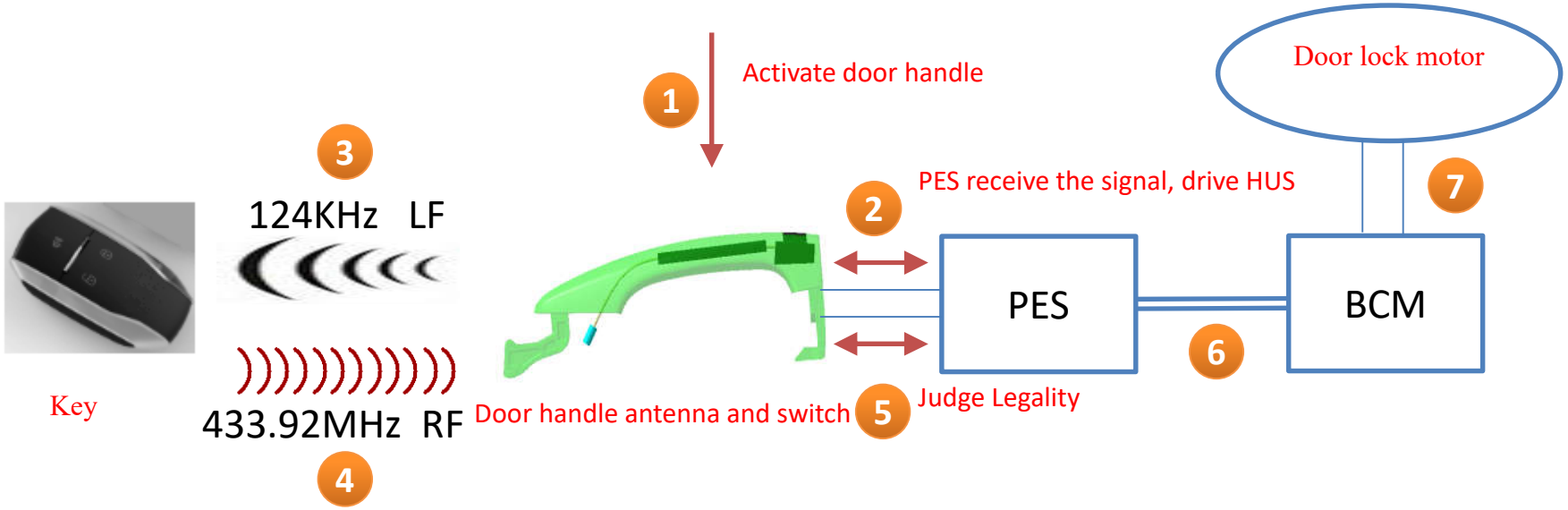
3 Principle


Unlock/lock
Using door handle
Using remote control
Using mechanical key
Using tail door
Using central door lock


Start/stop
Quick start
Standby start
Emergency start
Normal stop
Emergency stop

3 Principle

➢ Unlock/lock - Using door handle

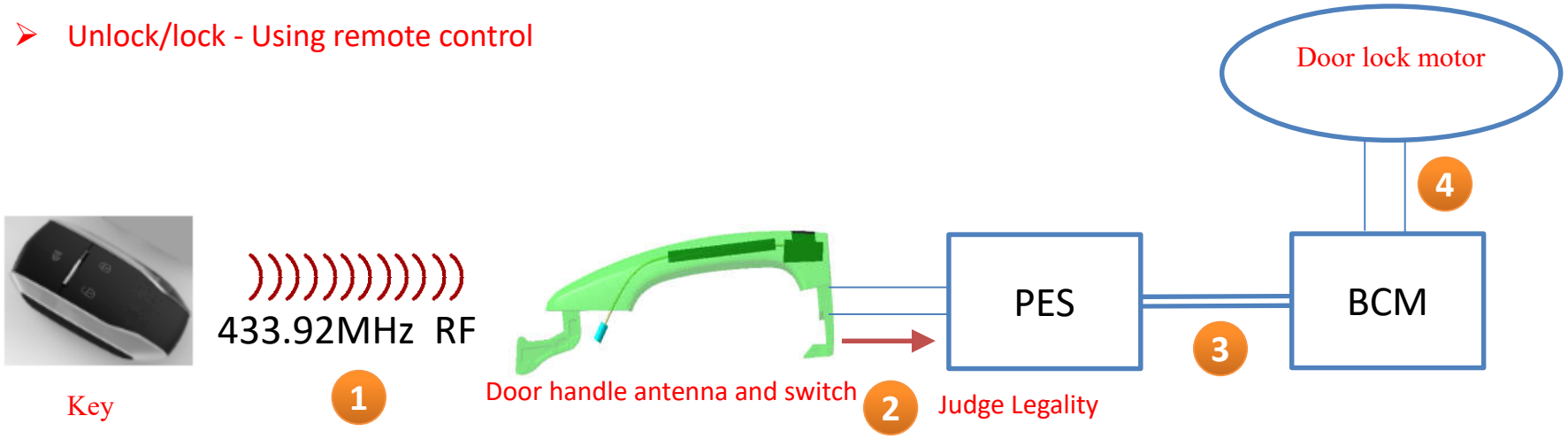


- Unlock conditions: stop and flameout, four doors closed, four doors locked, trunk closed, key outside the door

- Locking conditions: stop and flameout, four doors closed, trunk closed, key, key is not in the car

3 Working principle

- Unlock/lock - Using remote control



When the vehicle power is OFF and in the range of radio frequency, press the unlock/lock button to launch the corresponding unlock/lock radio frequency information. PSE radio frequency receiver receives this information and verifies it, and then sends the unlock/lock request to BCM. The user can open any door through the handle. If no doors are opened within 30 seconds of the remote unlock, the BCM automatically relocks the vehicle

3 Working principle

- Unlock/lock - Using mechanical key

After closing the driver's door, the user can insert the mechanical key into the lock and turn it to lock the door. BCM will detect this event, and if all other doors are closed, the BCM will lock all other doors, thereby locking the vehicle. If at least one door is not closed, the body control module unlocks the driver's door, telling the user to close all doors before attempting to lock the vehicle.

After the mechanical lock, if an identifier is found in the cab, the PE is disabled so that the next time the vehicle has to be unlocked, it must be unlocked by mechanical or RKE

3 Working principle

- Unlock/lock - Using tail door

If a switch is installed near the trunk handle, the authorized user must press the switch near the trunk handle when he wants to open the trunk of his vehicle. If a vehicle is equipped with a bumper antenna, PSE will search for a matching ID in the bumper antenna coverage area, and if an ID is detected, PSE will ask BCM to release the trunk and unlock the vehicle

If the vehicle is locked internally, PEPS will send an open request to BCM without checking for an identifier in the bumper antenna coverage area

3 Working principle

- Unlock/lock - Using central door lock

In the cab, the user or any passenger can lock the vehicle by pressing the central lock switch. Don't need an ID.

After locking through a central lock switch, PSE should disable passive entry if an identifier is detected in the cab

3 Working principle

➢ Start/stop - Quick start

Key

3

134KHz LF

433.92MHz RF

4

PES receive the signal, drive the low frequency antenna inside vehicle

Inside low-frequency antenna

2

1

PES

5 Judge Legality

6

G

7

EMS

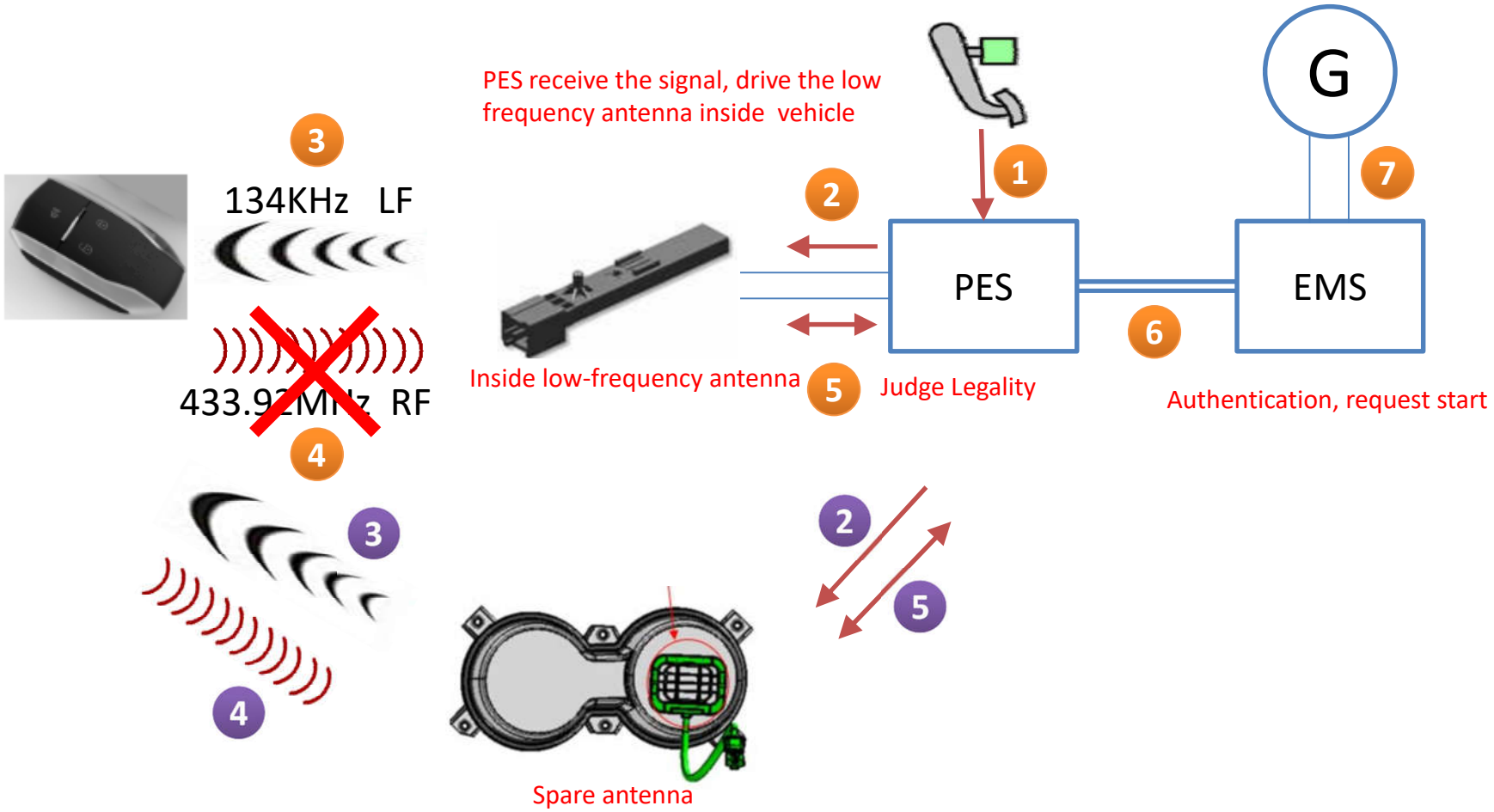
Authentication, request start

- Condition: transmission gear at N

- Note: if the key is placed in the dashboard and other corners of the car, the key may not be verified (because it is outside the detection area of the car).

3 Working principle

- Start/stop - Standby start



3 Working principle

- Start/stop - Emergency start
- Emergency start: the gear is in N, press and hold the start switch for 15s without pressing the brake pedal, which can start the vehicle in an emergency

3 Working principle

- Start/stop - Normal stop
  - When the speed is less than 4km/h, press the start switch to turn the vehicle off

3 Working principle

- Start/stop - Emergency stop

- Emergency stop: press the start switch 3 times in 3s to power down urgently

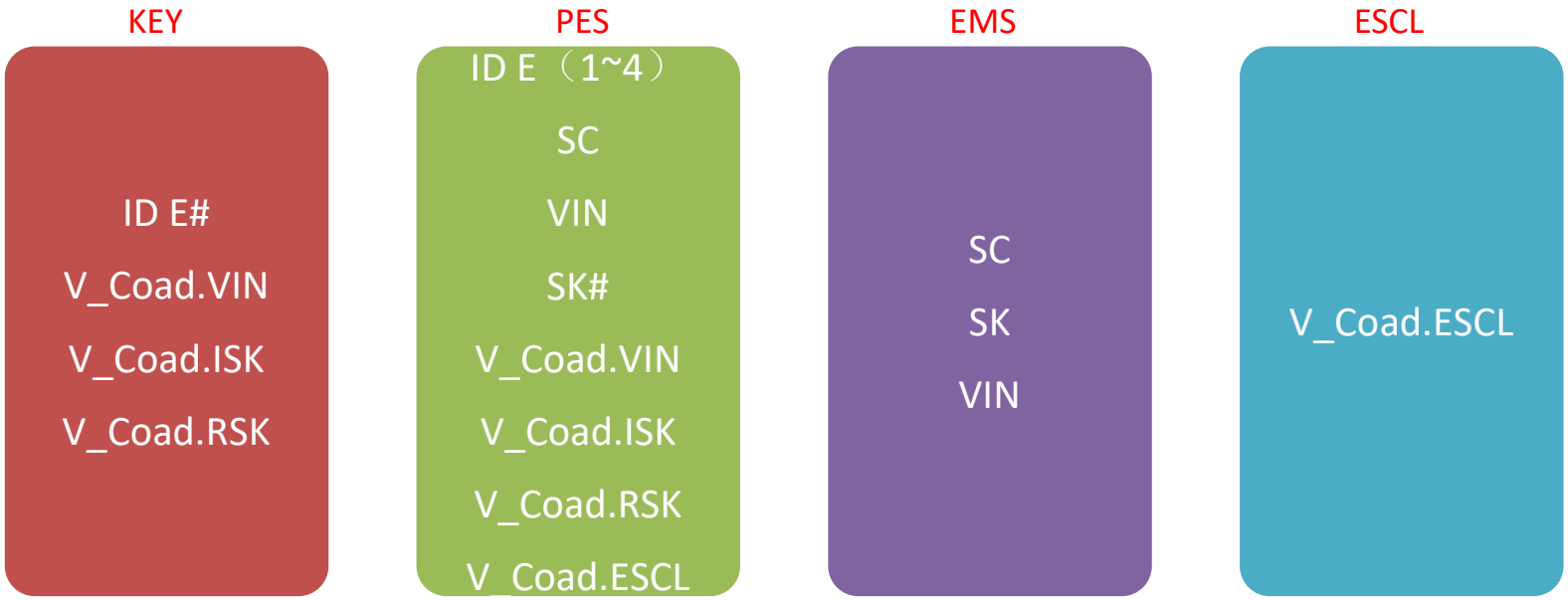
Note: do not press the start switch when the vehicle is moving, otherwise, the steering wheel will be locked, leading to crash and serious injury

3 Working principle

Explain circuit diagram of PEPS in detail

4 Maintenance points

➢ Match learning



- Matching reason: once the controller is replaced, the information inside the controller is lost and needs to be matched again
- Adaptation: models with PEPS. 18 situations that need to be matched
- Methods: corresponding model – PEPS - after-sales service

4 Maintenance points

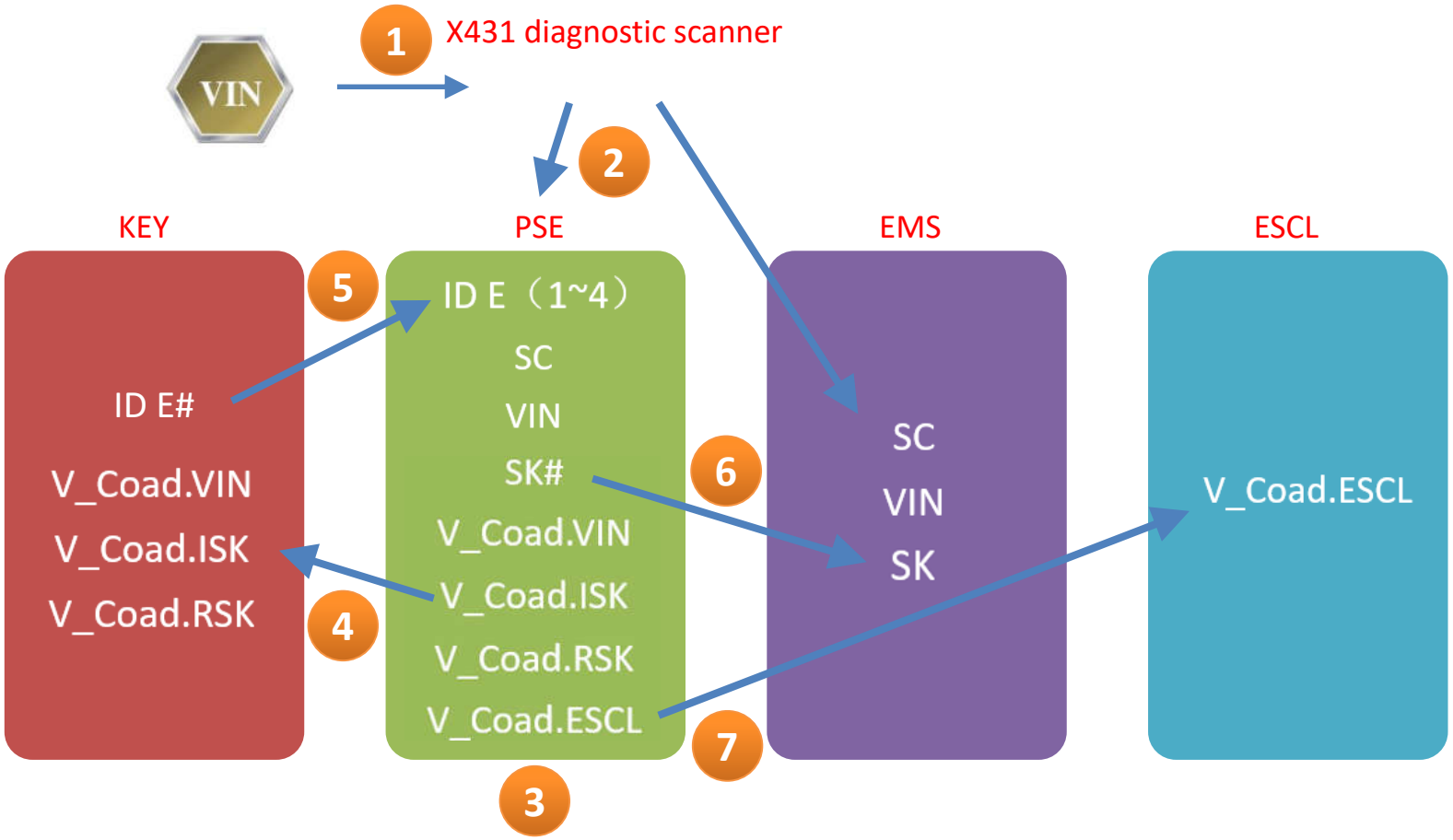
- Match learning

All match	Read the EMS status
Replace PEPS	Read the current key state
Match PEPS(learn SK from EMS)	Learn ESCL password
Replace EMS	Erase ESCL password
Match EMS(learn SK from PEPS)	Upload fault code of ESCL
Reset IMMO	Clear fault code of ESCL
Reset EMS	ESCL restore initial values
Add key	Tracking data upload of ESCL
Add old key	Restoring the original of IMMO
Delete key match	

4 Maintenance points

- Match learning

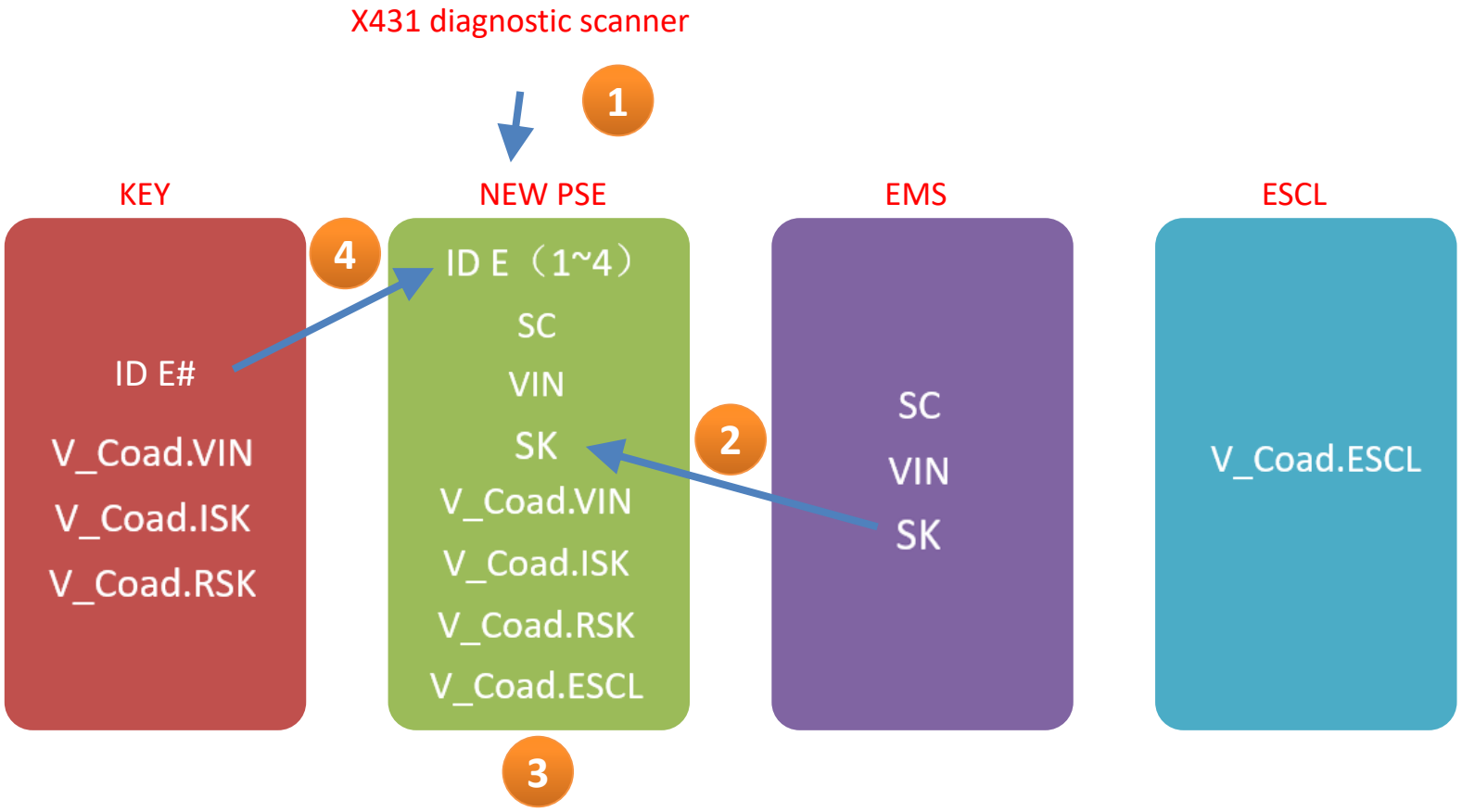
- Matching the whole system



4 Maintenance points

- Match learning

- Matching PSE



4 Maintenance points

- Matching situation check

Corresponding model – PEPS - read data stream

Antitheft status: VIN and antitheft security code status, programmed or unprogrammed

PEPS status: intelligent key IDE and forwarding transponder ID status

Key status: number of matched or unmatched keys:

:

Power status

Vehicle lock status

Corresponding model – PEPS - after-sales service

EMS status: not written or written to SC and SK currently

Key status: legal or illegal

4 Maintenance Points

➢ Fault codes

B130000	Internal control module EEPROM error	B150413	Open circuit of Rear internal LF antenna
B130100	Immobilizer and ECM authentication failed	B150513	Open circuit of Bumper LF antenna
B130200	VIN Not Programmed	B150600	Abnormality on switches of Engine switch
B130300	The antenna communication is disturbed	B150700	Abnormality in IG circuit
B130400	None transponder was detected	B150800	Abnormality in ACC circuit
B130500	Immobilizer has none key was storage	B150900	Abnormality in brake signal
B130600	Security code was not programmed	B150A00	Abnormality in vehicle speed signal
B150013	Open circuit of driver door outside LF antenna	B150D00	Abnormality on ESCL LCK_GND
B150213	Open circuit of Front internal LF antenna	B150E00	Abnormality on ESCL LCK_PS
B150313	Open circuit of Middle internal LF antenna	B150F00	ESCL anti scanning

4 Maintenance Points

- Fault codes

B151000	Abnormality on wheel speed signal	U015587	Lost communication of ICM
B151100	Abnormality in ESCL lock	U010087	Lost communication of EMS
B151200	Abnormality in ESCL unlock	U000087	Lost communication of SJB
B151300	ESCL external failure	U018787	Lost communication of DVD
B151400	Abnormality on STAR power supply	U010187	Lost communication of TCM
U007388	Control Module Communication Bus Off	U106487	Lost communication of HVAC
U014087	Lost communication with BCM	U032987	Lost communication of HVAC
U130055	Software configuration Error		

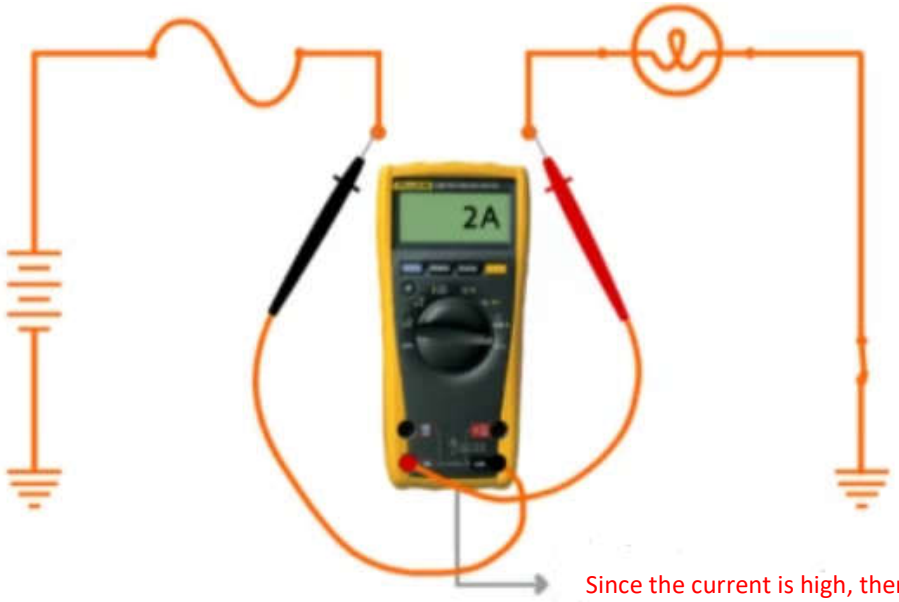
Service Training Materials

EVO 3 electric
Circuit Basis

1 Electrics Basis

- Current

Definition(the quantity of the charge going through a cross section in a second), Type(Alternating Current and Direct Current), Unit, Measurement, Measurement of static current(30mA), Way of finding the broken point



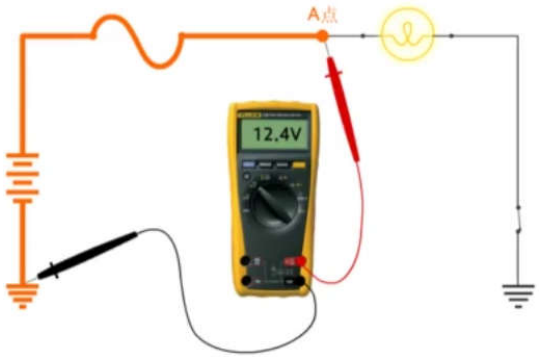
Since the current is high, there is a fuse inside the multimeter.

Measurement: Shut down the circuit, make the test pen series-connected to the circuit, turn on the circuit

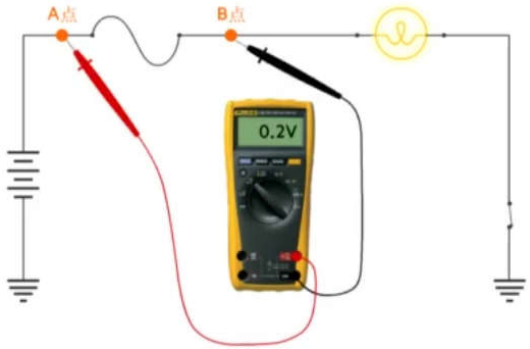
1 Electrics Basis

- Voltage

Definition(the reason why the electron moves), Type(Alternating and Direct), Unit, number of battery, difference between 12V model and 24V model(mainly for Light Truck), Measurement



To test 1 point's voltage



To test the voltage between 2 points

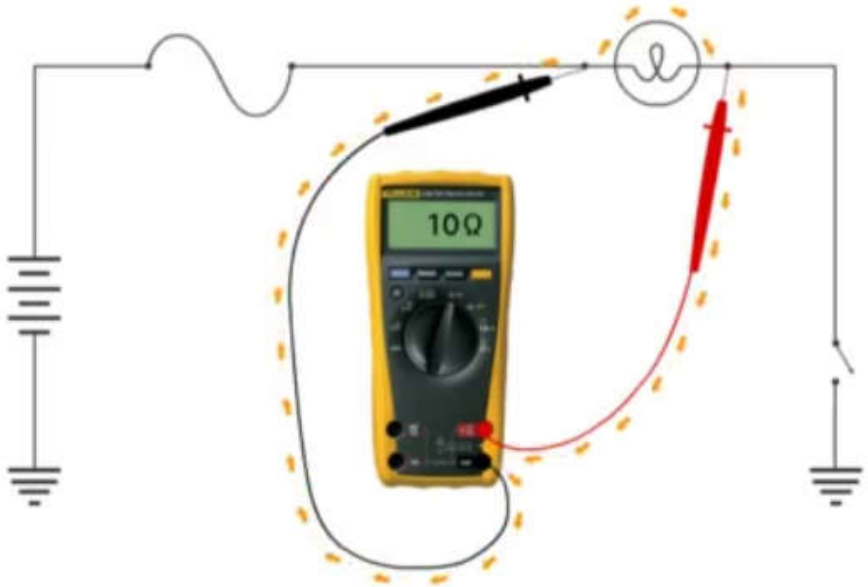
Measurement: Turn on the circuit, make the test pen parallel-connected to the circuit
Misunderstanding:

If you measure the power line and there is no voltage, then it is broken-circuit? Wrong range.

1 Electrics Basis

- Resistance

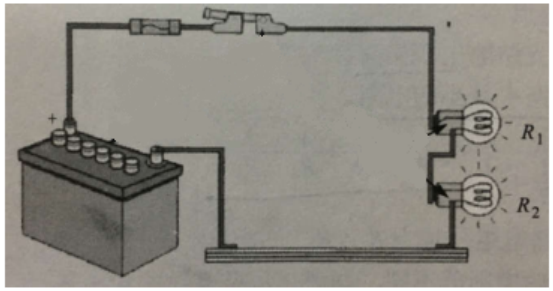
Definition(the obstruction for electron flowing in the circuit), Unit, influence factors(material, thickness, length, temperature)



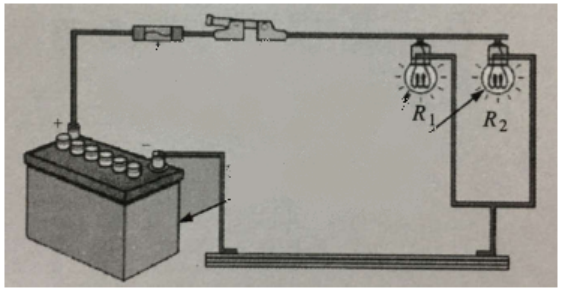
Measurement: Shut down the power or at least one side of the device you want to test. The measure of resistance is a kind of indirect measurement.

1 Electrics Basis

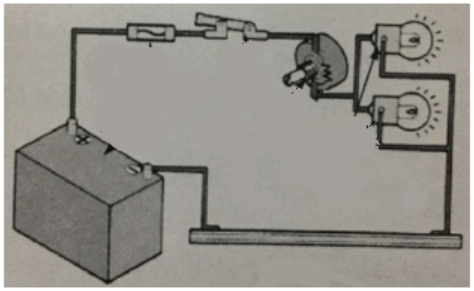
- Current, Voltage, resistance(Ohm's Law)



Series Connection



Parallel Connection

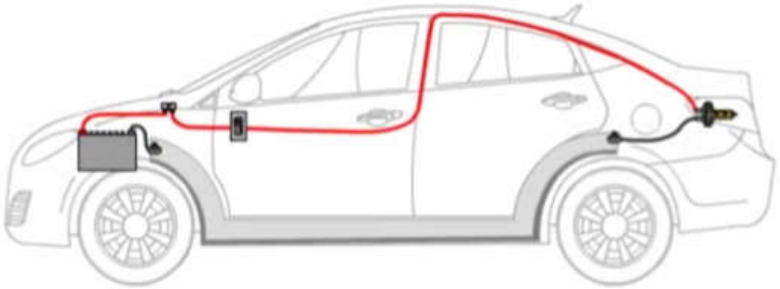

Mixed Connection

- Relationships between C, V, and R in different circuits

	Series Circuit	Parallel Connection
Current	I1=I2=I3	I1+I2+I3=I
Voltage	U1+U2+U3=U	U1=U2=U3=U
Resistance	R1+R2+R3=R	R<R1,R<R2,R<R3

2 Circuit Basis

- Vehicle Circuit Composition

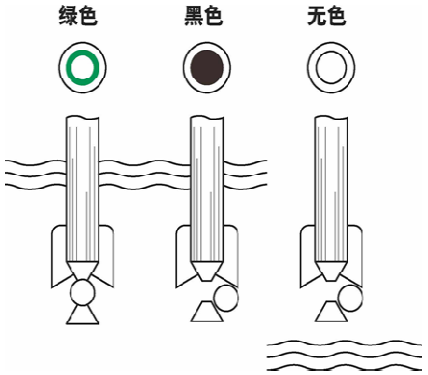


- Power 电源
  - Battery
  - Generator
- Wire
- Circuit Protection
  - Fuse
  - Fusible line
- Circuit Control
  - Switch
  - Relay
- Load
  - Starting System
  - Lighting System
  - ……
- Ground

2 Circuit Basis

- Power

Battery: Principle, Model, 12V/24V, S/P, Harm and Order of Disassembly, Normal V, State(observe and measure) , Maintenance(short-term, lone-term), Shipment



Generator: State(measure(generator side and battery side) and observe)

2 Circuit Basis

- Wire

Color(single, double), Specification, Type

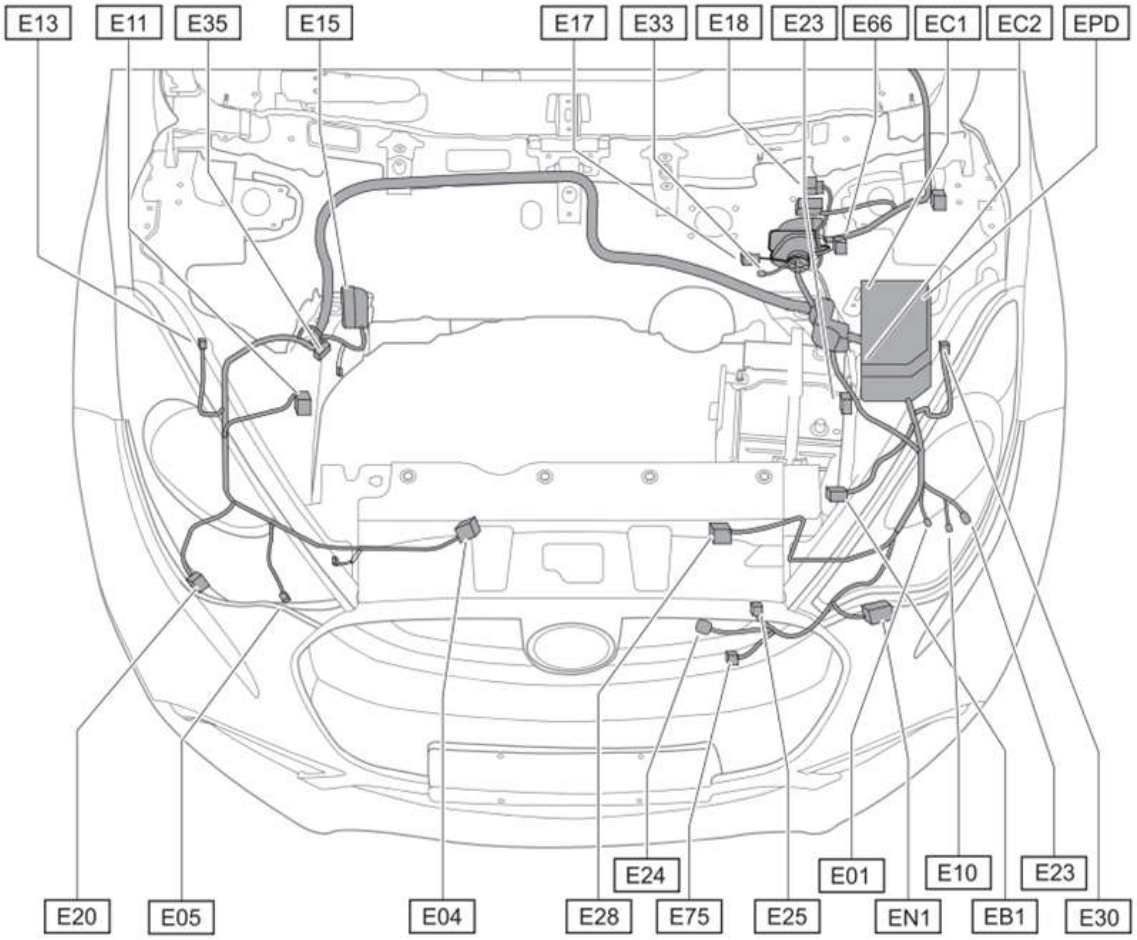
B	
Gr	
Br	
Bl	
G	

R	
Y	
O	
W	
V	
P	
Lg	
Lb	

B	Power wire harness
E	Engine wire harness
A	Engine control wire harness
M	Main wire harness
R	Roof wire harness
F	Body wire harness
DO	LF door wire harness
D1	RF door wire harness
D2	LR door wire harness
D3	RR door wire harness
T0	Rear door transition wire harness
T1	Rear door wire harness
RB	Reverse radar wire harness

2 Circuit Basis

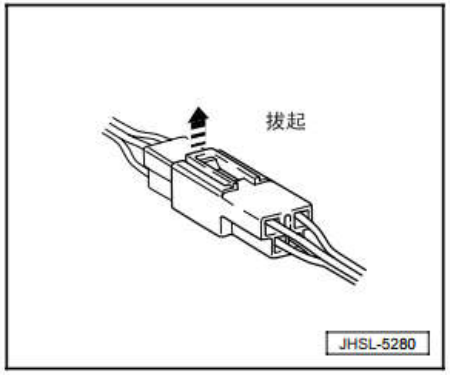
- Wire

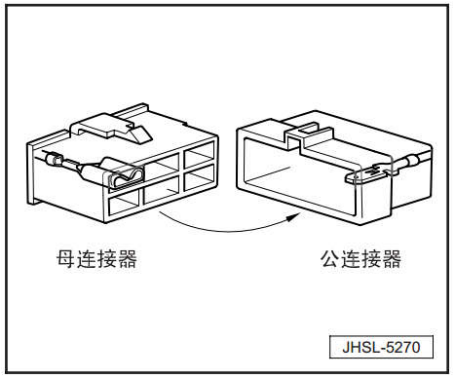


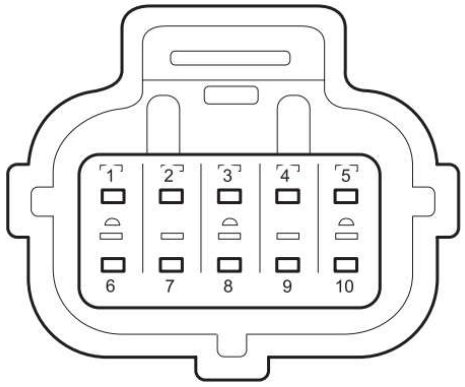
2 Circuit Basis

- Wire

Connecting and disconnecting of connectors, recognition of plug and socket, recognition of position of pins, disassembly of terminal





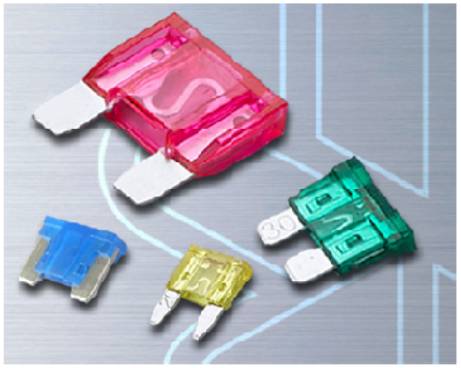


2 Circuit Basis

- Circuit Protection Device

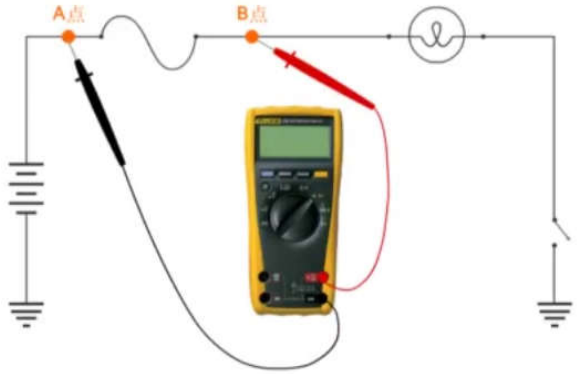
Fuse: Type(slice or glass pipe), color and rated current, state (observe and measurement)

Fusible wire: not frequently used



fuse

Fusible wire



Check on conductivity

Measurement of conductivity with multimeter : check on the connection state between two points, it will beep if the resistance is under 30 ohm.

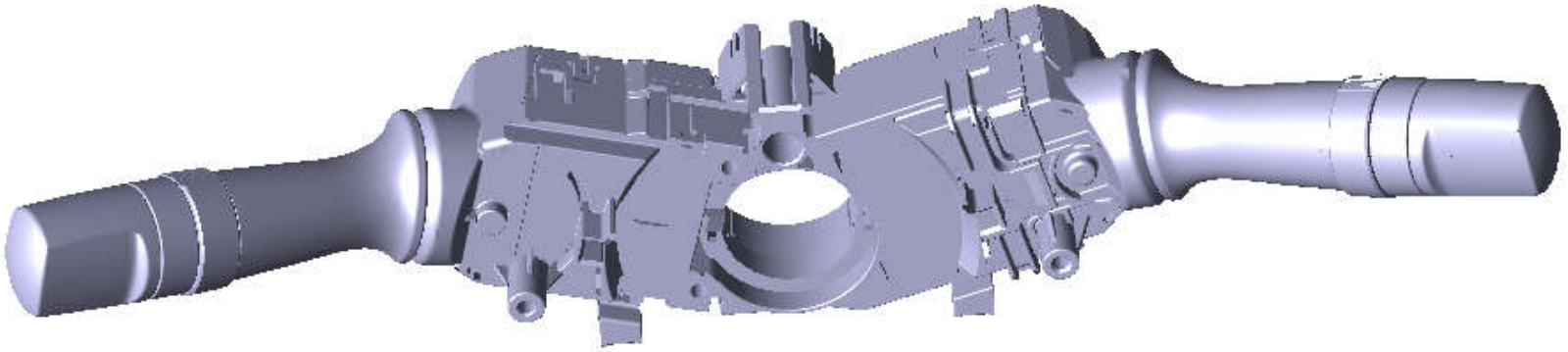
2 Circuit Basis

- Circuit Control Device - -Switch

SPST

SPDT

Touch Switch

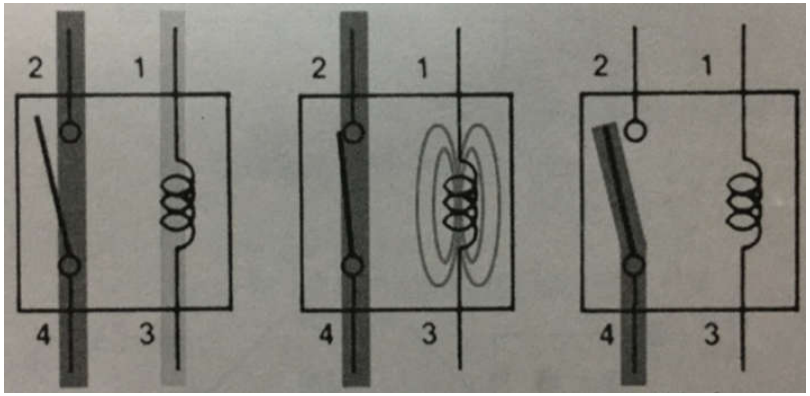


DPDT

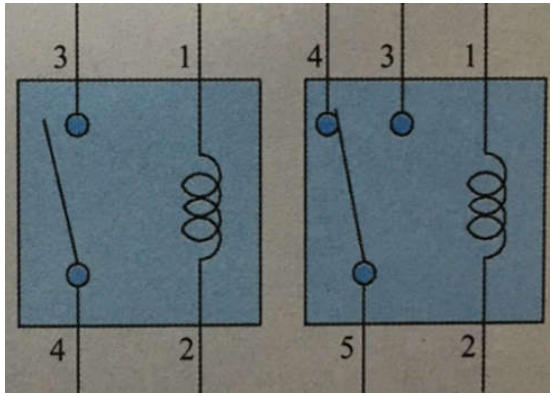
2 Circuit Basis

- Circuit control device – Relay

Relay: principle(a electromagnetic switch that use small current to control big current, control circuit and load circuit), Type(NC, NO, different number of pins), quality(measurement with or without power, voice), Steering Light relay



Original Turn on Shut down



4 pins 5 pins

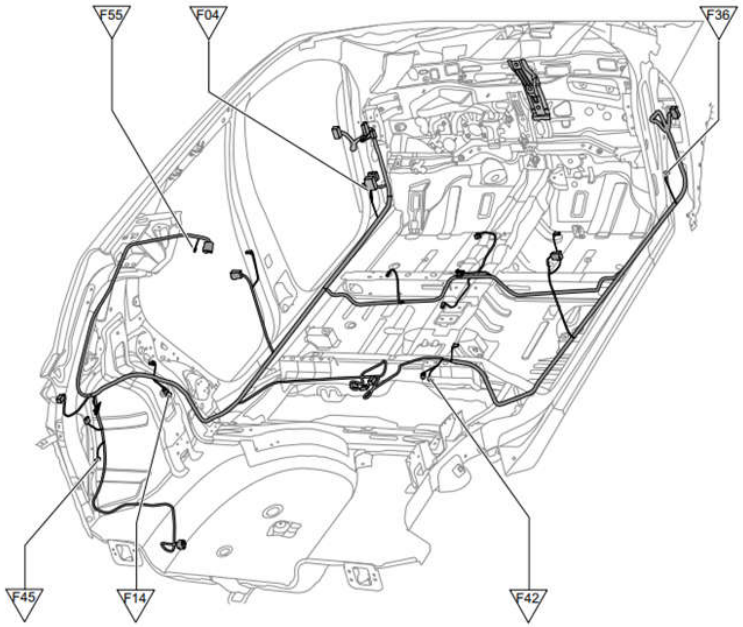
2 Circuit Basis

- Load

2 Circuit Basis

- Grounding

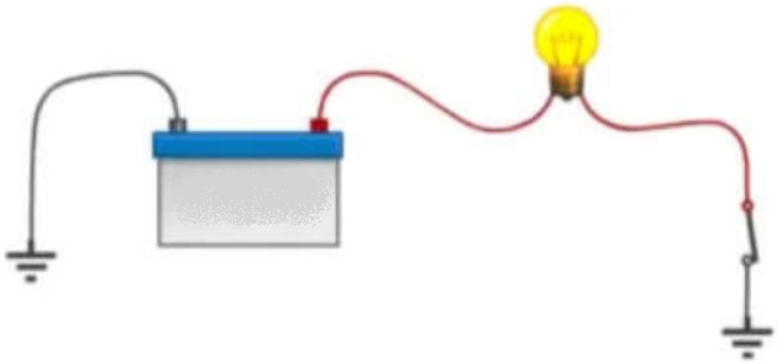
Consequence of grounding problems, vehicle wire harness grounding, examples



F04	Vehicle wire harness grounding(LF)
F14	Vehicle wire harness grounding(LR)
F36	Vehicle wire harness grounding(RF)
F42	Vehicle wire harness grounding(RR)
F45	Vehicle wire harness grounding(Left trunk)
F55	Vehicle wire harness grounding(LR door)

3 Maintenance

- Voltage drop check

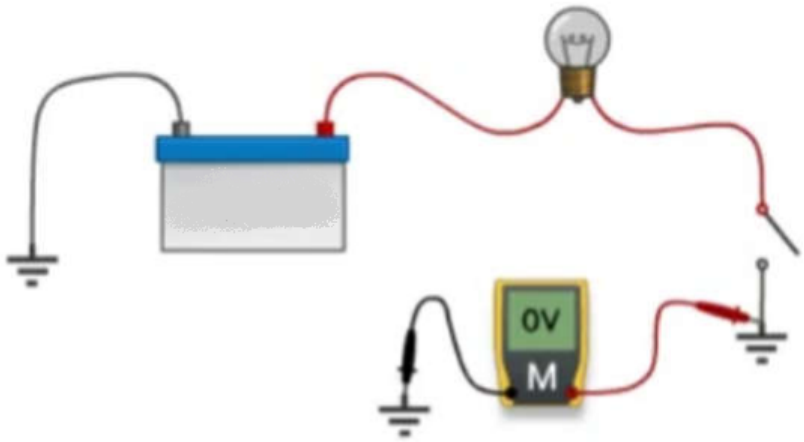


Position	Voltage drop
two ends of battery	
Wire before the load	
two ends of load	
Wire before the switch	
Two ends of the switch	
Grounding wire	

4 Common Faults

- Open-circuited

Definition(a discontinuous electrical fault. Poor contact between parts is a slight open-circuit.), multiple reasons, example(reverse light)



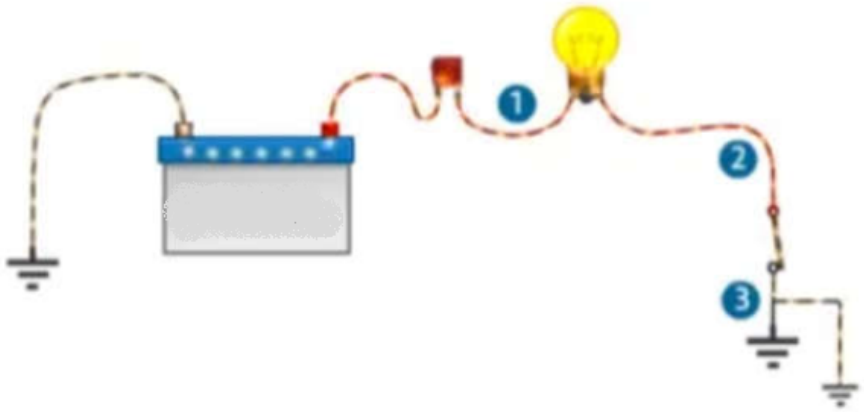
Position	Switch ON ON	Switch Off OFF
Bat. +	12.6V	12.6V
Before load	12.6V	12.6V
After load	0V	12.6V
Before switch	0V	12.6V
After switch	0V	0V
grounding	0V	0V

4 Common Fault

- Short-circuited

1. Short-circuited to the ground: definition(the circuit connected to the grounding without connected to the load), phenomenon, parts or wire harness short-circuited to the grounding, examples(reverse light, trunk light)

2. Short-circuited to the power: definition(another power is connected to this circuit), phenomenon, series connection short-circuited to the power, short-circuited between parallel connection, example(trunk light)

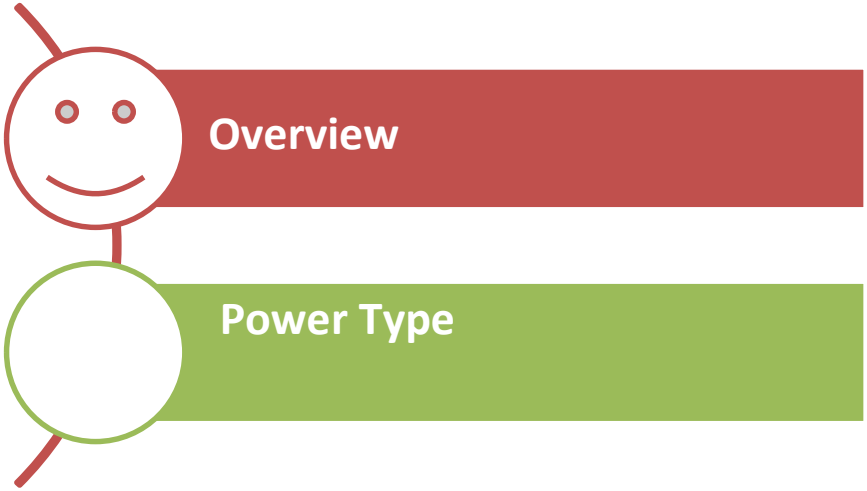


Position	Phenomenon
1	Fuse is fused due to big current.
2	The switch after the load is open, and the circuit is still working.(abnormal)
3	normal

service training materials

EVO 3 electric
LV Power Distribution

Catalog

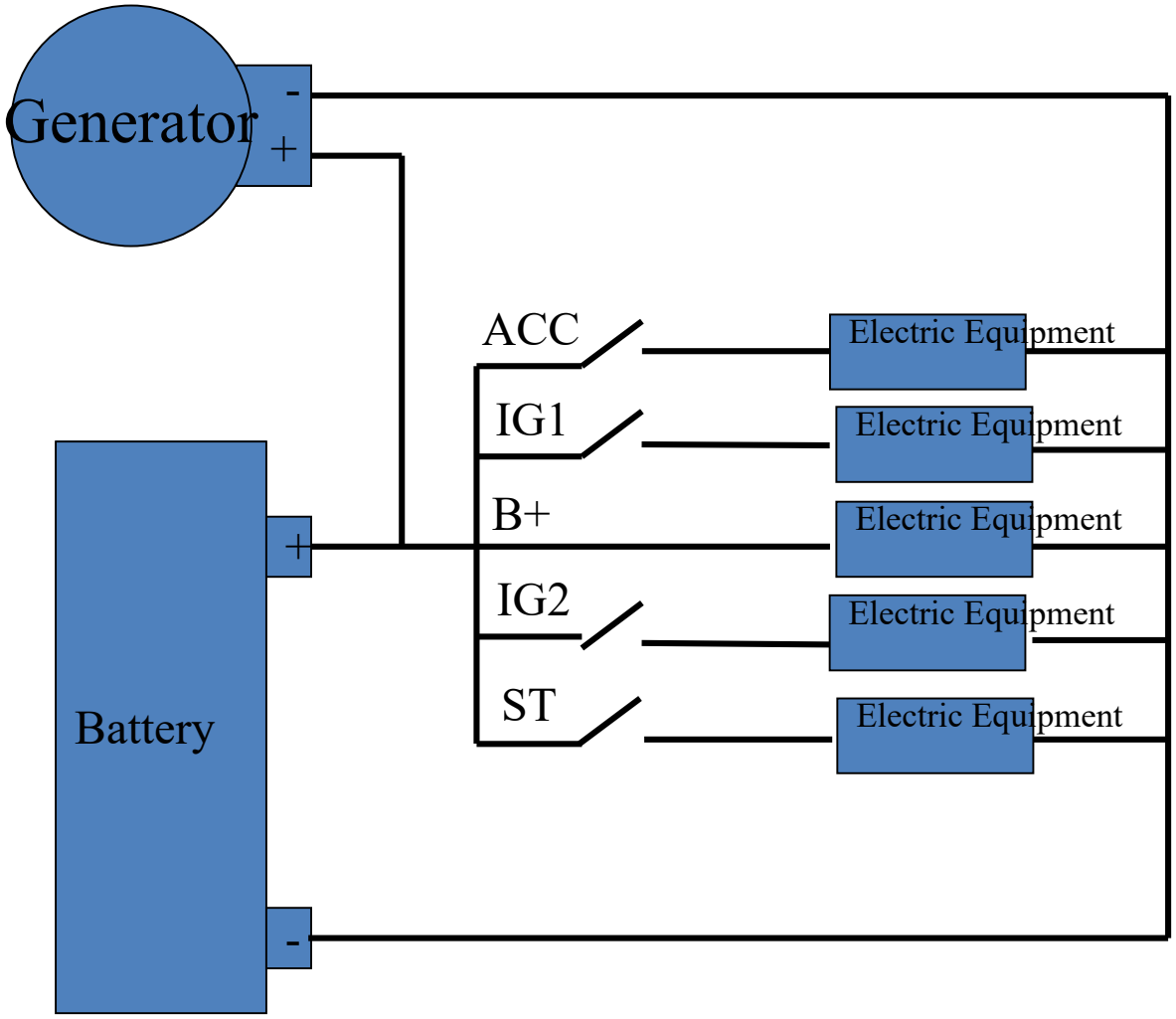


1 Overview

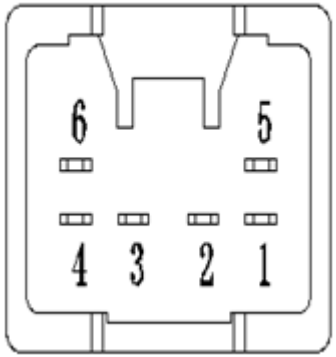
With the development of technology, to make vehicles more comfortable and more safe, electrical equipments have been widely used on vehicles. So figuring out the reasonable power distribution during research and design stage, is the basis for all the electrical parts to work steadily and securely.

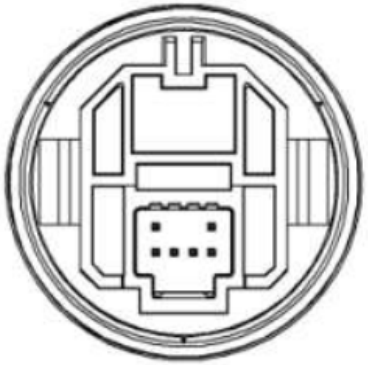
2 Power Type

- Constant Power
- ACC Power
- On Power
- ST Power
- Negative Power



2 Power Type

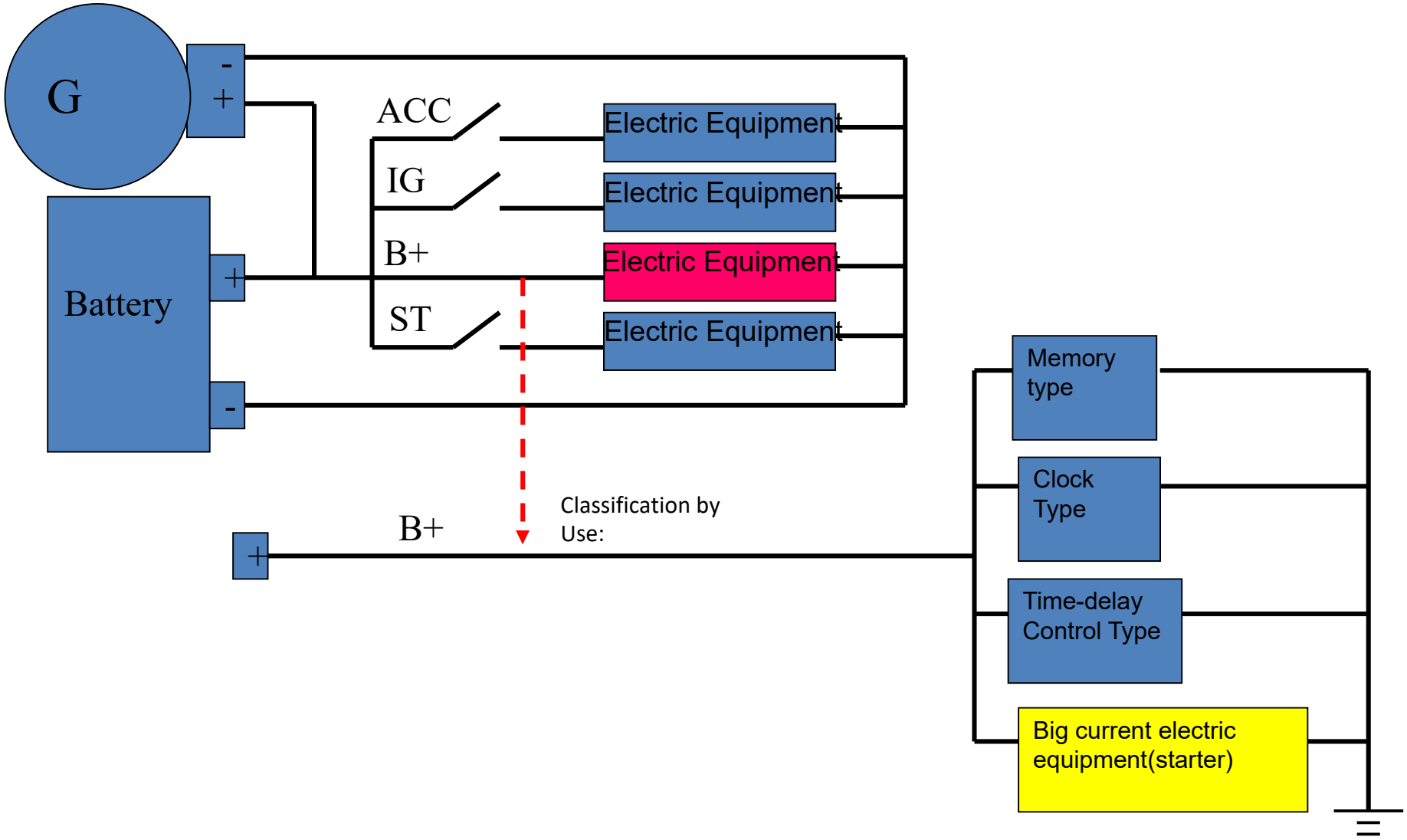




One-button start switch		
Order	Description	Notes
1	SS1	Start switch signal 1
2	GND	Start switch GND
3	SS2	Start switch signal 2
4	SWIL	Characterbacklight(White)
5	INDG	Character backlight(Green)
6	INDA	Character backlight(Amber)

2 Power Type

Constant Power: small power



2 Power Type

ACC Power:Accessory, supply power for accessory

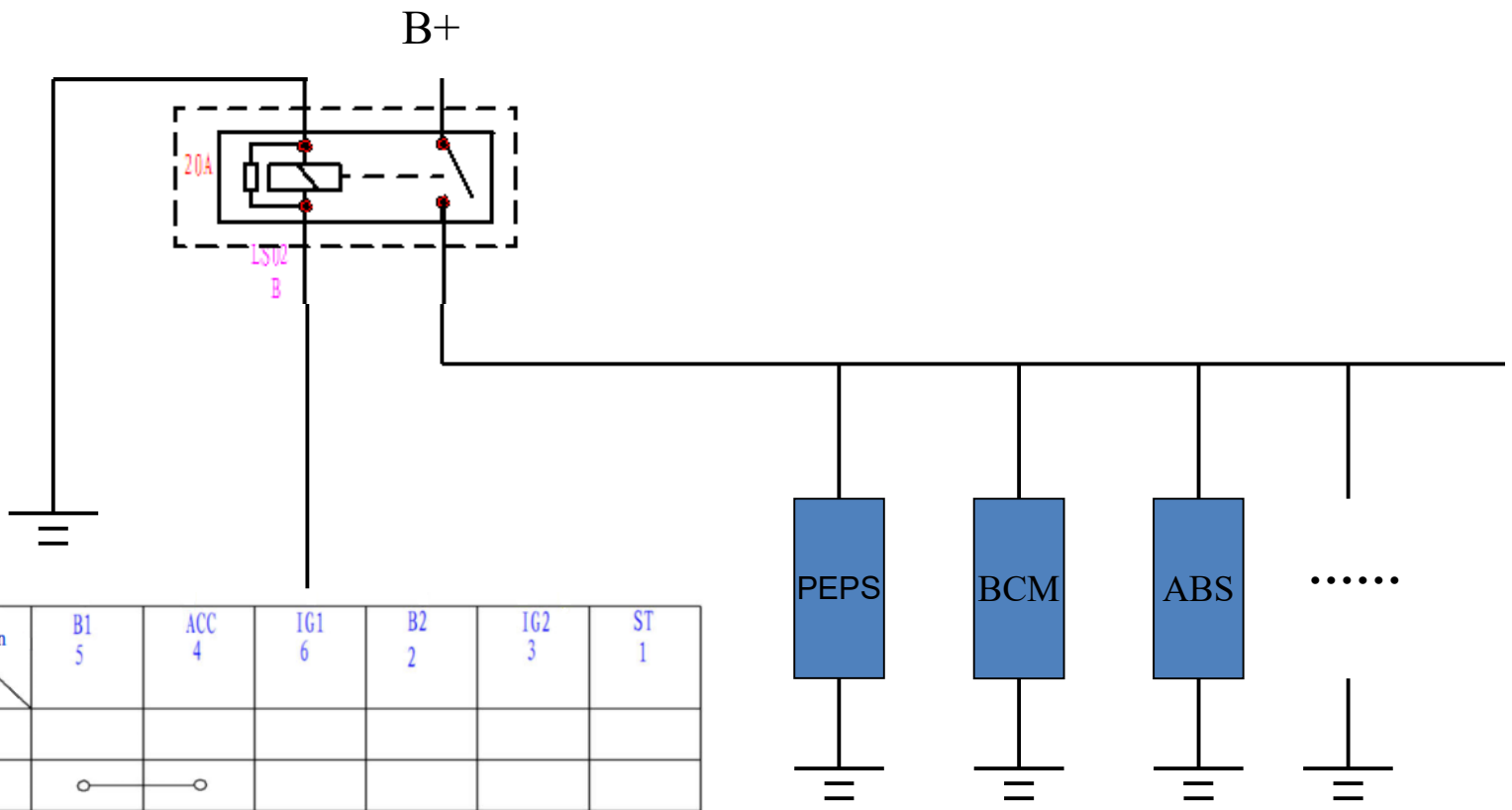
If 2 requirements are met, it belongs to acc control

1. Without it, the function of vehicle won't be affected

2.Can be used in engine-off state.

2 Power Type

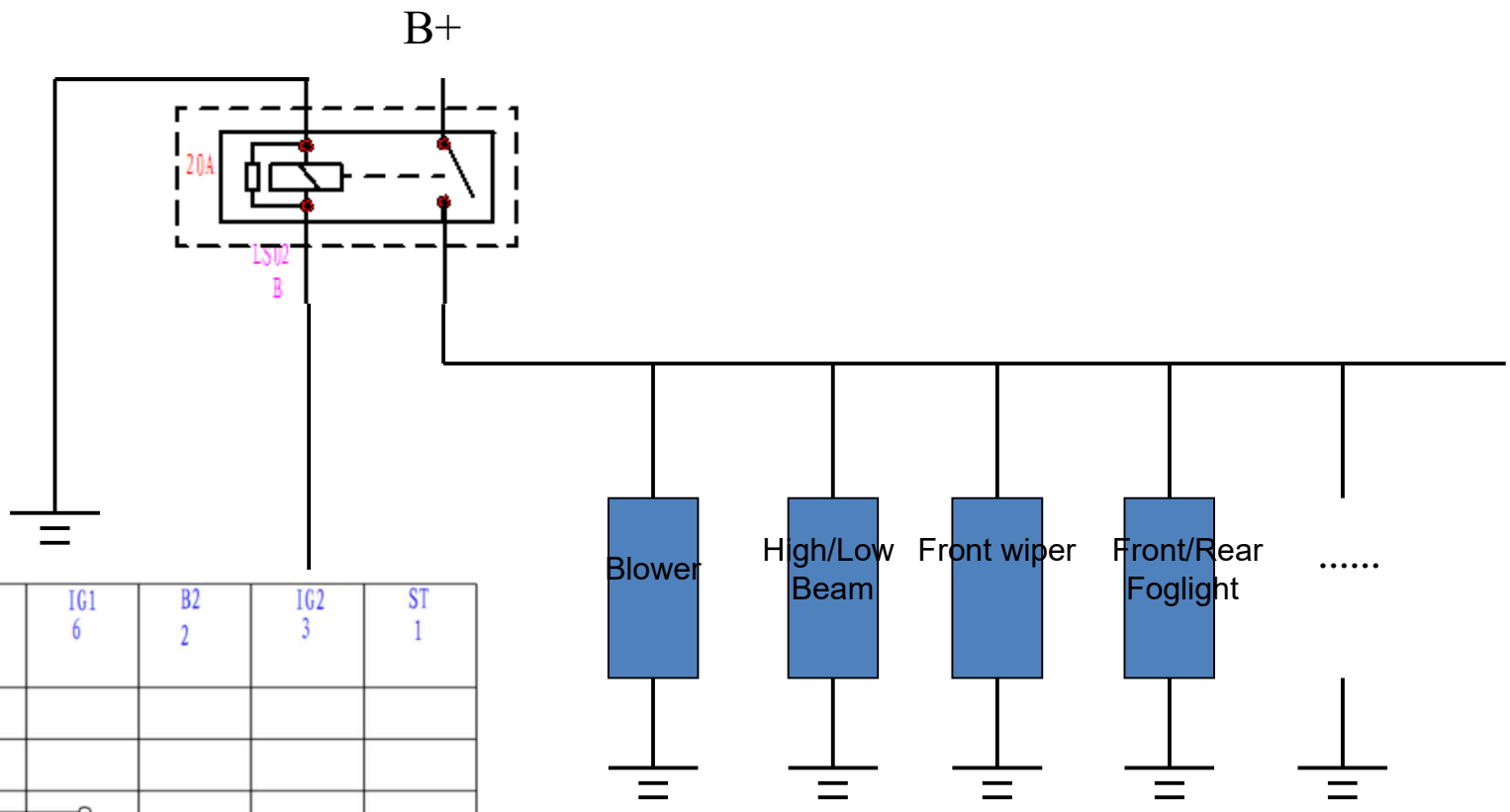
On Power:IG1 Power



Pin / Gear	B1 5	ACC 4	IG1 6	B2 2	IG2 3	ST 1
LOCK						
ACC	○	○				
ON	○	○	○	○	○	
START	○		○	○		○

2 Power Type

On Power:IG2 Power

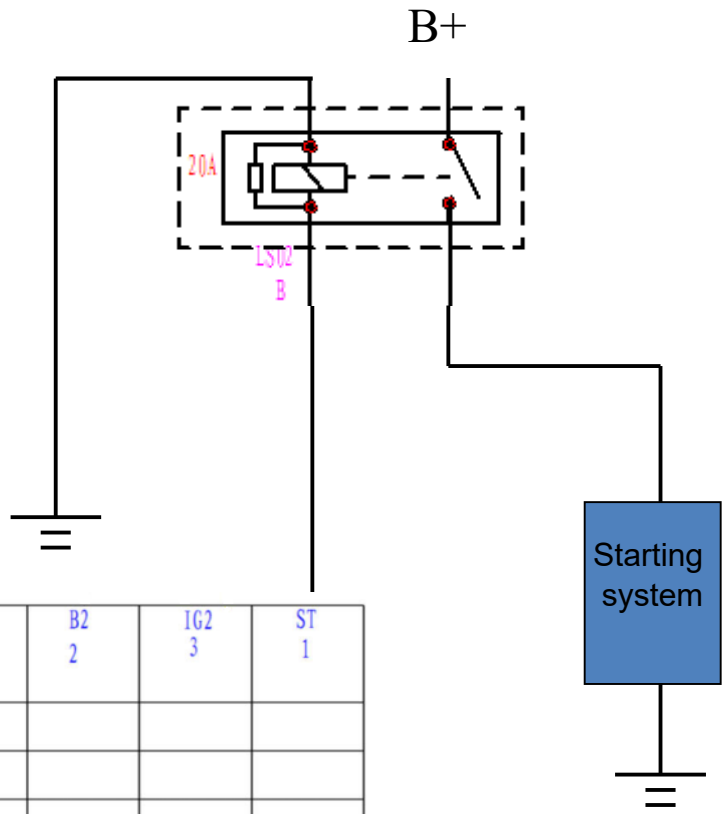


Pin / Gear	B1 5	ACC 4	IG1 6	B2 2	IG2 3	ST 1
LOCK						
ACC	○—○					
ON	○—○	○—○	○—○	○—○		
START	○—○		○—○	○—○	○—○	○—○

2 Power Type

ST Power:only for starting circuit

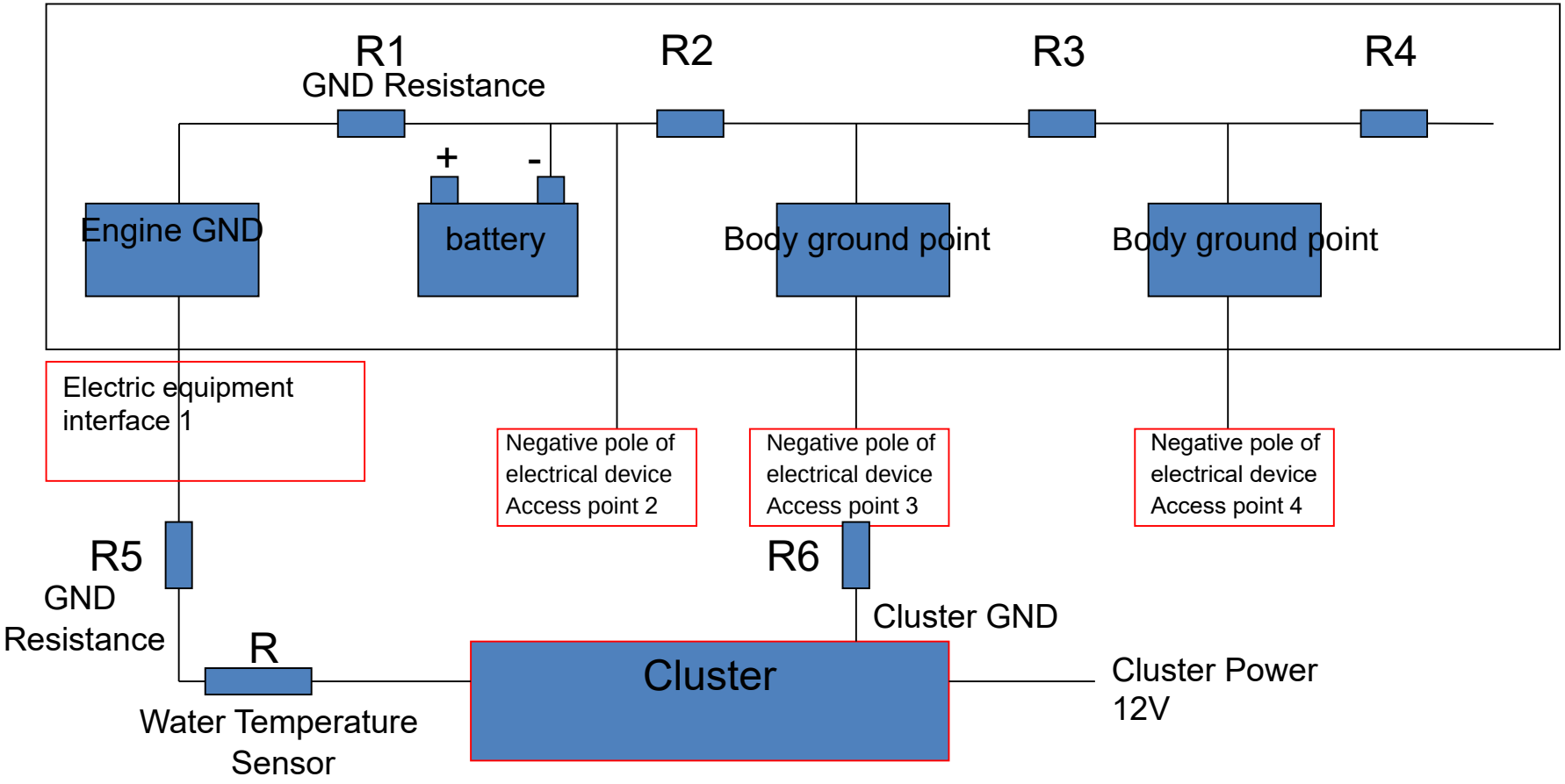
Because starting circuit needs big power, when ST Power is working, only the electric equipment which is controlled by IG1 and constant power. Other electric equipment which is not related to vehicle normal running should be power off.



Pin / Gear	B1 5	ACC 4	IG1 6	B2 2	IG2 3	ST 1
LOCK						
ACC	○——	——○				
ON	○——	——○	——○			
START	○——	——	——○	○——	——	——○

2 Power Type

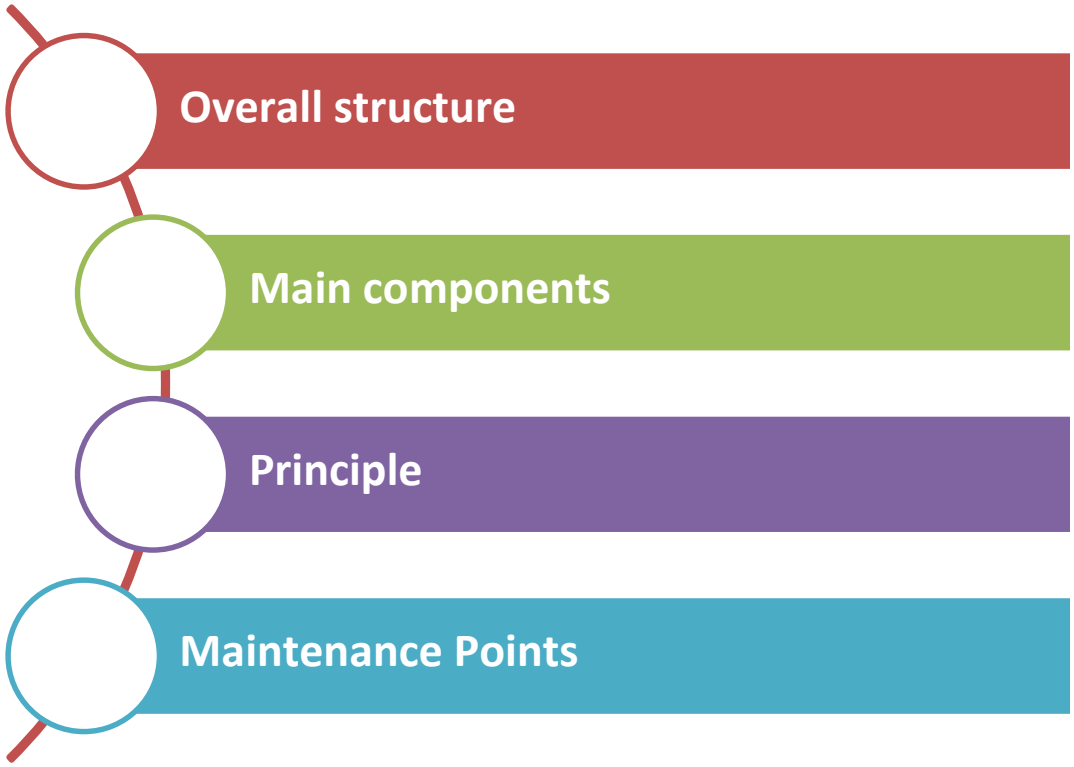
Negative Power: Negative pole of battery, the GND



service training materials

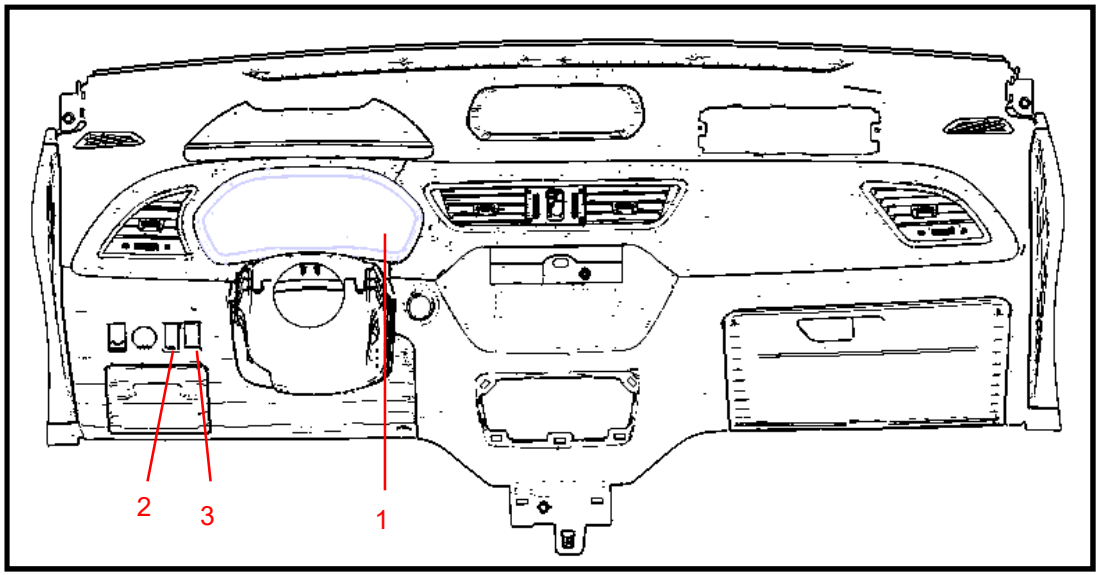
EVO 3 electric
Combination Instrument

Catalog


Overall structure
Main components
Principle
Maintenance Points

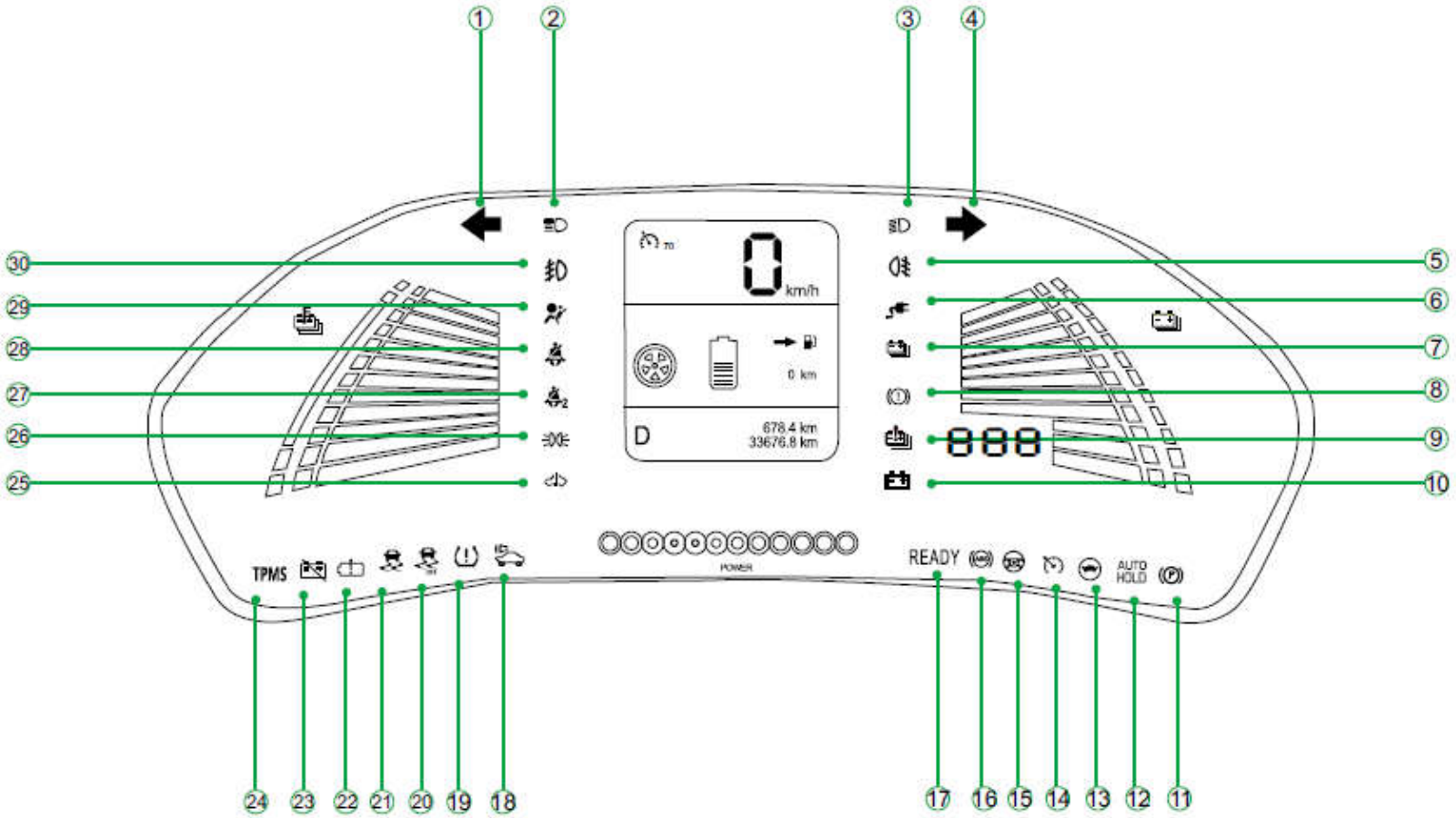
1 Overall structure

- system composition



SN	Part name	Description	Operation
1	Combination Instrument		
2	Adjusting Background Light SW	Adjusting instrument backlight	When the light is turned on, the roller is pushed up or down to adjust the backlight of the instrument to increase or decrease.
3	TRIP SW	Reset instrument subtotal mileage	Hold down TRIP switch for 3 seconds and reset the minute mileage

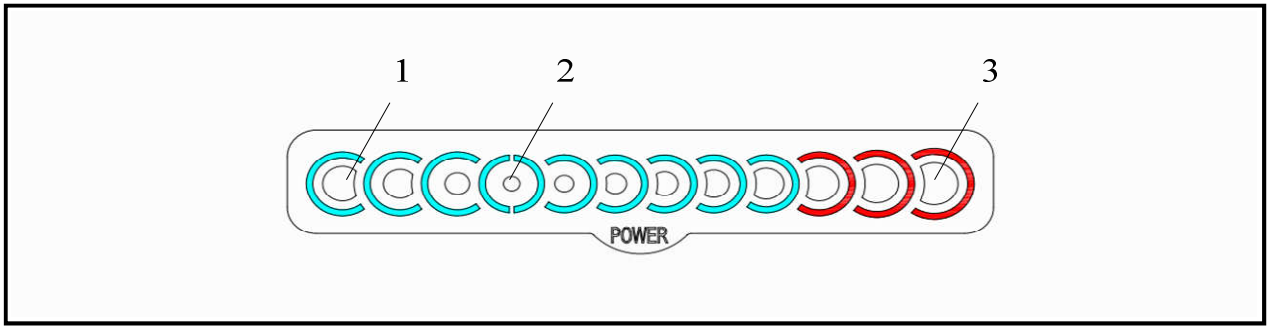
2 Main components



2 Main components

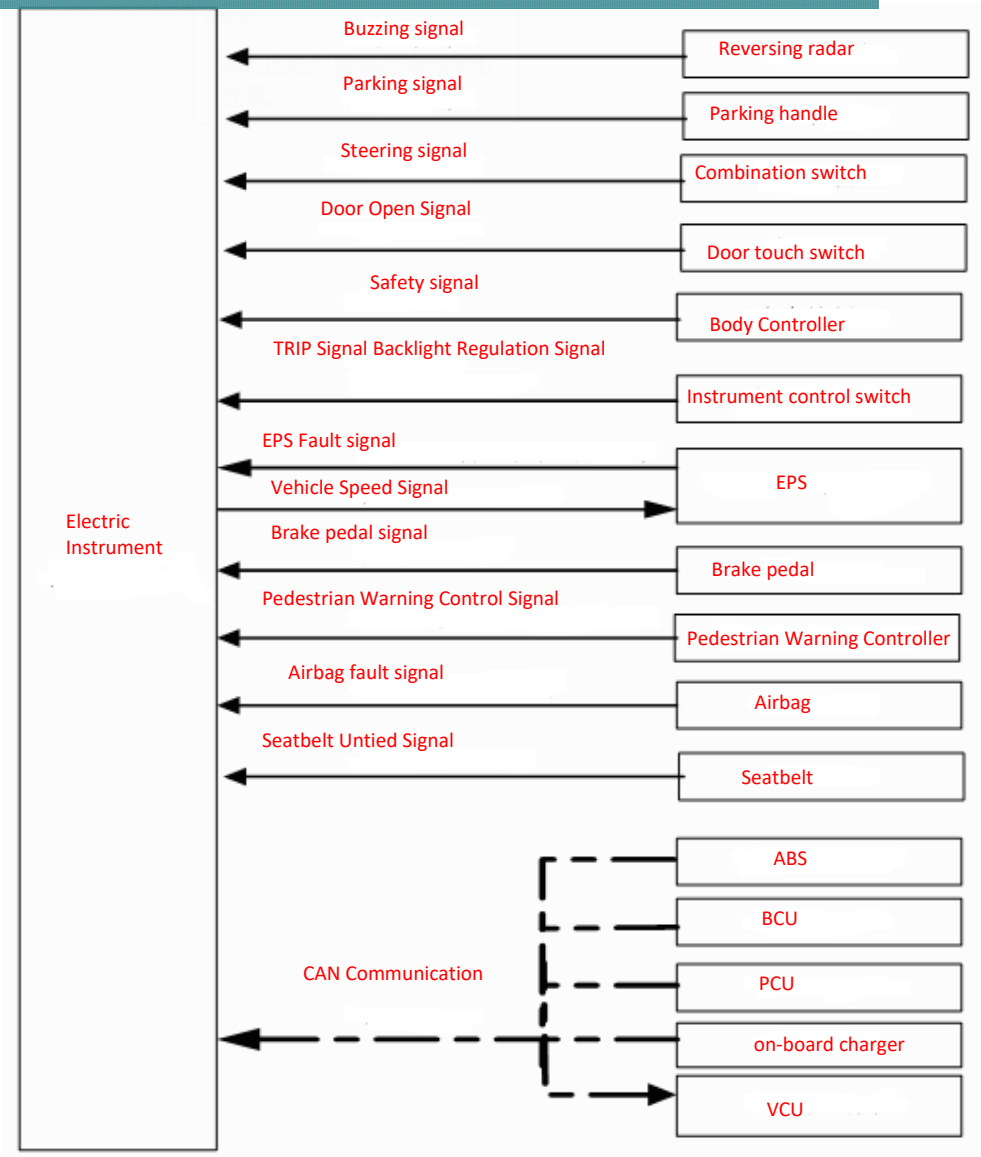
Serial No.	Icon	Description	Serial No.	Icon	Description
1		Left turn indicator	16		ABS fault warning lamp
2		Far-beam indicator	17	READY	Driving status indicator
3		Low-beam indicator	18		Pedestrian warning system fault indicator
4		Right turn indicator	19		Abnormal tire pressure warning lamp
5		Rear fog lamp indicator	20		Vehicle stability system off indicator (if configured)
6		Charging cable connection indicator	21		Vehicle stability system working indicator (if configured)
7		Charging status indicator	22		Motor fault warning light
8		Parking indicator and brake system malfunction warning lamp	23		Power battery off indicator
9		Power battery fault warning lamp	24	TPMS	TPMS fault warning lamp
10		12V battery fault warning lamp	25		System fault warning lamp
11		EPB fault warning light	26		Position lamp indicator
12	AUTO HOLD	AUTOHOLD indicator	27		Co-driver's seat belt warning lamp
13		Limited power indicator	28		Driver's seat belt warning lamp
14		CCS indicator	29		Safety airbag fault warning lamp
15		Power steering system fault warning lamp	30		Front fog lamp indicator

2 Main components



	Function	Describe	Signal name
1	Current motor power	Indicating black dots shows current motor power and energy recovery power.	Motor power signal
2	Maximum motor output power	Indicates maximum motor output power.	Fixed value
3	Maximum energy recovery power	Indicates maximum energy recovery power.	Fixed value

3 Principle


Electric Instrument
Buzzing signal
Reversing radar
Parking signal
Parking handle
Steering signal
Combination switch
Door Open Signal
Door touch switch
Safety signal
Body Controller
TRIP Signal Backlight Regulation Signal
Instrument control switch
EPS Fault signal
EPS
Vehicle Speed Signal
Brake pedal signal
Brake pedal
Pedestrian Warning Control Signal
Pedestrian Warning Controller
Airbag fault signal
Airbag
Seatbelt Untied Signal
Seatbelt
ABS
BCU
CAN Communication
PCU
on-board charger
VCU

3 Principle

Instrument Input Signal (CAN Communication)

Signal Source	Signal name
ABS	ABS Fault Warning Light Signal
VCU	Motor fault warning lamp signal
	Battery Failure Warning Light Signal
	System Fault Warning Light Signal
	Limited Power Indicator Signal
	High Voltage Cut-off Indicator Signal
	READY indicator signal
	Average power consumption signal
	Energy flow signal
	Remaining mileage signal
	Battery power signal

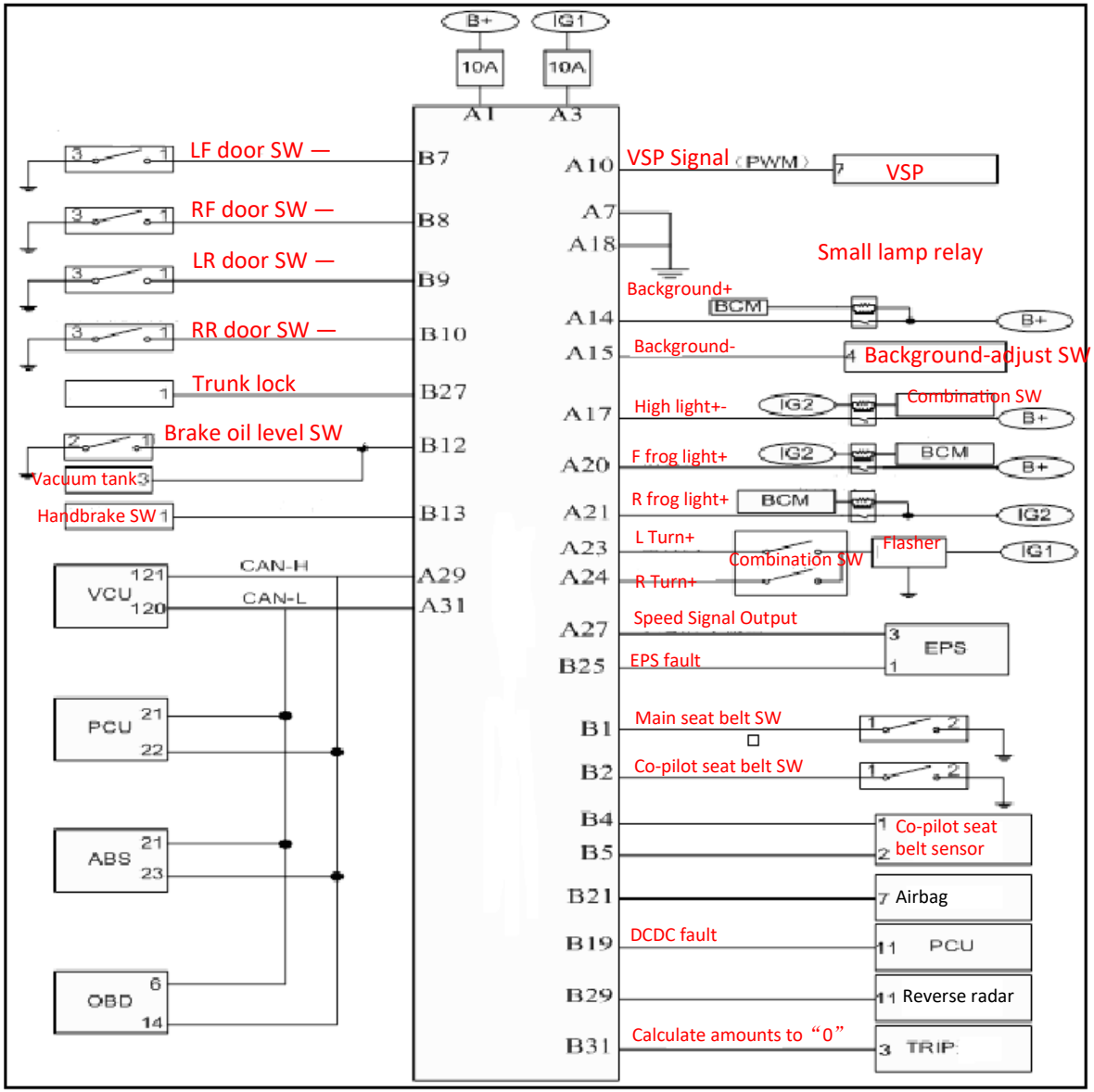
Signal Source	Signal name
VCU	Battery temperature signal
	Battery Available Capacity Signal
	Motor power signal
	Gear information signal
	"ECO" Gear Signal
	Charging wire connecting indicator signal
	Charging status indicator signal
PCU	Tachometer signal

3 Principle

Instrument Output Signal (CAN Communication)

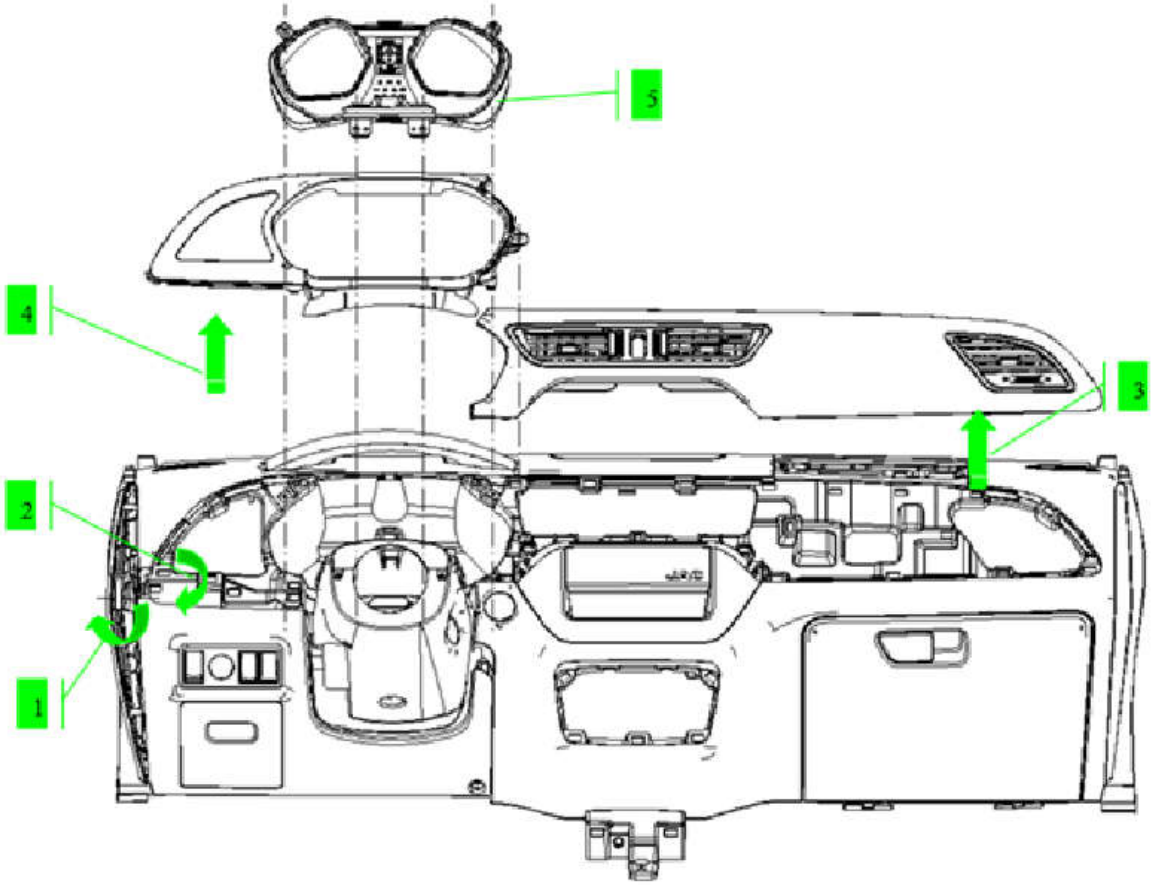
Receiving Signal Component	Signal name
VCU / Remote Intelligent Terminal	Total mileage
EPS controller	Vehicle Speed Signal
Sound signal	Door opening alarm signal
	Vehicle Availability Alarm Signal
	Unfastened alarm signal for seat belt
	Key CAN Signal Loss Alarm

3 Principle


B+
IG1
10A
10A
A1
A3
LF door SW
RF door SW
LR door SW
RR door SW
Trunk lock
Brake oil level SW
Vacuum tank
Handbrake SW
B7
B8
B9
B10
B27
B12
B13
VCU
CAN-H
CAN-L
A29
A31
PCU
ABS
OBD
A10
VSP Signal (PWM)
VSP
A7
A18
Small lamp relay
Background+
BCM
A14
B+
A15
Background-
Background-adjust SW
A17
High light+-
IG2
Combination SW
A20
F frog light+
BCM
A21
R frog light+
IG2
A23
L Turn+
Combination SW
Flasher
IG1
A24
R Turn+
A27
Speed Signal Output
EPS
B25
EPS fault
B1
Main seat belt SW
B2
Co-pilot seat belt SW
B4
B5
Co-pilot seat belt sensor
B21
Airbag
B19
DCDC fault
PCU
B29
Reverse radar
B31
Calculate amounts to "0"
TRIP

4 Maintenance Points

- Instrument disassembly and assembly



Disassemble

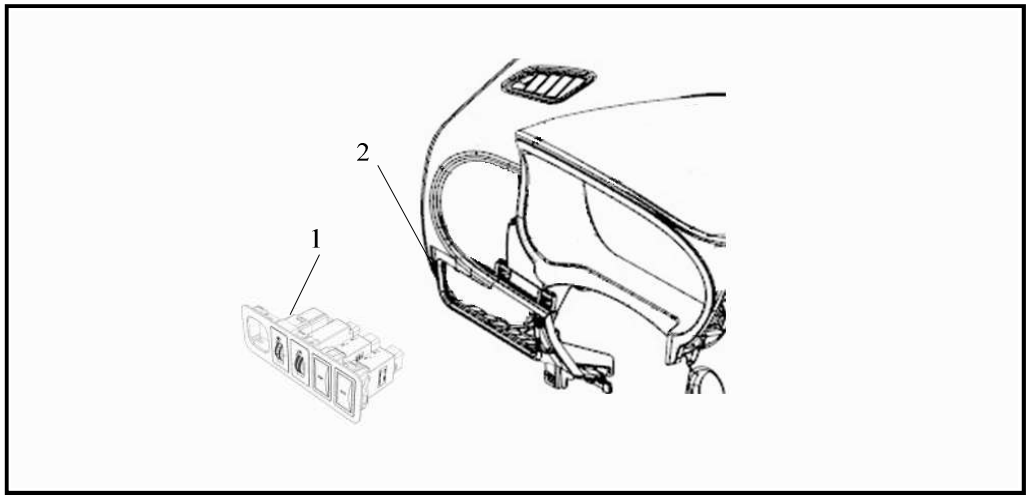
1.Remove the left lower guard plate. Remove the inner screw by lifting the guard plate through the disassembly opening of the lower left guard plate.
2. Remove the lower guard panel of the instrument
3. Remove the brightening strip of the dashboard Turn up the dashboard, shine the trim, and pull it out
4. Remove the lower guard panel of the instrument Remove the fixing screw of the instrument guard panel and pull out the guard panel
5. Remove the instrument combination Remove the four installation bolts, pull out the instrument and pull out the connector.

Install

Assemble in reverse order of disassembly.

4 Maintenance Points

- Removal and assembly of switch panel



Disassemble

1.Remove the control switch assembly;
2. Remove the plug-in;
3. Remove the control switch.

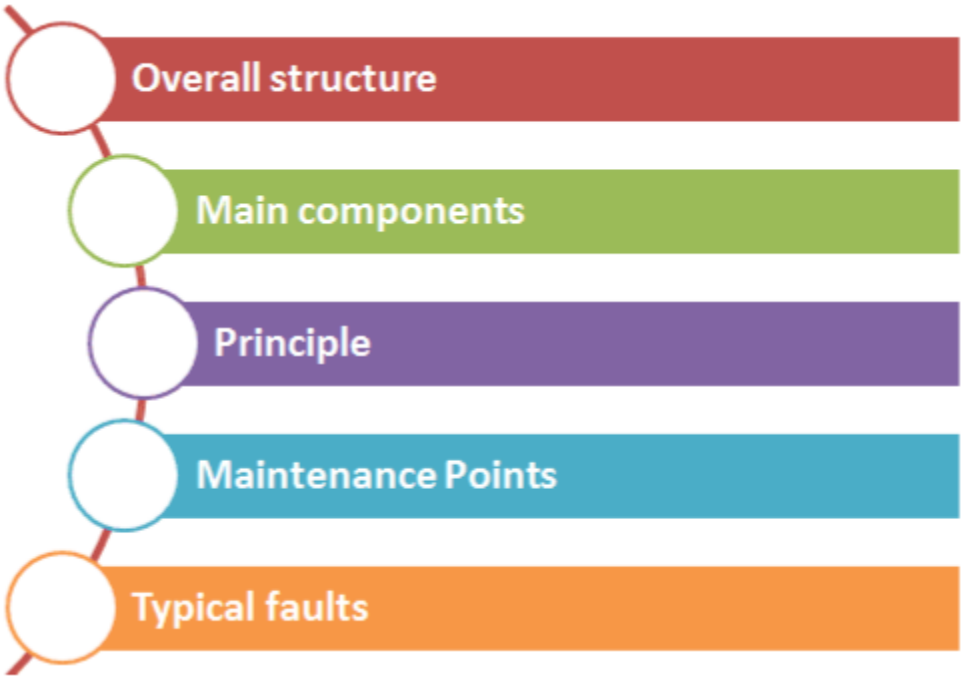
Install

Assemble in reverse order of disassembly.

service training materials

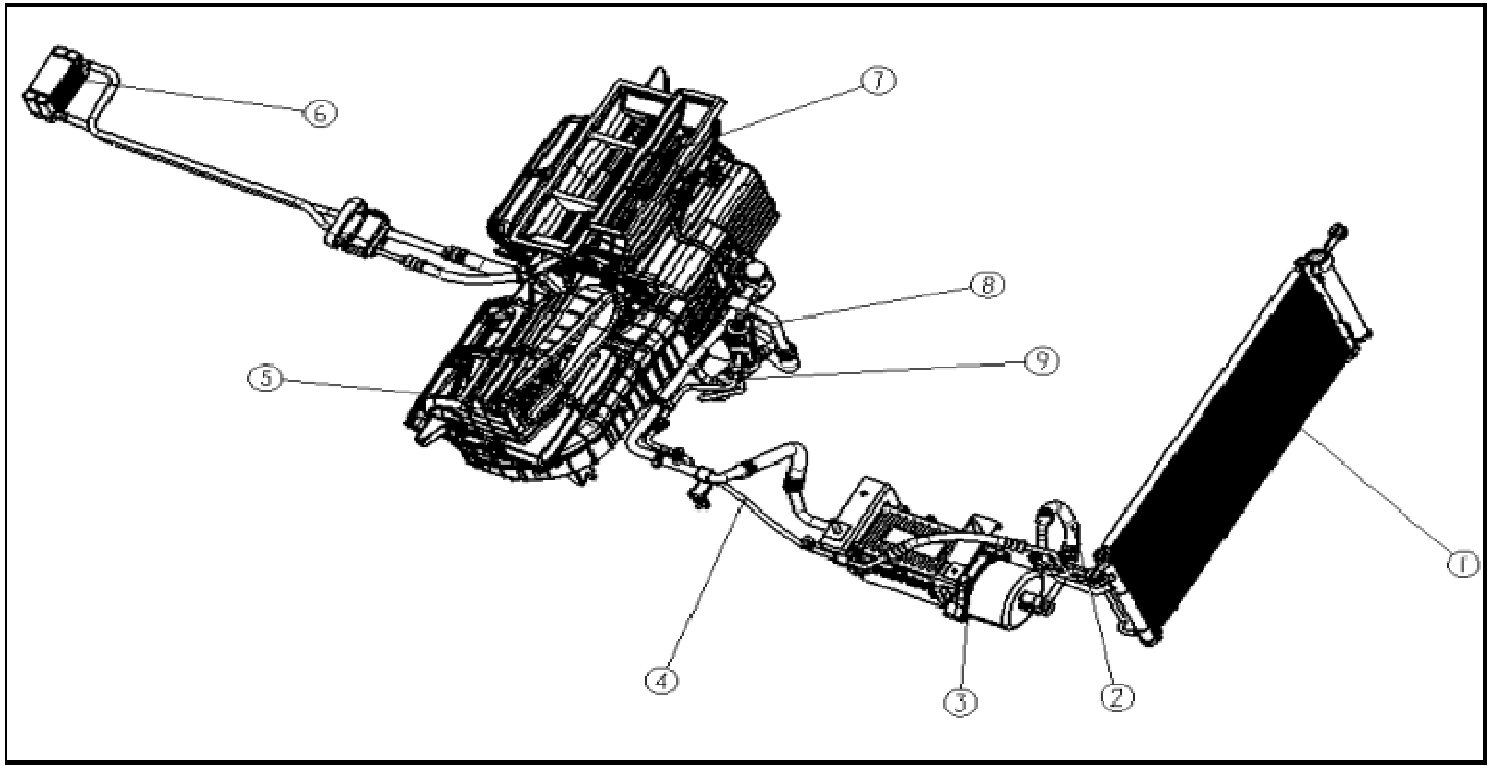
EVO 3 electric
A/C System

Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

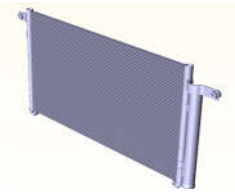
1 Overall structure

- System Structure



1 Condenser 2 Exhaust Pipelines Assembly 3 Compressor Assembly 4 Pipes and Expansion Valve Assembly 5 Blower Evaporator 6 Battery Evaporator 7 Wind Heater 8 Pilot Cabin Electromagnetic Valve 9 Battery Electromagnetic Valve

2 Main components

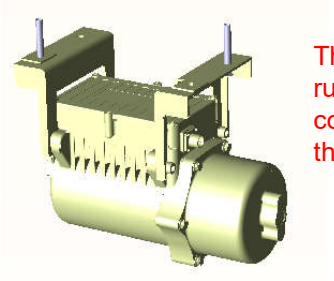


Condensor

Cooling Compressor exhausts high-temperature high-voltage cooling gas, and will turn into liquid. The heat the cooling gas gives out will be taken away by the air.

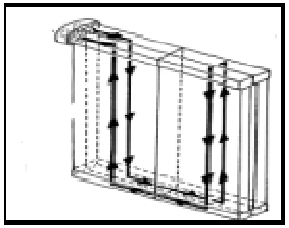
Pipelines and Expansion Valve

The high-voltage coolant flowing from the Liquid-storing Dryer spouts out of the hole of the Expansion Valve,after expanding rapidly, it changes from liquid into low-pressure fog.



Compressor

Through making the electric motor running, it drives the vortex plate to compress, which provides power for the cooling recycle.



Evaporator

The coolant, whose flow has been limited and pressure reduced, absords heat in the Evaporator and boils. The heat in the air is absorbed by the coolant, the blower blows the cooled air into the pilot cabin constantly to lower the temperature.

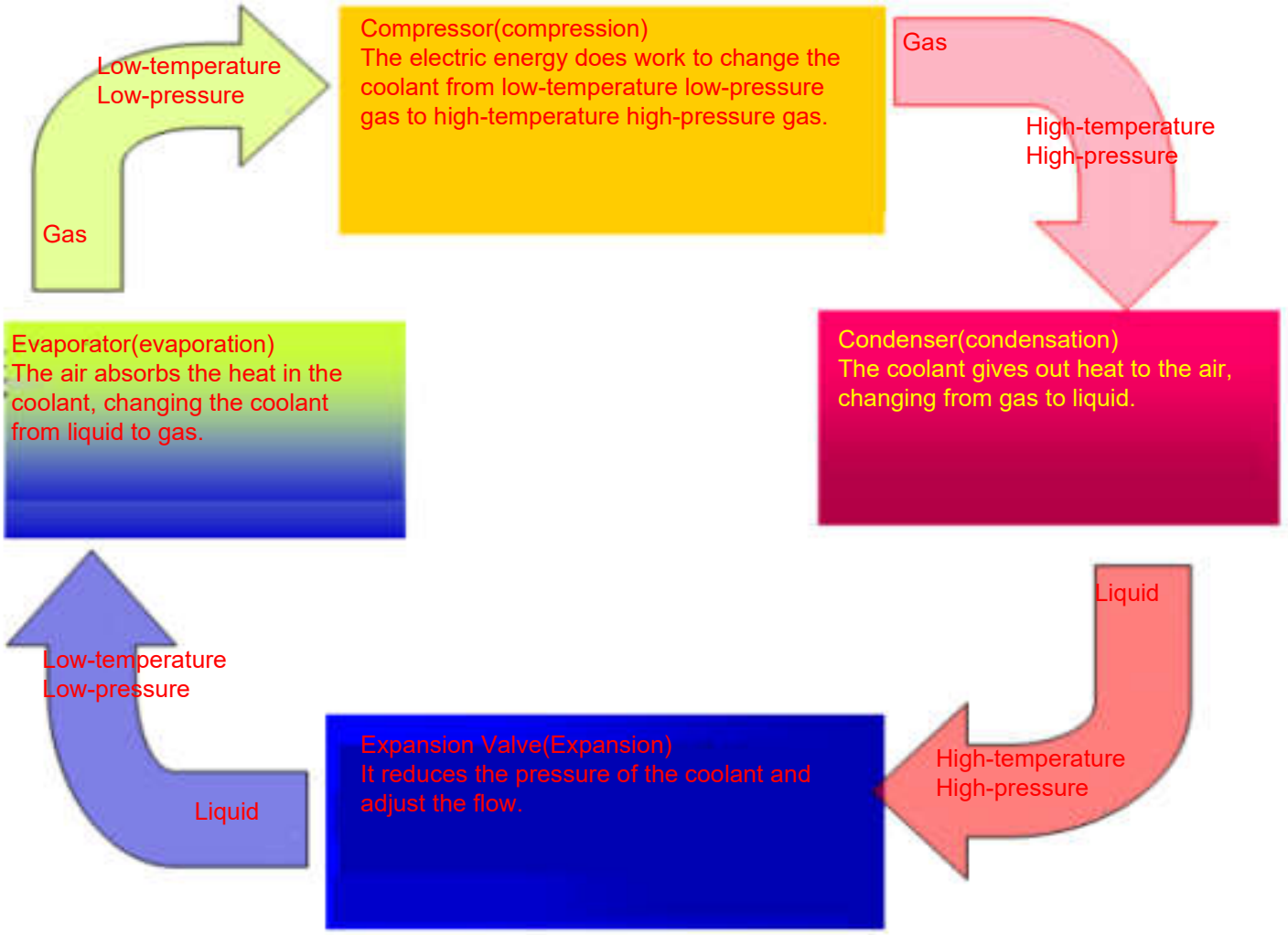
A/C Controller

A/C Controller receives the A/C requiring signal from the touching pad, collects the signal of temperature inside and outside the vehile etc, and controls the actuator of the A/C system to work.

Liquid-storing Dryer

Liquid-storing Dryer is abbreviated as Liquid Storer. The pupose of using it is to prevent excessive liquid-state coolant staying in the Condenser, which will reduce the heat dissipation area and reduce efficiency. It can also filter the coolant and absorb the water inside it, preventing the cooling pipelines from blockage and ice, and can protect pipelines from corrosion.

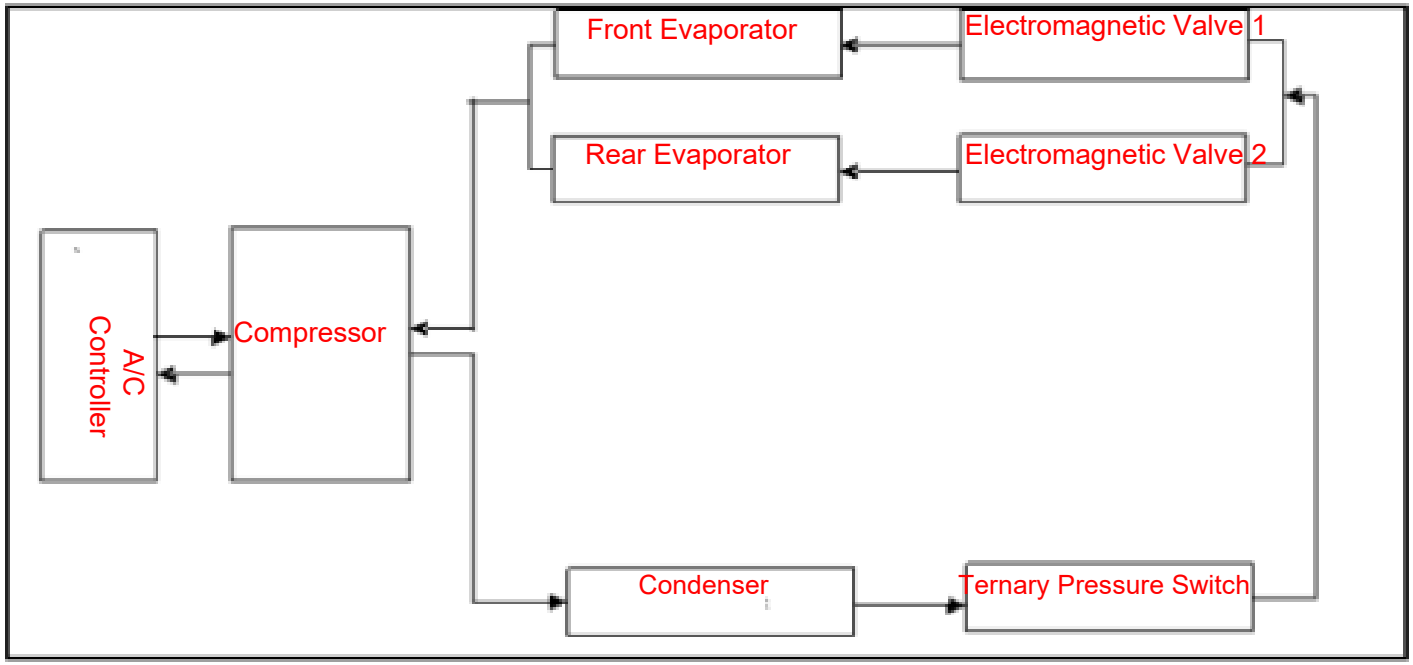
2 Main components



3 Principle

- Cooling System

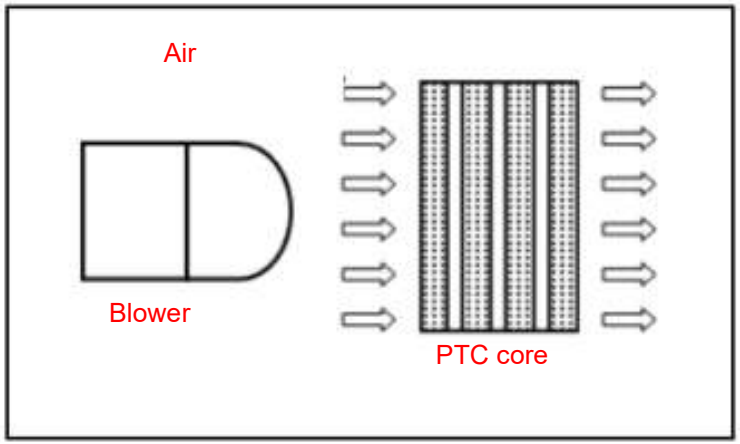
A/C System includes Compressor, Condenser, Front Evaporator, Ternary Pressure Switch, Rear Evaporator, Electromagnetic Valve, A/C Controller and Pipelines etc. It is composed by 2 sets of cooling circuits, each is controlled by the Electromagnetic Valve.



3 Principle

- Heating System

Heating System includes Blower and PTC Electric Heater Core. The air is blowed by the Blower through the Electric Heater Core, which heats the air and realizes the function of heating.



4 Maintenance Points

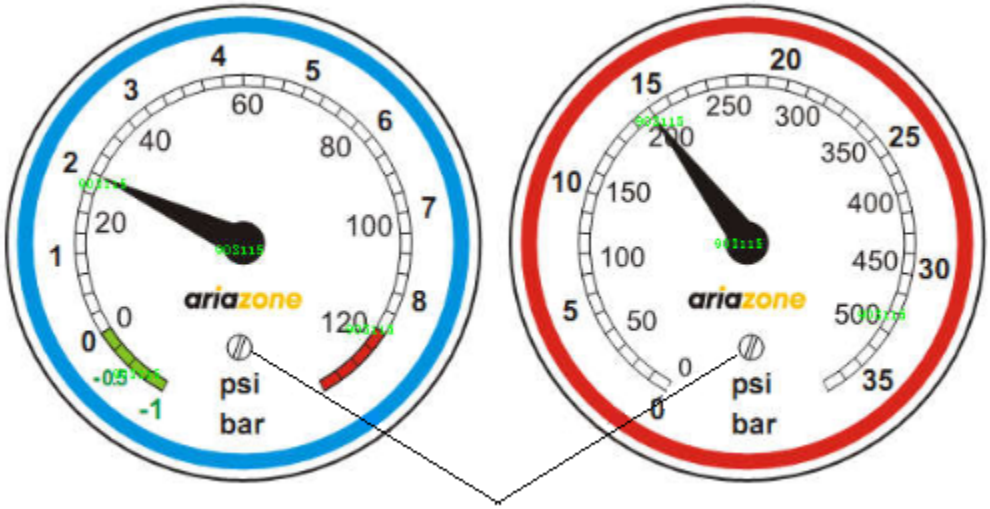
- **Comprehensive Analysis of Refrigerating System**

There are 4 comprehensive aspects to diagnose AC system:
1.to look(the surfaces of every equipments in system)
2.to listen(voice while machine is working)
3.to touch(to feel the temperature of every euquipments)
4.to measure(relevant parameters with Piezometer, Thermometer, Multimeter, Leak Detector)
Meanwhile ask the driver about the faults details to decide if it is man-made or caused by equipment faults. If it is man-made, teach the driver the proper way to operate; if it is caused by equipment faults, troubleshoot as steps above.

4 Maintenance Points

1. Pre-check of the Pressure Gauge

When using, check the Pressure Gauge frequently. Make sure the hands of the high-pressure gauge and the low-pressure gauge stay at the 0 point. If not, use the flat-end screwdriver to adjust it.



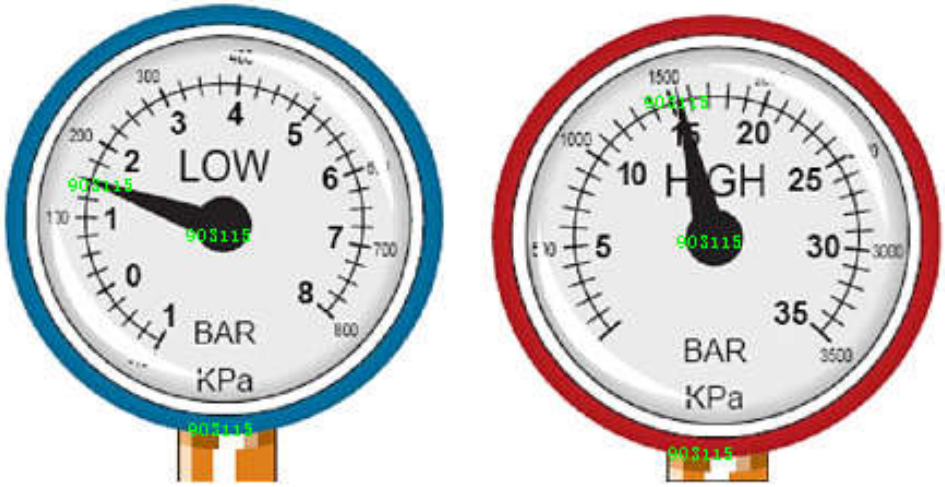
Low-pressure Gauge Adjusting Screw High-pressure Gauge

4 Maintenance Points

2. Standard Pressure

Connect the Pressure Gauge, turn on the A/C Cooling System for 15mins, check the gauge when the wind is blowing steadily.

When the cooling system is working normally, the standard pressure is: low-pressure1.5~2.5bar high pressure 15~20bar.



4 Maintenance Points

3. Coolant Leakage

(1) Phenomenon

As showed below, low-pressure and high-pressure are both lower than standard value, and you can feeel the wind isn't cool enough.

(2) Casue

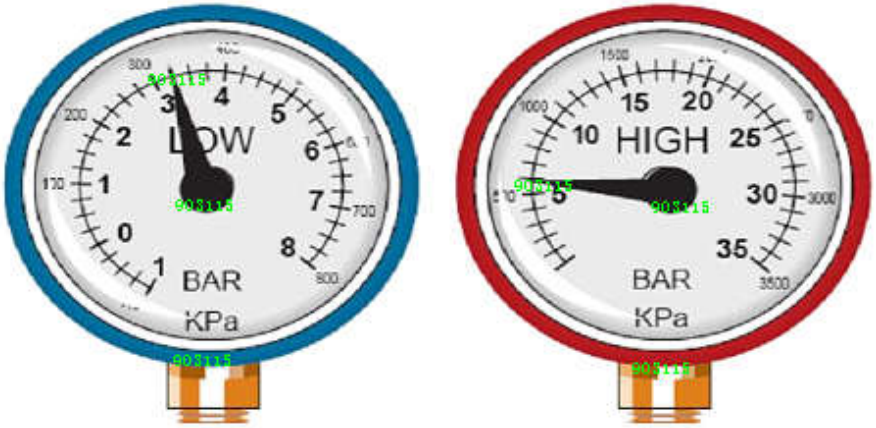
Coolant shortage, low flow or leakage.

4 Maintenance Points

4. Compressor Fault

(1) Phenomenon

Low-pressure is higher than normal, high-pressure is lower than normal; Compressor has noises; When touching the high-pressure pipe, it isn't warm enough.



(2) Cause

Mechanical fault of Compressor; Blockage between inlet pipelines and Pressure Gauge; Blockage in the Liquid-storing Dryer.

4 Maintenance Points

5. Expansion Valve Blockage

(1) Phenomenon

Low-pressure is lower than normal, even close to vacuum, high-voltage is lower than normal value ; The wind isn't cool enough, just a little cool, yet low-pressure pipe may has already frosted.

(2) Cause

Blockage in Expansion Valve.

4 Maintenance Points

6.Blockage in High-pressure End

(1) Phenomenon

Low-pressure and high-pressure is lower than normal; The wind isn't cool enough; There is lots of water drops or frost after the blockage point.

(2) Cause

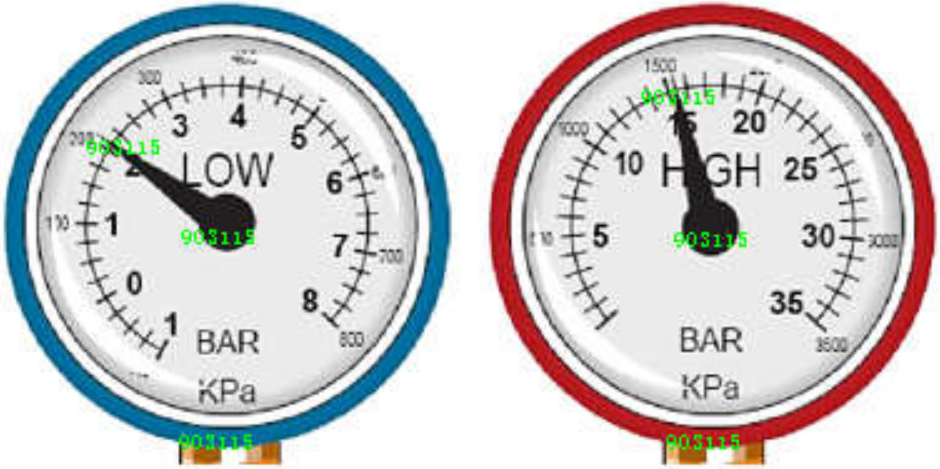
Blockage in high-pressure pipelines.

4 Maintenance Points

8. Excessive Water in the System

(1) Phenomenon

Low-pressure is lower than normal, even close to vacuum, high-pressure is normal; The wind is not steady; Sometime cool, low-pressure pipelines may has frost.



(2) Cause

Excessive water in the system, causing ice inside the pipelines or the Expansion Valve.

4 Maintenance Points

- **Diagnostic Tools**

From Diagnostic Tools you can know:
rotating speed, power, voltage, evaporator temperature, temperature inside the vehicle, requiring temperature and the state of fan.

5 Typical faults

Phenomenon	Possible Cause	Solutions
No coolant in A/C system	Coolant leakage	See: 1)Check if there is any oil, if so, the leakage happens.2)Check if there is any breakage at the surface of condenser or evaporator.
		Vacuum: Vacuum the cooling system, listen if there is any noise, if so, the leakage happens.
		Instrument: 1) Electric Leakage Tester 2) Dyestuff Tracing Leakage Tester
Compressor Lubricant Shortage	Replace, refill as required	First confirm the compressor lubricant specifications, can not be mixed, compressor lubricant for POE
		After recycling coolant, refill 30ml.
		Replace Compressor, pour out all lubricant and refill 120ml.
		After replacing pipelines: refill 30ml.
		After replacing condenser: refill 60ml.
		After replacing evaporator: refill 50ml
		After replacing desiccant: refill 10ml
Wind Flow Abnormality	No wind from A/C	Circuit fault: 1)Check the Blower circuit and if there is any loosen connector. 2)Replace the fuse if it is broken. 3)Replace the relay if it is broken.

5 Typical faults

Wind Flow Abnormality	No Wind from A/C	Mechanical Fault:1)Replace the Blower if it is broken. 2)Replace the Temperature Windgate Equipment if it is broken. 3)Replace the A/C Controller if it is broken. 4)Replace the Speed-adjusting Module if it is broken.
	Little Wind from A/C	Check the battery voltage.
		Check if the Windgate has fault and the grille has opened.
		Check the Speed-adjusting Module.
		Chekc if there is any bloackage.
		Check if the Blower is running reversely.
Fail To Refrigerate	Compressor Fault	Check if there is pressure signal, if not, replace the A/C pipelines.
		Check if there is any mechanical problem inside the compressor.
Poor air conditioning	Insufficient refrigerant	Test whether the pressure is within the normal range;If the refrigerant is insufficient, add the filling refrigerant.
		Whether there is micro leakage in the air conditioning system, if there is, check for leakage.
	Excessive lubricating oil of compressor	Eliminate excess compressor lubricating oil and add adequate compressor lubricating oil.
	Abnormal compressor	If the compressor does not reach the normal working speed, replace the compressor.

5 Typical faults

The air conditioning system has no heating	PTC is not working	PTC core is damaged，replace heater assembly
		PTC connectors are not in good contacting replace heater assembly
	Air conditioning without blowing	Refer to "abnormal air volume" check.
	Control failure	Air conditioning controller temperature regulation damage, unable to adjust the temperature valve to maximum heating, replacement of air conditioning controller
There is abnormal noise in the air conditioning system	Abnormal sound of pipeline expansion valve	After turning on the air conditioner, adjust or replace the expansion valve if there is a flowing "chirp" sound in the position of expansion valve.
	Abnormal noise from the damper mechanism	Whether there is resistance when adjusting the damper mechanism, whether there is a "tick" or "gurgle" sound, if there is this phenomenon, in the damper mechanism grease or replace the parts of the mechanism.
	The blower sounded strangely	Abnormal sound in the blower volute: 1) there is a "rumble" sound to confirm whether the blower motor has been reversed, replace the wiring harness or adjust the connector terminals;2) replace the blower motor with "crunch" or "sizzle" sound;3) there is a "bang" sound. If there is any foreign matter in the volute, remove, check and handle it.
		Whether the blower is not firmly installed, generating vibration abnormal sound.

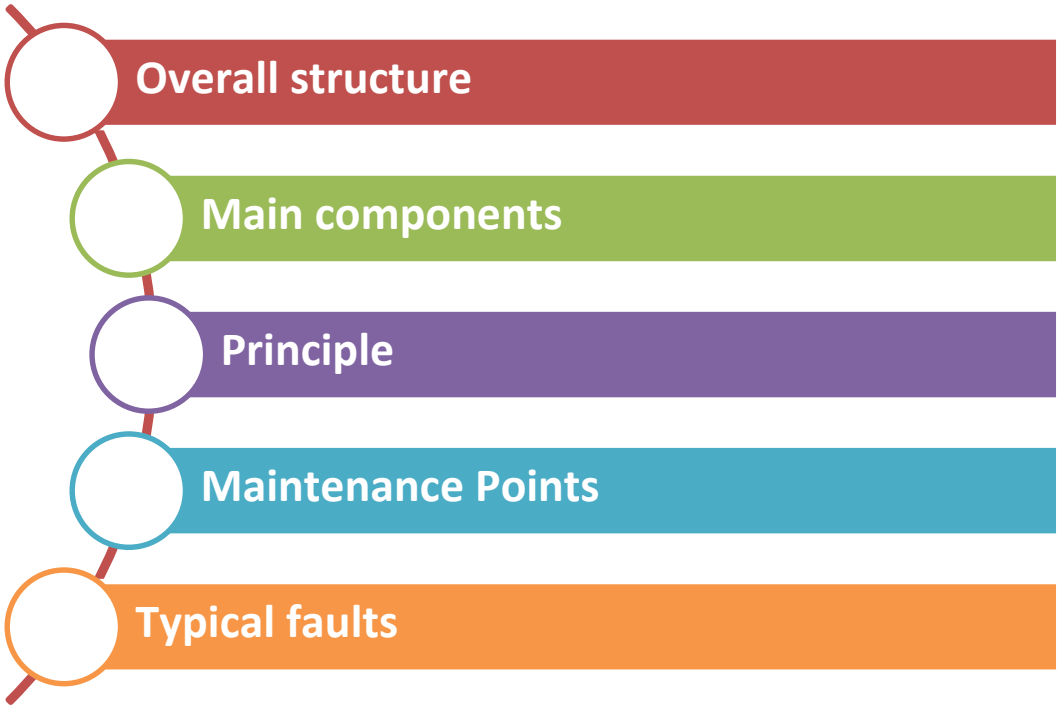
5 Typical faults

Frequently Asked Question	fault	Confirmation method	phenomenon
Compressor not working	Compressor controller itself fault	Check whether the compressor's control connection key and circuit are in good condition, and connect the 12V power supply to see whether the relevant indicator light can work normally.	
	Compressor controller power is not connected	Measure whether the 12V power supply is connected. If not, check whether the wiring harness is correct	
Compressor controller is not working normally, the compressor is not working	Compressor controller ON/OFF, speed signal, can-h, can-l and other signal lines are wrong connected	Check whether the output signal of the control module is normal.If not, debug the control module and check the circuit;If normal, check that the signal lines are properly connected	Although the compressor controller light is displayed, the compressor controller cannot normally control the start and stop.
	No or missing HVDC power supply	Check whether the high voltage is connected, check whether the hv-box output voltage is normal, if not, adjust the line;If normal, check whether the high voltage connector with the compressor controller is correctly connected	
	Wrong connection of three-phase power cord	Check whether the three-phase power output is normal and the connection is correct	
Condenser fan, compressor, compressor controller not working		If the refrigerant is normal, check whether the 12V power supply connected by the condenser fan is normal. If it is normal, replace the condenser fan. If not, check whether the condenser fan relay is normal and the air conditioning control module is connected normally	

Service Training Materials

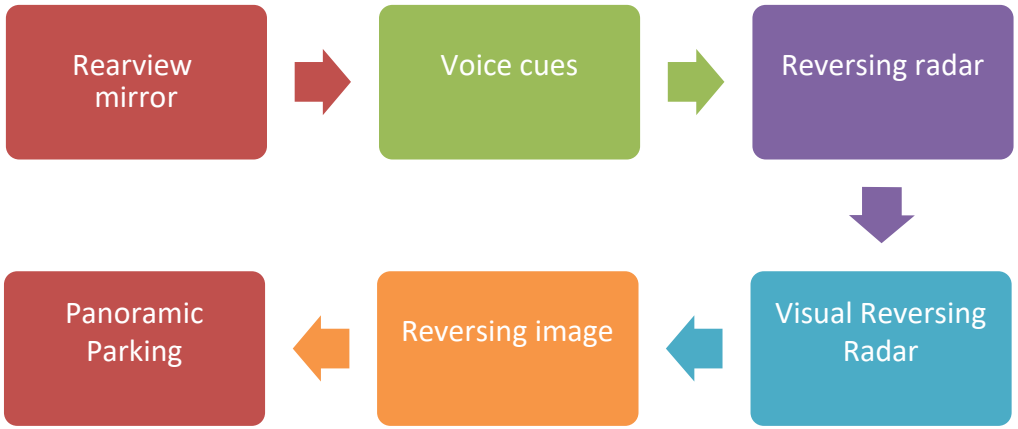
EVO 3 electric
Around View Monitor

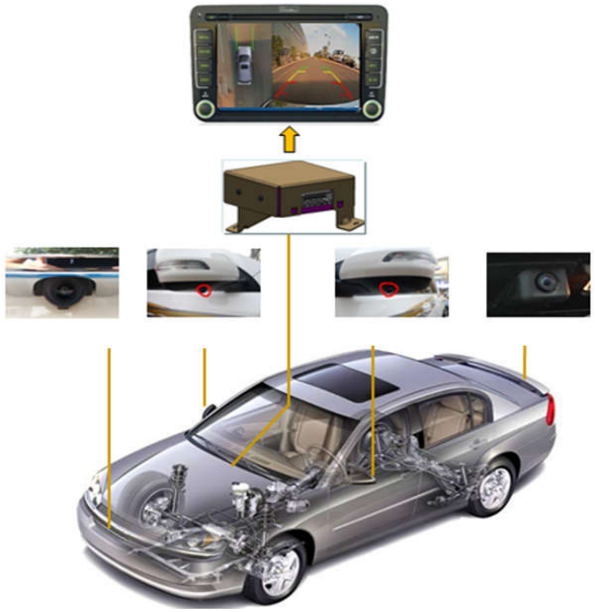
Catalog


Overall structure
Main components
Principle
Maintenance Points
Typical faults

1 Overall structure

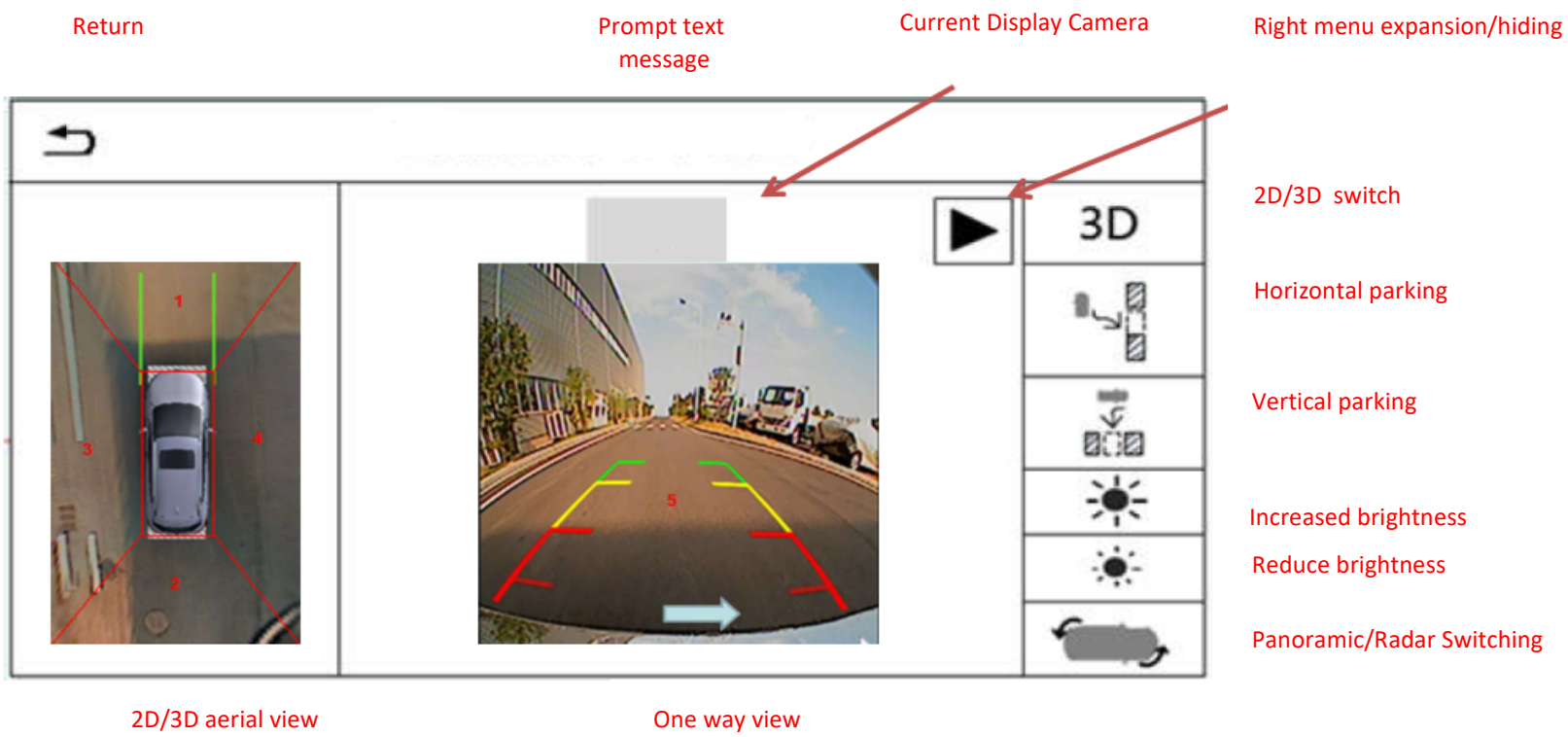
Four wide-angle cameras are installed around the vehicle, which can cover the surrounding area of the vehicle. The multi-channel video images collected at the same time are processed into a 360-degree view of the car body. Finally, they are displayed on the MP5 screen, so that the driver can clearly see whether there are obstacles around the vehicle and know the relative orientation and distance of the obstacles.





1 Overall structure

Multiple start/close modes (operation of AVM keys, hang-ups, speed information), multiple view modes (2D + one-way view, 3D + one-way view、 Front-looking vehicle auxiliary line, rear-looking vehicle auxiliary line), and fault display function.



1 Overall structure

- Various view switching in 2D aerial view+ one-way view mode

e. When selecting the "1" area in Figure 1, (non R gear & non turn on left / right light) is shown as 2D aerial view + forward view (default view);
f. When selecting the "2" area in Figure 1 or hanging R gear, it is shown as 2D aerial view + rear view.
g. When selecting the “3" area in Figure 1 or turn on left light, it is shown as 2D aerial view + left view.
h. When selecting the “3” area in Figure 1 or turn on right light, it is shown as 2D aerial view + right view.

Example: Figure 2 shows case “b”

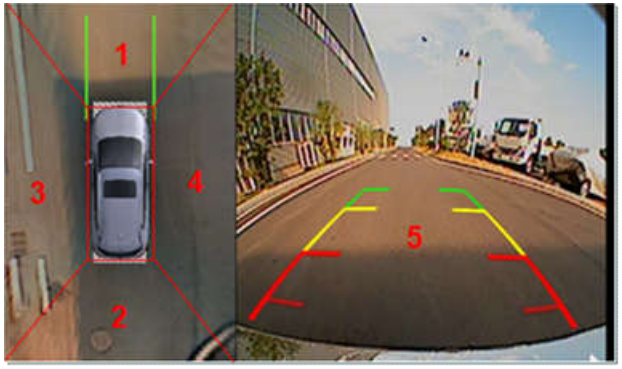


Figure 1: 2D aerial view + forward view

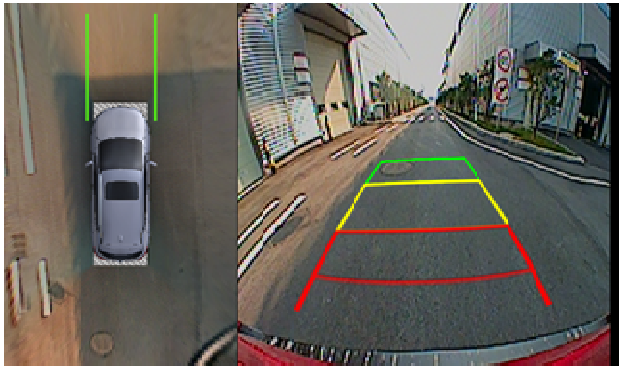


Figure 2: 2D aerial view + rear view

1 Overall structure

- 2D aerial view + single view / single full screen mode switching

c. In the aerial view + single view mode, switch to the current one-way full-screen view according to the "5" area

in Figure 1. It includes four views: front-view single-channel full-screen, rear-view single-channel full-screen,

d. Press the return key in the single full screen view to return the corresponding 2D + single view.

For example, when the "5" area in Figure 3 (the current view is 2D + forward-looking) is displayed as a forward-looking single-channel full-screen view, as shown in Figure 4.

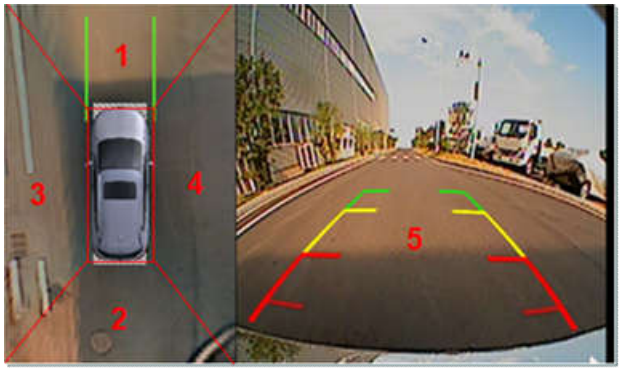


Figure 3: 2D aerial view + forward view

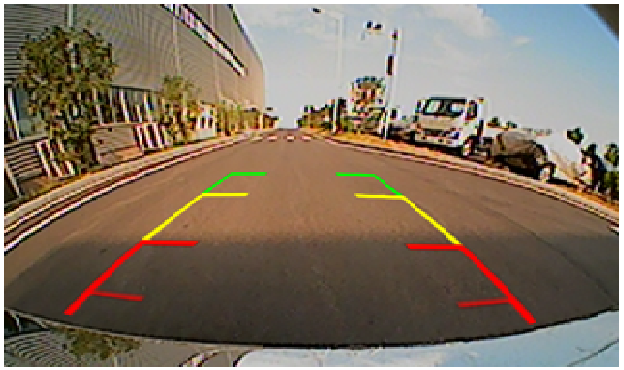


Figure 4 Front View Single-way Full Screen View

1 Overall structure

- 2D/3D mode switching

b. In 2D view mode, by touching the 2D/3D toggle button on the navigation screen, you can switch between 2D and 3D view, as shown in the following figure.

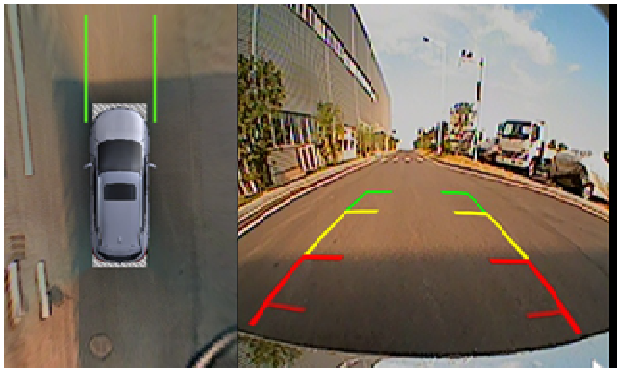


Figure 5: 2D aerial view + forward view

Figure 6 3D Front View Mode

1 Overall structure

- Panoramic screen switching 3D mode switching of various views

c. Switch the 3D view by right-left turn or reverse. When the left-right turn or reverse signal disappears, it returns to the 3D default view.

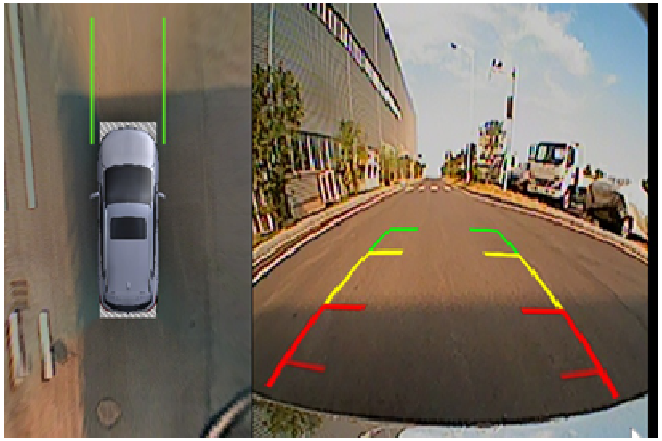
d. There are five cases. Turn left, turn right, reverse, turn left + reverse, turn right + reverse

For example, when the "5" area in Figure 3 (the current view is 2D + forward-looking) is displayed as a forward-looking single-channel full-screen view, as shown in Figure 4.

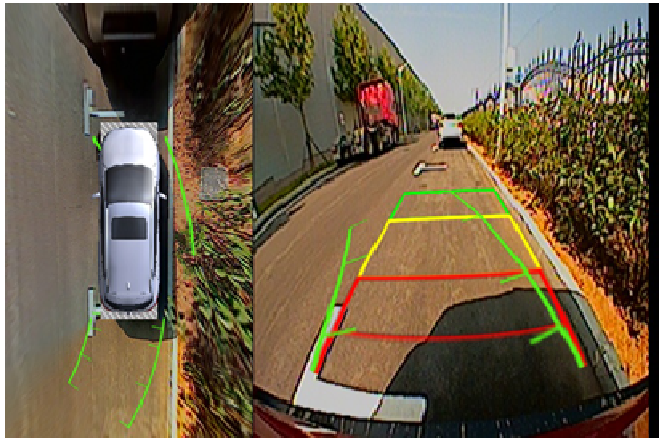
1 Overall structure

- Vehicle Auxiliary Line Function

c. Front Vehicle Auxiliary Line: Vehicle Auxiliary Line + Static Auxiliary Line in Single View in 2D Aerial View
d. Rear Vehicle Auxiliary Line: Vehicle Auxiliary Line in 2D Aerial View + Static Auxiliary Line in Single View + Dynamic Auxiliary Line in Single View



Front Vehicle Auxiliary Line Function



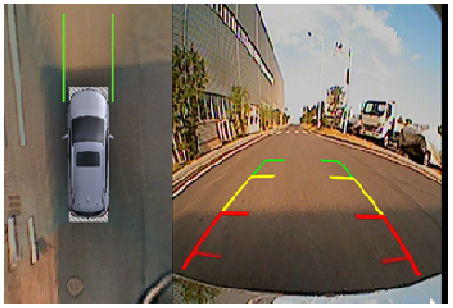
Rear Vehicle Auxiliary Line Function

1 Overall structure

- Technical Barriers to Panoramic Systems under Special Conditions

Noise points appear in night images

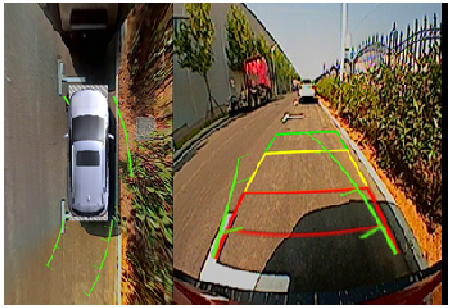
Spatial objects will not be visible at image mosaics



There are some blind areas in front and rear camera field of vision

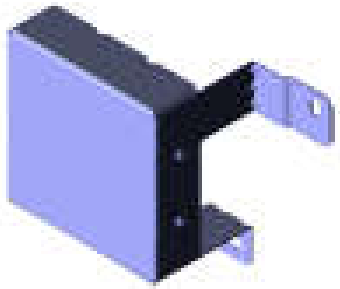
Misalignment of the same object at the joint

The reflective effect of accumulated water on rainy days is poor



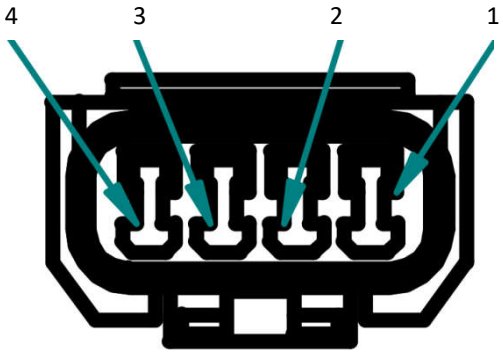
Over-stitching effect at the corner joints

2 Main components



1	CVBS output +		17	CVBS output -	
2	Rear camera input(+)		18	Rear camera signal input(+)	
3	Rear camera input(Ground)		19	Rear camera signal input(Ground)	
4	Front camera input(+)		20	Front camera signal input(+)	
5	Front camera input(Ground)		21	Front camera signal input(Ground)	
6	Right camera input(+)		22	Right camera signal input(+)	
7	Right camera input(Ground)		23	Right camera signal input(Ground)	
8	Left camera input(+)		24	Left camera signal input(+)	
9	Left camera input(Ground)		25	Left camera signal input(Ground)	
10	Panoramic Activation Key		26	NC	NC
11	Bus		27	NC	NC
12	Bus		28	NC	NC
13	NC	NC	29	NC	NC
14	NC	NC	30	NC	NC
15	NC	NC	31	NC	NC
16	Power input(+)		32	Power input(Ground)	

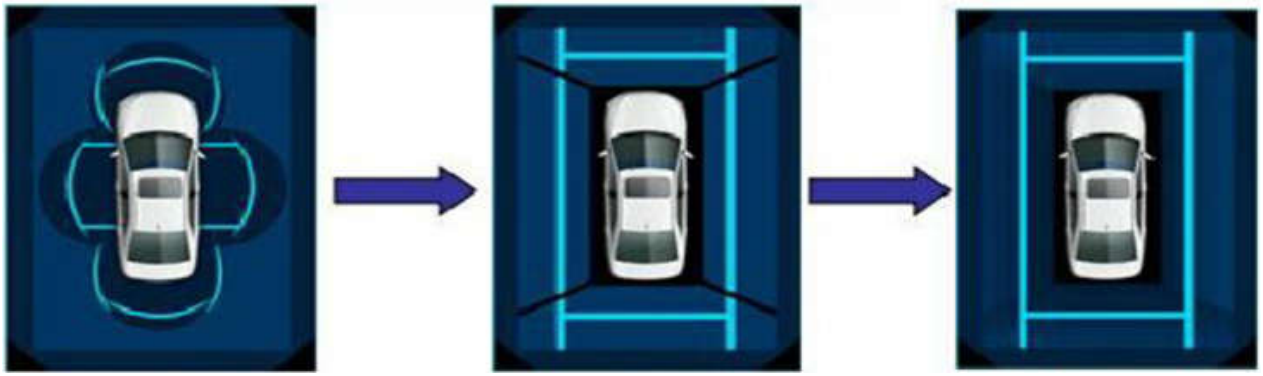
2 Main components



PIN	
1	Video+
2	Video-
3	GND
4	VCC

3 Principle

By installing four ultra wide angle cameras around the body and collecting images around the vehicle at the same time, and through the special "real-time image distortion reduction docking technology", image distortion reduction - > perspective conversion - > Image Mosaic - > image enhancement and other processing, a seamless panoramic aerial view is finally formed.

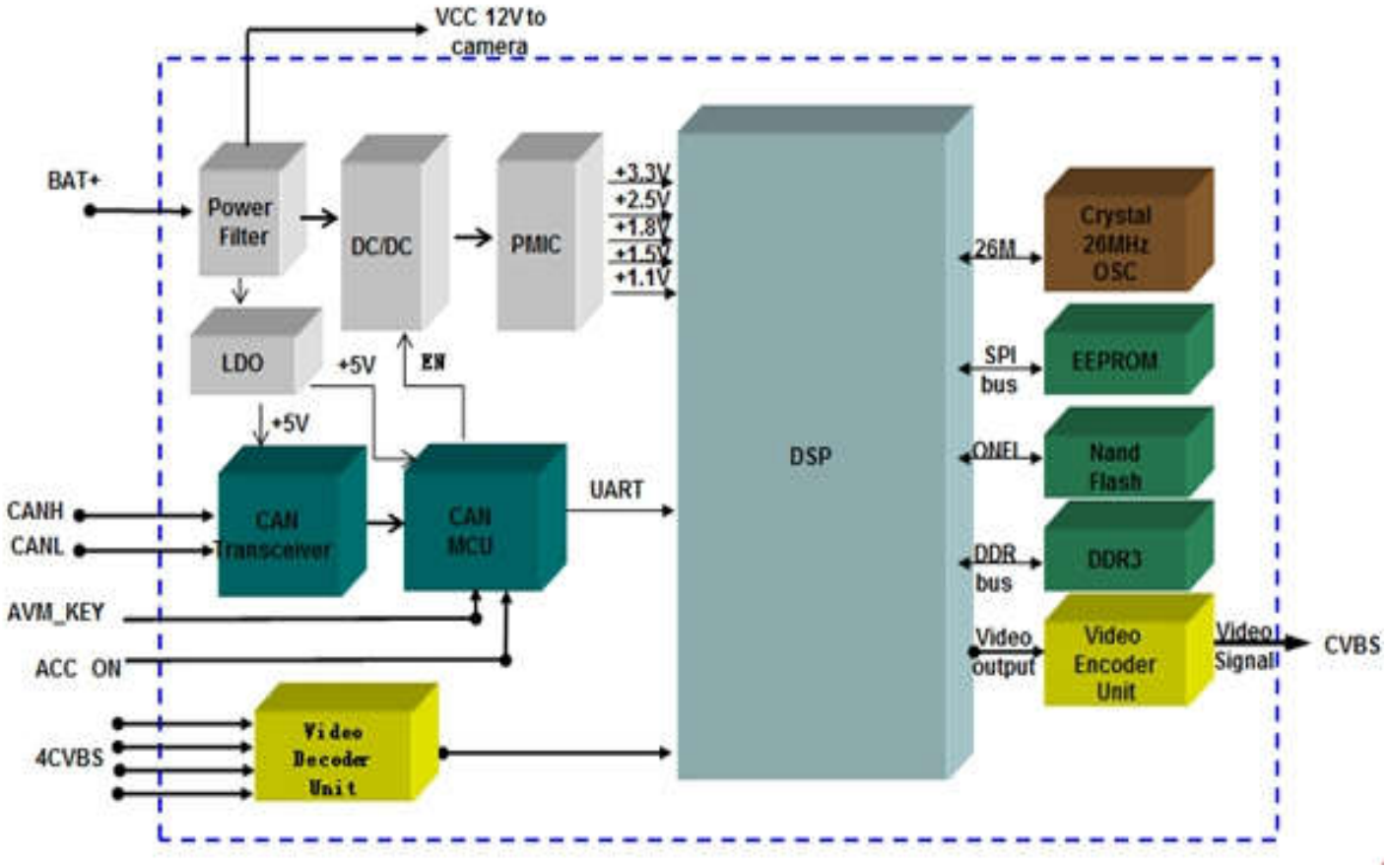


Real picture

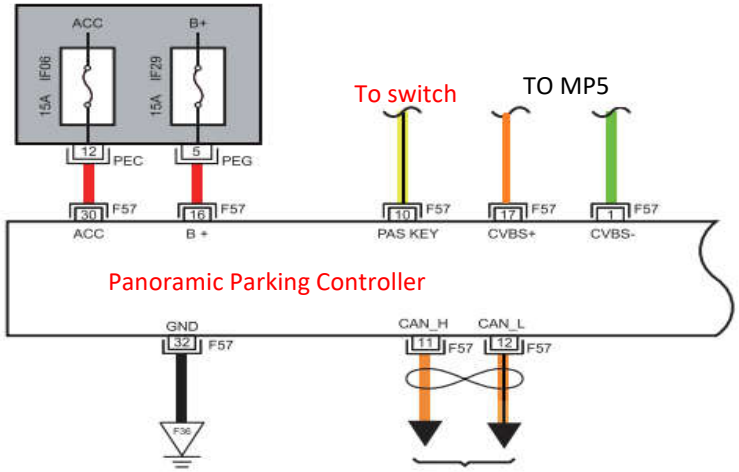
Correction of distortion

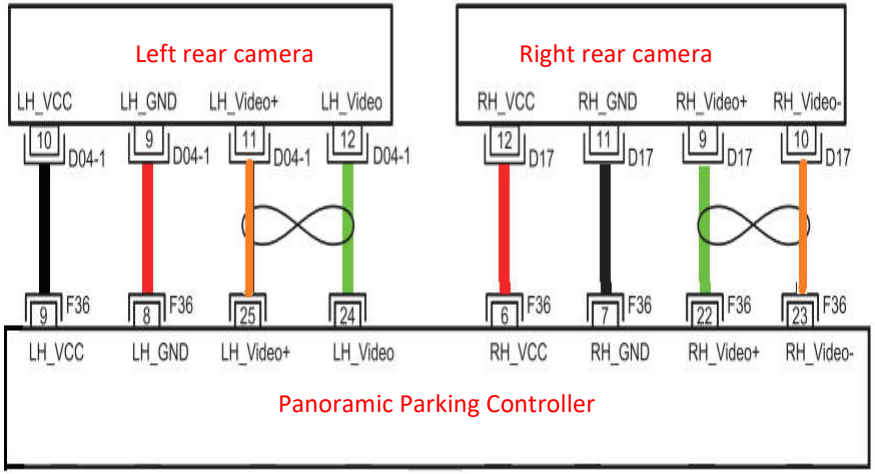
seamless splicing

3 Principle


VCC 12V to camera
BAT+
Power Filter
DC/DC
PMIC
+3.3V
+2.5V
+1.8V
+1.5V
+1.1V
LDO
+5V
EN
+5V
CANH
CANL
CAN Transceiver
CAN MCU
UART
AVM_KEY
ACC ON
4CVBS
Video Decoder Unit
DSP
26M
Crystal 26MHz OSC
SPI bus
EEPROM
ONFI
Nand Flash
DDR bus
DDR3
Video output
Video Encoder Unit
Video Signal
CVBS

3 Principle


ACC
B+
15A IF06
15A IF29
12 PEC
5 PEG
30 F57
16 F57
ACC
B +
To switch
TO MP5
10 F57
17 F57
1 F57
PAS KEY
CVBS+
CVBS-
Panoramic Parking Controller
GND
32 F57
F36
CAN_H
CAN_L
11 F57
12 F57


Left rear camera
LH_VCC
LH_GND
LH_Video+
LH_Video
10 D04-1
9 D04-1
11 D04-1
12 D04-1
9 F36
8 F36
25
24
LH_VCC
LH_GND
LH_Video+
LH_Video
Right rear camera
RH_VCC
RH_GND
RH_Video+
RH_Video-
12 D17
11 D17
9 D17
10 D17
6 F36
7 F36
22 F36
23 F36
RH_VCC
RH_GND
RH_Video+
RH_Video-
Panoramic Parking Controller

4 Maintenance Points

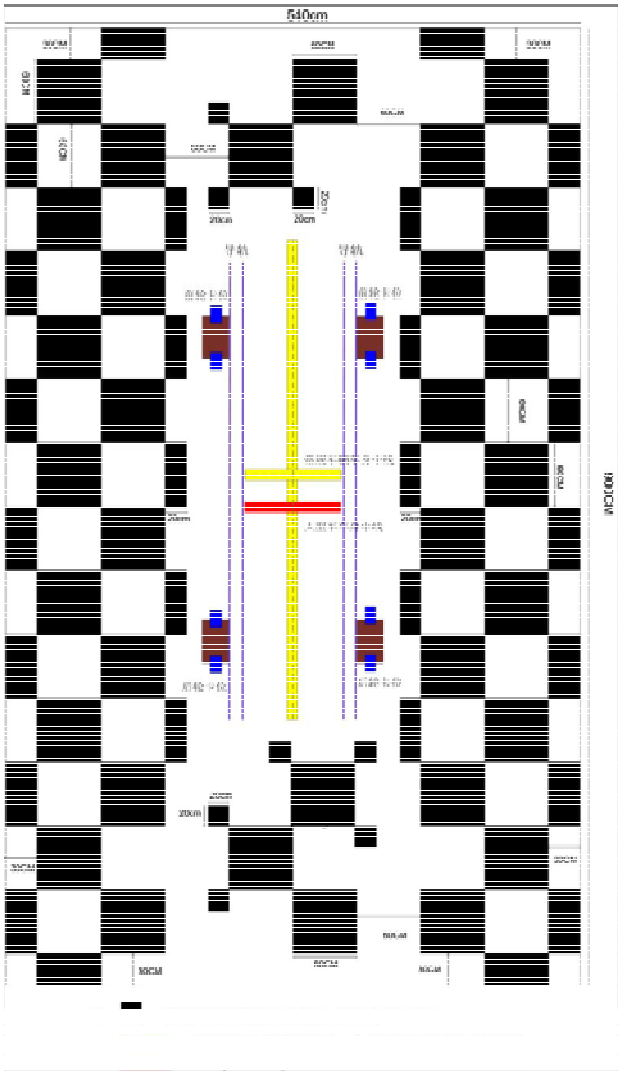
- System calibration

1. Adaptation: panoramic mosaic dislocation occurs when replacing camera or controller

2. Calibration Tool: Diagnostic Instrument, Calibration Cloth

3. Basic Conditions: Ground, Site Size, Illumination, Surrounding Block, Vehicle Status, Parking Position

4. Calibration method: automatic and manual



4 Maintenance Points

- System calibration

5. Site layout

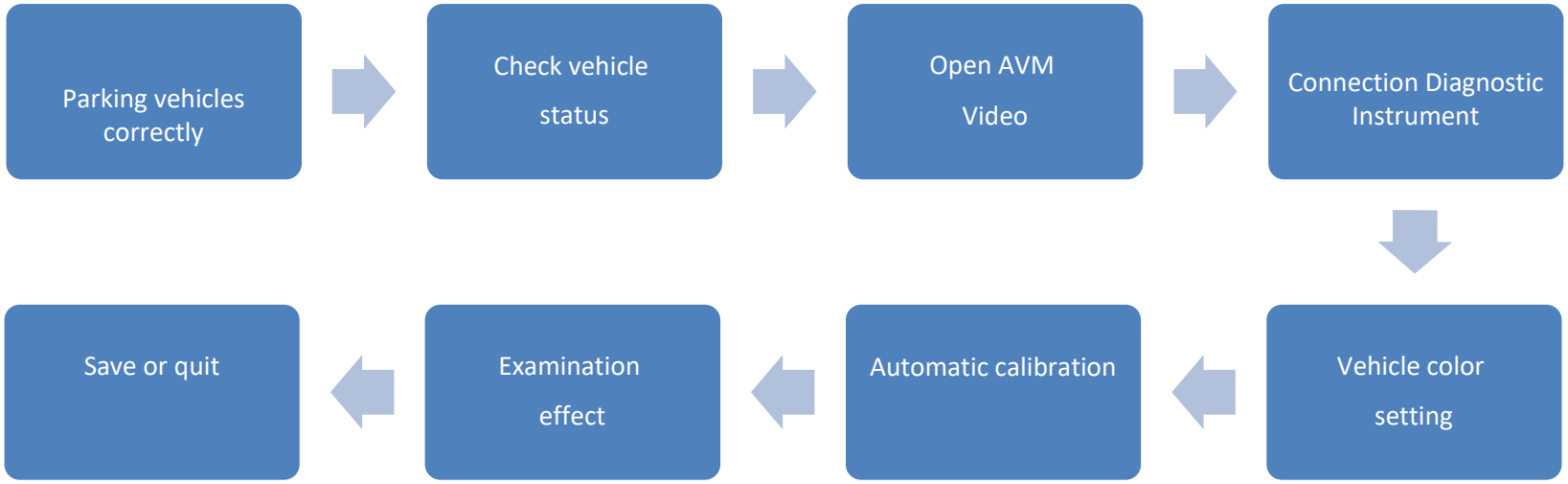
1 LED Light Source Left
2 guideway
3 Clipper
4 White checkerboard
5 Black checkerboard

Left guideway

4 Maintenance Points

- System calibration

6. Automatic calibration

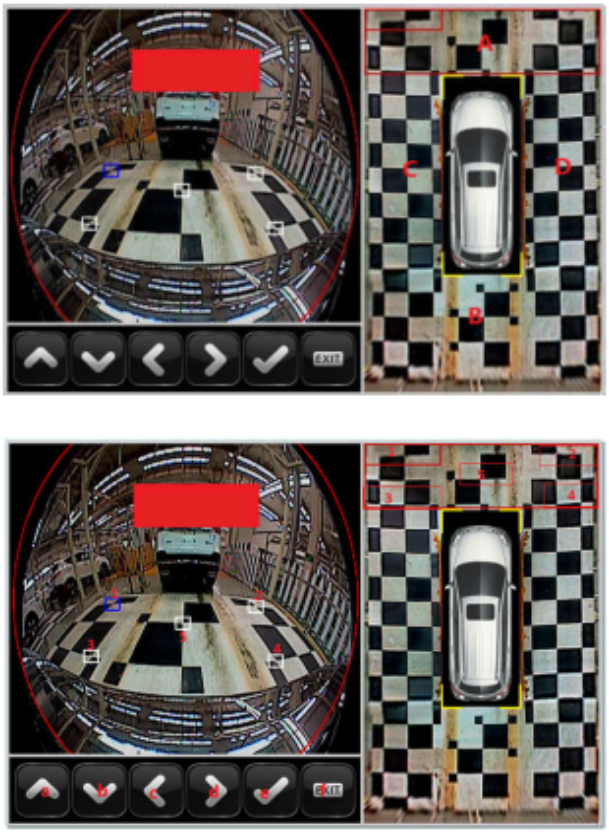


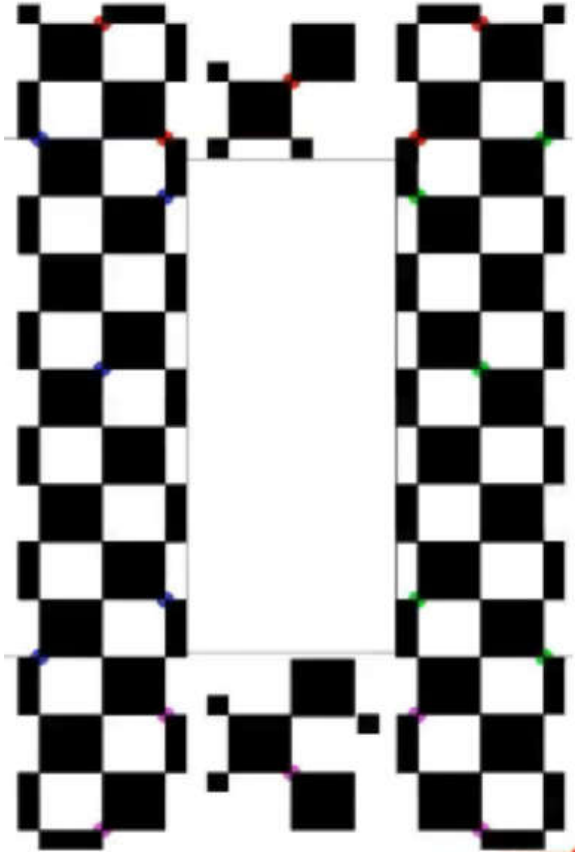
The main unsatisfactory calibration conditions are: door opening, trunk opening, speed not 0, camera failure, etc.

4 Maintenance Points

- System calibration

7. Manual calibration





- Select a camera area
- Five points were calibrated one by one. The position of the midpoint in the video is as consistent as possible with that of the point on the right.
- Calibration of other cameras one by one

4 Maintenance Points

- Fault Code

B100100	Front camera failture	B161300	Internal EEPROM failture
B100200	Rear(Back) camera failture	U014600	Miss gw fr01 message
B100300	Left camera failture	U018700	Miss mp5 fr02 message
B100400	Right camera failture	U007300	CAN Bus Off error
B100500	Front camera current above threshold	U007200	CAN rx or tx err
B100600	Rear camera current above threshold	B110100	ECU Voltage supply: high voltage
B100700	Left camera current above threshold	B110200	ECU Voltage supply: low voltage
B100800	Right camera current above threshold	B110300	AVM key is breakdown
B150000	Dsp communicate err		

5 Typical faults

Phenomenon: image mosaic effect becomes worse

Reason analysis:

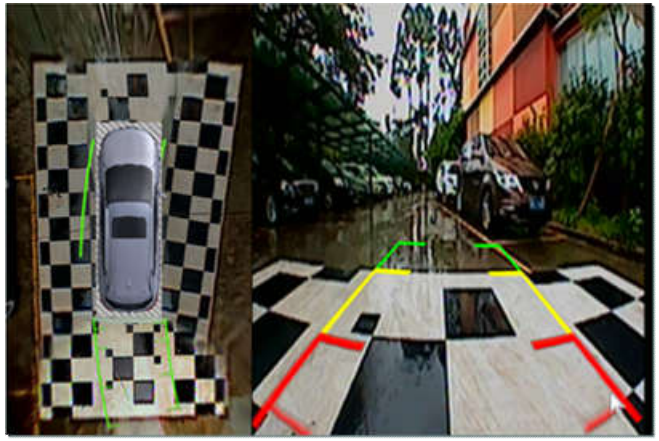
1、Change of camera installation position or angle in panoramic system

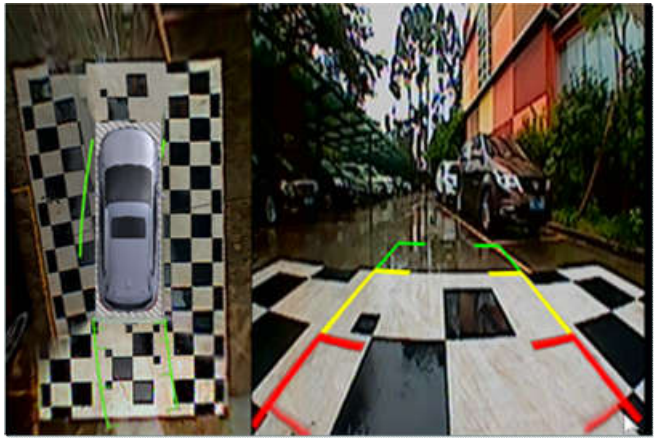
2、Left and right rearview mirror not corrected

Exclusion methods:

1、Re-calibration panorama

2、Rectify left and right rearview mirror to initial position





5 Typical faults

Phenomenon:

Reason analysis:

1、The camera surface is covered with snow, mud, water droplets, dirt, etc.

2、Icing on camera surface

3、Driving in stormy or foggy weather

4、Camera scratch

5、Camera damage

Exclusion methods:

1、Clean Camera

2、Thawing with warm brine

3、Use cautiously in rainy and foggy days

4、Replacement of Camera

5 Typical faults

Phenomenon:

Reason analysis:

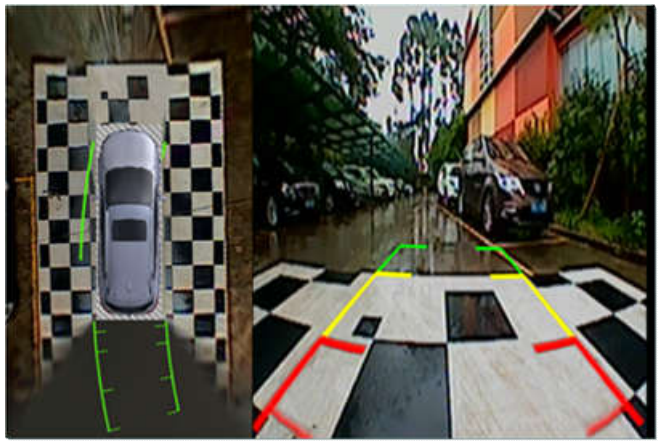
1、One or more of the camera wiring harnesses fell off

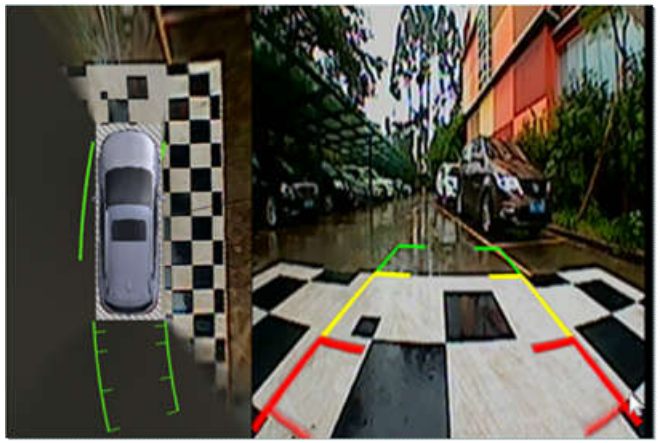
2、One or more of the cameras were damaged

3、The installation angle of one or more cameras exceeds the error.

Exclusion methods:

1、Check cameras or change cameras





5 Typical faults

Phenomenon:

Reason analysis:

1、Wire harness shedding, circuit breaking, poor contact or short circuit

2、Display screen failure

3、Controller failure

4、Abnormal battery voltage

Exclusion methods:

1、Contact professional maintenance

2、Check whether the display screen is out of order

3、Contact professional maintenance

4、Measuring Battery Voltage 8-16V as Normal

5 Typical faults

Phenomenon:

Reason analysis:

1、Display screen failure

2、Controller failure

Exclusion methods:

1、Please confirm if the display is malfunctioning.

2、If non-display failure occurs, please contact professional maintenance

5 Typical faults

Phenomenon: Severe water ripple appears in the image

Reason analysis:

1、Wire harness aging is serious or poor contact

2、Disturbance caused by wire harness being too close to other body appliances

Exclusion methods:

1、Replacement or maintenance of wiring harness

2、Wire harness should be far away from high-power appliances