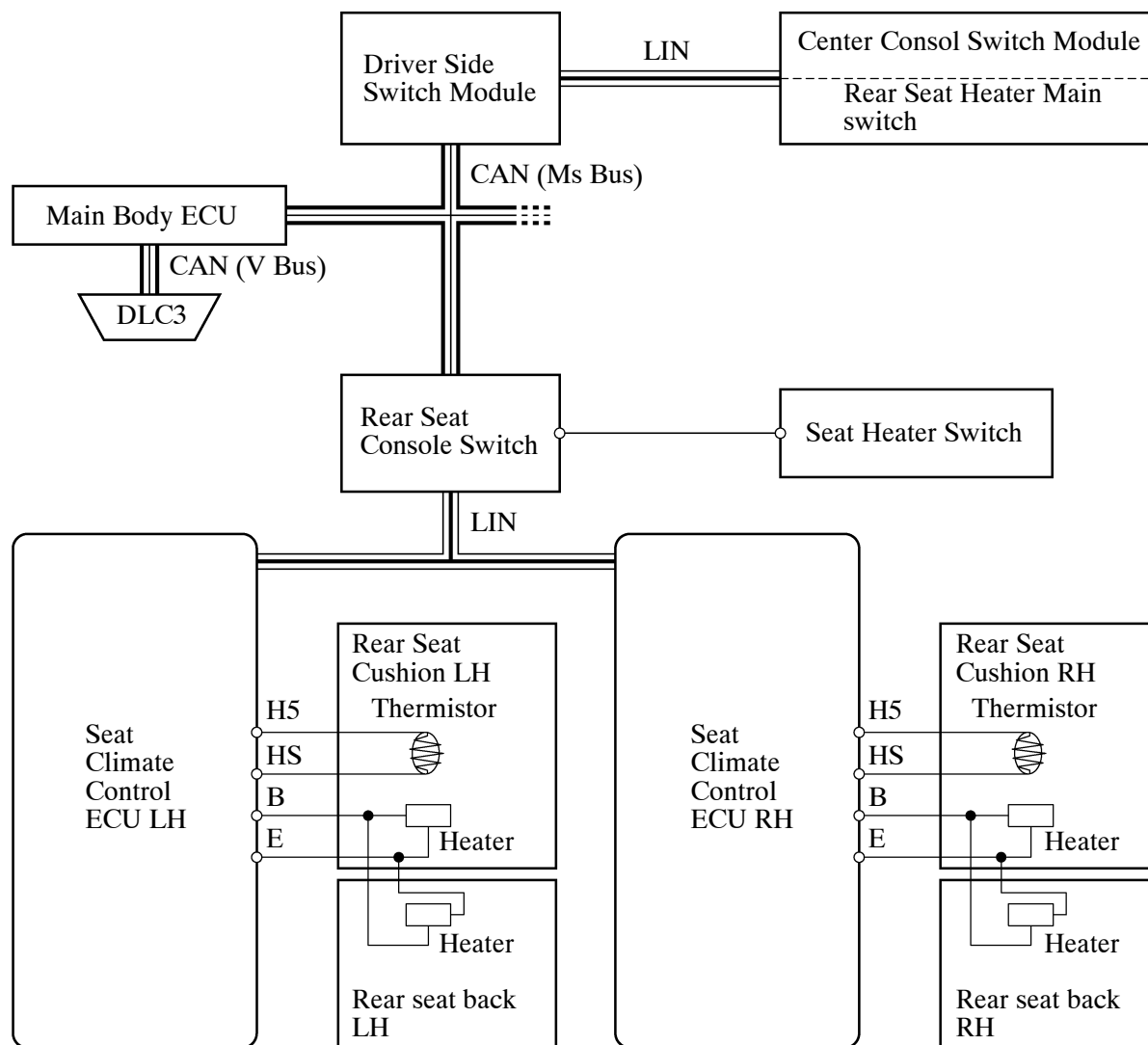


## SEAT HEATER SYSTEM

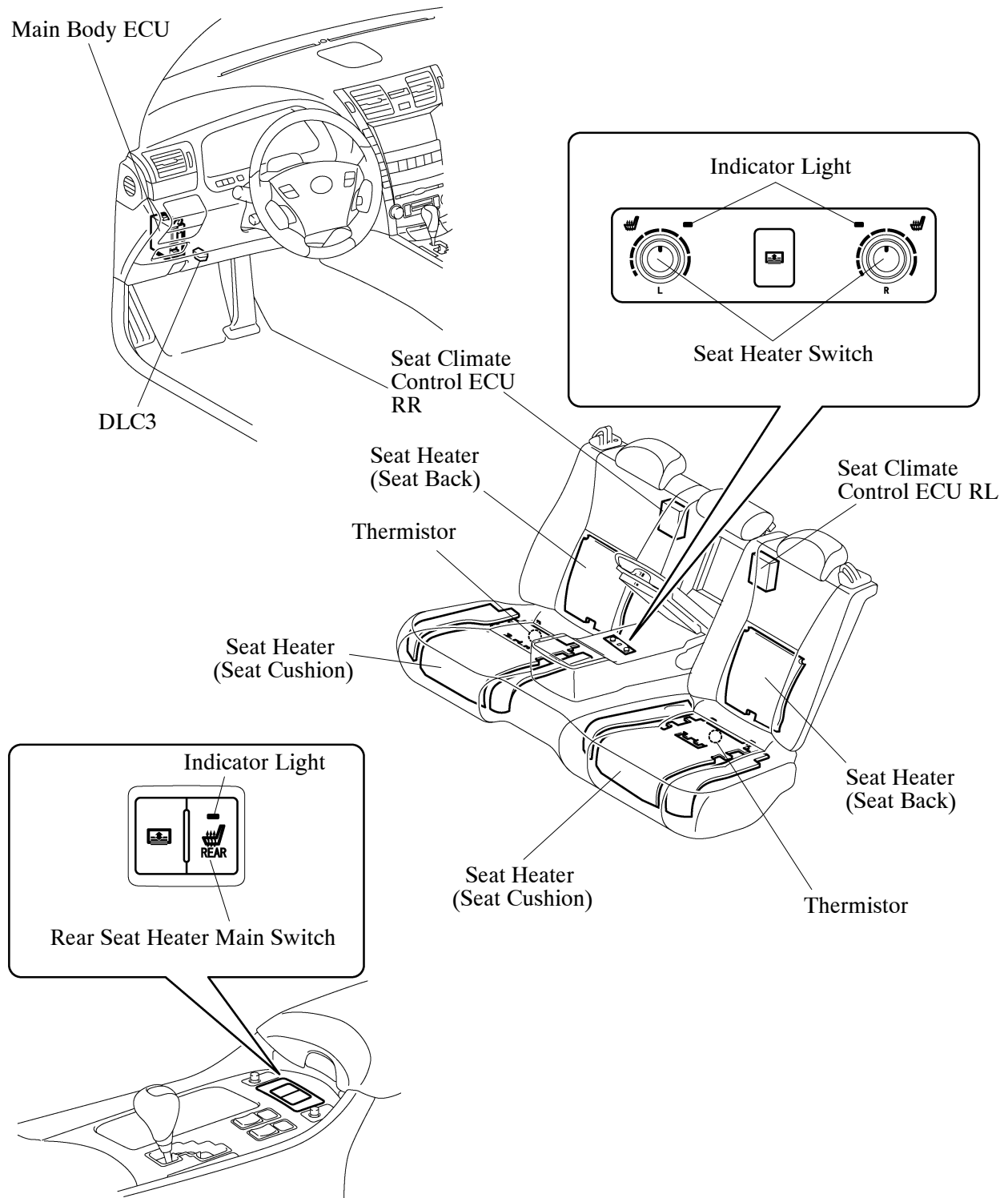
### DESCRIPTION

- A seat heater system is an available standard on models with fixed rear seat. There are independent seat heater systems for both right and left, and each one is controlled by an independent seat climate control ECU.
- The output temperatures of the seat heaters are detected by thermistors built in the right and left seat cushions and the temperatures are controlled by each seat climate control ECU.
- A rear seat heater main switch is provided in the front seat center console.

### System Diagram



■ LAYOUT OF COMPONENTS



## ■ FUNCTION OF MAIN COMPONENTS

Component	Outline
Seat Heater Switch	Turns off the heater when turned counterclockwise as far as possible. Turns on the heater and the indicator light illuminates when turned clockwise. The seat surface temperature rises in accordance to the amount the switch is turned.
Rear Seat Heater Main Switch	Turns on and off the rear seat heater system.
Thermistor	Detects the surface temperature of the seat cushion.
Seat Climate Control ECU (Rear LH and Rear RH)	Controls the system based on the signals from the thermistor and the seat heater control switch.
Seat Heater	The seat heater is sewn to the internal surfaces of the seat cushion and the seat back. It warms up the seat surface using the heat caused by electrical resistance.
Main Body ECU	Outputs a diagnosis signal to the DLC3 as a gateway from the MS bus to the V bus.

## ■ FAIL-SAFE

### 1. General

Fail-safe control effects the following three controls:

- Overcurrent protection control
- Transient voltage drop control
- Temperature sensor open/short detection control

### 2. Overcurrent Protection Control

Areas for detecting overcurrent are provided in the seat heater. The seat heater stops or reinstates when the conditions listed below have been met.

Detection Condition	When both conditions listed below have been met: <ul style="list-style-type: none"> <li>• The seat heater switch is ON.</li> <li>• The amount of the current provided for the seat heater has exceeded 10 A for 2 seconds or more.</li> </ul>
Reinstatement Condition	When the seat heater switch is turned OFF, the indicator light turns OFF, and when the switch is operated, the indicator light operates in accordance with the volume. <ul style="list-style-type: none"> <li>• The power source is turned to OFF and then to IG-ON again.</li> </ul>

### 3. Transient Voltage Drop Control

When the power source voltage of the climate control seat ECU has met the conditions listed below, this control stops or is reinstated.

Detection Condition	When both conditions listed below have been met: <ul style="list-style-type: none"> <li>• The seat heater switch is ON.</li> <li>• Continuously drops below approximately 8 V for approximately 10 msec.</li> </ul>
Reinstatement Condition	The reinstatement conditions consist of the resumption of system control in accordance with the volume setting of the seat heater switch when the power voltage of the ECU reaches above approximately 10 V continuously for approximately 10 msec.

### 4. Temperature Sensor Open/Short Detection Control

The control is suspended or reinstated when the voltage of the temperature sensors that is supplied to the input signal terminals (HS) has met the conditions listed below:

Suspended Condition	The detected value is 110°C (230°F) or more or -40°C (104°F) or less for 8 consecutive seconds.
Reinstatement Condition	The normal value is detected by the sensors for 8 consecutive seconds.

## ■ SELF-DIAGNOSIS

If the climate control seat system malfunctions, the system stops its function and a DTC (Diagnostic Trouble Code) is stored in the climate control seat ECU. The DTC can be read by connecting a hand-held tester or Techstream to DLC3.

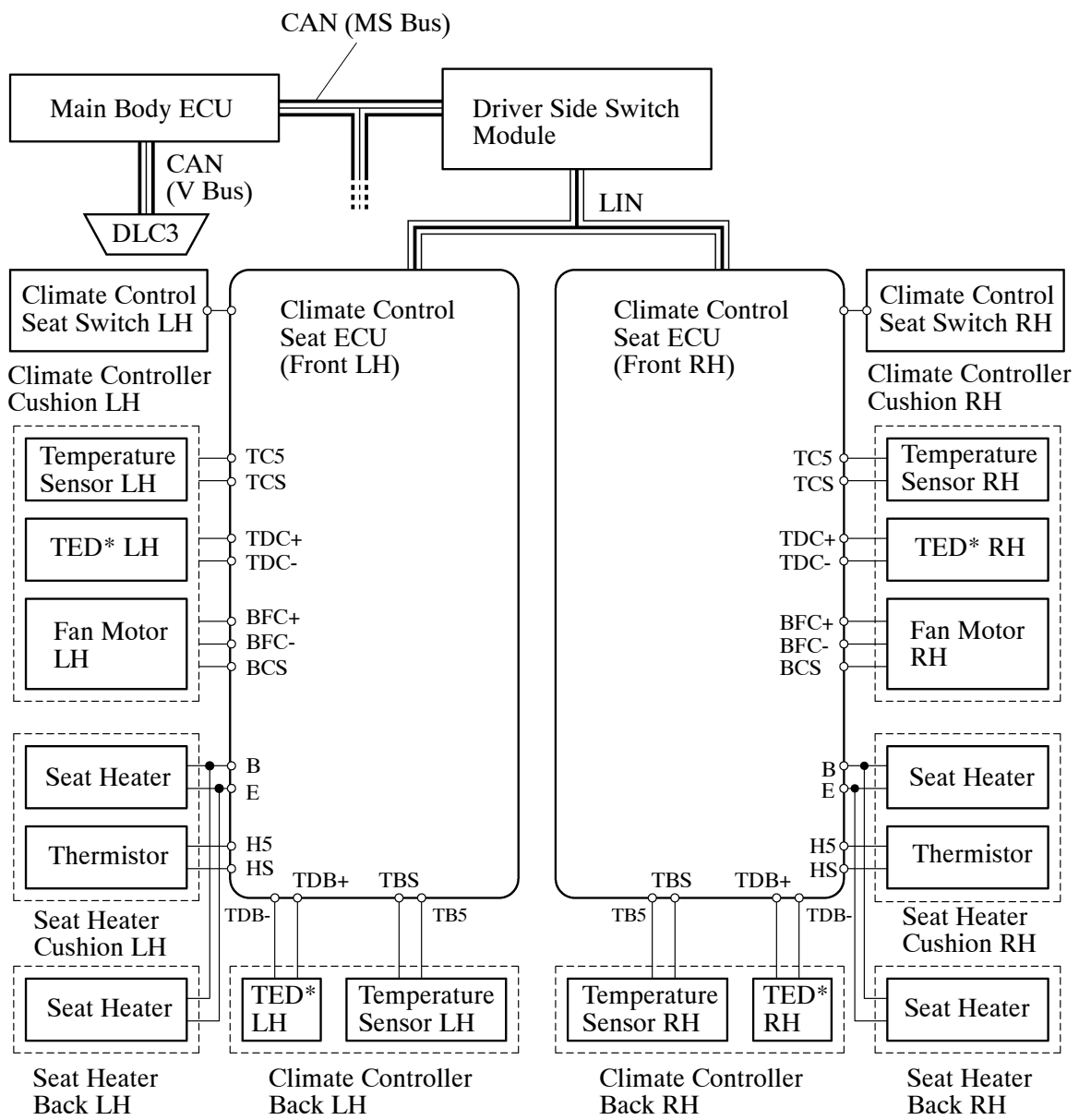
## CLIMATE CONTROL SEAT SYSTEM

### ■ DESCRIPTION

- The front seat climate control seat system is standard on all models. The rear seat climate control seat system is optional on all models with power seats.
  - The climate control seat system allows each passenger to adjust the temperatures of the seat back and the seat cushion of each seat.
  - The climate control seat system uses 2 methods to control the seat surface temperatures: One using a Peltier element to warm or cool the airflow provided to the seat surface and the other using a hot wire to warm up the seat surface. Both functions are controlled by the climate control seat ECU which is built into each seat.
  - A rear seat climate control main switch is provided in the front seat floor console. The rear seat climate control system can be turned off from the front seat whenever the rear seat climate control system is left on by a rear passenger.
- \* Peltier element: Consisting of two different types of metals, the area in which the metals are joined generated or absorbs heat when an electric current is applied to element at a prescribed temperature.

■ SYSTEM DIAGRAM

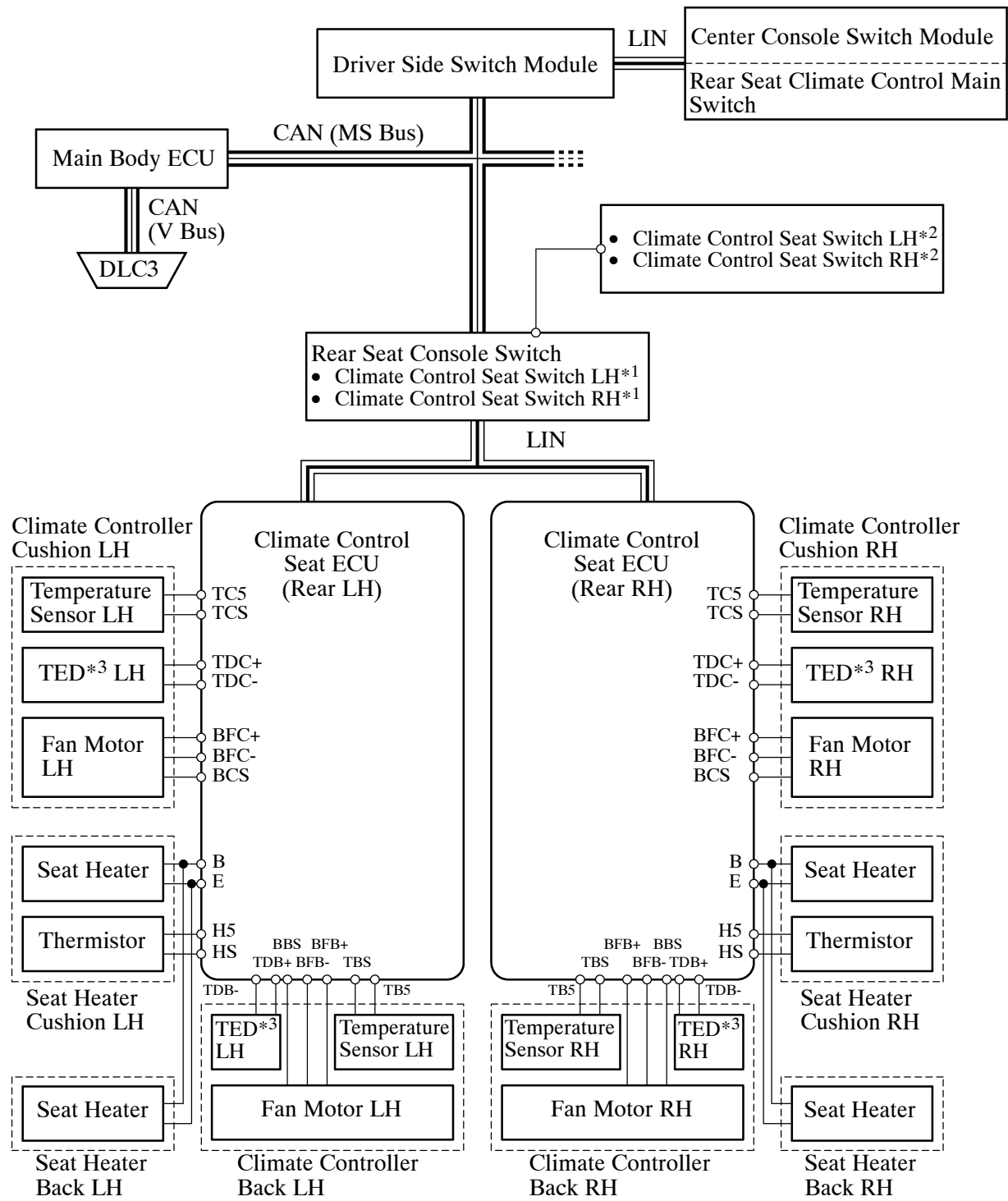
► Front Seat ◀



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\*: TED (thermo electric devices) indicate Peltier elements.

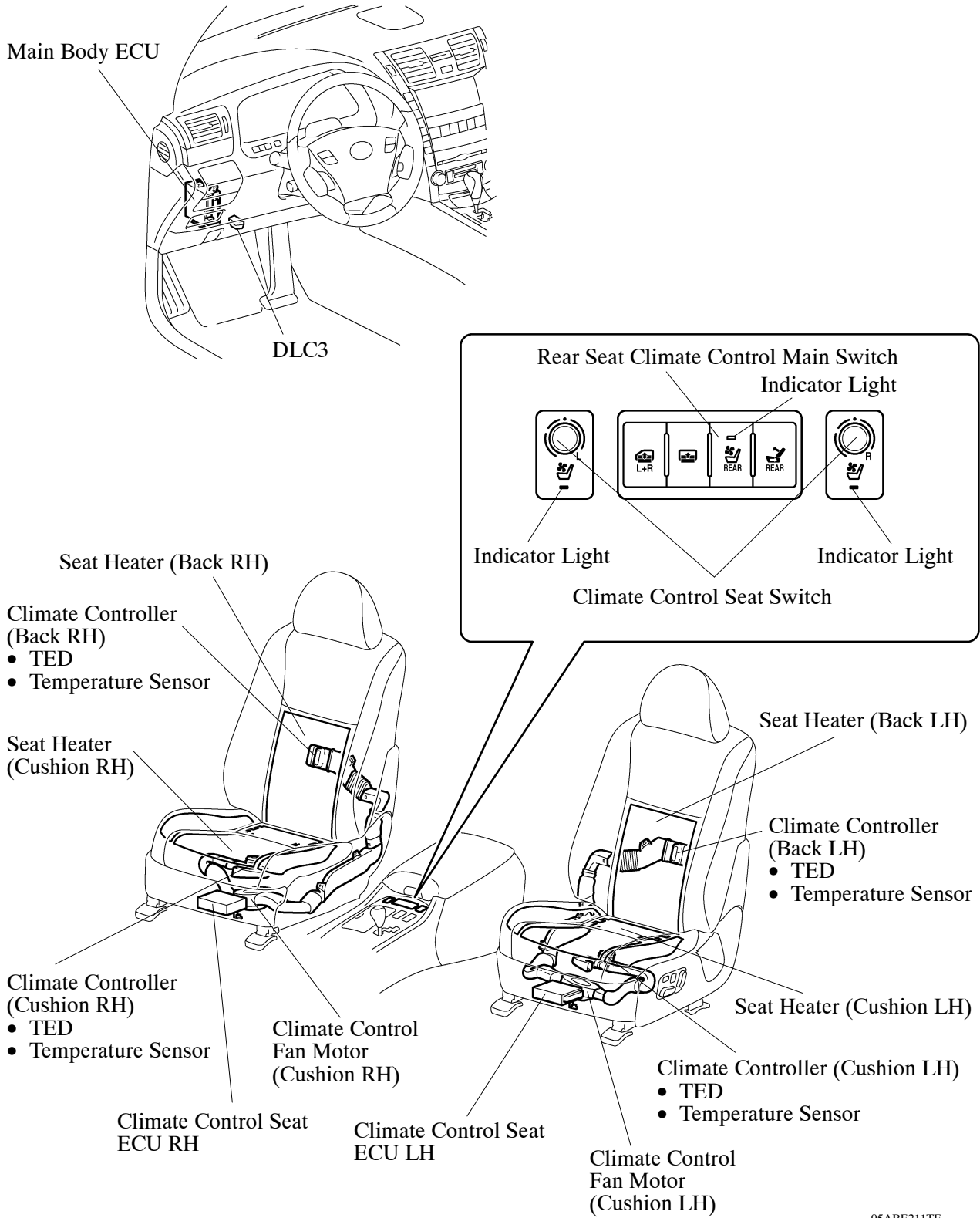
► Rear Seat ◄



\*1: Models with 4-4 split rear power seat.  
 \*2: Models with 4-2-4 split rear power seat.  
 \*3: TED (thermo electric devices) indicate Peltier elements.

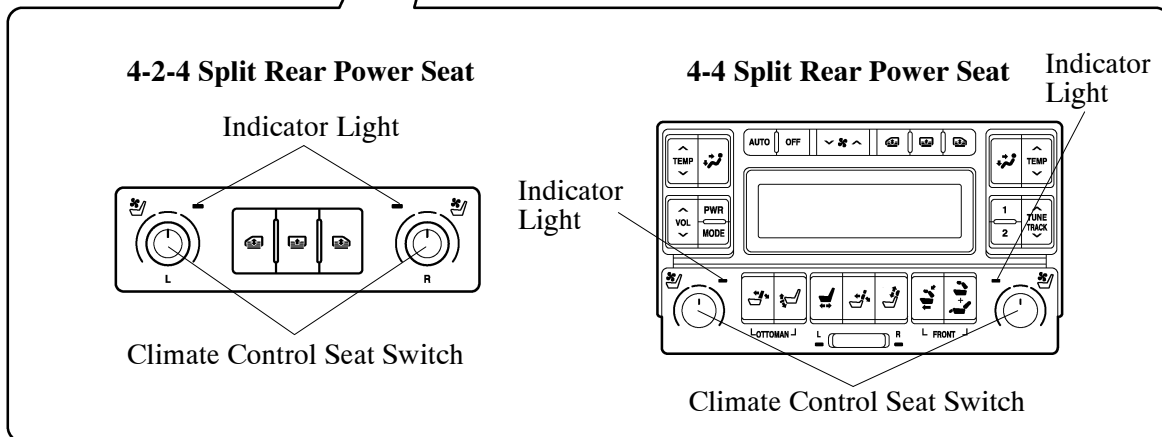
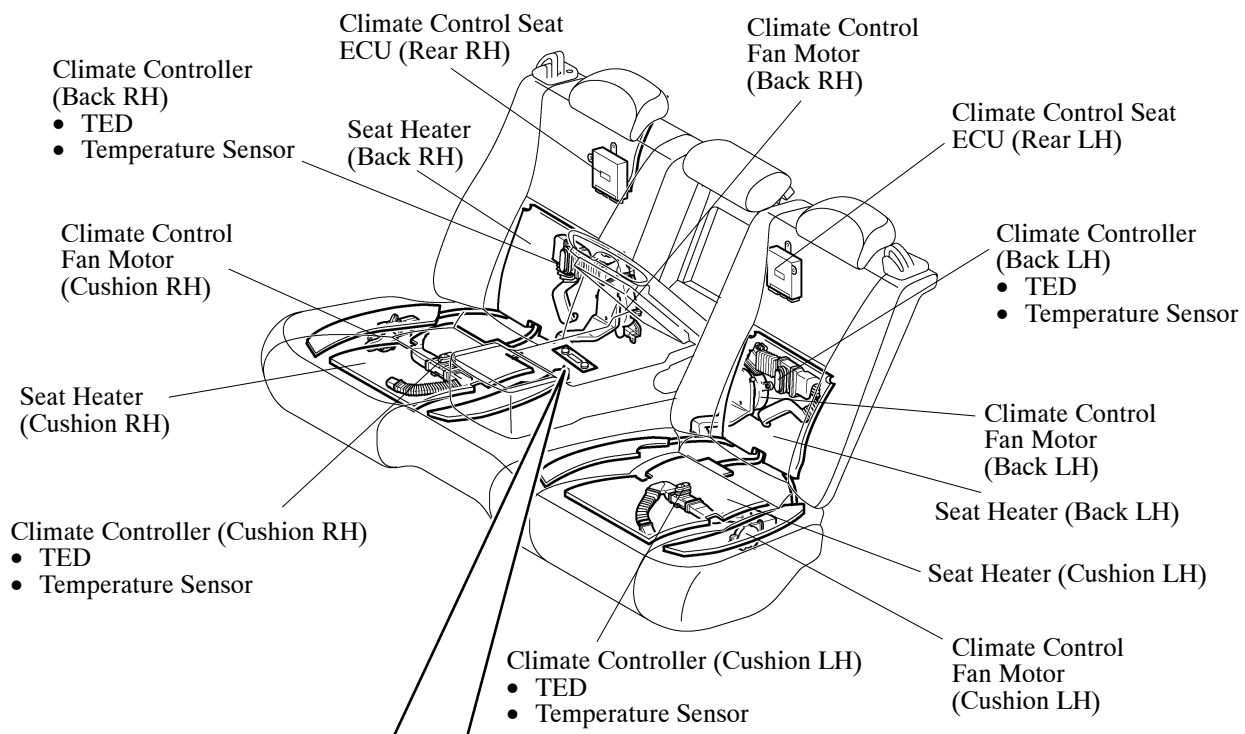
■ LAYOUT OF MAIN COMPONENTS

► Front Seat ◀





► Rear Seat ◀



■ FUNCTION OF MAIN COMPONENTS

Component		Outline
Climate Control Seat Switch		Switches the modes: <ul style="list-style-type: none"> <li>• Cool air in 3 stages: MIN, MID and MAX modes</li> <li>• Airflow</li> <li>• Warm air in 3 stages: MIN, MID and MAX modes</li> </ul>
Rear Seat Climate Control Main Switch		Turns on and off the rear seat climate control seat system.
Climate Controller	Temperature Sensor	Detects the surface temperature of the seat back and seat cushion.
	TED (Thermo electric Device)	Cools and heats through the function of the Peltier Element.
	Fan Motor	Provides airflow to the seat back and seat cushion upon receiving instructions from the ECU in accordance with the volume setting of the climate control switch.
Climate Control Seat ECU(Rear LH and Rear RH)		<ul style="list-style-type: none"> <li>• Controls the system based on the signals from the temperature sensor and the climate control switch.</li> <li>• Monitors the output amperage of the climate control fan motor.</li> </ul>
Seat Heater		The fast acting seat heater warms the seat in the initial stage of the heating mode.
Main Body ECU		Outputs a diagnosis signal to the DLC3 as a gateway from the MS bus to the V bus.

■ SYSTEM OPERATION

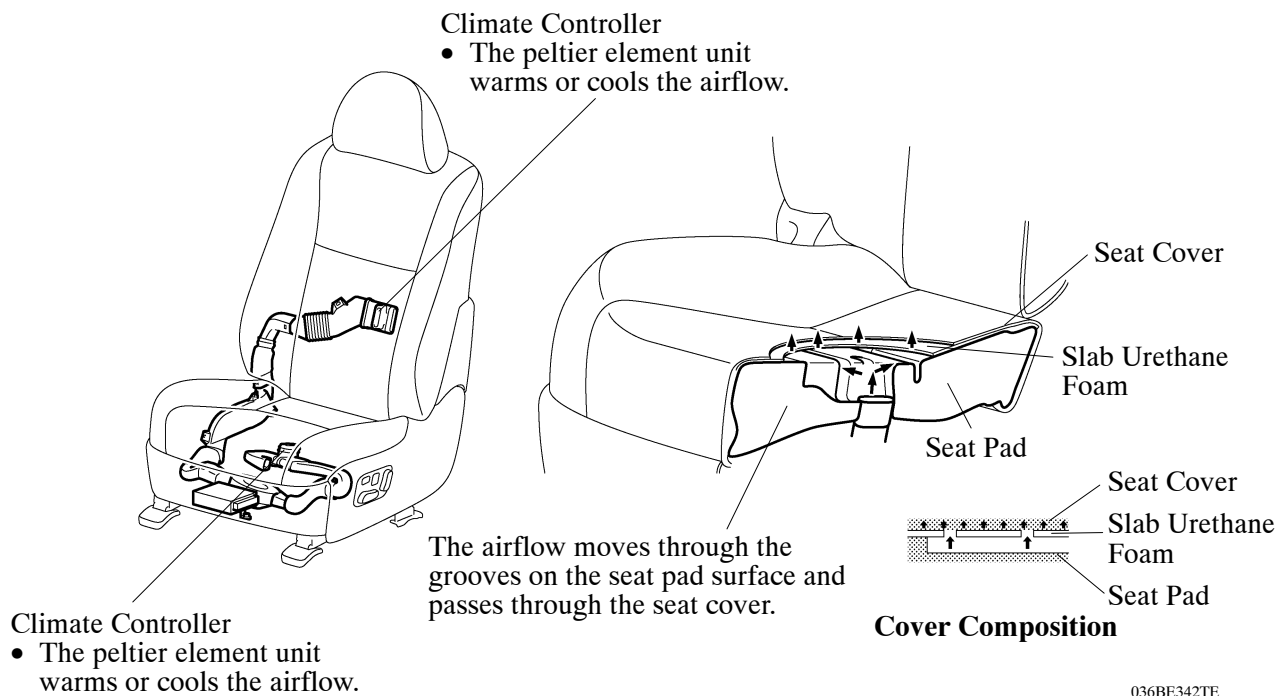
1. General

This system effects the controls listed below:

Control	Outline
Normal Control	Normal control is conducted when the climate control seat switch is turned to COOL or HOT with the power source turned to IG-ON.
Power ON Full-power Control	Power on full-power control is conducted when the climate control seat switch is turned to any HOT mode or MAX COOL with the power source turned to IG-ON.
Fail-safe	If the climate control seat system malfunctions, the system stops its function.
Self-diagnosis	If the climate control seat system malfunctions, a DTC (Diagnostic Trouble Code) is stored in the climate control seat ECU.

2. Normal Control

This system operates the climate control fan motor located underneath the seat to provide airflow to the seat cushion and seat back. The airflow is warmed or cooled by the peltier element in the climate controller. The air that flows to the seat surface is distributed by moving along the grooves on the seat pad surface. This air is then moves through the slab urethane foam and seat cover.



### 3. Power ON Full-Power Control

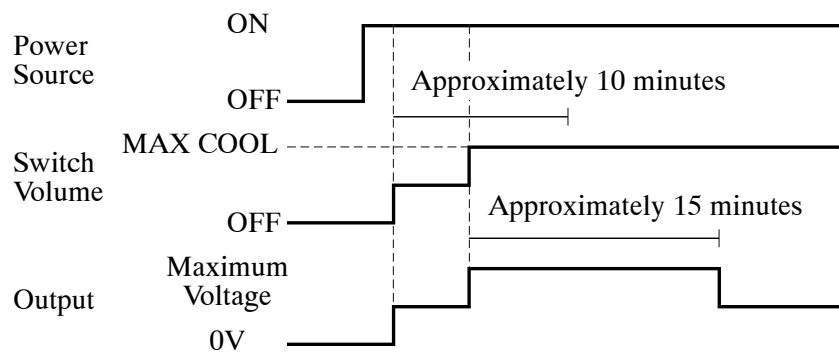
#### General

- This control outputs maximum voltage to the climate controller and the climate control fan motor when power on.
- MAX COOL control is conducted when the climate control seat switch is turned to MAX COOL with the power source turned to IG-ON.
- MAX HOT control is conducted when the climate control seat switch is turned to MAX HOT, MID HOT or MIN HOT with the power source turned to IG-ON. When the seat temperature reaches the set temperature, the seat heater turns off and then the climate controller maintains the seat temperatures.

#### MAX COOL Control

MAX COOL control is conducted under the following conditions:

- The power source is turned to IG-ON.
- After the climate control seat switch has been turned ON, and the switch volume has been turned to MAX COOL within approximately 10 minutes.
- Full-power control is performed for approximately 15 minutes.
- Any climate controller temperature sensor detects 0°C or more.

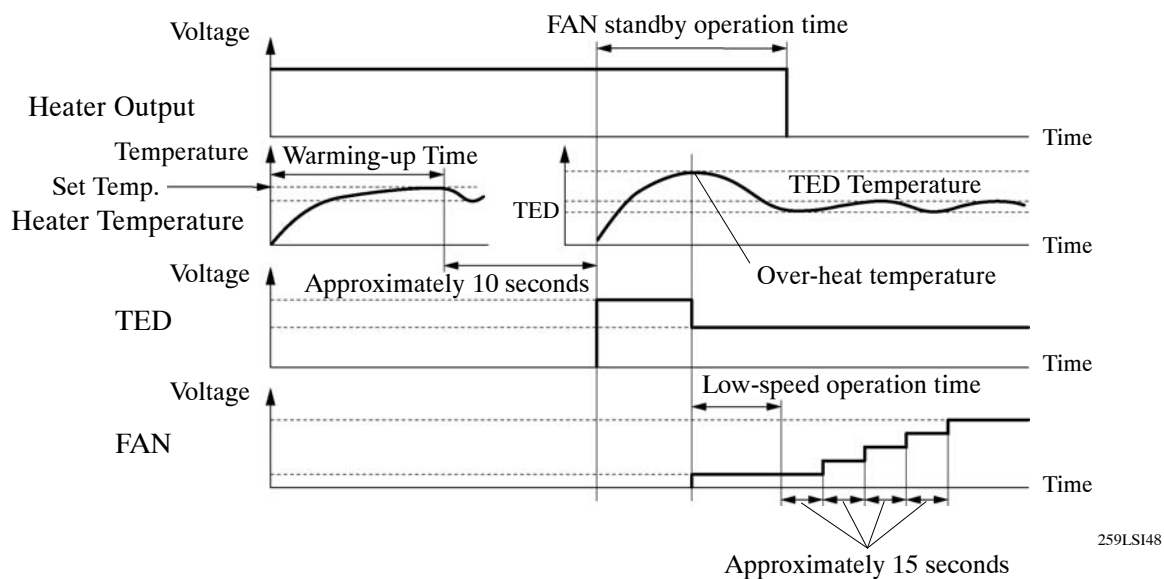


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### MAX HOT Control

MAX HOT control is conducted under the following conditions:

- The power source is turned to IG-ON.
- After the climate control seat switch has been turned ON, and the switch volume has been turned to MAX HOT, MID HOT or MIN HOT.
- When the seat reaches the set temperature, switching the heater on/off keeps the seat temperature.
- TED operates after approximately 10 seconds.
- When the TED over-heat temperature is detected, the output voltage is decreased and the FAN begins to operate. Then, switching the TED on/off keeps the set temperature.
- After a certain time passes, the output voltage to the FAN is increased gradually every 15 seconds.



## 4. Fail-safe

### General

Fail-safe control effects the following three controls:

- Overcurrent protection control
- Transient voltage drop control
- Temperature sensor open/short detection control

### Overcurrent Protection Control

Areas for detecting overcurrent are provided in the climate controller and the seat heater. The climate control stops or reinstates when the conditions listed below have been met.

#### ► Climate Controller ◀

Detection Condition	When both conditions listed below have been met: <ul style="list-style-type: none"> <li>• The climate control seat switch is ON. (without airflow mode)</li> <li>• The amount of current provided for the climate controller actuation has exceeded 10 A for 2 seconds or more.</li> </ul>
Reinstatement Condition	<ul style="list-style-type: none"> <li>• When the climate control seat switch is turned OFF, the indicator light turns OFF, and when the switch is operated, the indicator light operates in accordance with the volume.</li> <li>• The power source is turned to OFF then back to IG-ON.</li> </ul>

► **Seat Heater** ◀

Detection Condition	When both conditions listed below have been met: <ul style="list-style-type: none"> <li>• The climate control seat switch is ON. (without airflow mode)</li> <li>• The amount of current provided for the seat heater has exceeded 10 A for 2 seconds or more.</li> </ul>
Reinstatement Condition	When the climate control seat switch is turned OFF, the indicator light turns OFF, and when the switch is operated, the indicator light operates in accordance with the volume. <ul style="list-style-type: none"> <li>• The power source is turned to IG-OFF then back to IG-ON.</li> </ul>

**Transient Voltage Drop Control**

When the power source voltage of the climate control seat ECU has met the conditions listed below, this control stops or is reinstated.

Detection Condition	When both conditions listed below have been met: <ul style="list-style-type: none"> <li>• The climate control seat switch is ON.</li> <li>• Continuously drops below approximately 8 V for approximately 10 msec.</li> </ul>
Reinstatement Condition	The reinstatement conditions consist of the resumption of system control in accordance with the volume setting of the climate control seat switch when the power voltage of the ECU reaches above approximately 10 V continuously for approximately 10 msec.

**Temperature Sensor Open/Short Detection Control**

The control is suspended or reinstated when the voltage of the temperature sensors that is supplied to the input signal terminals (TBS, TCS, and HS) has met the conditions listed below:

► **Temperature Sensor (for Climate Control)** ◀

Suspended Condition	The detected value is 110°C (230°F) or more or -40°C (104°F) or less for 8 consecutive seconds.
Reinstatement Condition	The normal value is detected by the sensors for 8 consecutive seconds.

► **Temperature Sensor (for Seat Heater)** ◀

Suspended Condition	The detected value is 110°C (230°F) or more or -40°C (104°F) or less for 8 consecutive seconds.
Reinstatement Condition	The normal value is detected by the sensors for 8 consecutive seconds.

**5. Self-diagnosis**

If the climate control seat system malfunctions, the system stops its function and a DTC (Diagnostic Trouble Code) is stored in the climate control seat ECU. The DTC can be read by connecting a hand-held tester or Techstream to DLC3.