



东风乘用车

# E70完整版热管理系统

# **E70 Complete Thermal Management System**



- 1、熟悉E70完整版热管理系统的功用
- 2、熟悉E70完整版热管理系统的工作原理
- 3、能对E70完整版热管理系统进行故障诊断与排除
- 4、掌握E70完整版热管理系统相关部件的拆装更换方法及维修注意事项





1. Familiar with the functions of the E70 complete thermal management system
2. Familiar with the working principle of the E70 complete thermal management system
3. Troubleshoot the E70 complete thermal management system
4. Master the removal and refitting and replacement methods and service precautions of the E70 complete thermal management system



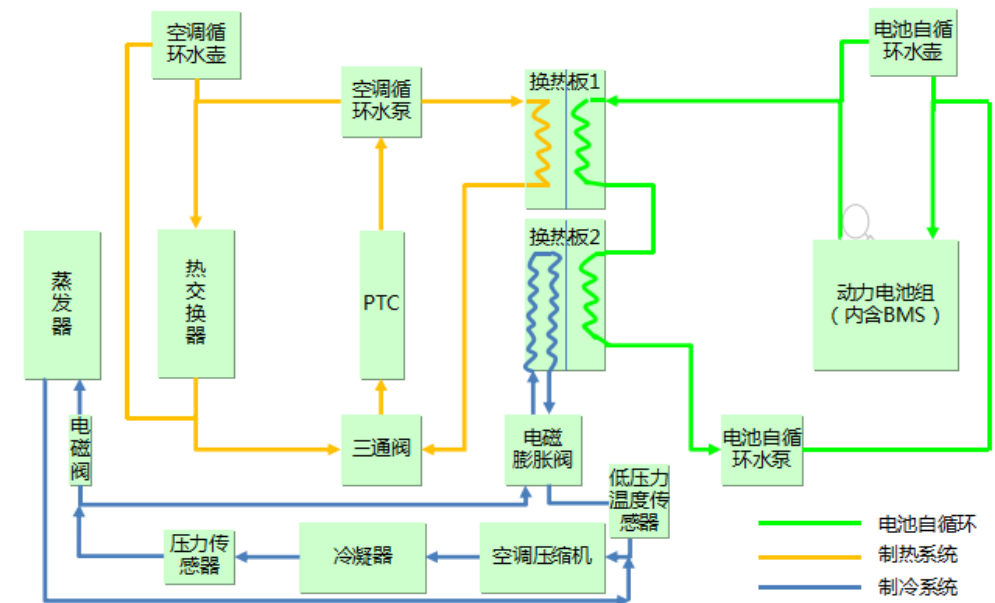
# 一、E70完整版热管理系统概述



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E70完整版热管理系统作用是解决充电问题同时保证电池工作在适宜的温度范围内，提升电池寿命。实现充电、行驶工况下，电池系统及乘员舱的温度管理。

完整版热管理系统是在空调系统回路中增加电池温控回路（制冷剂、冷却液）对电池组、乘员舱单独或同时进行冷却/加热，维持电池组正常工作温度。



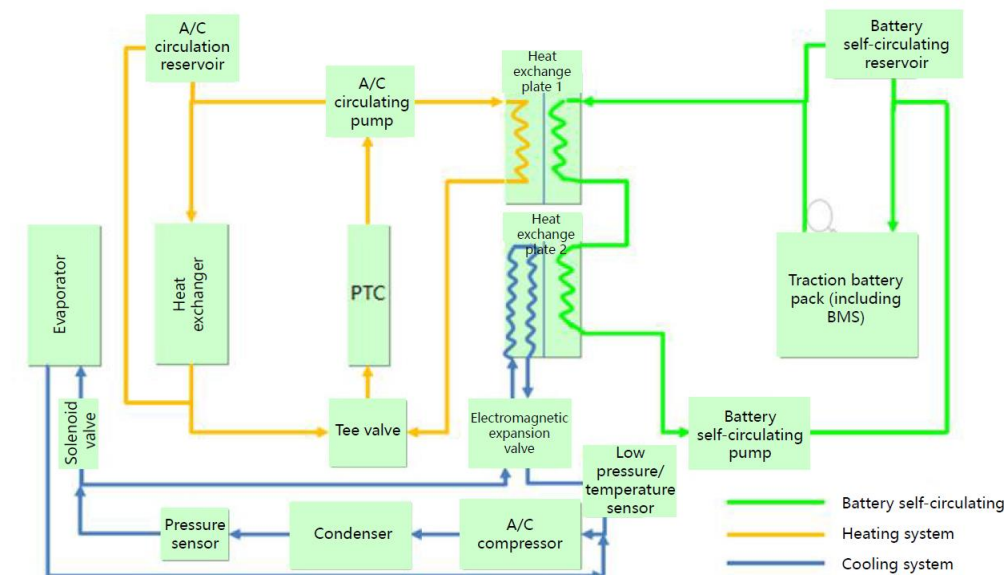
# I. Overview of E70 complete thermal management system



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The E70 complete thermal management system is intended to solve the charging problem while ensuring that the battery works within an appropriate temperature range and to improve the service life of the battery. It performs the temperature management of the battery system and the passenger compartment under the charging and driving conditions.

The complete thermal management system cools/heats the battery pack and the passenger compartment separately or simultaneously by increasing the battery temperature control loop (refrigerant, coolant) in the A/C system loop to maintain the normal operating temperature of the battery pack.



# 一、E70完整版热管理系统概述



## E70完整版热管理系统功能

功能描述		简化版 ( 互联版 )	完整版 ( 周年版 )
行车工况 ( 含怠速 )	乘员舱温控	√	√
	电池温控	×	√
	乘员舱、电池同时温控	×	√
		×	×
充电工况	乘员舱温控	×	√
	电池温控	√	√
	乘员舱、电池同时温控	×	√
控制方式	压缩机转速控制	额定转速	转速可调
	PTC功率控制	额定功率	功率可调
	暖风水泵控制	额定转速	额定转速
	电池水泵转速控制	额定转速	转速可调

变频控制，器件功率及转速自动调整，降低功耗，低温环境下续驶里程提升15~35km。

# I. Overview of E70 complete thermal management system



## Functions of E70 complete thermal management system

Function Description				Simplified version (Internet version)	Full version (Anniversary version)
Driving conditions (including idling)	Passenger compartment temperature control			√	√
	Battery temperature control			×	√
	Temperature control of passenger compartment and battery	Cooling		×	√
		Heating		×	×
Charging conditions	Passenger compartment temperature control			×	√
	Battery temperature control			√	√
	Temperature control of passenger compartment and battery			×	√
Control mode	Compressor speed control			Rated speed	Adjustable speed
	PTC power control			Rated power	Adjustable power
	Heater water pump control			Rated speed	Rated speed
	Battery water pump speed control			Rated speed	Adjustable speed

Variable frequency control and automatic adjustment of component power and speed reduce power consumption, and increase the driving range by 15~35 km in low temperature environment.

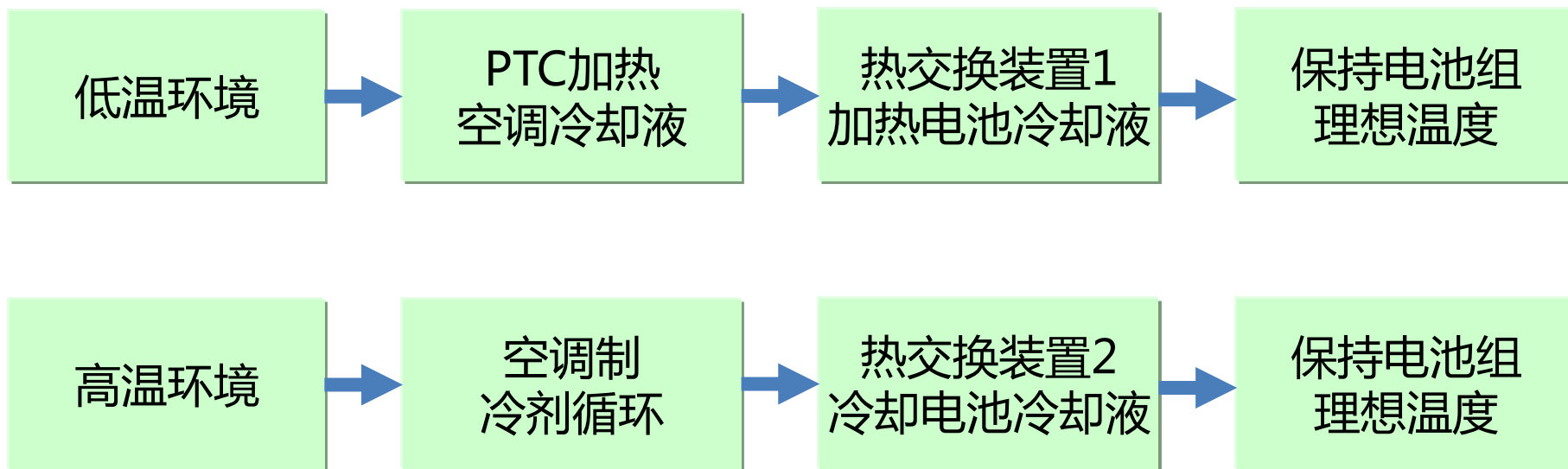


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## E70完整版热管理系统工作流程



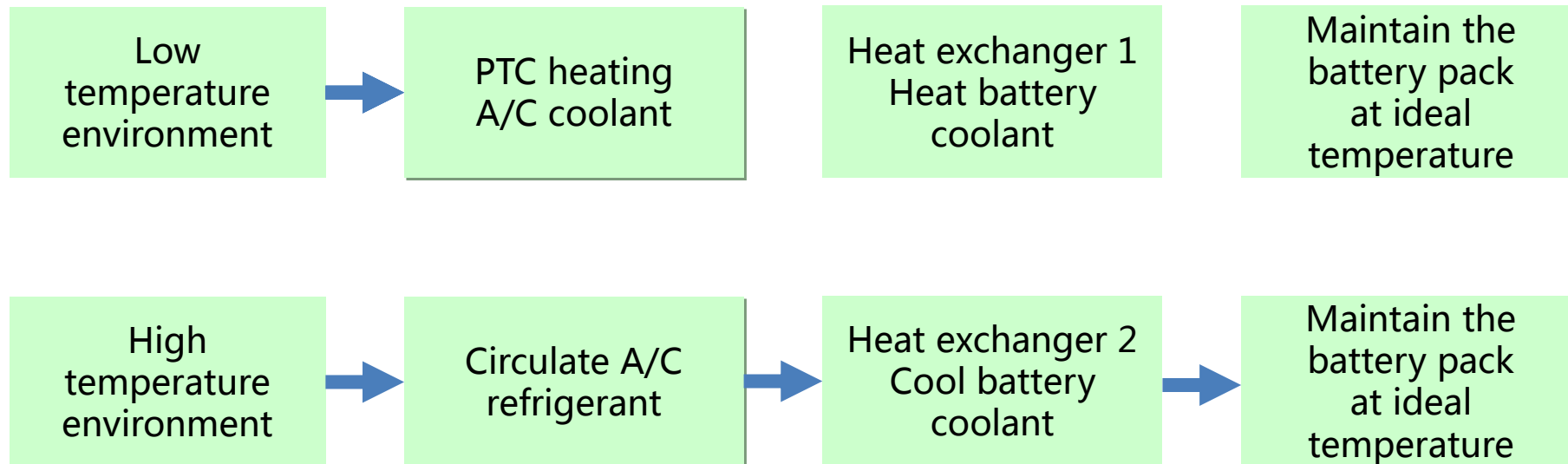
说明：乘员舱温控详见空调系统

# I. Overview of E70 complete thermal management system



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## Work flow of E70 complete thermal management system



Description: The passenger compartment temperature control is detailed in the section of A/C system.

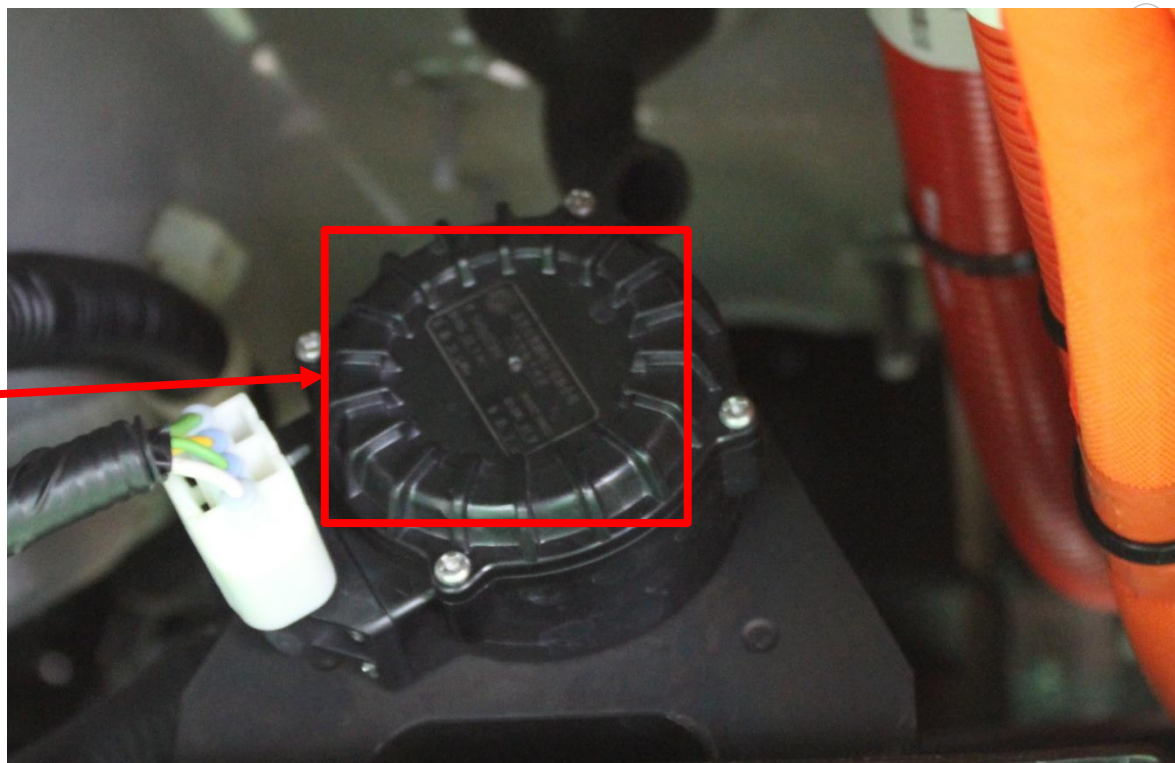
# 一、E70完整版热管理系统概述



## 电池组自循环水泵

电池组自循环水泵用于驱动电池组内部冷却液循环，在自循环模式下，根据电池冷却液入口温度控制电池组冷却液独立循环。**E70完整版热管理系统电池组循环水泵转速自动调整（无极式）。**

电池组循环水泵



# I. Overview of E70 complete thermal management system

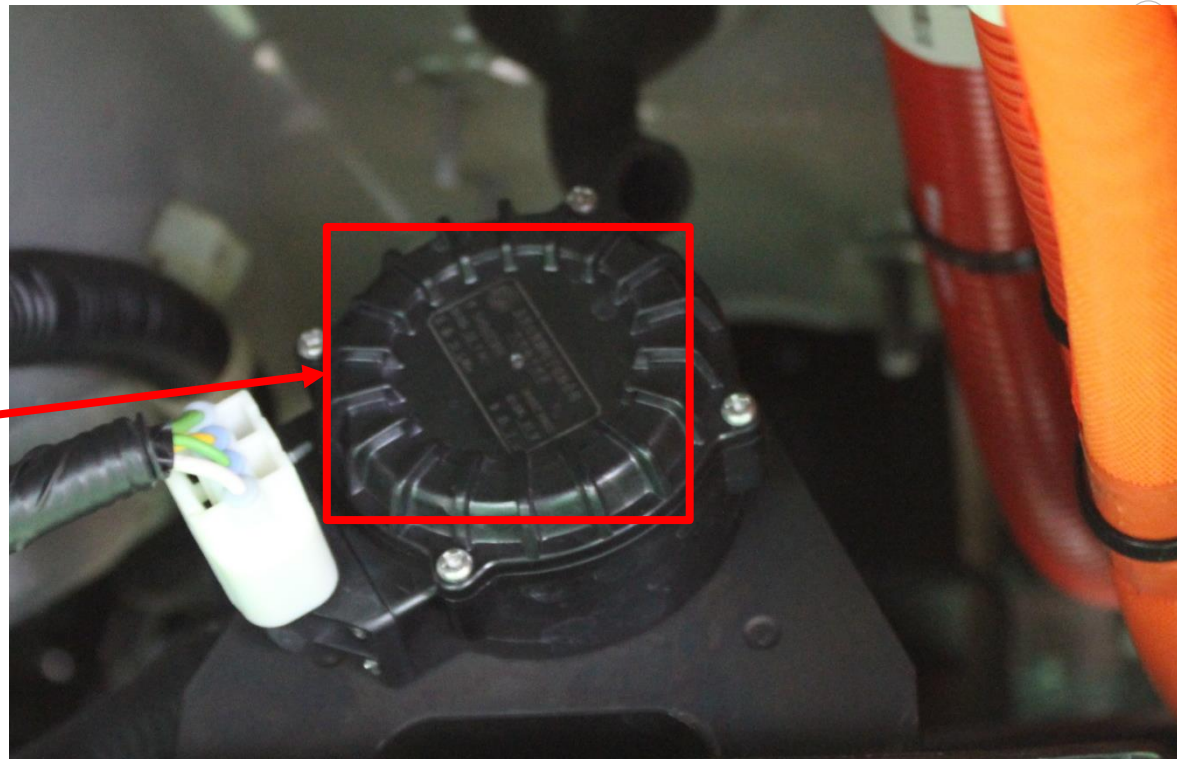


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## Battery pack self-circulating pump

The battery pack self-circulating pump is used to drive the internal coolant of the battery pack to circulate. In the self-circulation mode, the battery pack coolant is independently circulated according to the battery coolant inlet temperature. **The battery pack self-circulating pump of the E70 complete thermal management system can automatically adjust its speed (stepless).**

Battery pack self-circulating pump

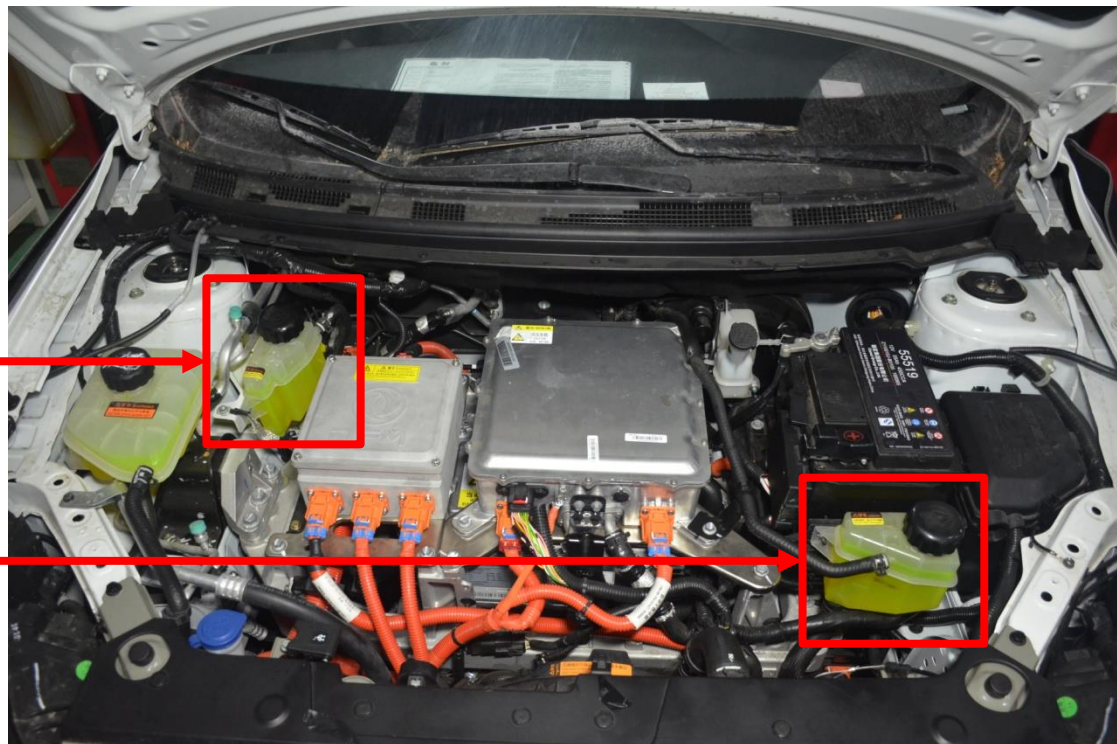


# 一、E70完整版热管理系统概述



## 电池自循环冷却液罐

E70电池组冷却液循环是独立的，与空调系统冷却液不能互通，独立的储液罐在前舱内。



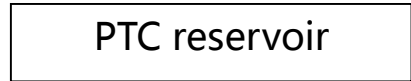
电池组储液罐

PTC储液罐



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The E70 battery pack coolant is independently circulated and does not communicate with the A/C system coolant. The separate reservoir is installed in the engine compartment.



# 一、E70完整版热管理系统概述



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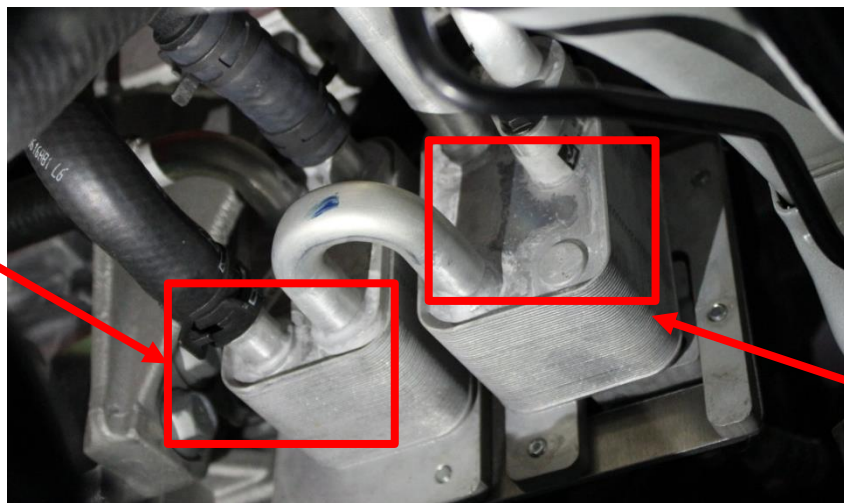
## 热交换装置

热交换装置在E70中称为换热板，用于充电/行车（含怠速）工况下空调系统制冷/制热时将冷量/热量交换给电池组冷却液。

换热板1用于电池组制热，换热板2用于电池组制冷。换热板1和换热板2之间由管道连接用于电池组冷却液自循环。



换热板1



换热板2

# I. Overview of E70 complete thermal management system

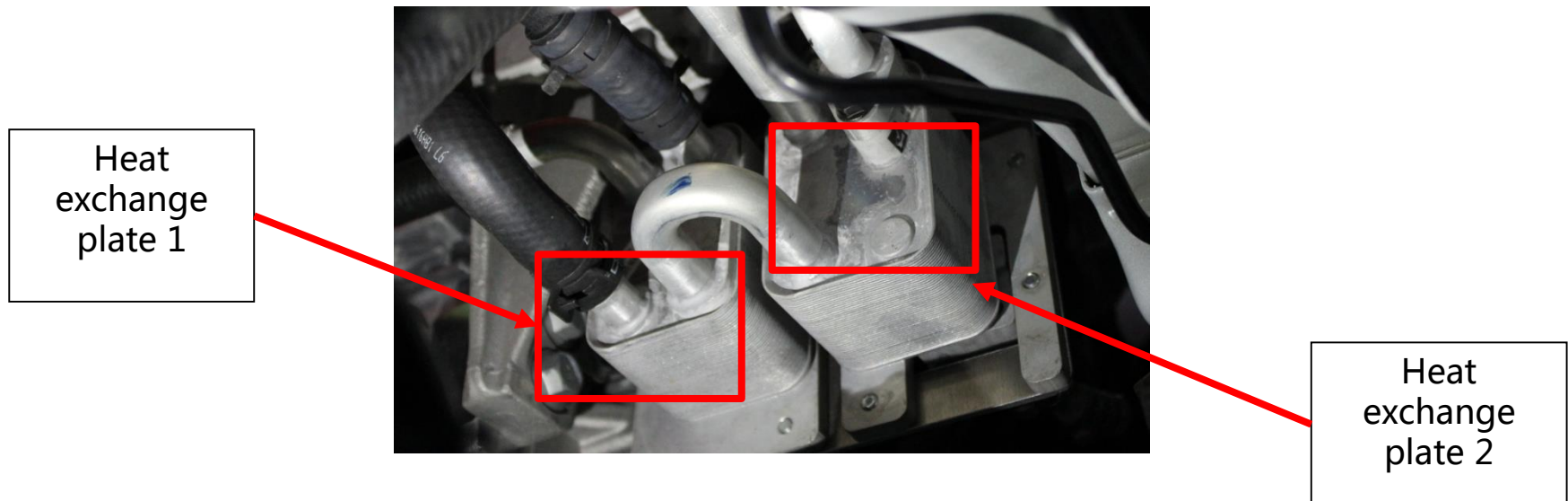


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## Heat exchanger

The heat exchanger is called a heat exchange plate in the E70, and is used to exchange cool/heat to the battery pack coolant during cooling/heating of the A/C system under charging/driving (including idling) conditions.

**The heat exchange plate 1 is used for battery pack heating, and the heat exchange plate 2 is used for battery pack cooling. The heat exchange plate 1 and the heat exchange plate 2 are connected by a pipe for self-circulation of the battery pack coolant.**



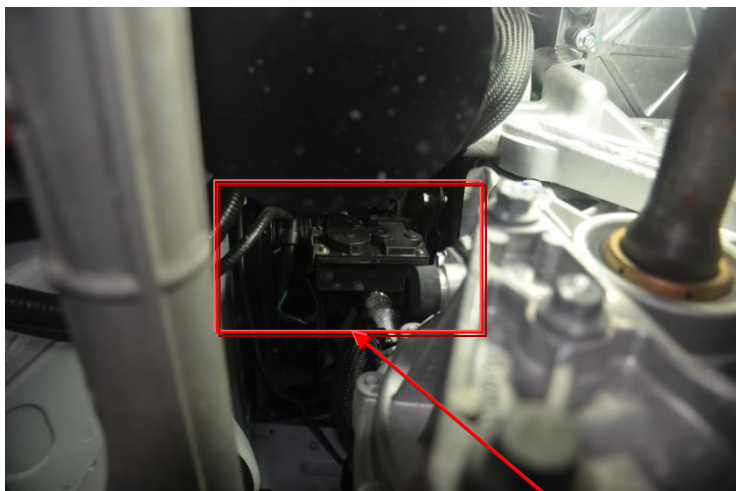


# 一、E70完整版热管理系统概述



## 三通阀

三通阀是电磁控制转换阀，由电池冷却控制器BCU控制。充电/行车（含怠速）工况下，在空调系统单独对电池制热时，三通阀关闭PTC与空调热交换器通道，同时打开PTC与换热板1通道，PTC加热后的冷却液流经换热板1，对电池冷却液制热。



三通阀

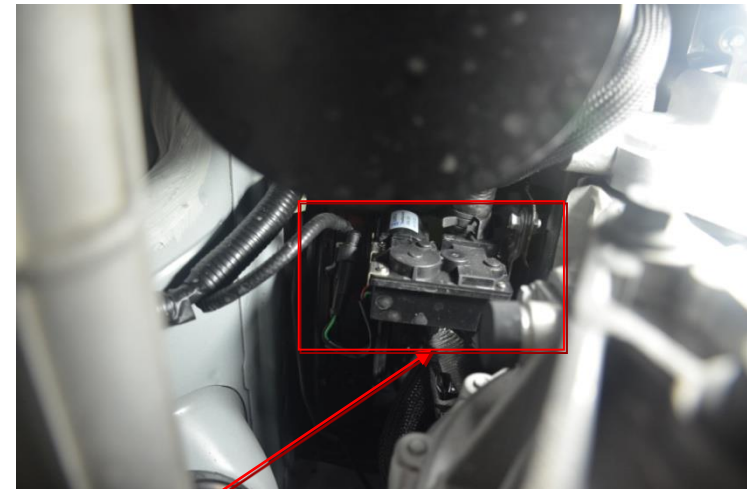
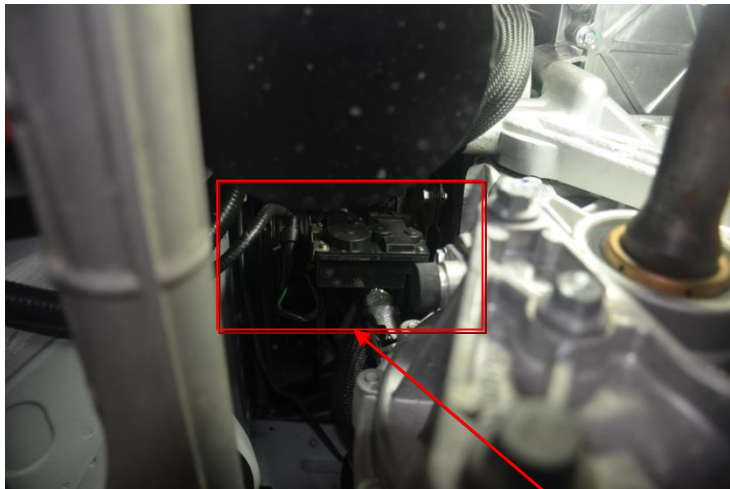
# I. Overview of E70 complete thermal management system



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## Tee valve

The tee valve is an electromagnetically controlled switching valve that is controlled by the BCU. Under the charging/driving (including idling) conditions, when the A/C system separately heats the battery, the tee valve will close the channel between the PTC and the A/C heat exchanger, and simultaneously open the channel between the PTC and the heat exchange plate 1 through which the PTC heated coolant will flow to heat the battery coolant.



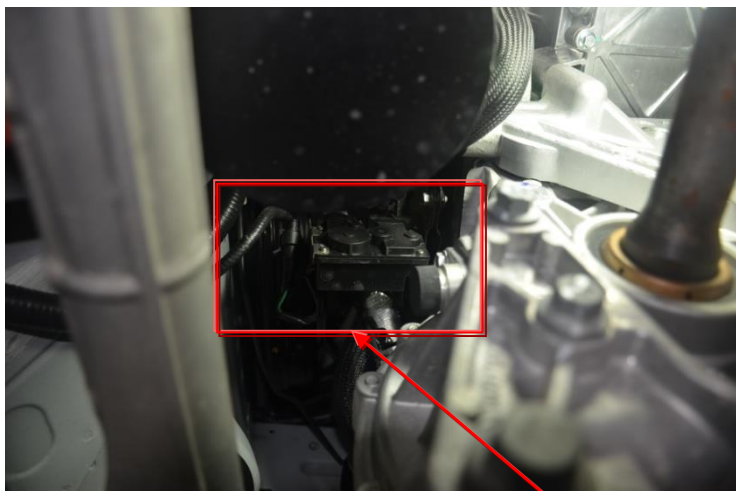
Tee valve

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三通阀是电磁控制转换阀，由电池冷却控制器BCU控制。充电/行车（含怠速）工况下，在空调系统单独对乘员舱制热时，三通阀打开PTC与空调热交换器通道，同时关闭PTC与换热板1通道，PTC加热后的冷却液流经空调热交换器，对乘员舱制热。



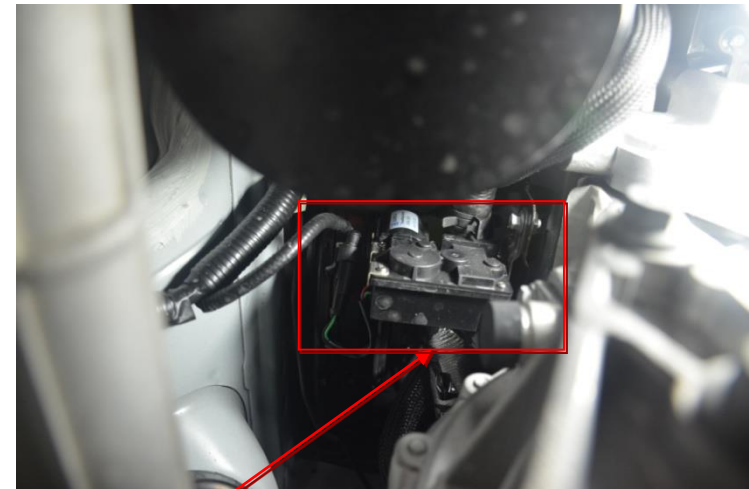
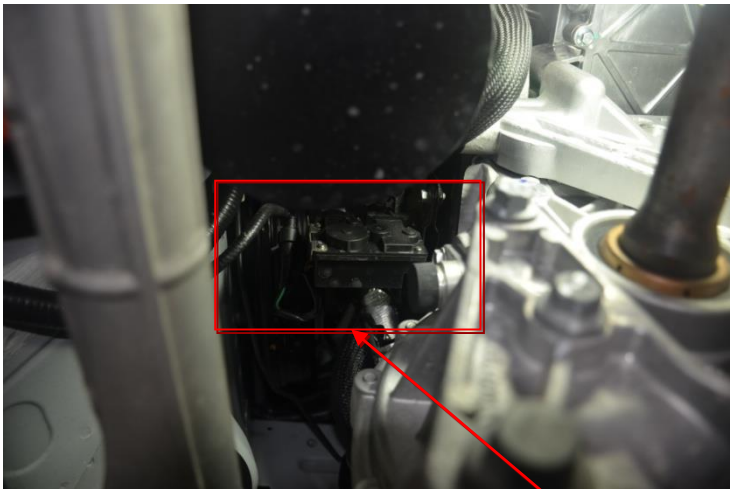
三通阀

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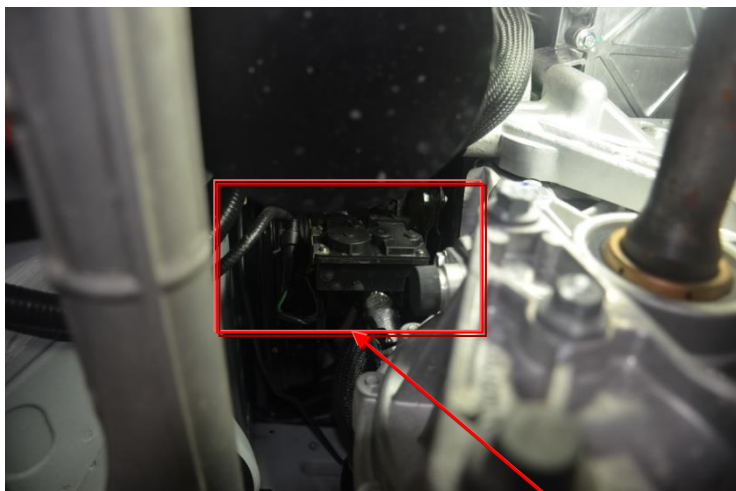
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三通阀

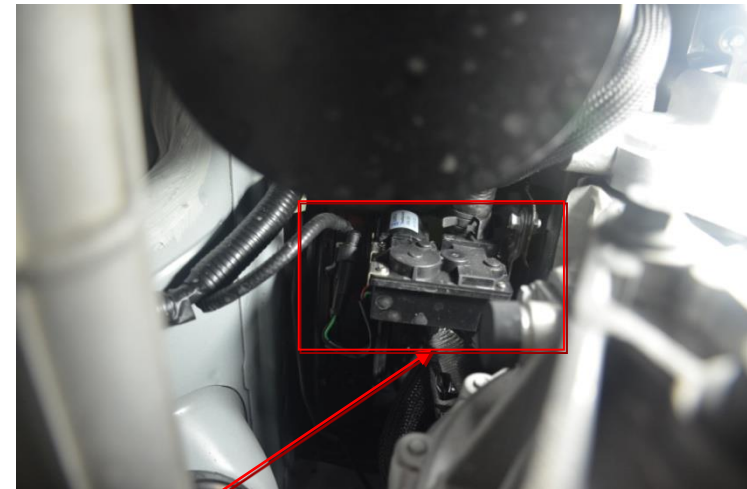
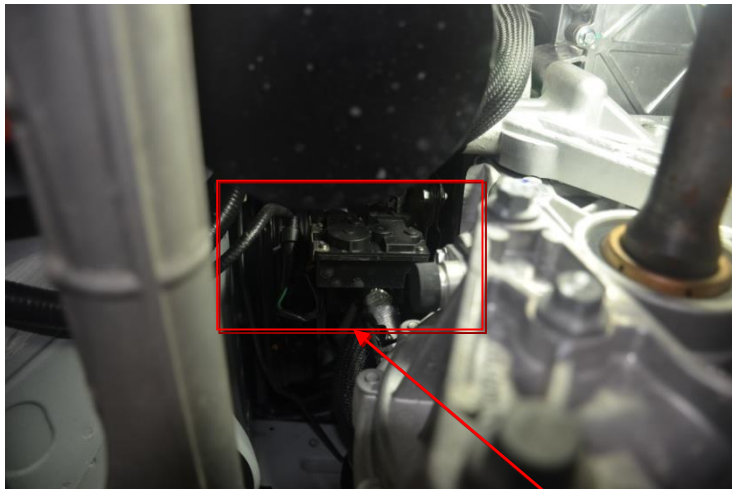


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The tee valve is an electromagnetically controlled switching valve that is controlled by the BCU. Under the charging conditions, when the A/C system simultaneously heats the battery and the passenger compartment, the tee valve will close the channel between the PTC and the A/C heat exchanger, as well as the channel between the PTC and the heat exchange plate 1, and the PTC heated coolant will flow through the A/C heat exchanger and the heat exchange plate 1 to heat the battery coolant and the passenger compartment.



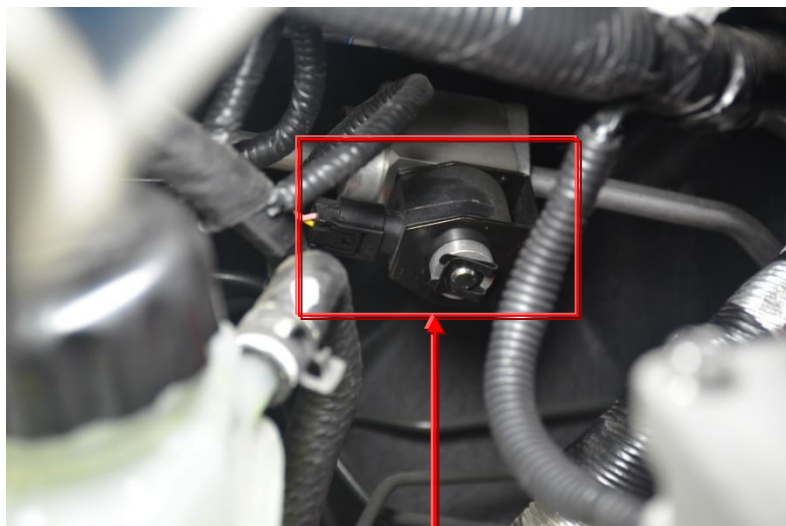
Tee valve

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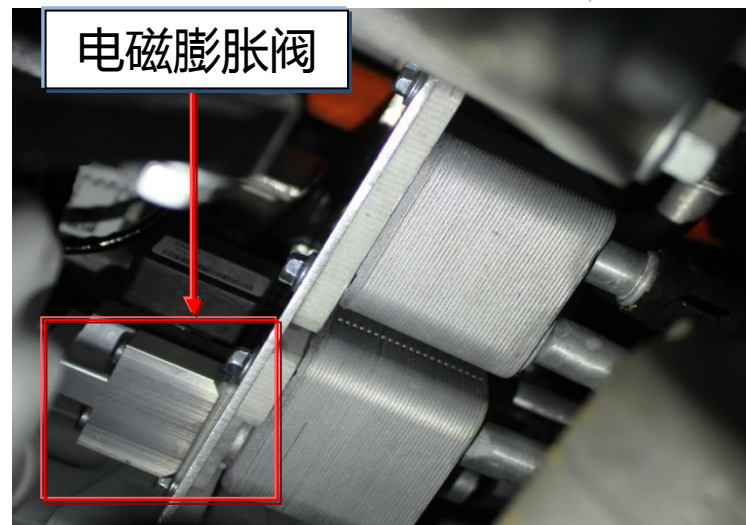


## 电磁膨胀阀

电磁膨胀阀是电磁控制式膨胀阀，由电池冷却控制器BCU控制，充电/行车（含怠速）工况下，在空调系统单独对电池制冷时，电池膨胀阀打开，空调系统电磁阀关闭，切断制冷剂与空调蒸发器通道，制冷剂流经换热板2，对电池冷却液制冷。



空调电磁阀



电磁膨胀阀

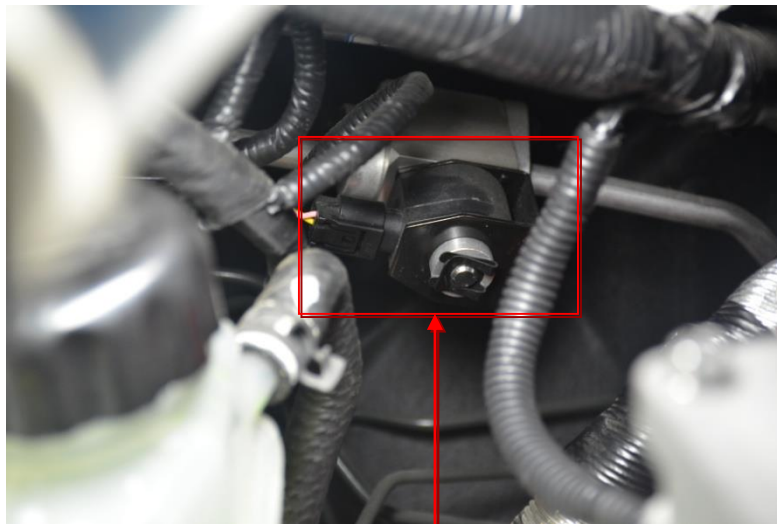
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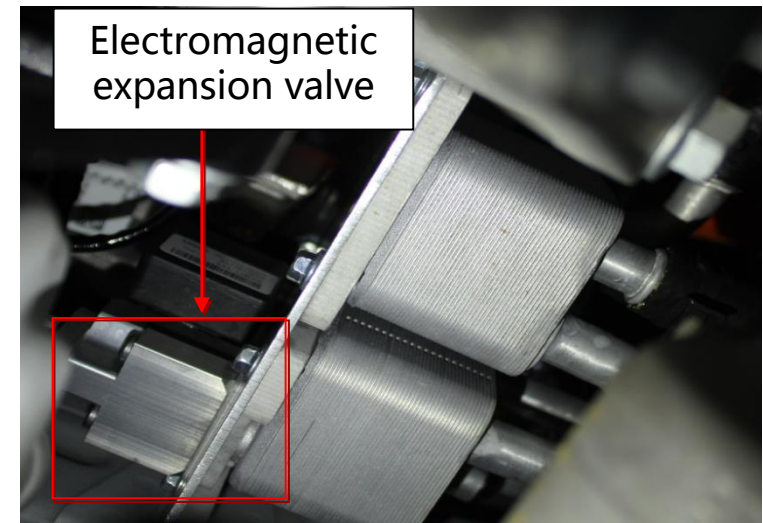
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## Electromagnetic expansion valve

The electromagnetic expansion valve is an electromagnetically-controlled expansion valve controlled by the BCU. Under the charging/driving (including idling) conditions, when the A/C system separately cools the battery, the battery expansion valve will be opened, and the A/C system solenoid valve will be closed to cut off the channel between the refrigerant and the A/C evaporator, and the refrigerant will flow through the heat exchange plate 2 to cool the battery coolant.



A/C solenoid valve



Electromagnetic expansion valve

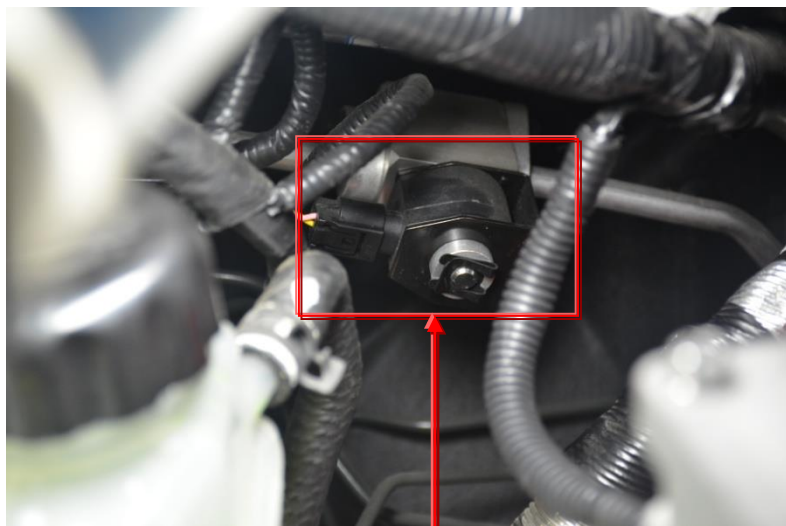


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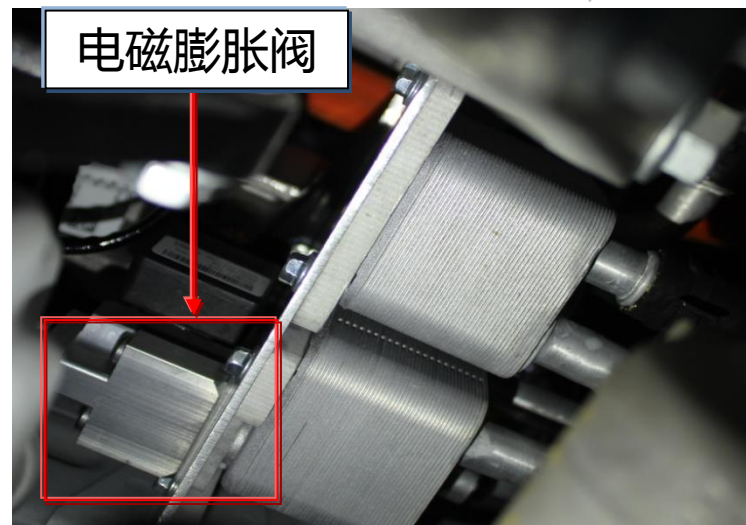


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空调电磁阀



电磁膨胀阀

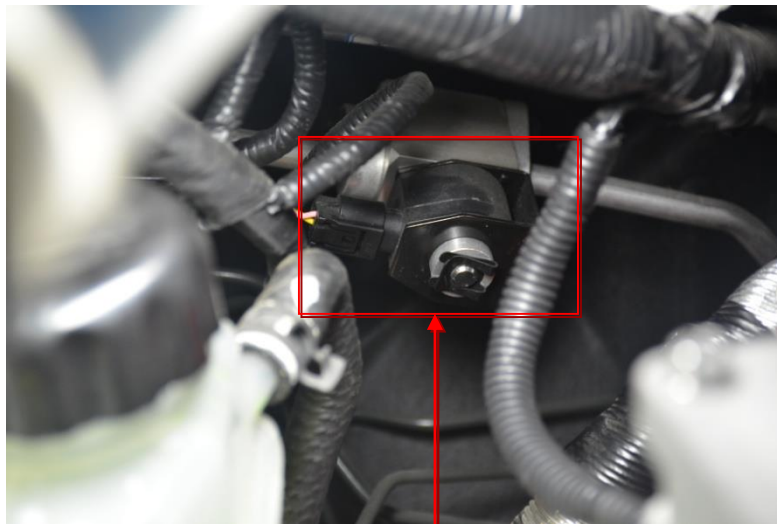
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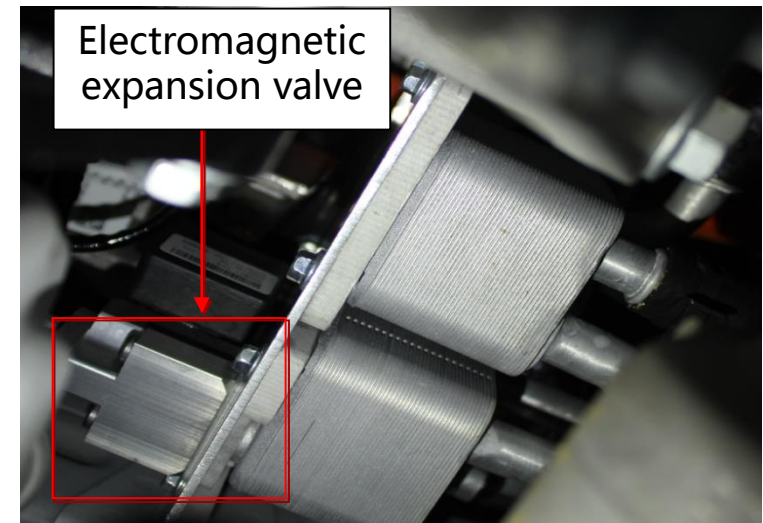
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A/C solenoid valve



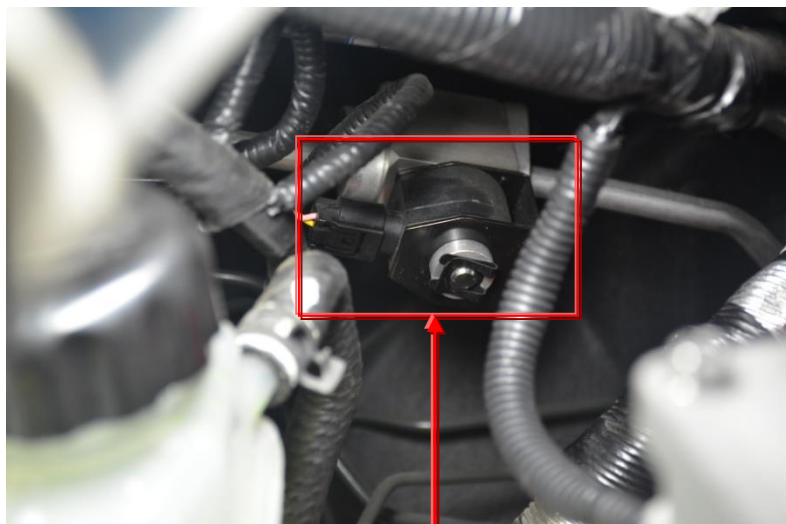
Electromagnetic expansion valve

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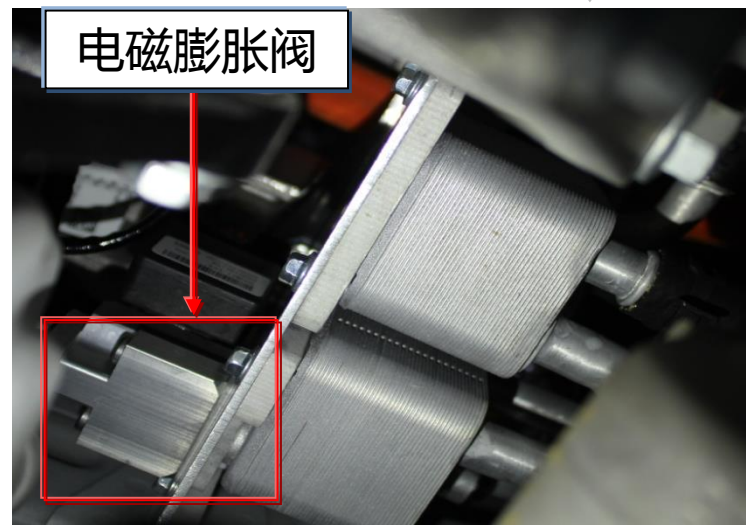


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空调电磁阀



电磁膨胀阀

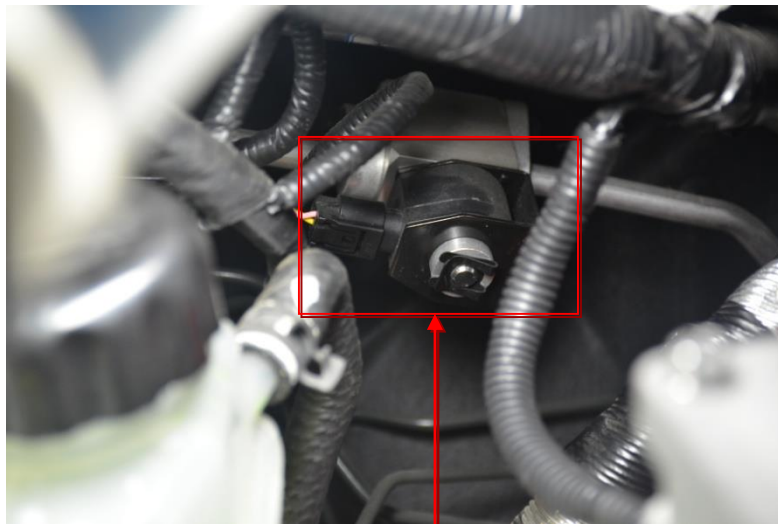
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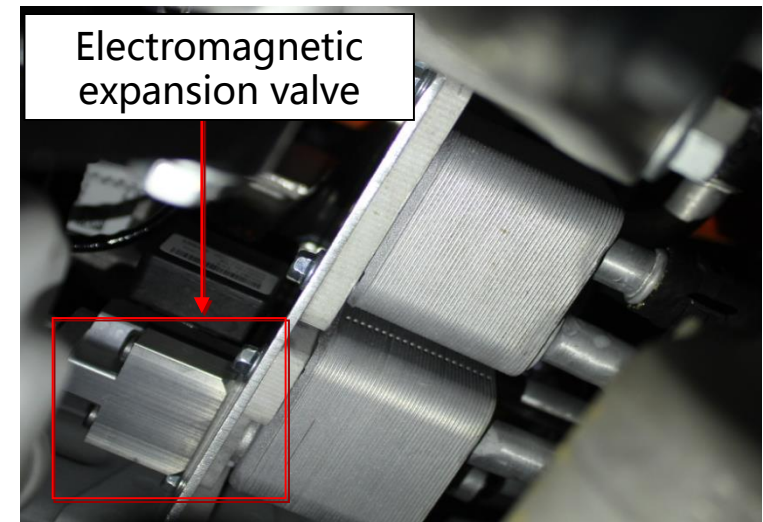
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## Electromagnetic expansion valve

The electromagnetic expansion valve is an electromagnetically-controlled expansion valve controlled by the BCU. Under the charging/driving (including idling) conditions, when the A/C system simultaneously cools the battery and the passenger compartment, the battery expansion valve, as well as the A/C system solenoid valve will be opened, and the refrigerant will flow through the A/C evaporator and the heat exchange plate 2 to cool the battery and the passenger compartment.



A/C solenoid valve



Electromagnetic expansion valve



# 一、E70完整版热管理系统概述



## 电池冷却控制器BCU

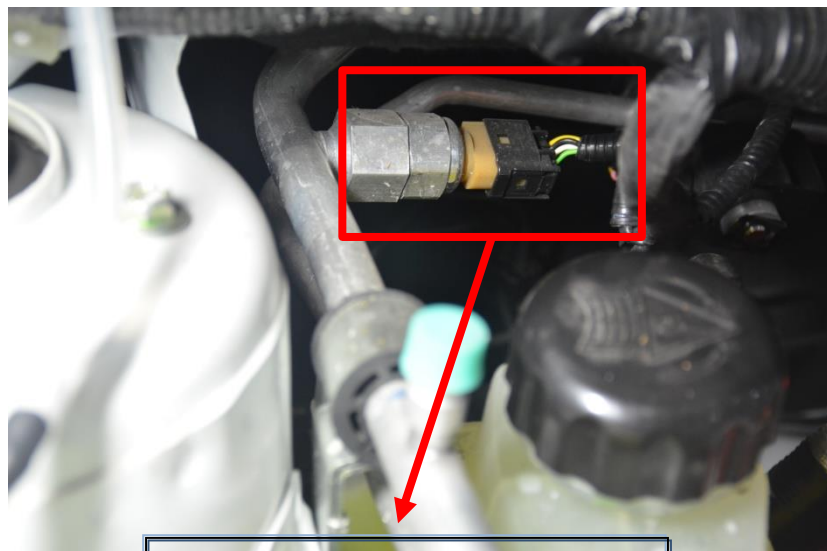
电池冷却控制器BCU用于电池热管理控制，是B-CAN的一个节点，但该控制单元没有独立的诊断地址。

BCU控制元件包括：电磁膨胀阀、空调电磁阀、三通阀、PTC加热器、电池自循环水泵继电器、空调水泵。

BCU获取信号包括：高压压力传感器信号、低压压力/温度传感器信号、电池组进水口温度传感器信号、压缩机反馈信号。



BCU



低压压力/温度传感器

# I. Overview of E70 complete thermal management system

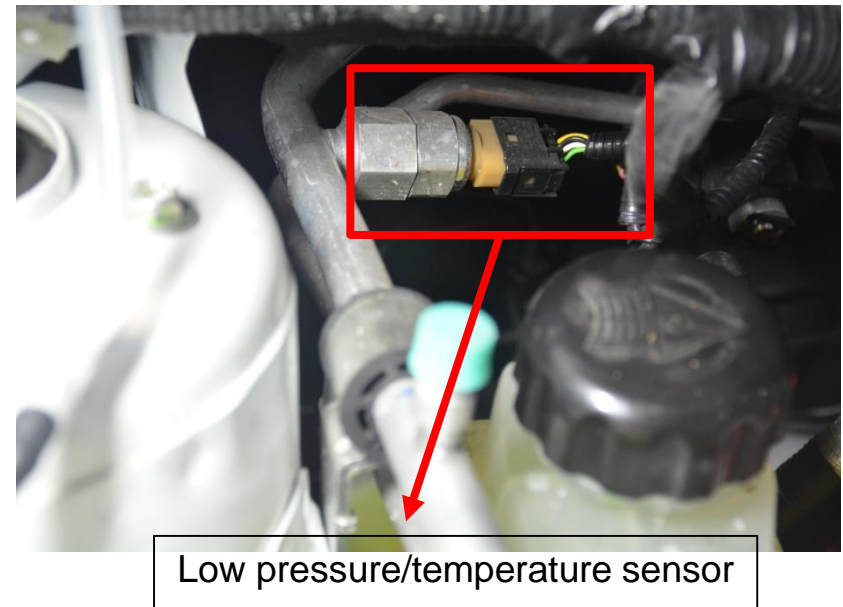
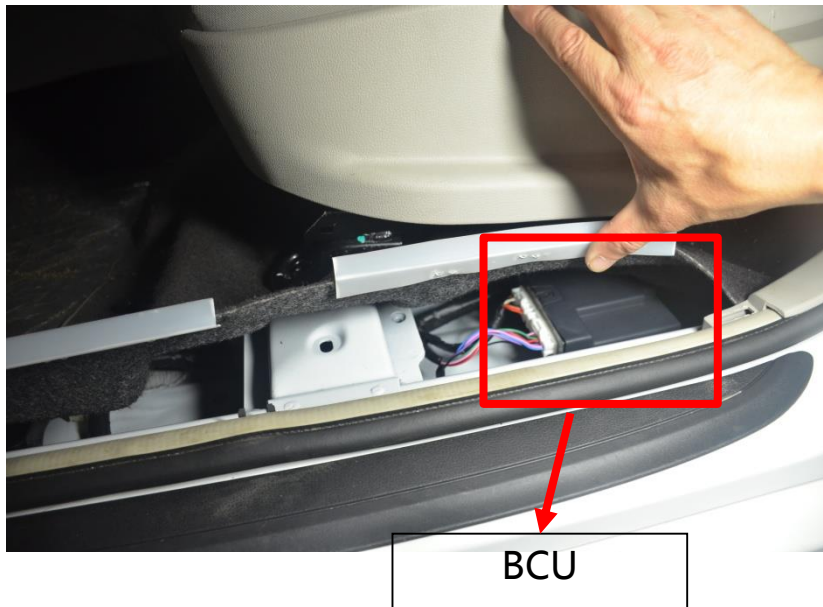


## BCU

BCU is used for battery thermal management control and is a node of B-CAN, but it has no separate diagnostic address.

BCU control components include electromagnetic expansion valve, A/C solenoid valve, tee valve, PTC heater, battery self-circulating pump relay, and A/C water pump.

BCU acquired signals include the high pressure sensor signal, low pressure/temperature sensor signal, battery pack inlet temperature sensor signal, and compressor feedback signal.





### 完整版热管理系统工作模式

工作模式	原理描述
加热模式	PTC加热后的冷却液通过换热板、空调热交换器将热量分别传递给电池组冷却液用于加热电池组和乘员舱制热
制冷模式	制冷剂循环将电池组冷却液制冷用于冷却电池组 制冷剂循环通过蒸发器用于乘员舱制冷
自循环模式	电池组冷却液独立循环

## II. Working principle of E70 complete thermal management system



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### Working mode of complete thermal management system

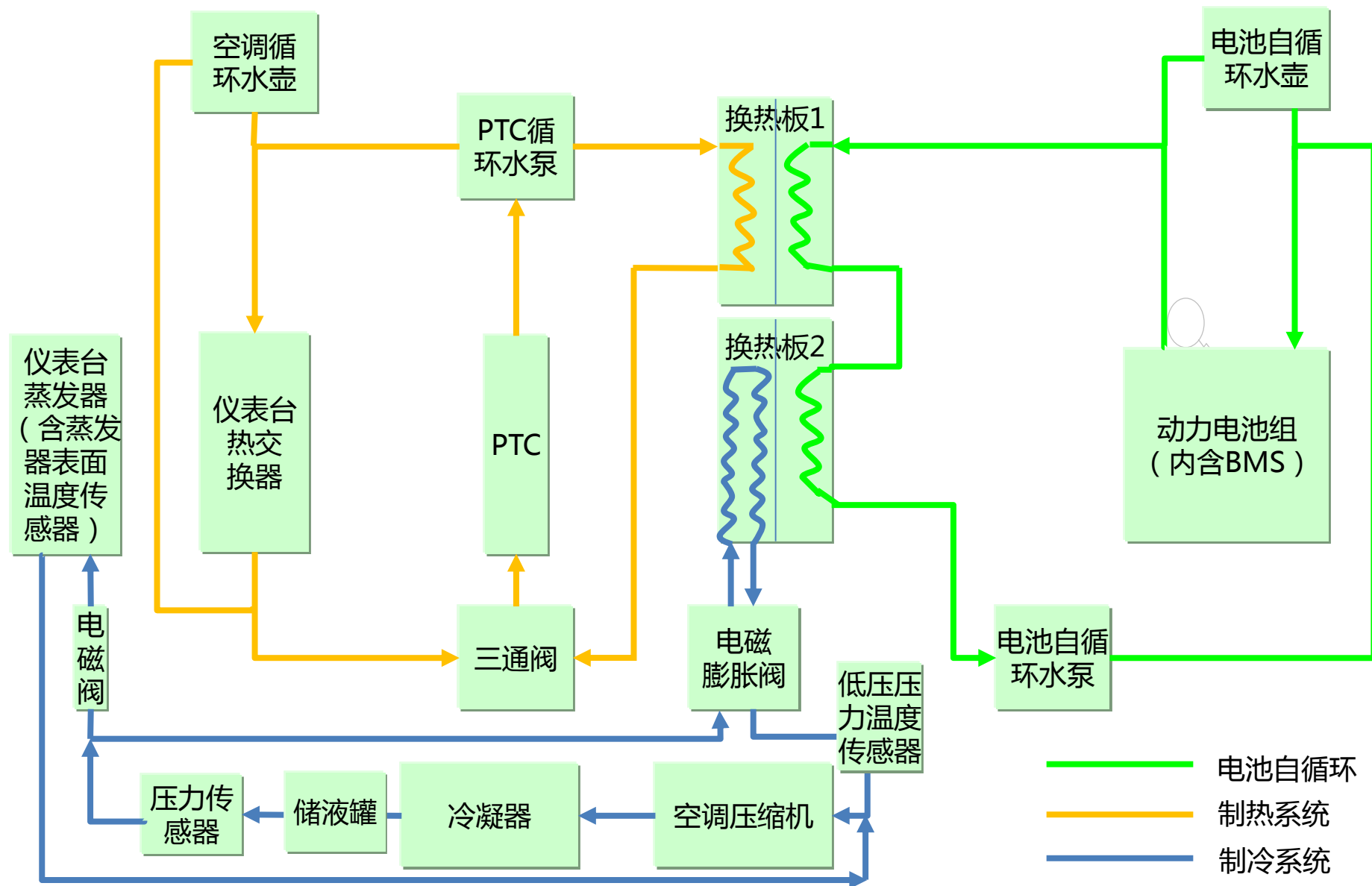
Working mode	Principle
Heating mode	The PTC heated coolant flows through the heat exchange plate and the A/C heat exchanger to transfer heat to the battery pack coolant for heating the battery pack and the passenger compartment.
Cooling mode	Refrigerant circulation aims to cool battery pack coolant for use in the battery pack. Refrigerant circulation aims to cool the passenger compartment via the evaporator.
Self-circulating mode	Battery pack coolant is independently circulated.



## 二、E70完整版热管理系统工作原理



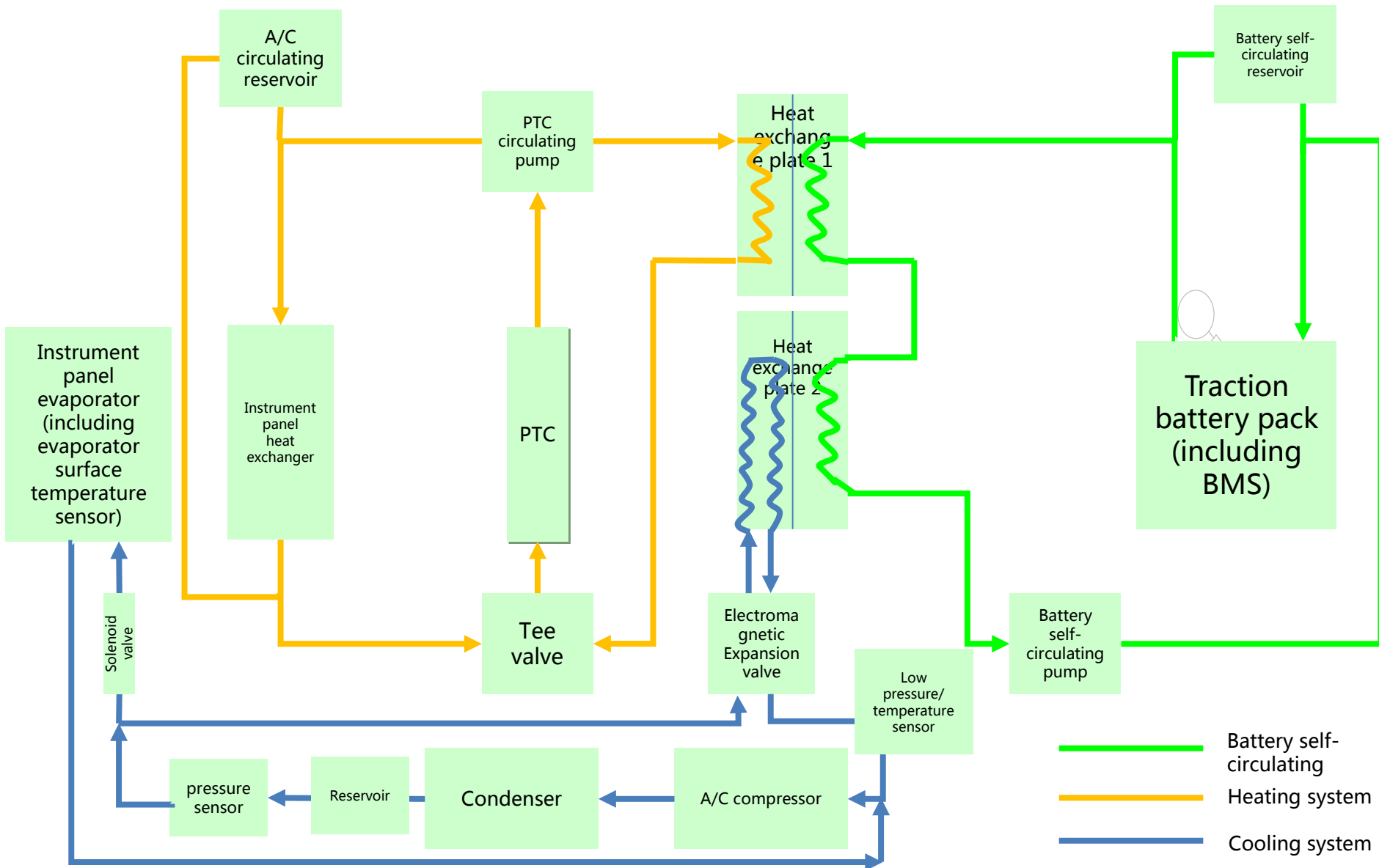
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## II. Working principle of E70 complete thermal management system



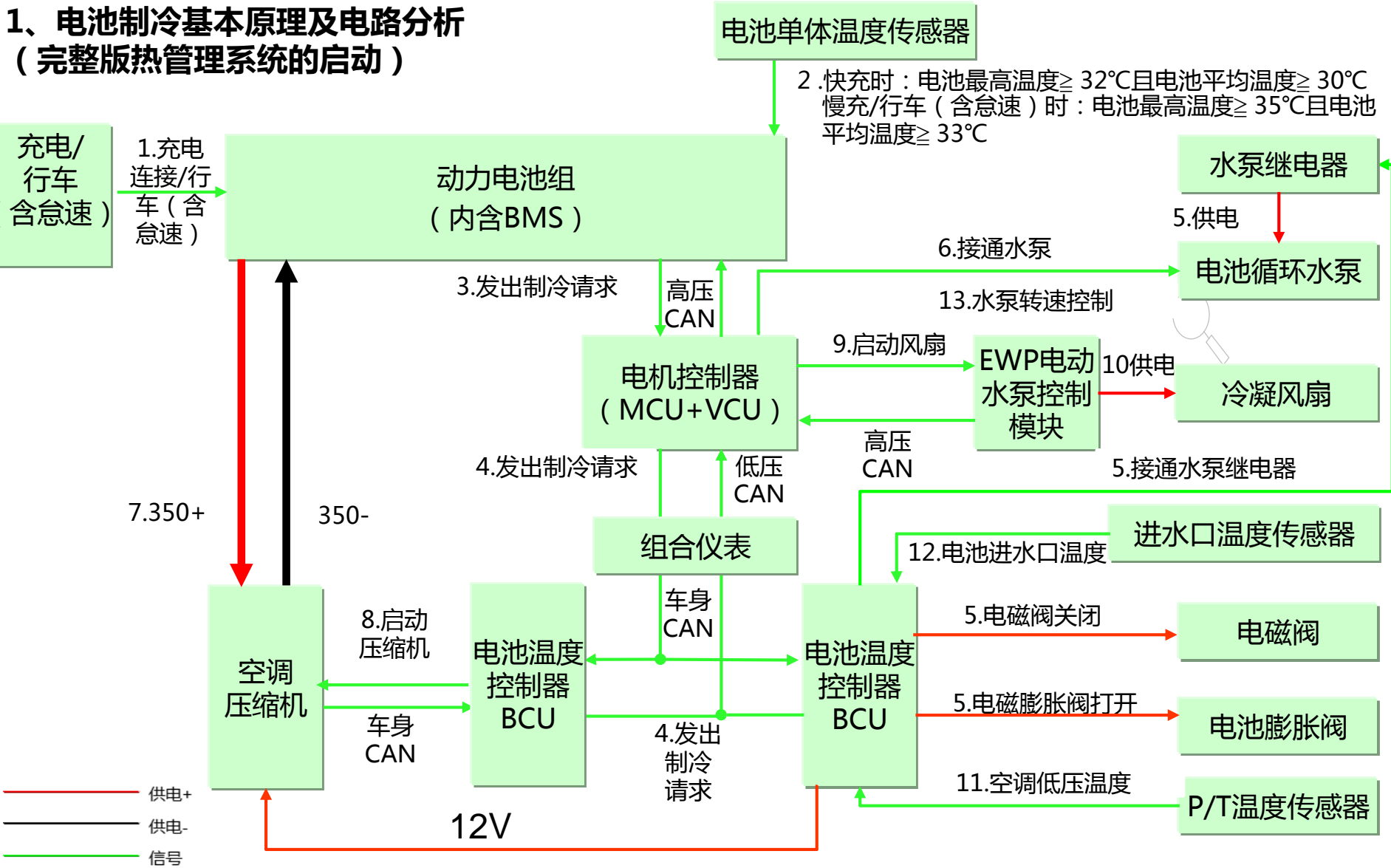
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# 三、E70完整版热管理的基本原理及电路图分析



## 1、电池制冷基本原理及电路分析 (完整版热管理系统的启动)





### III. Analysis of working principle and circuit diagram of E70 complete thermal management system

#### 1. Analysis of working principle and circuit diagram of battery cooling (Activation of complete thermal management system)

Cell temperature sensor

2. Quick charging: battery maximum temperature  $\geq 32^{\circ}\text{C}$  and average battery temperature  $\geq 30^{\circ}\text{C}$   
Slow charging/driving (including idling): battery maximum temperature  $\geq 35^{\circ}\text{C}$  and average battery temperature  $\geq 33^{\circ}\text{C}$

Water pump relay

5. Power supply

Battery circulating pump

6. Connect the water pump

13. Water pump speed control

9. Start the fan.

10. Power supply

Condenser fan

High voltage CAN

5. Connect the water pump relay.

Low voltage CAN

4. Issue a cooling request

Instrument cluster

12. Battery water inlet temperature

Water inlet temperature sensor

5. Solenoid valve closed

Magnetic valve

5. Electromagnetic expansion valve opened

Battery expansion valve

11. A/C low pressure/temperature

P/T temperature sensor

4. Issue a cooling request

Body CAN

Battery temperature control unit BCU

8. Start Compressor

A/C Compressor

Body CAN

12V

7.350+

350-

Power supply +

Power supply -

Signal

Charging/  
driving  
(including  
idling)

1. Charging/  
driving  
(including  
idling)

Traction battery pack  
(including BMS)

3. Issue a cooling request

High voltage CAN

MCU  
( MCU+VCU )

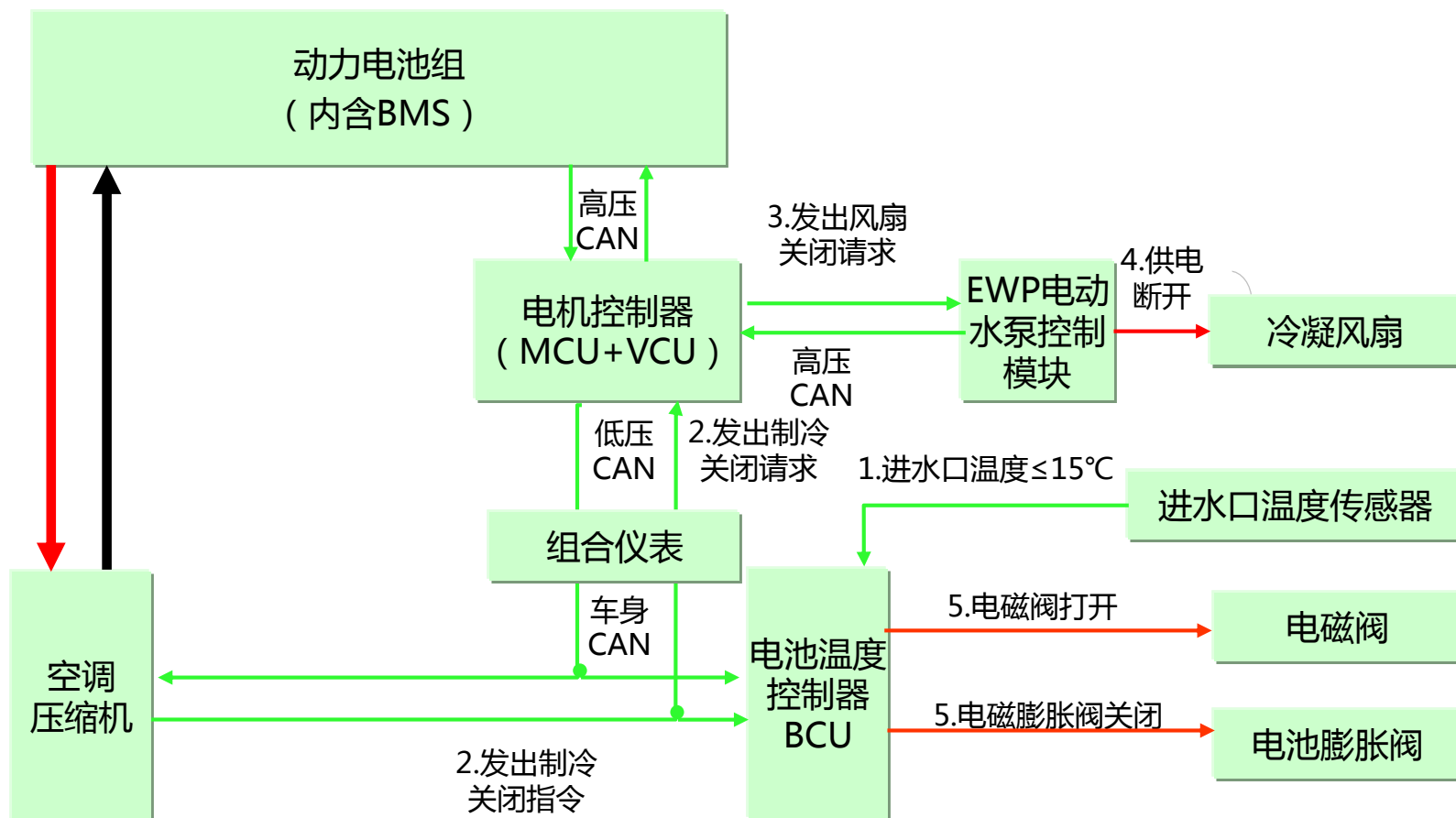
Charging/  
driving  
(including  
idling)

### 三、E70完整版热管理的基本原理及电路图分析



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#### 1、电池制冷基本原理及电路分析（完整版热管理系统的制冷关闭）



供电+

供电-

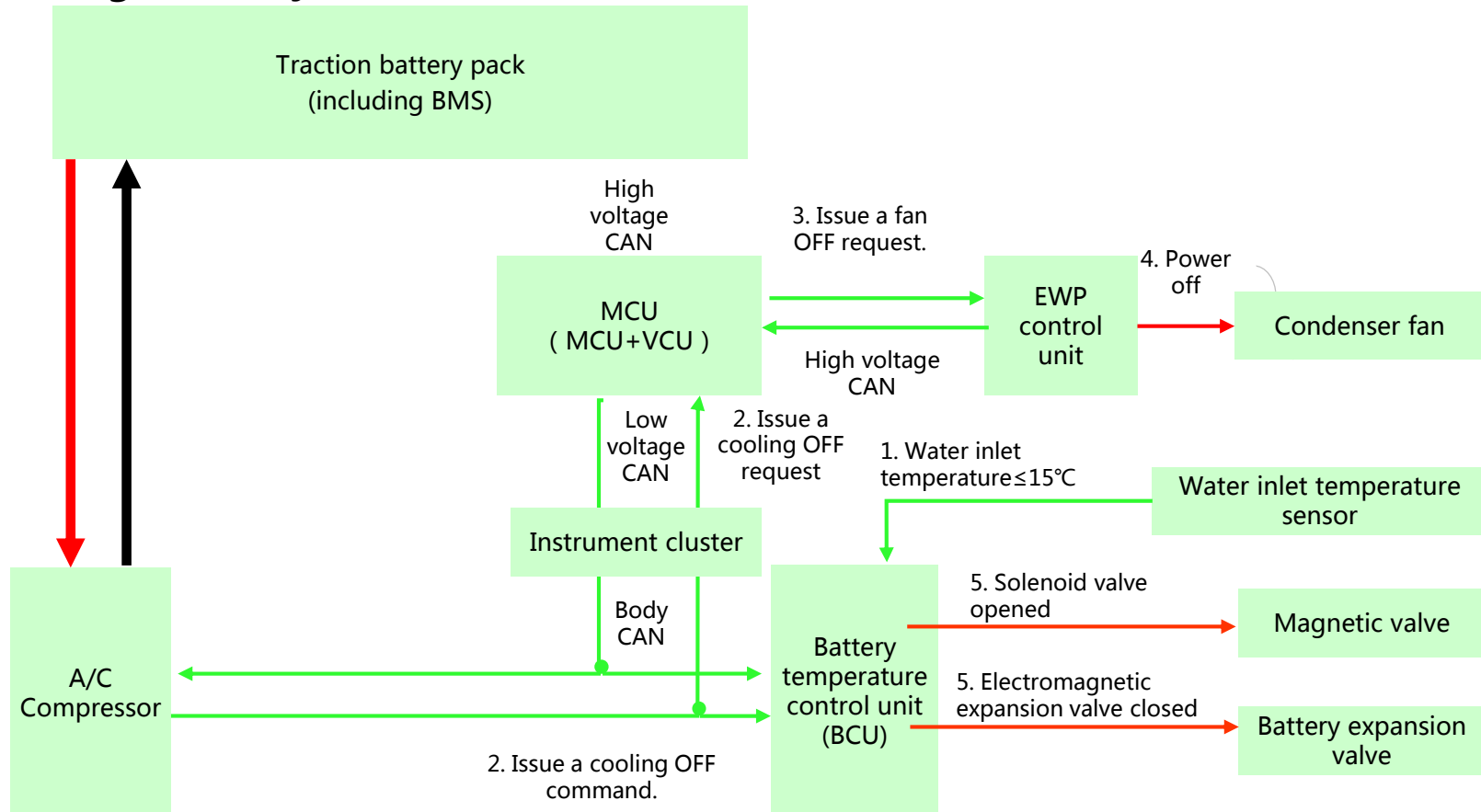
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### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



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#### 1. Analysis of basic principle and circuit diagram of battery cooling (complete thermal management system deactivated)



— Power supply +

— Power supply -

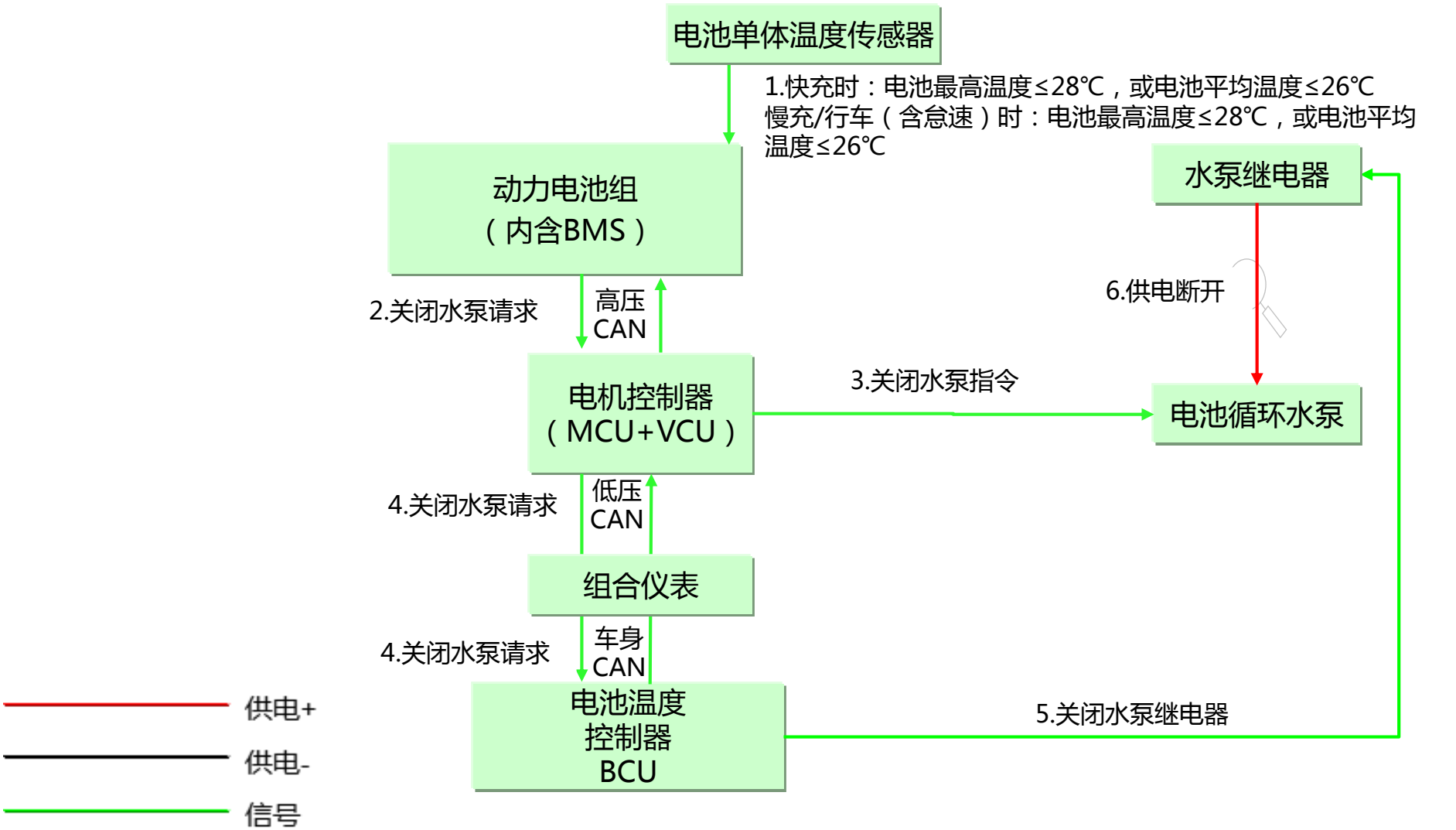
— Signal



# 三、E70完整版热管理的基本原理及电路图分析



## 1、电池制冷基本原理及电路分析（完整版热管理系统的水泵自循环关闭）

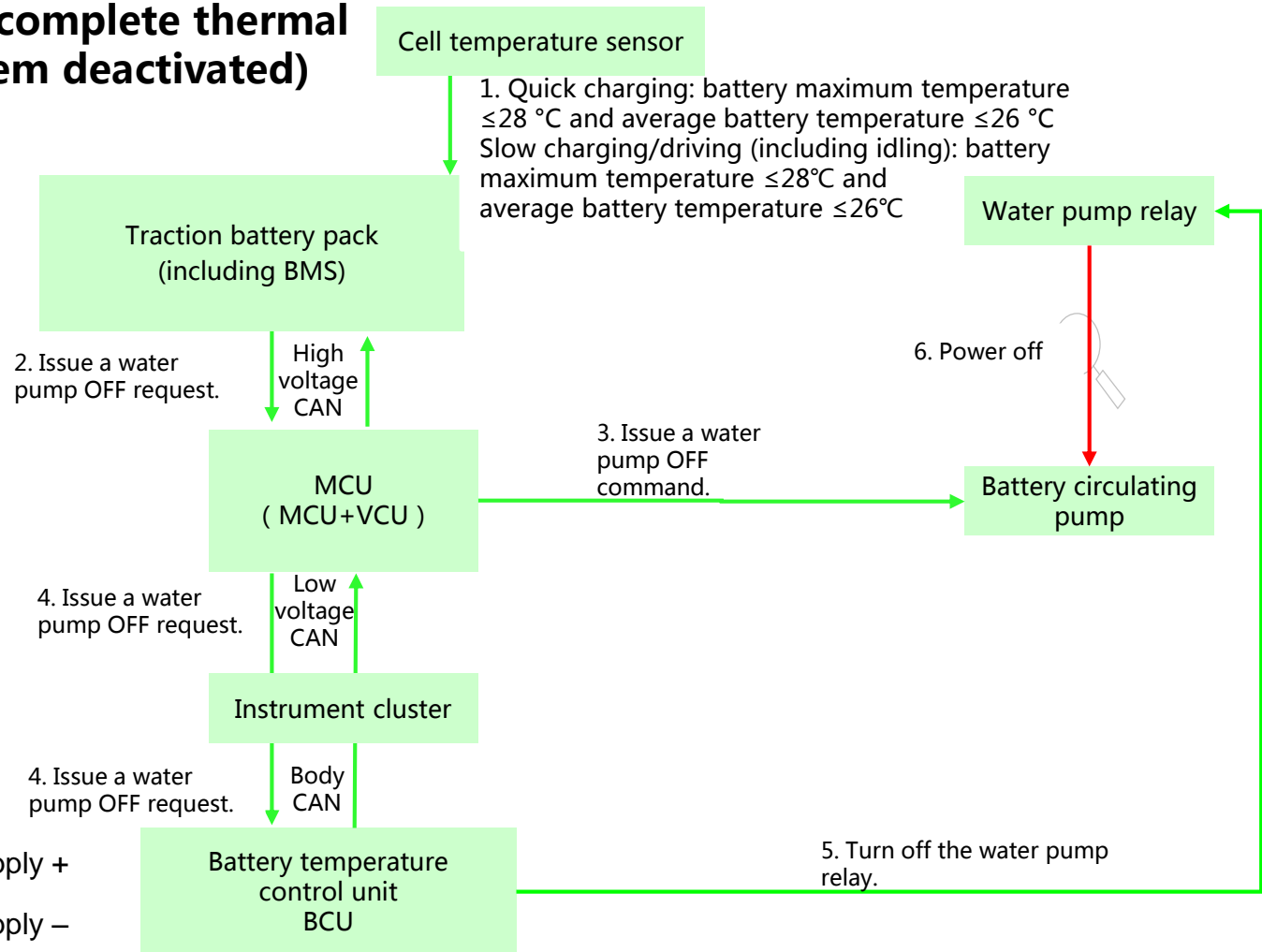


### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



东风乘用车

#### 1. Analysis of basic principle and circuit diagram of battery cooling (water pump self-circulation of complete thermal management system deactivated)



Power supply +

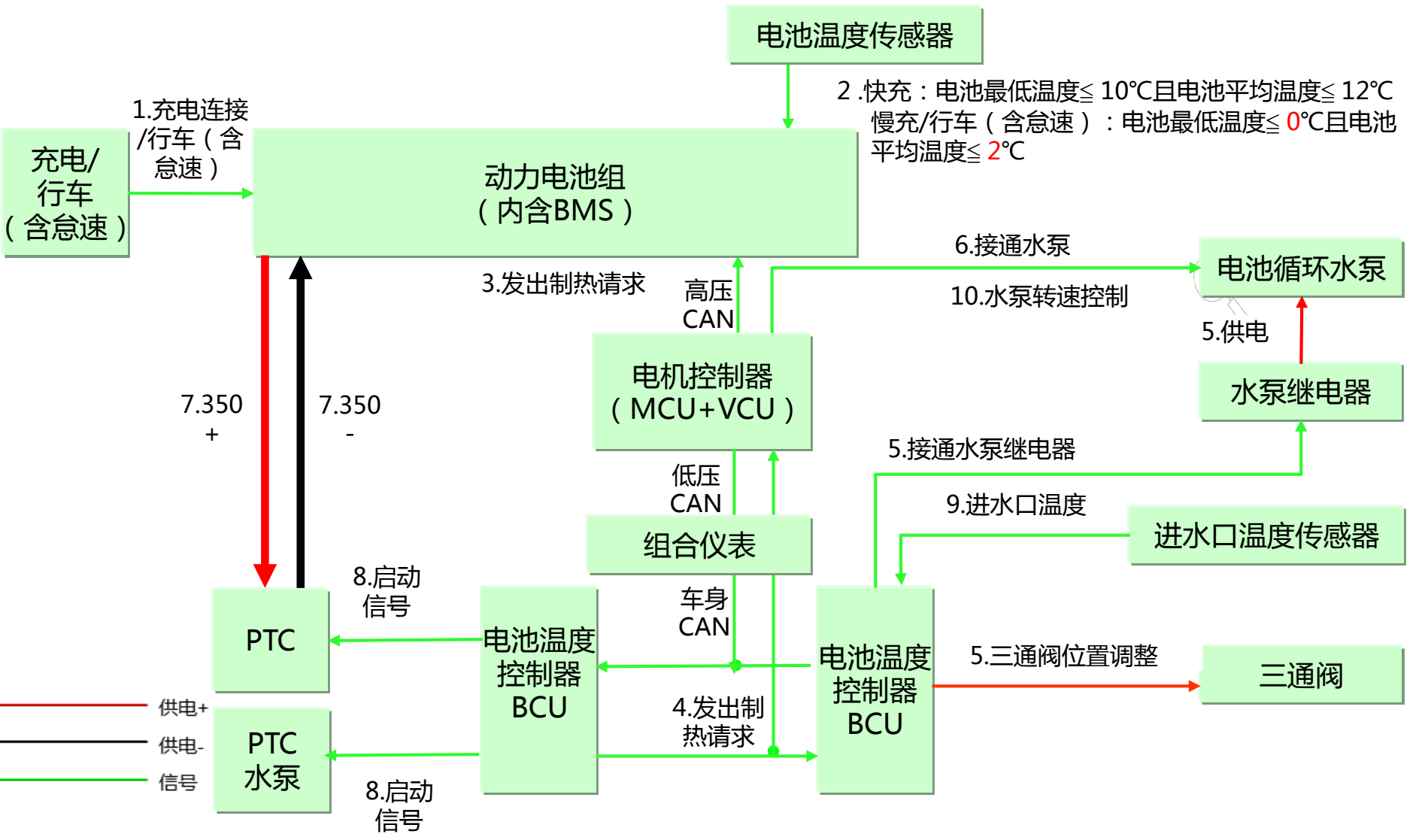
Power supply -

Signal

# 三、E70完整版热管理的基本原理及电路图分析



## 2、电池制热基本原理及电路分析（完整版热管理系统的制热启动）

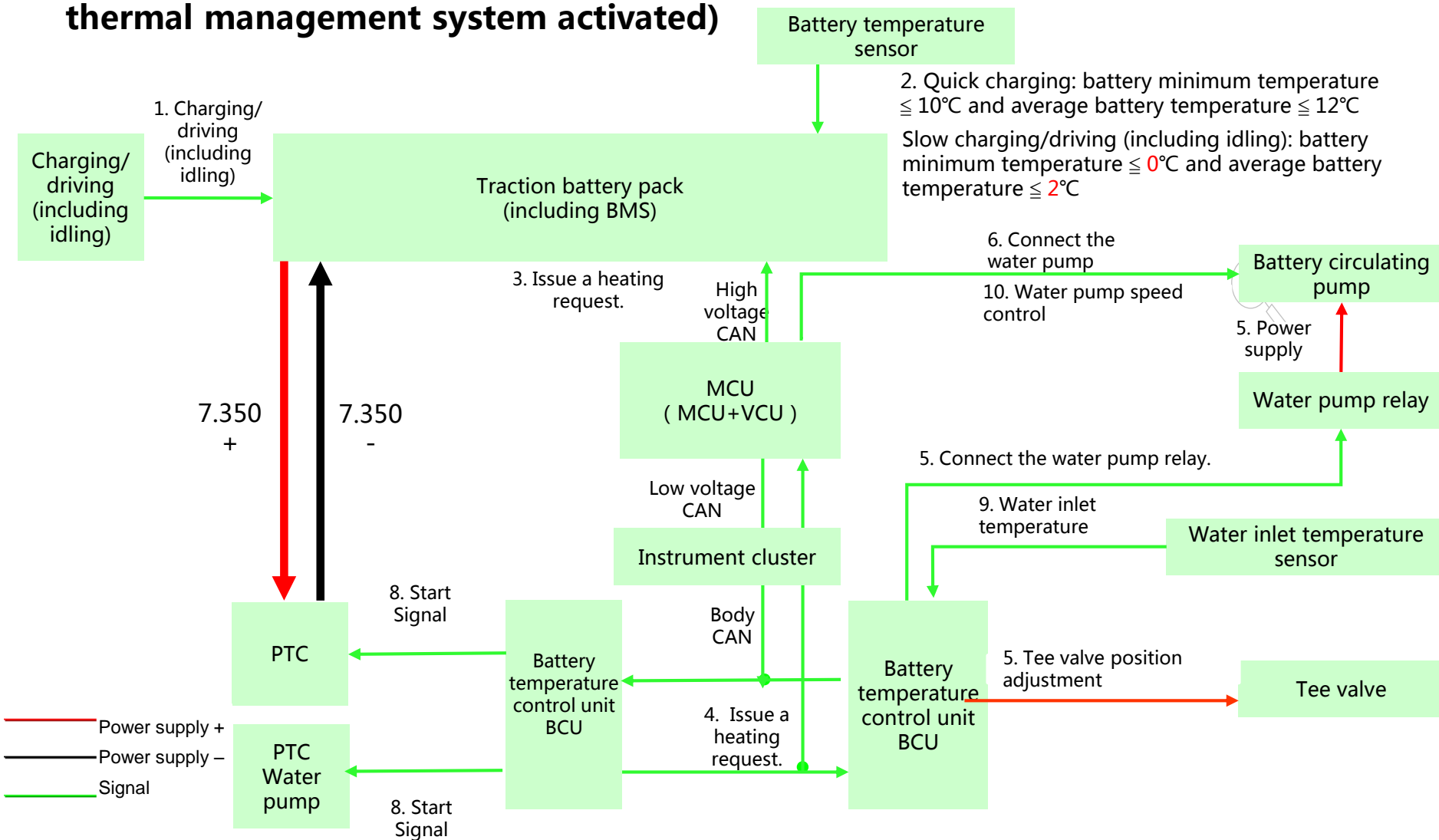


### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



东风乘用车

#### 2. Analysis of basic principle and circuit diagram of battery heating (complete thermal management system activated)

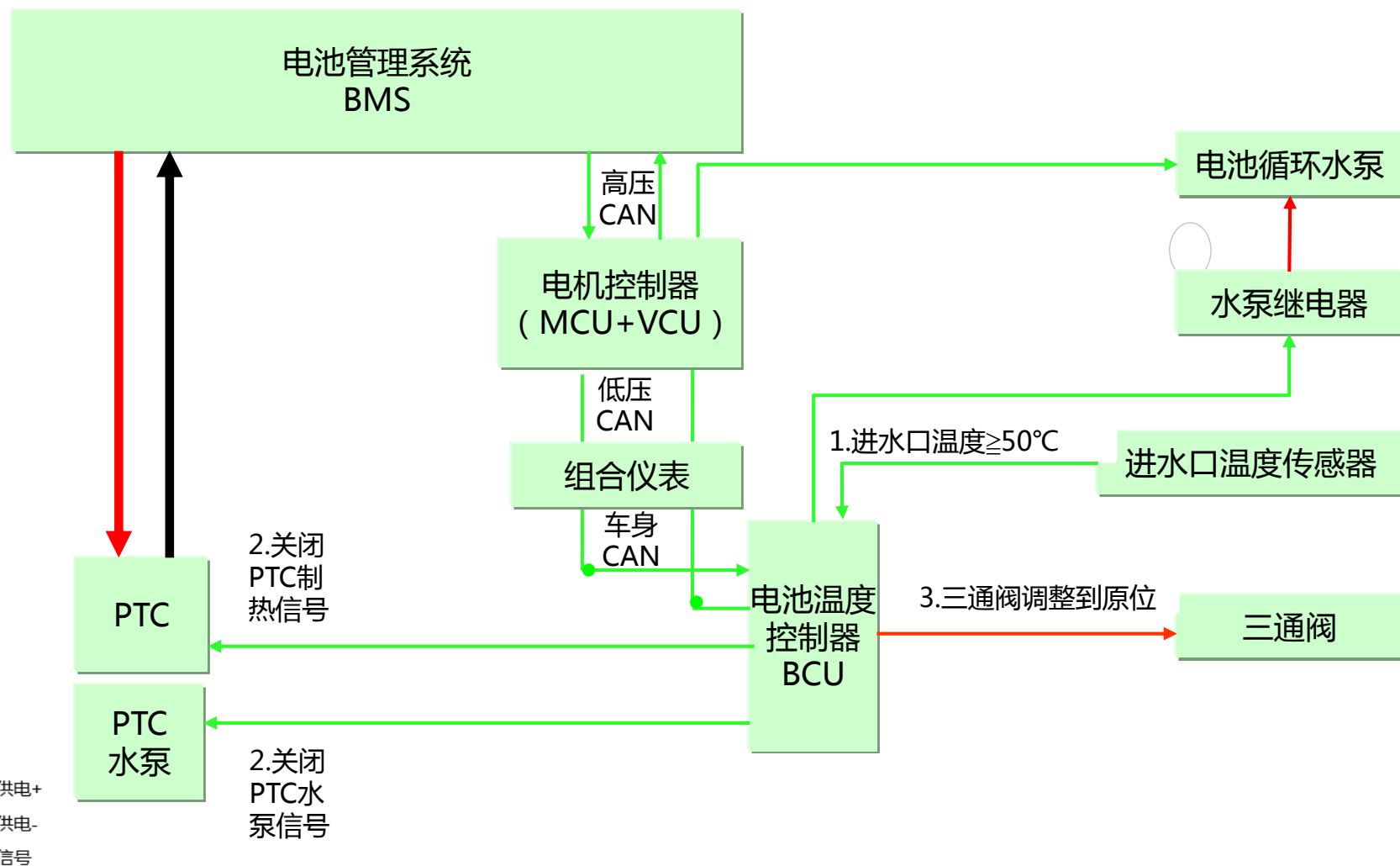


### 三、E70完整版热管理的基本原理及电路图分析



东风乘用车

#### 2、电池制热基本原理及电路分析（完整版热管理系统的制热关闭）

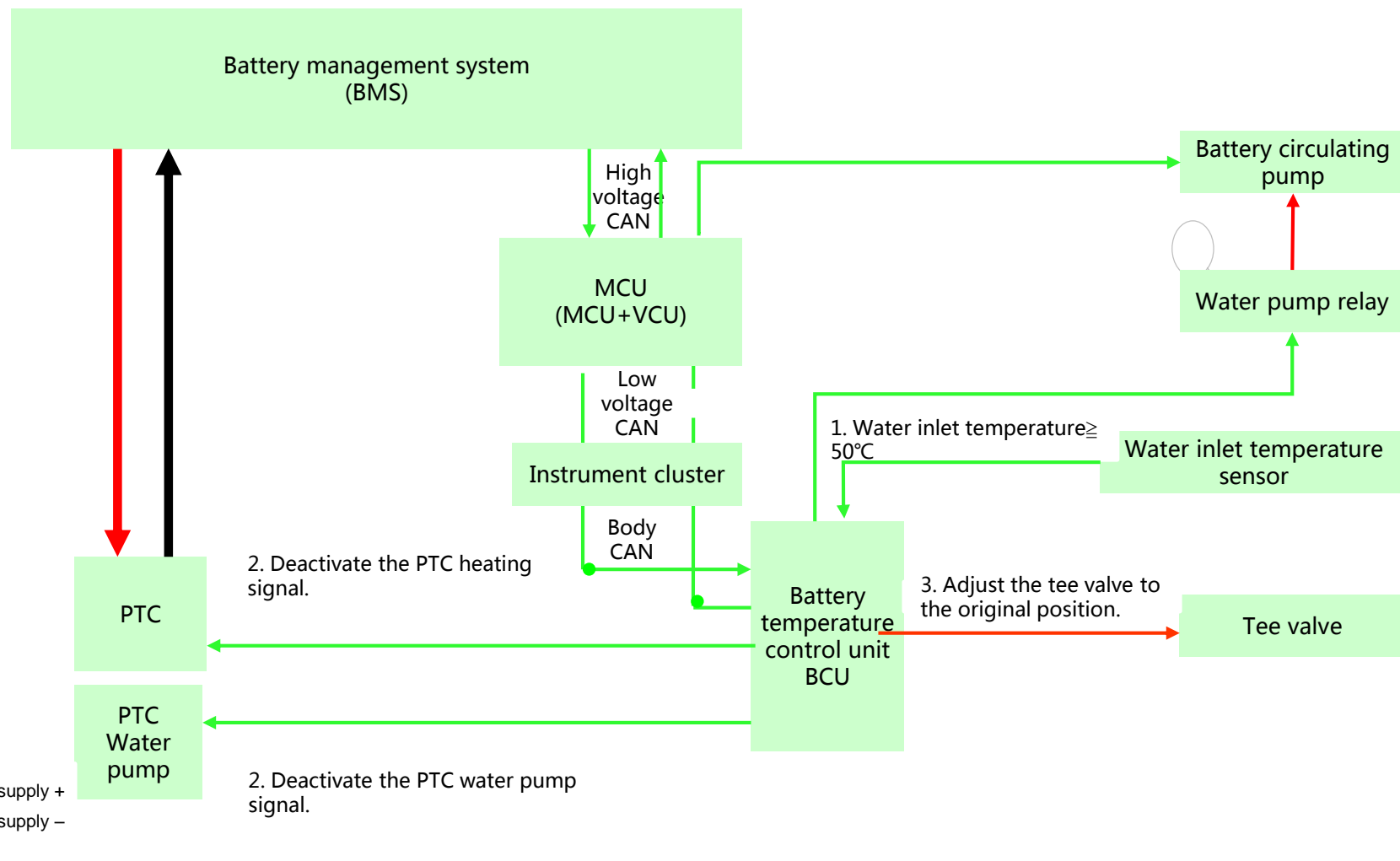


### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



东风乘用车

#### 2. Analysis of basic principle and circuit diagram of battery heating (complete thermal management system deactivated)

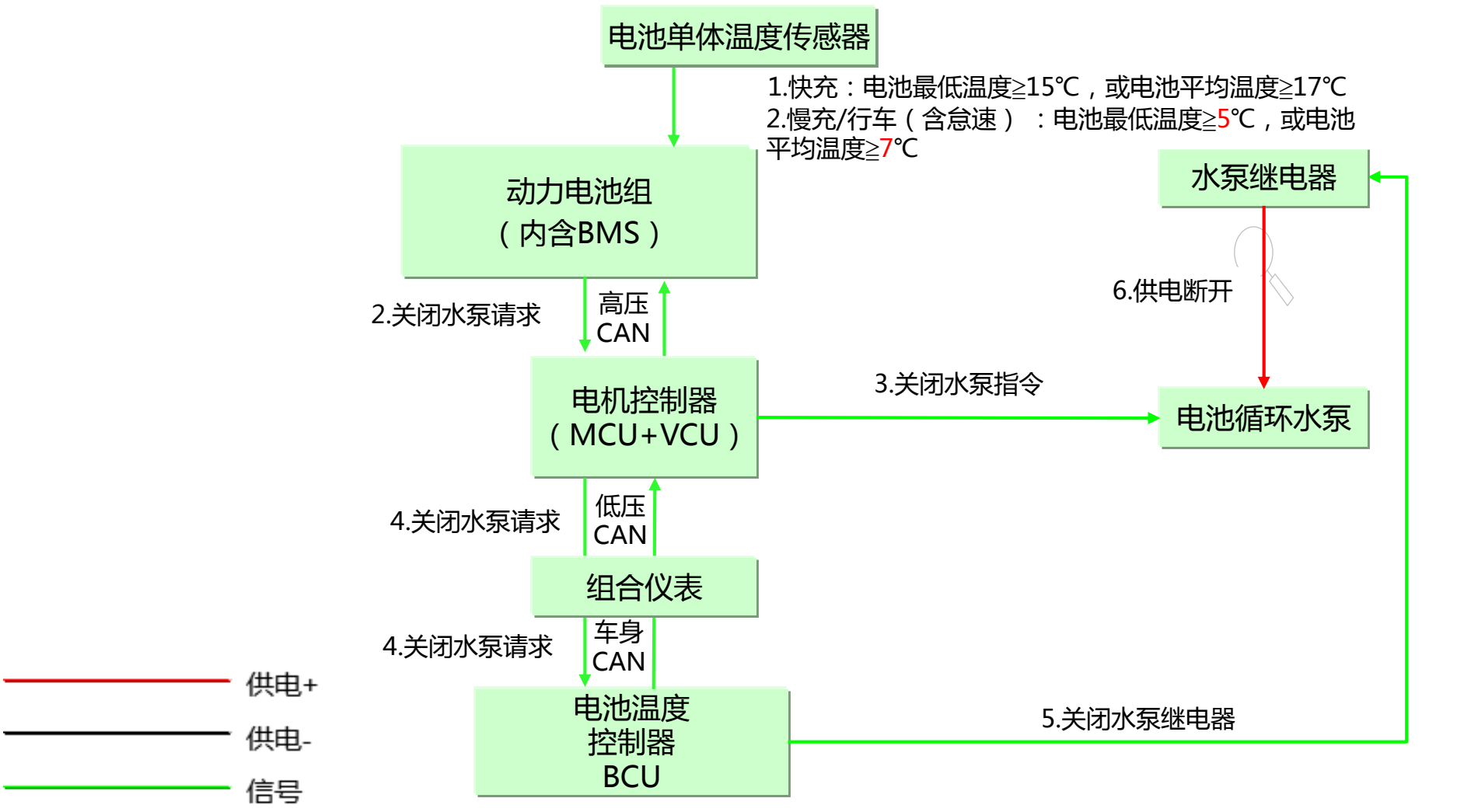




# 三、E70完整版热管理的基本原理及电路图分析



## 2、电池制热基本原理及电路分析（完整版热管理系统的水泵自循环关闭）

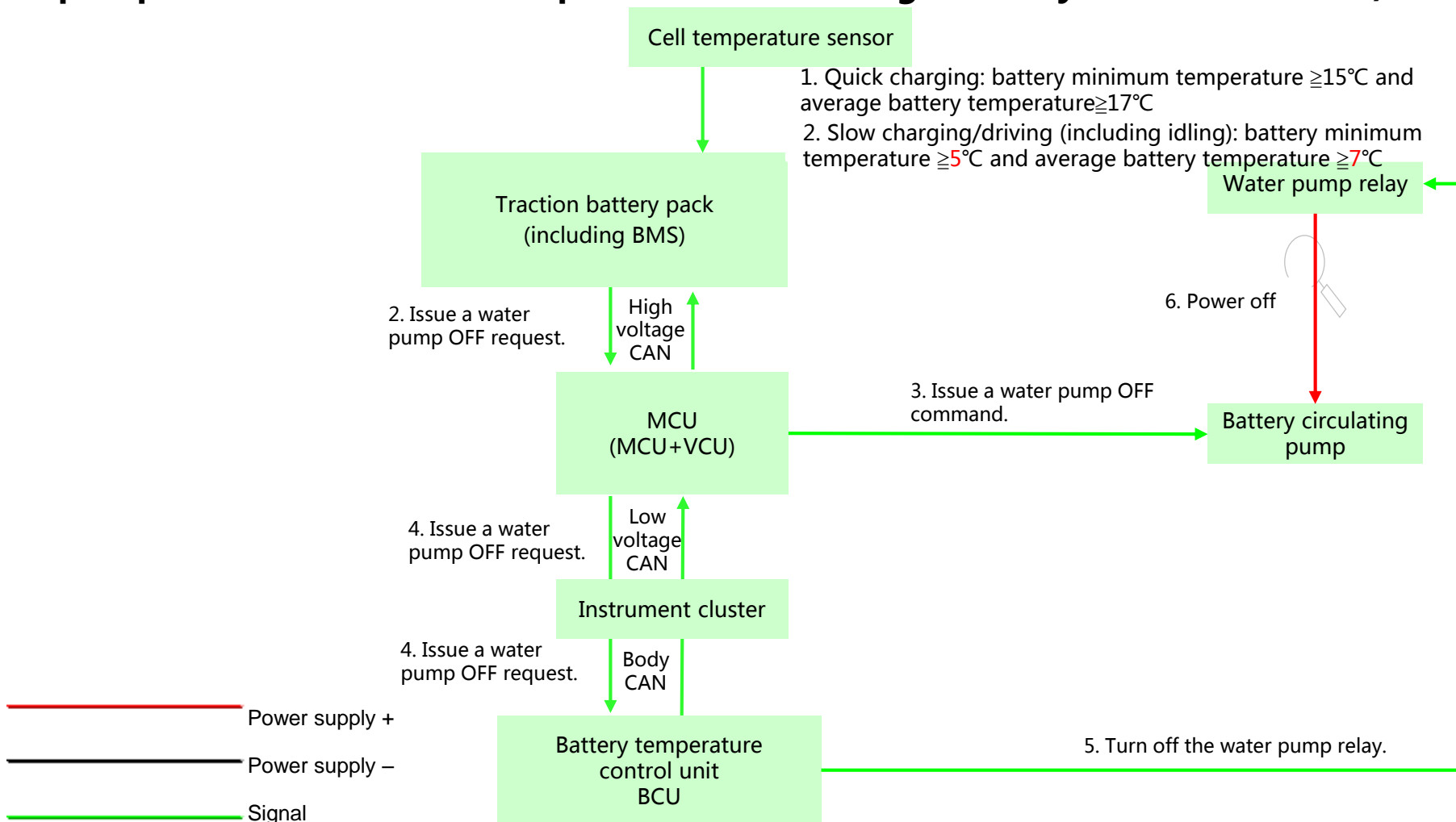


### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



东风乘用车

#### 2. Analysis of basic principle and circuit diagram of battery heating (water pump self-circulation of complete thermal management system deactivated)

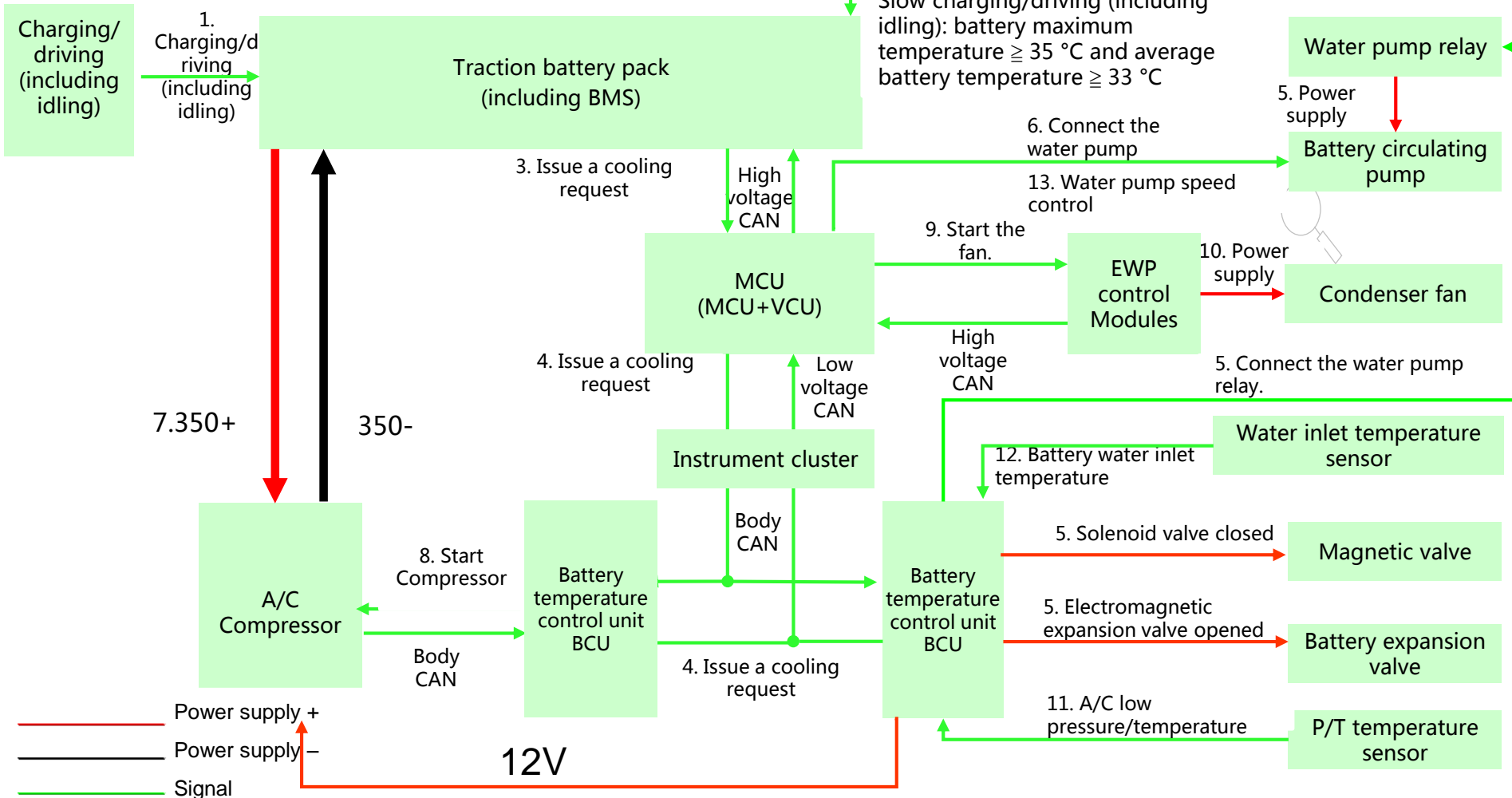


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东风乘用车

Cell temperature sensor

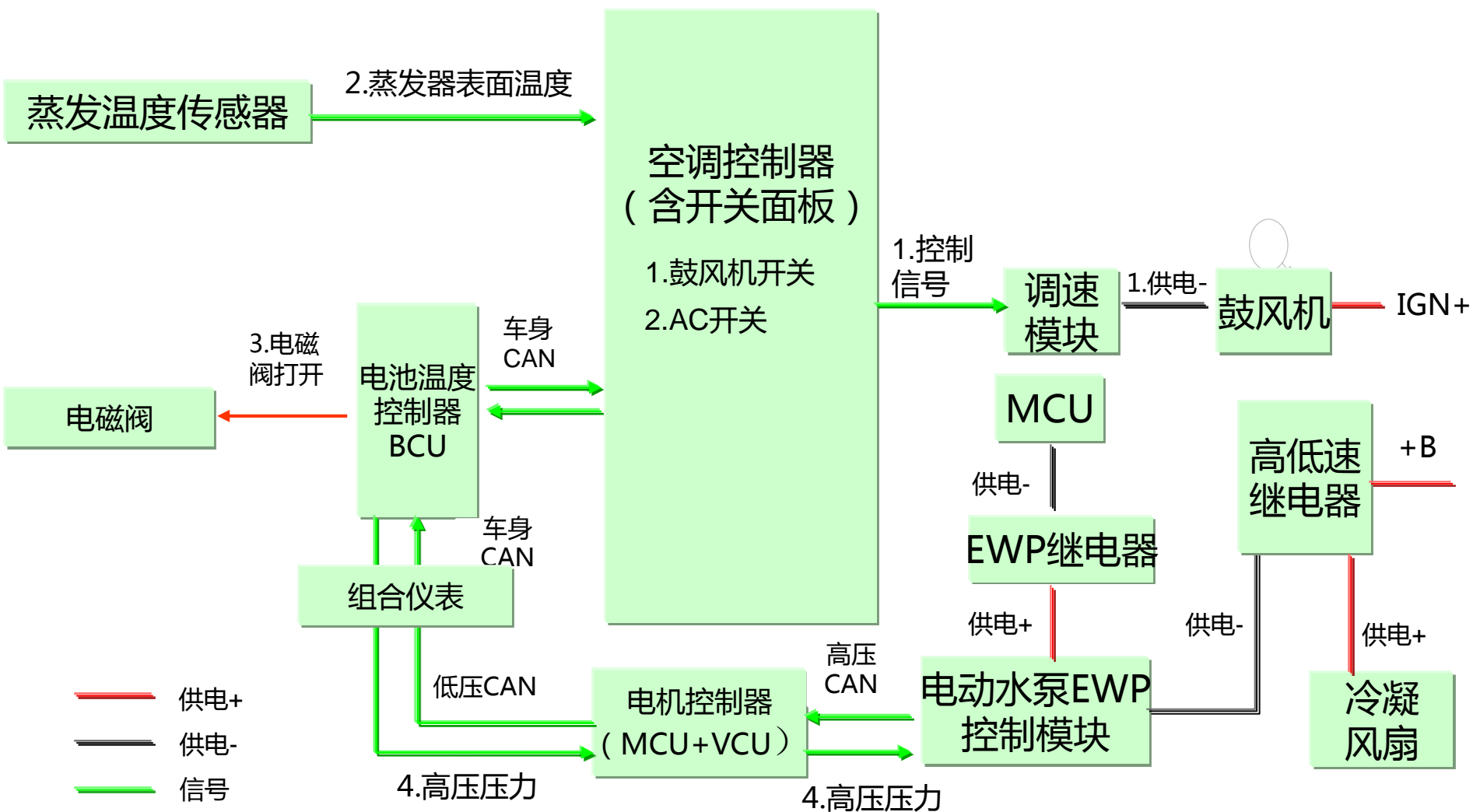
## Water pump relay





### 三、E70完整版热管理的基本原理及电路图分析

#### 3、电池、乘员舱同时制冷基本原理及电路分析（完整版热管理系统的启动）



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Evaporator temperature sensor

2. Evaporator surface temperature

A/C (including switch panel)

1. Blower switch

2. AC switch

1. Control signal

Speed control unit

1. Power supply -

Blower

IGN+

MCU

Power supply -

EWP relay

Power supply +

EWP Control module

Power supply -

HI/LO relay

+B

Condenser fan

Power supply +

MCU (MCU+VCU)

High voltage CAN

Low voltage CAN

Instrument cluster

Battery temperature control unit (BCU)

Body CAN

3. Solenoid valve opened

Magnetic valve

4. High pressure

4. High pressure

Power supply +

Power supply -

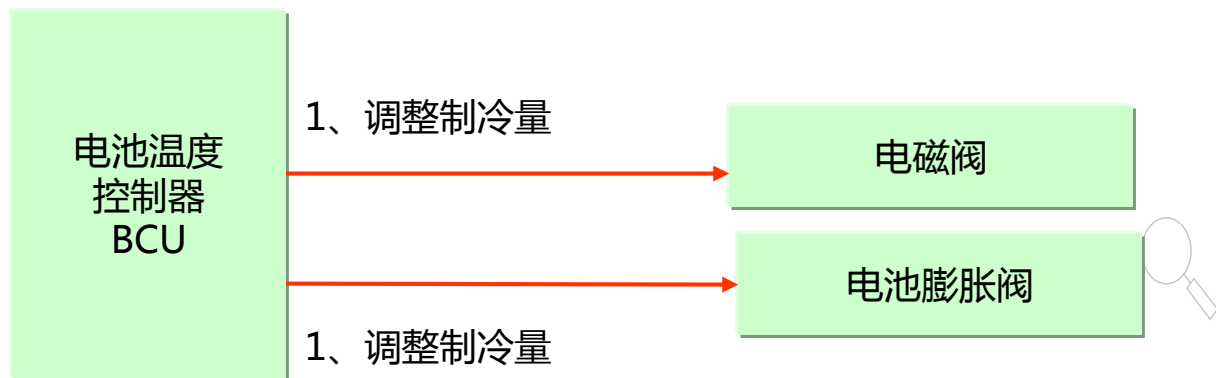
Signal





### 三、E70完整版热管理的基本原理及电路图分析

#### 3、电池、乘员舱同时制冷基本原理及电路分析（完整版热管理系统的启动）



1、电池温度高于设定值，优先保证电池包；电池包的制冷量尽可能大，乘员舱不关闭，也有制冷量。

2、电池温度低于设定值，优先保证乘员舱；乘员舱达到出风温度设定值之前，不给电池冷却。达到出风温度设定值之后，在维持出风温度不变的前提下（同时给电池和乘员舱分配制冷量），逐渐增加电池冷却回路的制冷量给电池进行冷却。

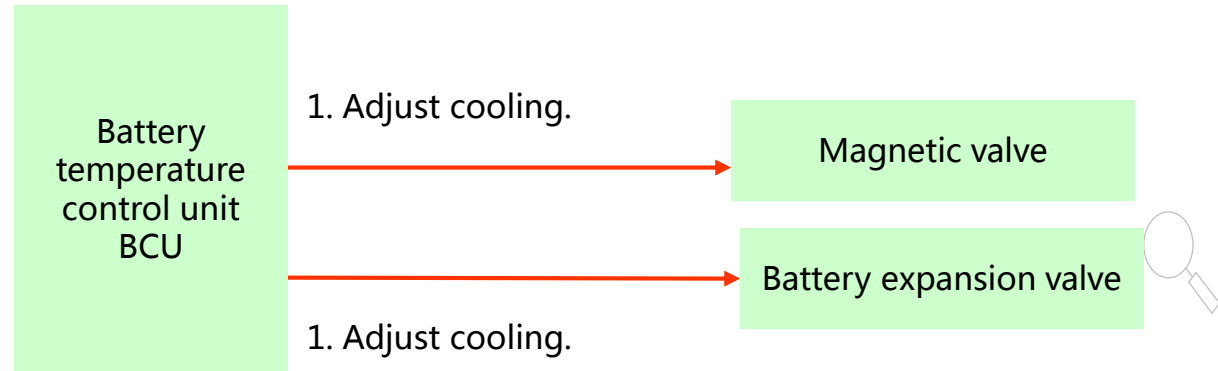
3、如果检测过程中发现电池水温没有降低，请将乘员舱的风量调至最低或直接关闭乘员舱空调，电池的水温会很快降低。

### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



东风乘用车

#### 3. Analysis of basic principle and circuit diagram of battery and passenger compartment cooling (complete thermal management system activated)



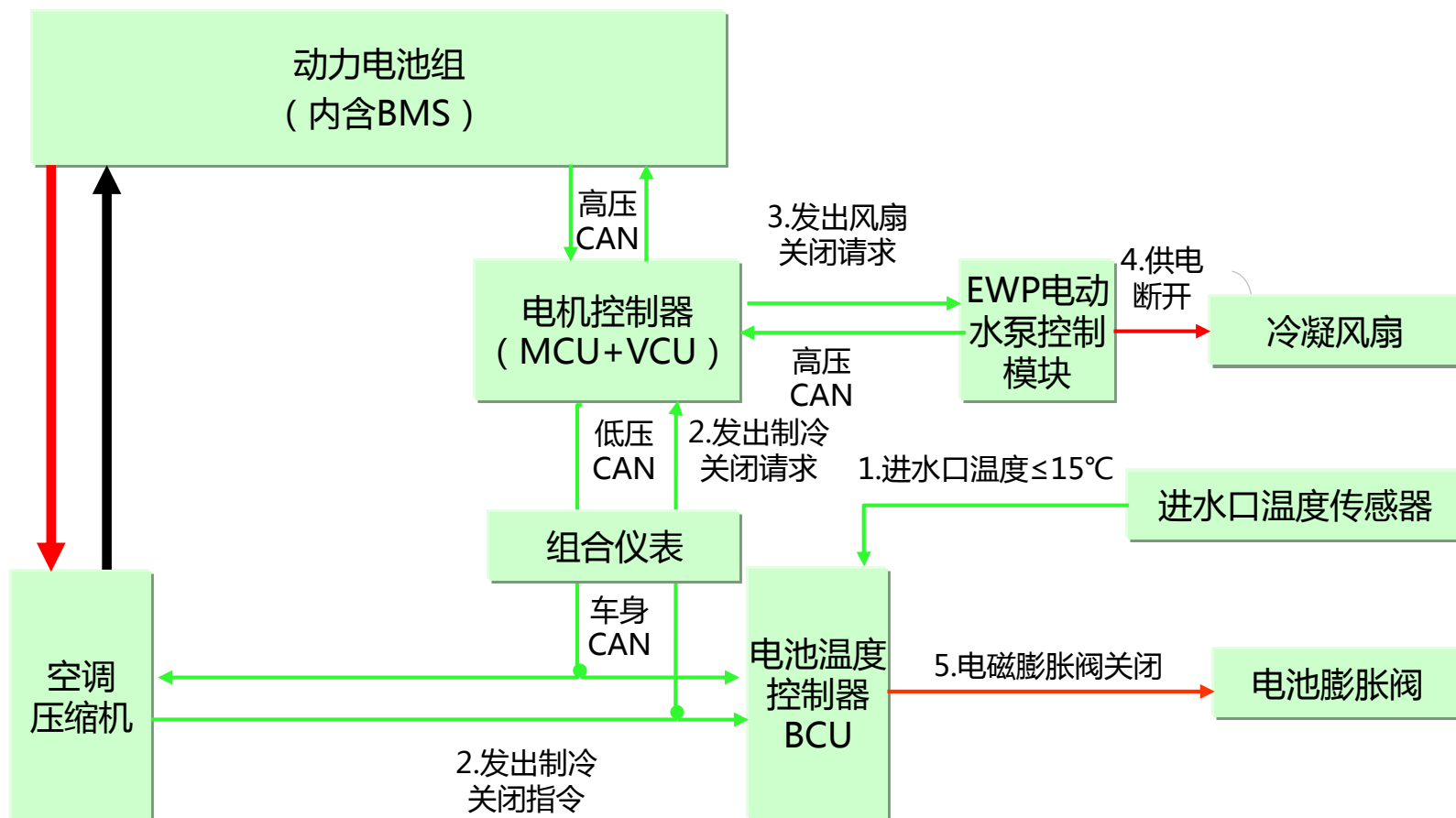
1. If the battery temperature is higher than the set value, the cooling capacity of the battery pack shall be preferentially guaranteed to be as large as possible, as the cooling of the passenger compartment is also available even if it is closed.
2. If the battery temperature is lower than the set value, the cooling capacity of the passenger compartment shall be preferentially guaranteed, and the battery will be not cooled before the passenger compartment temperature reaches the set value of the air outlet temperature. After the set value of the air outlet temperature is reached, the cooling capacity of the battery cooling circuit shall be gradually increased to cool the battery provided that the air outlet temperature is unchanged (the cooling capacity is simultaneously allocated to the battery and the passenger compartment).
3. If the battery water temperature is not reduced during the test, please adjust the air volume of the passenger compartment to the lowest level or directly turn off the A/C of the passenger compartment. In this case, the water temperature of the battery will decrease rapidly.

### 三、E70完整版热管理的基本原理及电路图分析



东风乘用车

#### 3、电池、乘员舱同时制冷基本原理及电路分析（完整版热管理系统的制冷关闭）



供电+

供电-

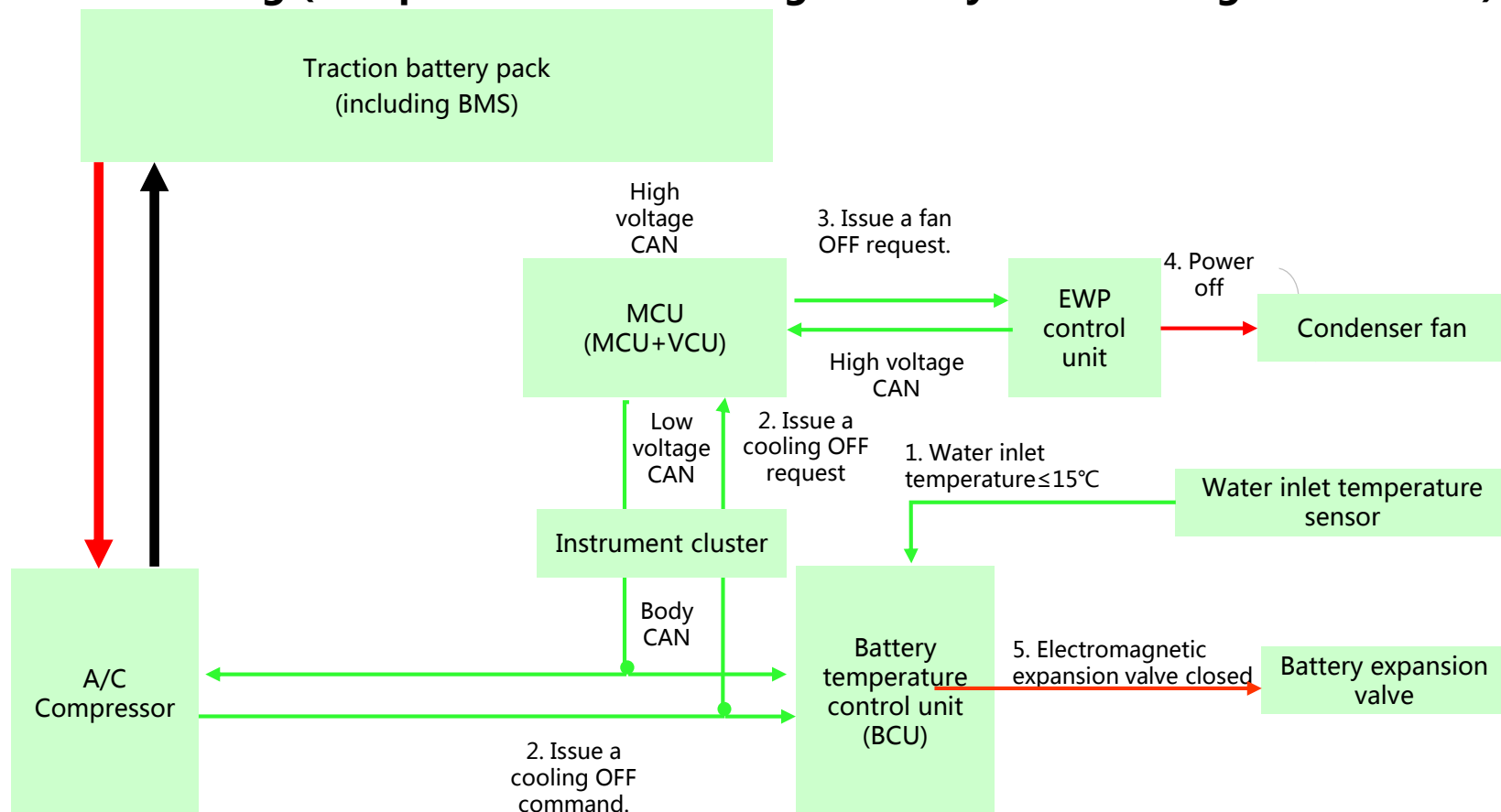
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### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



东风乘用车

#### 3. Analysis of basic principle and circuit diagram of battery and passenger compartment cooling (complete thermal management system cooling deactivated)



Power supply +

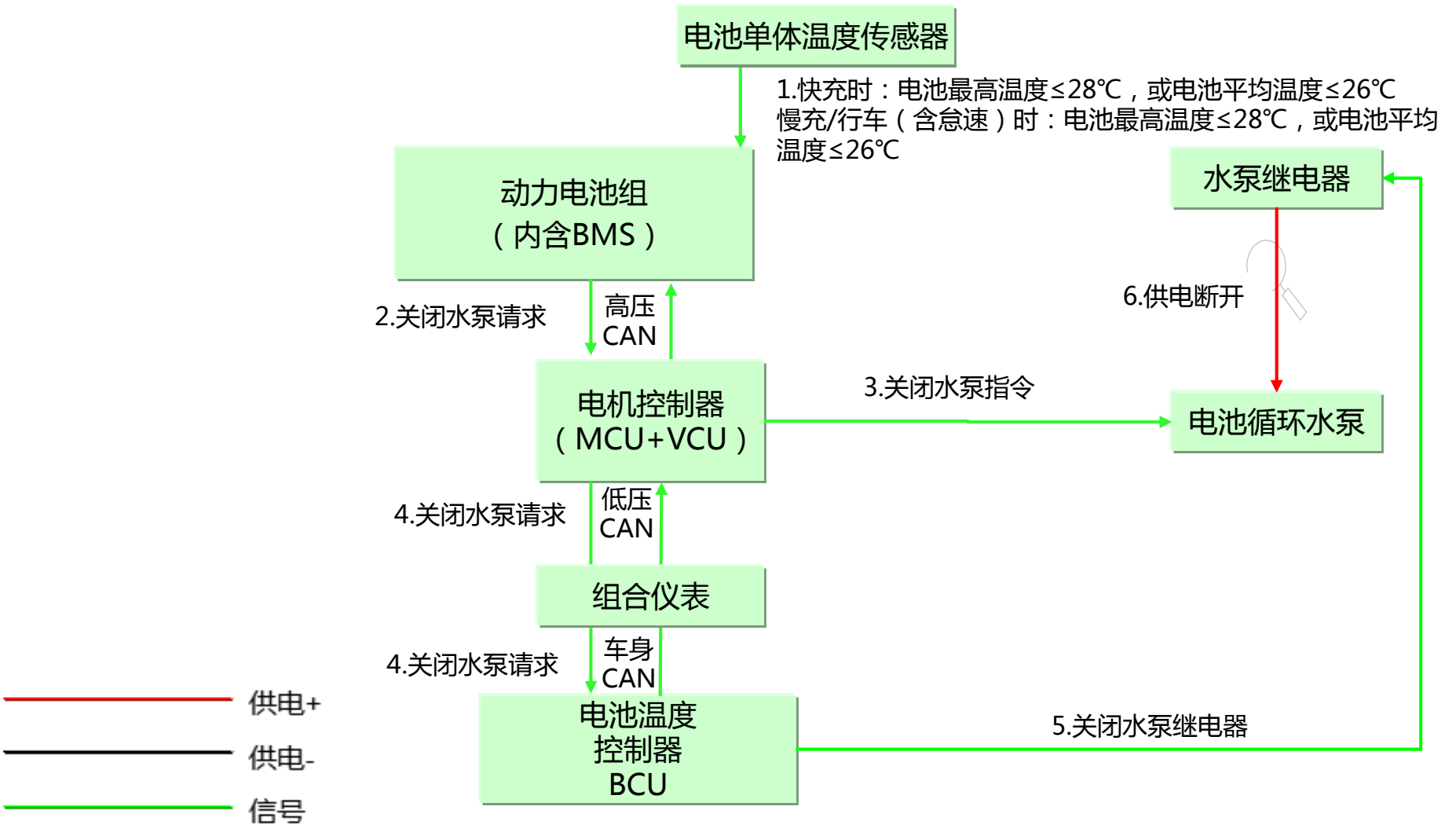
Power supply -

Signal

# 三、E70完整版热管理的基本原理及电路图分析



## 3、电池、乘员舱同时制冷基本原理及电路分析（完整版热管理系统的水泵自循环关闭）



### III. Analysis of working principle and circuit diagram of E70 complete thermal management system

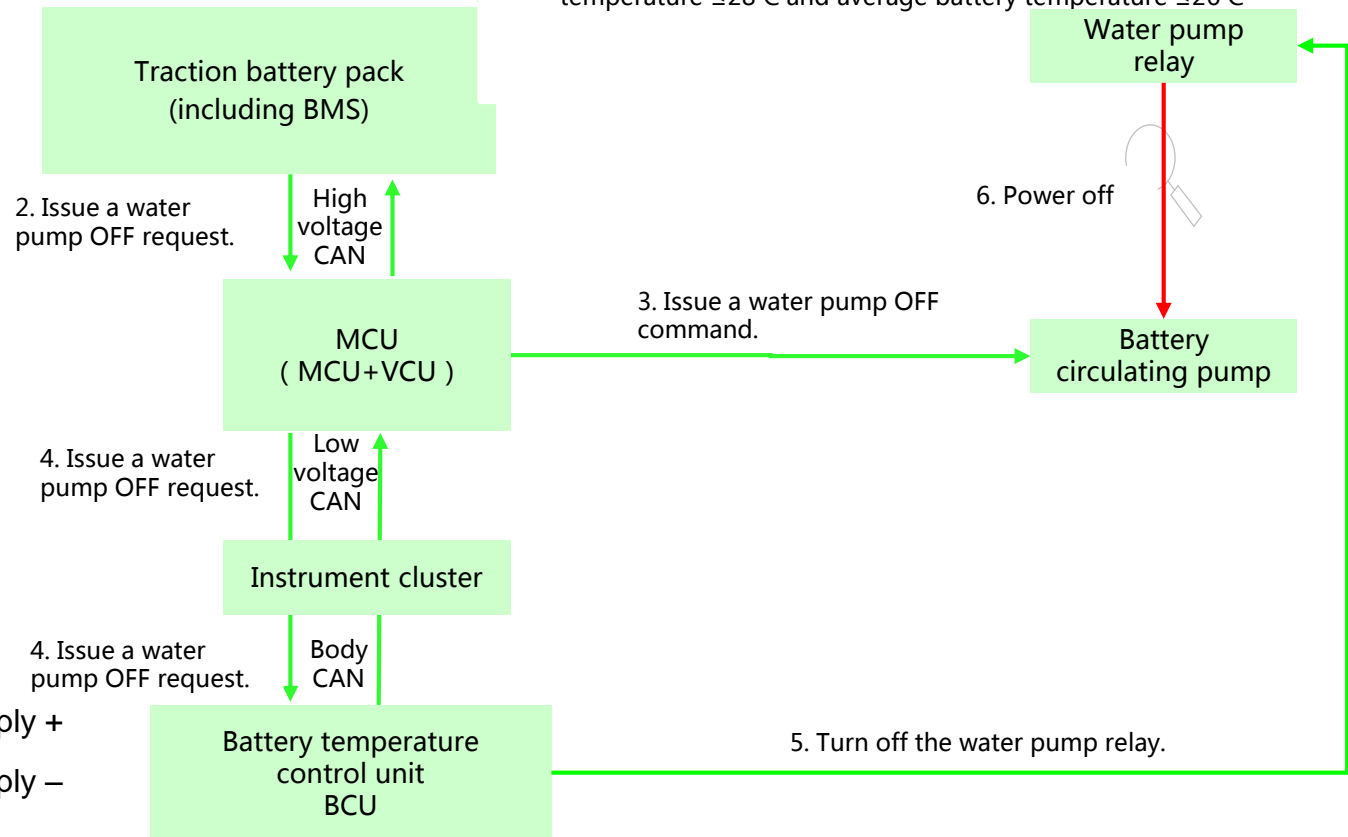


东风乘用车

#### 3. Analysis of basic principle and circuit diagram of battery and passenger compartment cooling (water pump self-circulation of complete thermal management system deactivated)

Cell temperature sensor

1. Quick charging: battery maximum temperature  $\leq 28^{\circ}\text{C}$  and average battery temperature  $\leq 26^{\circ}\text{C}$   
Slow charging/driving (including idling): battery maximum temperature  $\leq 28^{\circ}\text{C}$  and average battery temperature  $\leq 26^{\circ}\text{C}$



Power supply +

Power supply -

Signal

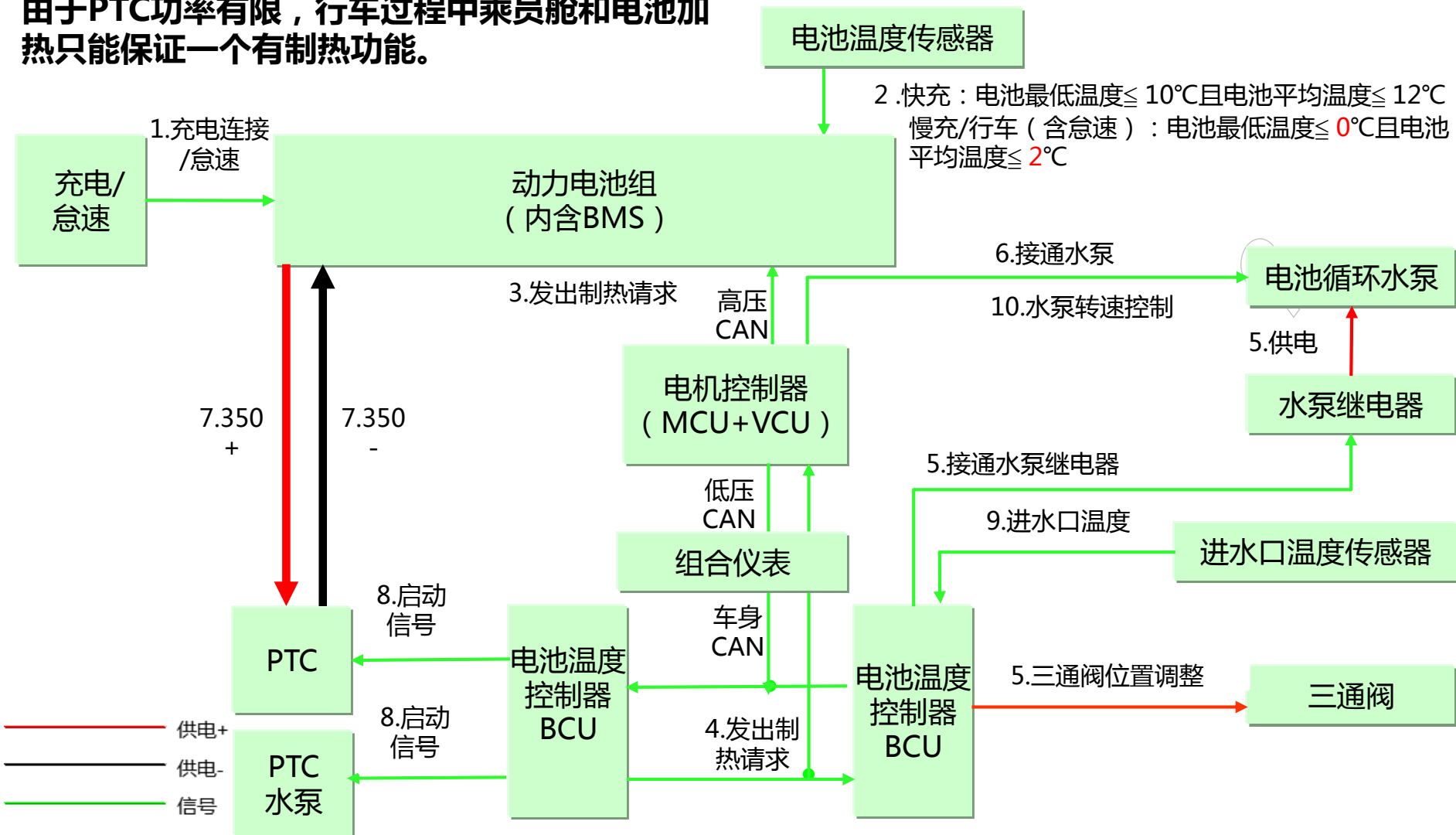




### 三、E70完整版热管理的基本原理及电路图分析

#### 4、电池、乘员舱同时制热基本原理及电路分析（完整版热管理系统的启动）

由于PTC功率有限，行车过程中乘员舱和电池加热只能保证一个有制热功能。



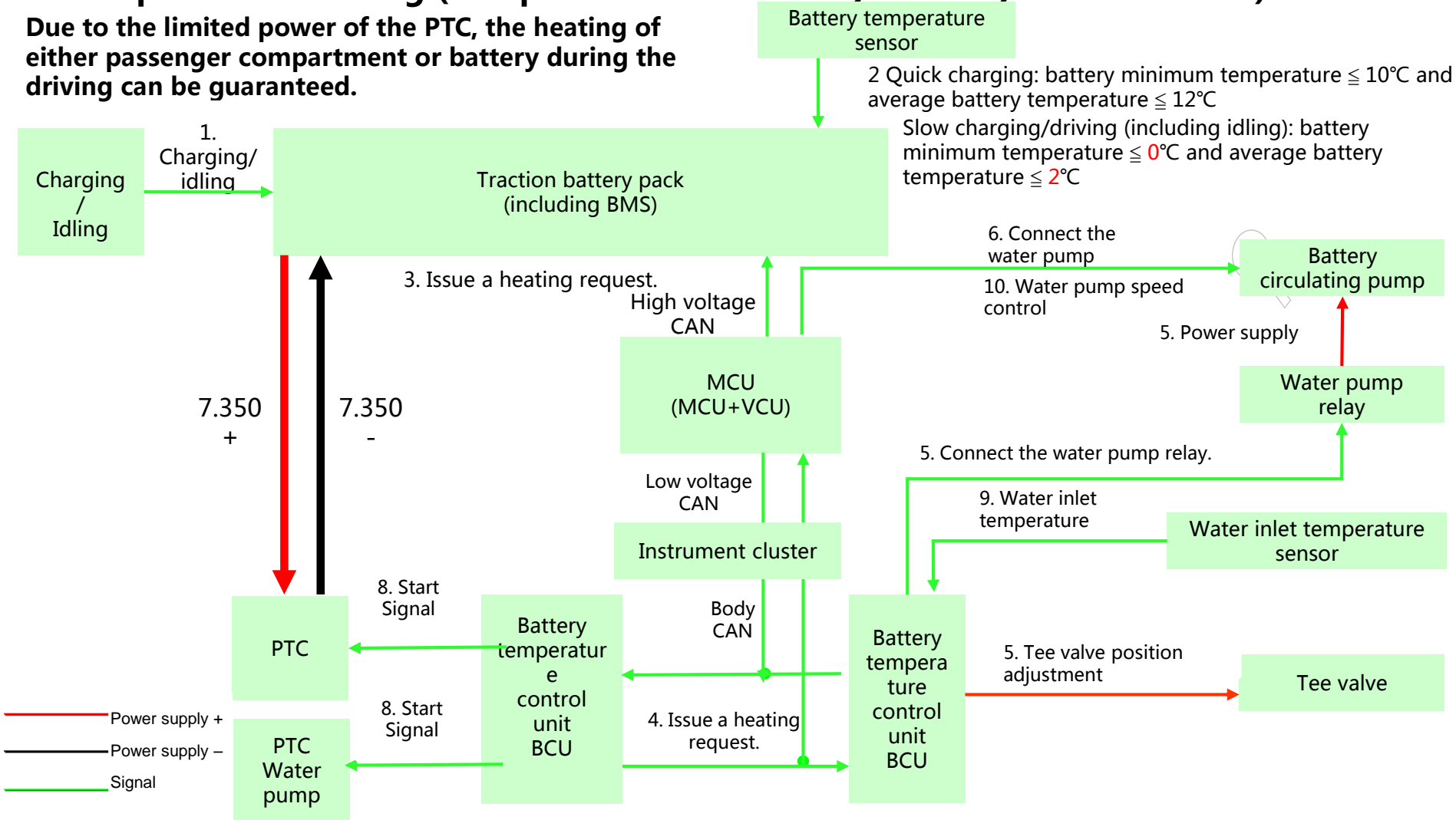
### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



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#### 4. Analysis of basic principle and circuit diagram of battery and passenger compartment heating (complete thermal management system activated)

Due to the limited power of the PTC, the heating of either passenger compartment or battery during the driving can be guaranteed.

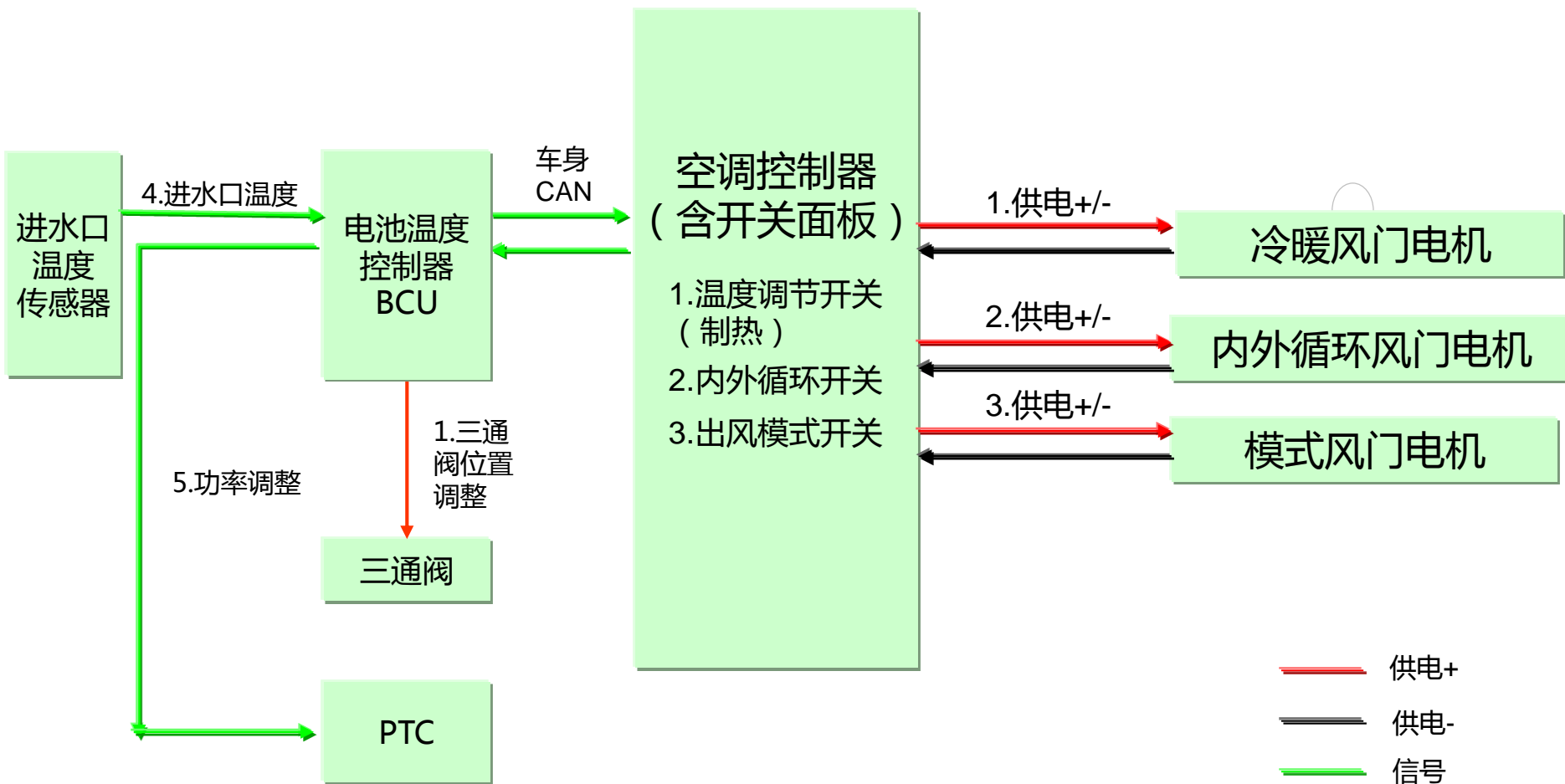




### 三、E70完整版热管理的基本原理及电路图分析

#### 4、电池、乘员舱同时制热基本原理及电路分析（完整版热管理系统的启动）

充电工况时两个都会有加热功能，但是加热程度相对都会差一点。因此建议充电的时候不要开空调



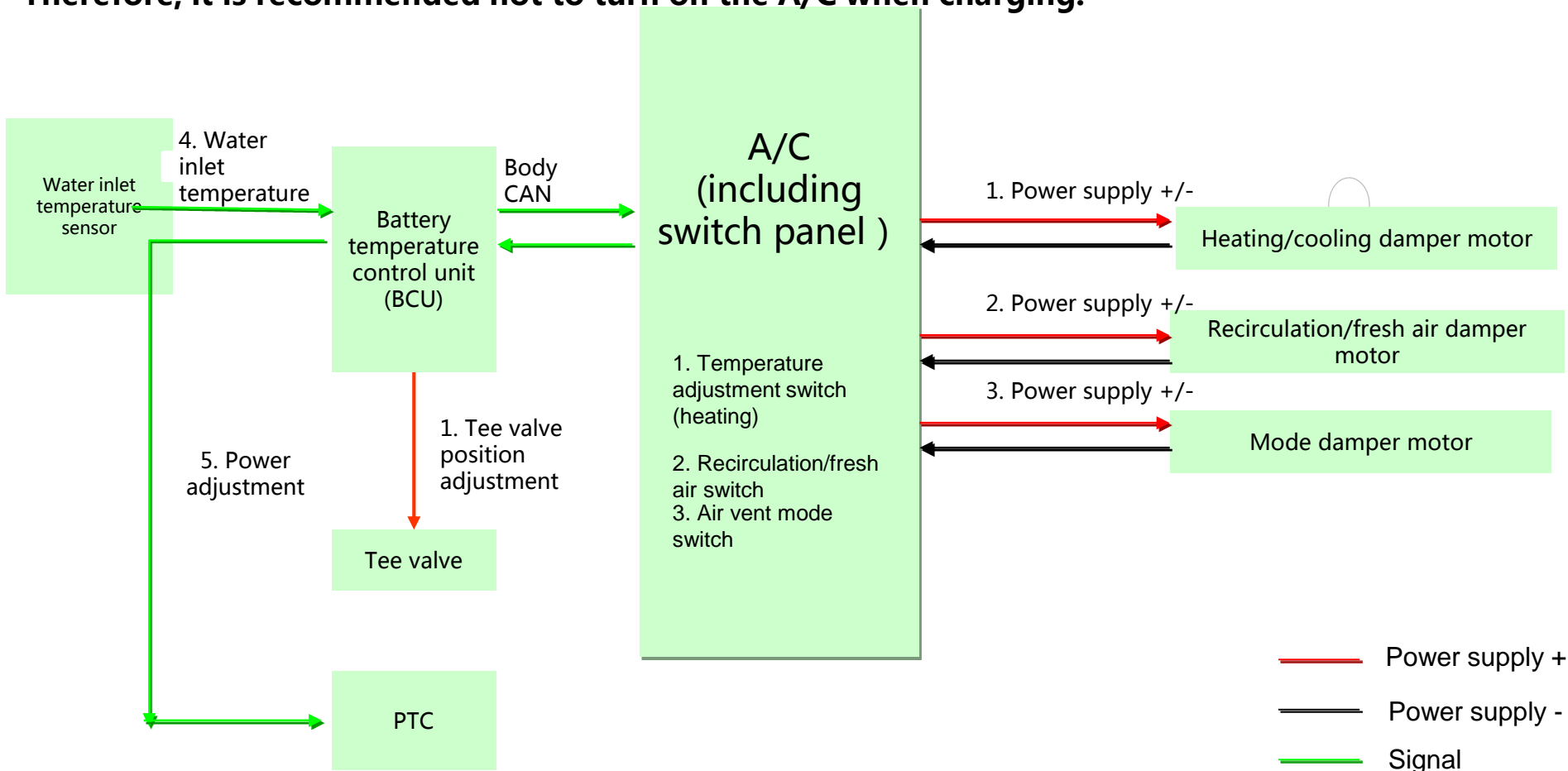
### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



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#### 4. Analysis of basic principle and circuit diagram of battery and passenger compartment heating (complete thermal management system activated)

Heating will be activated during charging conditions, but they will be heated to a lower level. Therefore, it is recommended not to turn on the A/C when charging.

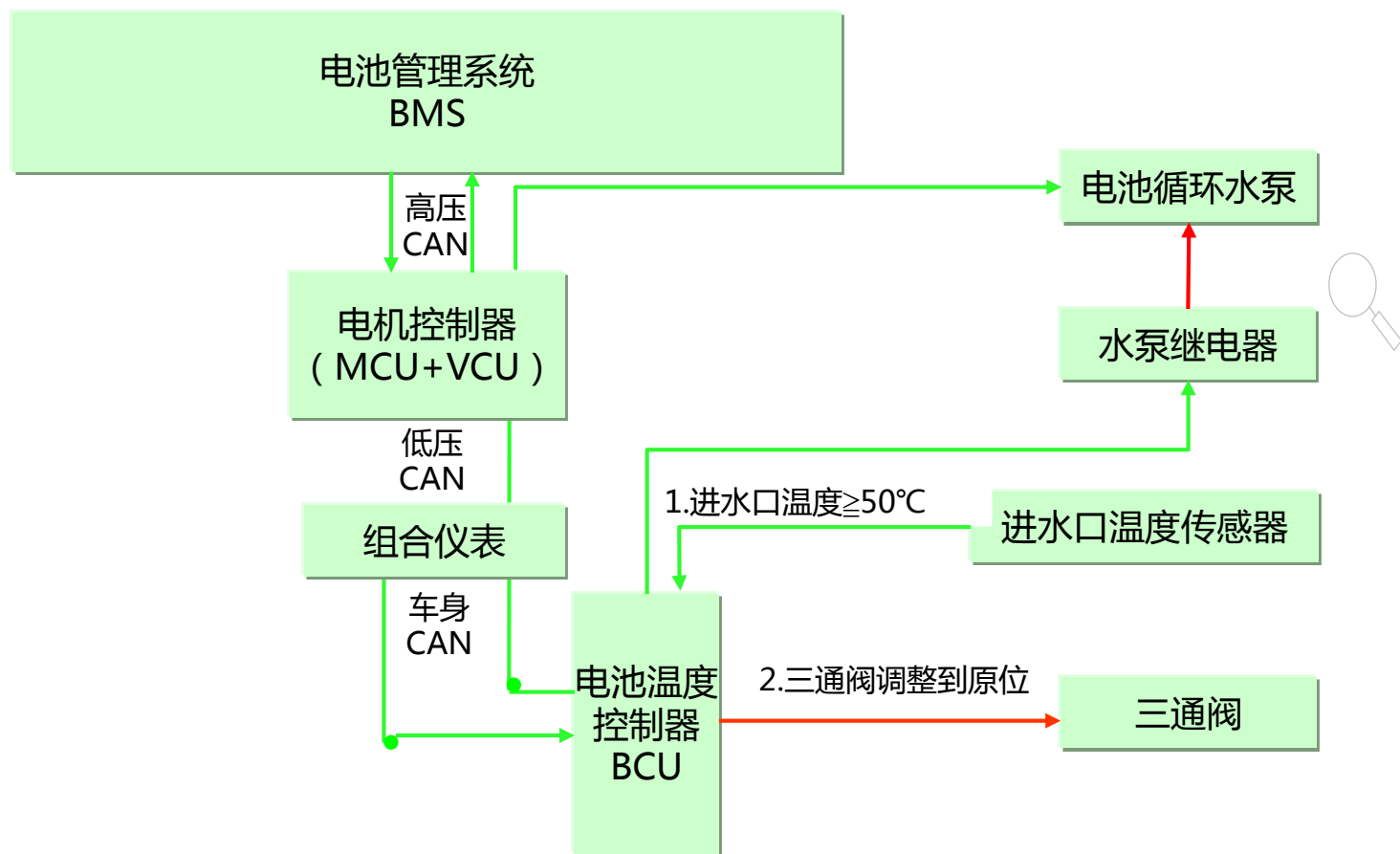


### 三、E70完整版热管理的基本原理及电路图分析



东风乘用车

#### 4、电池、乘员舱同时制热基本原理及电路分析（完整版热管理系统的制热关闭）

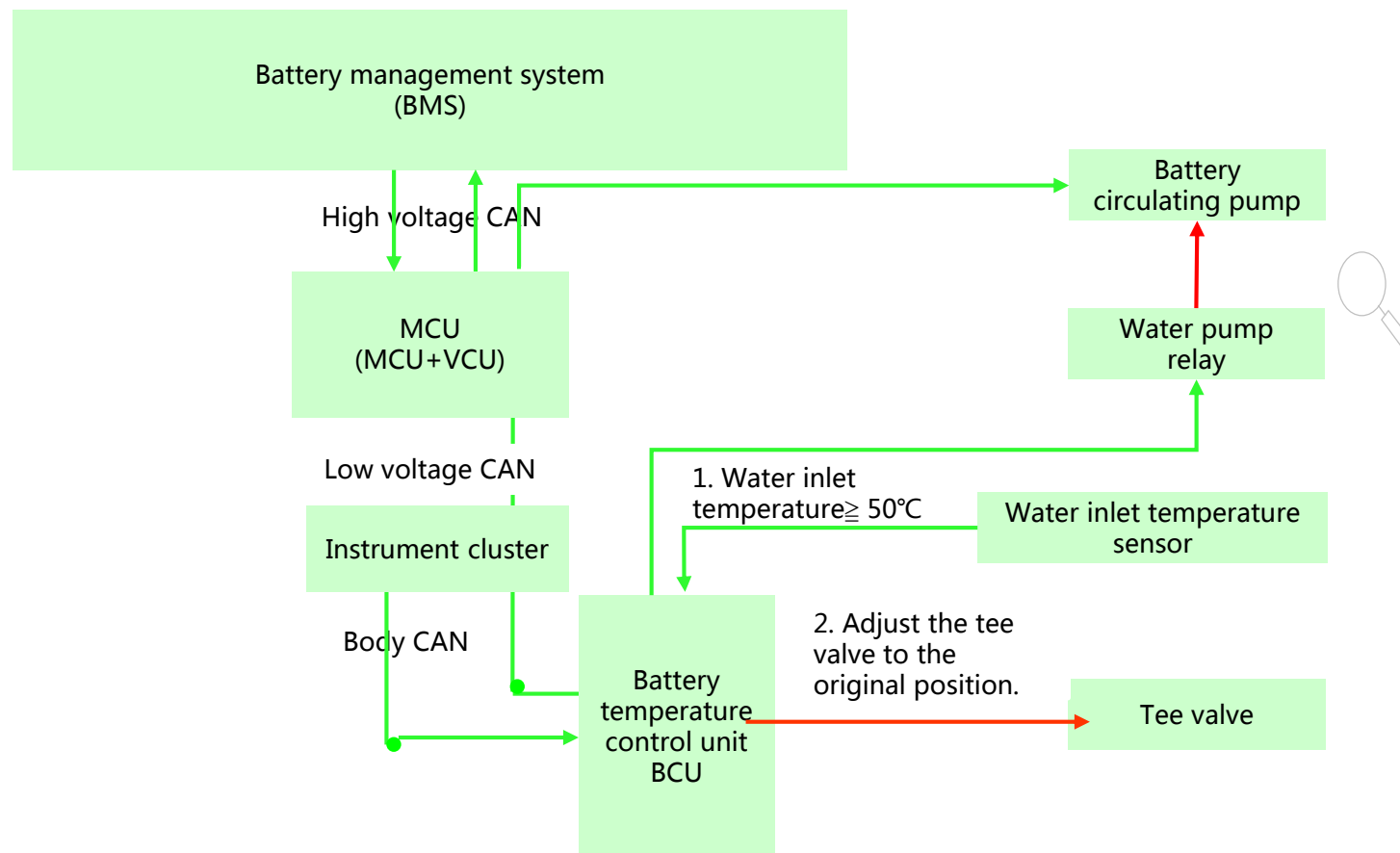


### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



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#### 4. Analysis of basic principle and circuit diagram of battery and passenger compartment heating (complete thermal management system heating deactivated)



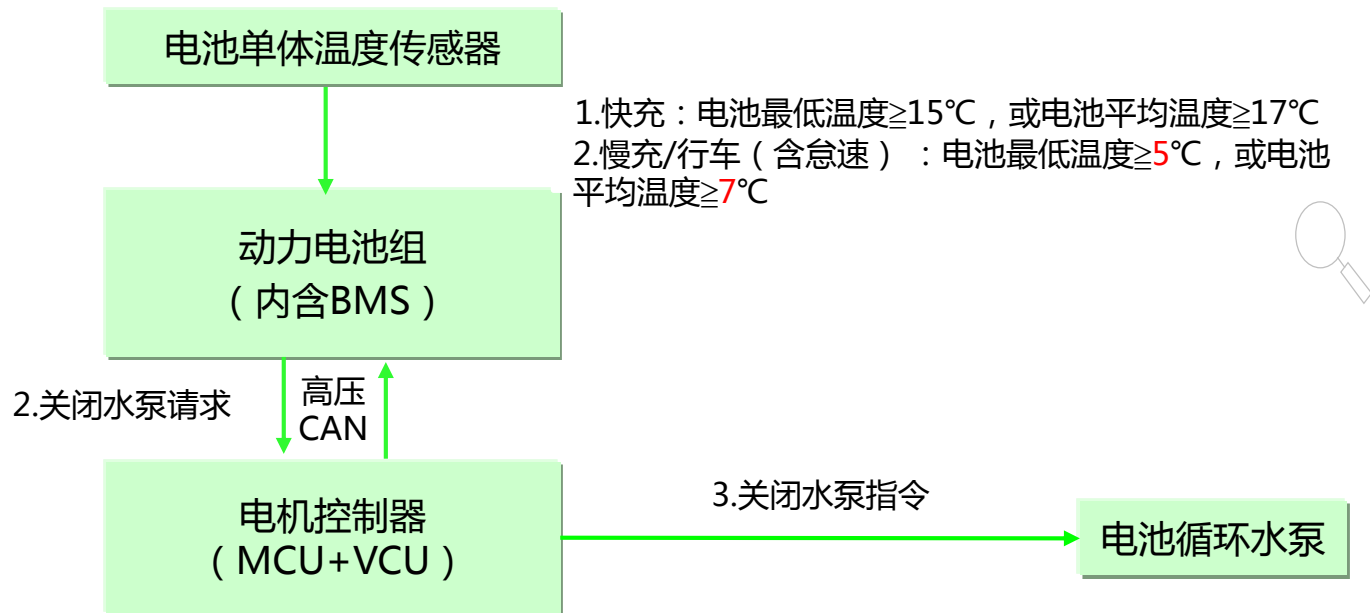


### 三、E70完整版热管理的基本原理及电路图分析



东风乘用车

#### 4、电池、乘员舱同时制热基本原理及电路分析（完整版热管理系统的水泵自循环关闭）



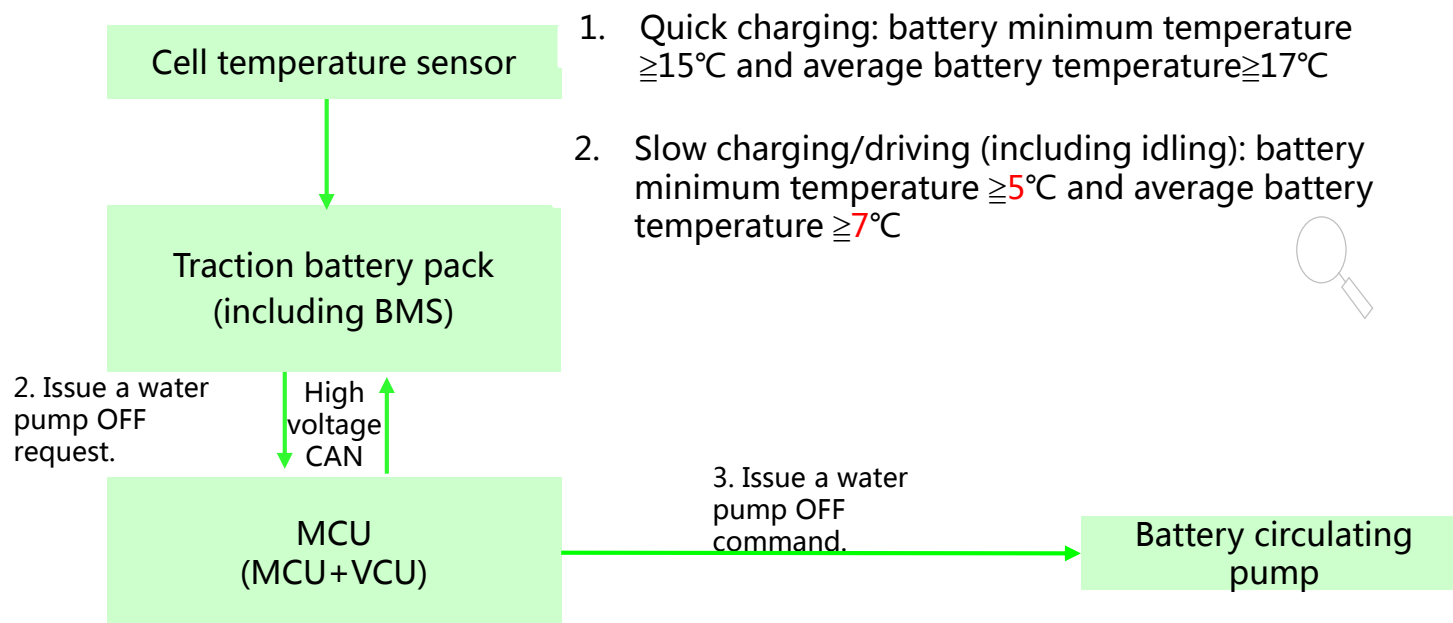
—— 供电+  
—— 供电-  
—— 信号

### III. Analysis of working principle and circuit diagram of E70 complete thermal management system



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#### 4. Analysis of basic principle and circuit diagram of battery and passenger compartment heating (water pump self-circulation of complete thermal management system deactivated)



Power supply +

Power supply -

Signal

## 四、E70完整版热管理系统故障诊断



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完整版热管理系统是基于空调系统，增加回路实现充电时的电池温度管理，空调系统故障会影响到热管理系统的工作。电池冷却控制器BCU无单独的诊断地址，不可用诊断仪诊断。

常见故障现象及原因如下

故障现象	维修建议
因温度过高而无法正常工作 (充电连接正常)	1、检查电池组冷却液液位是否正常 2、检查电池组自循环水泵是否运转 3、检查电池膨胀阀电气插头及部件状态 4、检查空调系统压力是否正常 5、检查空调压缩机及其供电是否正常 6、检查制冷剂压力传感器、低压压力温度传感器、蒸发箱温度传感器。 7、检查换热板是否正常 8、检查BCU电气插头、电源、搭铁等
因温度过低而无法正常工作 (充电连接正常)	1、检查电池组冷却液液位是否正常 2、检查电池组自循环水泵是否运转 3、检查三通阀电气插头及部件状态 4、检查PTC是否正常 5、检查PTC水泵是否正常 6、检查换热板是否正常 7、检查空调储液罐液位 8、检查BCU电气插头、电源、搭铁等


# IV. Troubleshooting of E70 complete thermal management system



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The complete thermal management system is designed based on the A/C system, and increases the circuits to realize the battery temperature management during the charging. The failure of the A/C system will affect the work of the thermal management system. The BCU does not have a separate diagnostic address and thereby can not be diagnosed by using the scan tool.

Common fault phenomena and causes are as follows:

Trouble phenomenon	Recommended countermeasures
Failure to charge properly due to high temperature (charging connection is normal)	 <ol style="list-style-type: none"><li>1. Check if the level of the battery pack coolant is normal.</li><li>2. Check if the battery pack self-circulating pump is running.</li><li>3. Check the status of the battery expansion valve electrical plug and components.</li><li>4. Check if the A/C system pressure is normal.</li><li>5. Check if the A/C compressor and its power supply are normal.</li><li>6. Check the refrigerant pressure sensor, low pressure/temperature sensor, and evaporator temperature sensor.</li><li>7. Check if the heat exchange plate is normal.</li><li>8. Check the electrical plug, power supply, grounding, etc. of BCU.</li></ol>
Failure to charge properly due to low temperature (charging connection is normal)	<ol style="list-style-type: none"><li>1. Check if the level of the battery pack coolant is normal.</li><li>2. Check if the battery pack self-circulating pump is running.</li><li>3. Check the status of the tee valve electrical plug and components.</li><li>4. Check if the PTC is normal.</li><li>5. Check if the PTC water pump is normal.</li><li>6. Check if the heat exchange plate is normal.</li><li>7. Check the level of the A/C reservoir.</li><li>8. Check the electrical plug, power supply, grounding, etc. of BCU.</li></ol>

## 四、E70完整版热管理系统维修注意事项



东风乘用车

- 严禁未经培训的人员进行高压部分检修，避免发生安全事故；
- 在开始换件维修工作之前，**请先拔出开启钥匙，再断开蓄电池，断开维修开关,装好相应的专用堵盖**
- 维修人员必须佩戴必要可靠的安全防护用品（绝缘手套，绝缘鞋）
- **在维修作业前请采用安全隔离措施（使用警戒栏隔离），并树立高压警示牌，以警示相关人员，避免发生安全事故；**
- 工作环境要求保持干燥，照明充足，透风；
- 工作环境中要求没有杂物，散乱的工具和部件，燃烧源和危险物品；
- **注意断开维修开关后，在维修动力电池时仍然有触电风险，不要触碰电池的任何正负级端子以及维修开关座上的端子，以免触电**

# IV. Troubleshooting of E70 complete thermal management system



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- It is strictly forbidden for untrained personnel to carry out high voltage maintenance to avoid safety accidents;
- Before starting the replacement, please pull out the opening key, disconnect the battery, disconnect the service switch, and install the corresponding special plug;
- Service personnel must wear necessary and reliable PPE (insulated gloves, insulated shoes);
- Take safety isolation measures (isolating by the warning bar) before service, and set up high voltage warning signs to alert relevant personnel to avoid safety accidents;
- The working environment is required to remain dry, with sufficient lighting and ventilation;
- No debris, scattered tools and components, sources of ignition and dangerous goods exist in the working environment;
- Pay attention to the risk of electric shock when servicing the traction battery after disconnecting the service switch. Do not touch any positive and negative terminals of the battery and the terminals of the service switch base to avoid electric shock.



1.对E70完整版热管理系统进行认知

2.完成E70完整版热管理系统实践任务单







1. Cognize the E70 complete thermal management system.
2. Complete the tasks list of the E70 complete thermal management system.

