

FULL-AUTO AIR CONDITIONER SYSTEM [FULL-AUTO AIR CONDITIONER]

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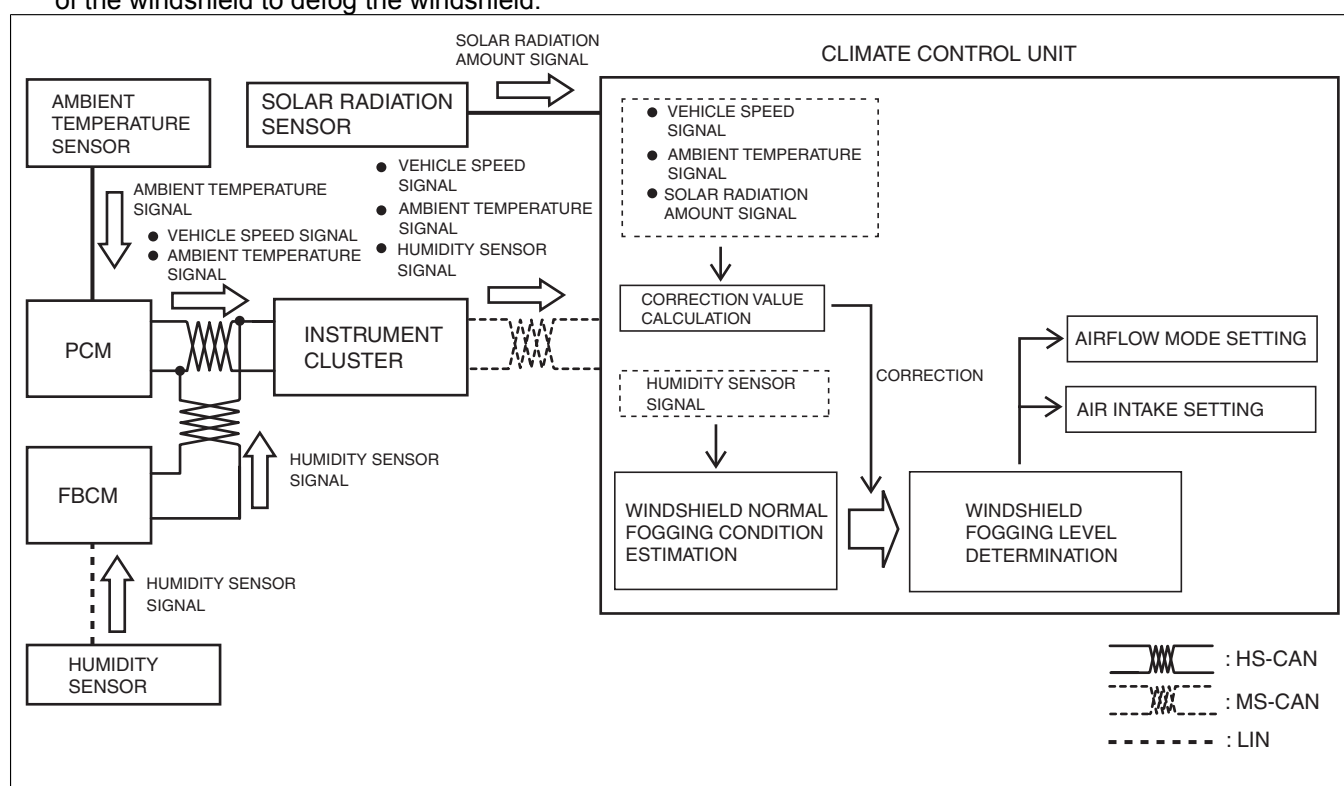
Outline

- The climate control unit performs the following controls based on the signals from each switch/dial and the sensor.
 - Airflow temperature control
 - Airflow volume control
 - Airflow mode control
 - Air intake control
 - A/C compressor control
 - Air conditioner i-stop control (With i-stop)

Function

Windshield fogging judgment (With humidity sensor)

- The front climate control unit applies the calculated correction value from each signal based on the signal from the humidity sensor to determine the fogging level of the windshield.
- The front climate control unit dehumidifies the air around the windshield (interior) by changing the settings for each control (airflow mode control, air intake control, and A/C compressor control) according to the fogging level of the windshield to defog the windshield.



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Airflow temperature control

- The airflow temperature control operates the air mix actuator and switches the air mix door position in conjunction with the airflow temperature setting and the vehicle conditions.

Airflow volume control

- The airflow volume control changes the blower motor control speed and switches the airflow volume in conjunction with the airflow volume setting and the vehicle conditions.

Airflow mode control

- The airflow mode control operates the airflow mode actuator and switches the airflow mode door position in conjunction with the airflow mode setting and the vehicle conditions.

Air intake control

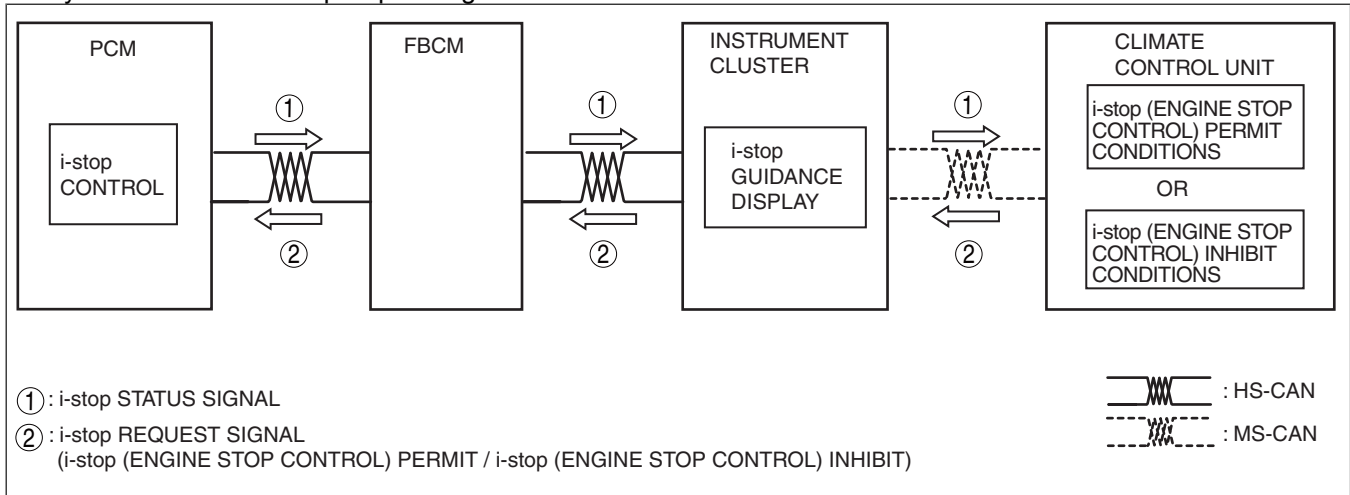
- The air intake control operates the air intake actuator and switches the air intake door position in conjunction with the air intake setting and the vehicle conditions.

A/C compressor control

- The A/C compressor control sends the A/C signal to the PCM based on the climate control unit operation and signals from each sensor.

Air conditioner i-stop control (With i-stop)

- The climate control unit determines i-stop control according to the operation condition of the air conditioner system and sends i-stop request signals to the PCM.



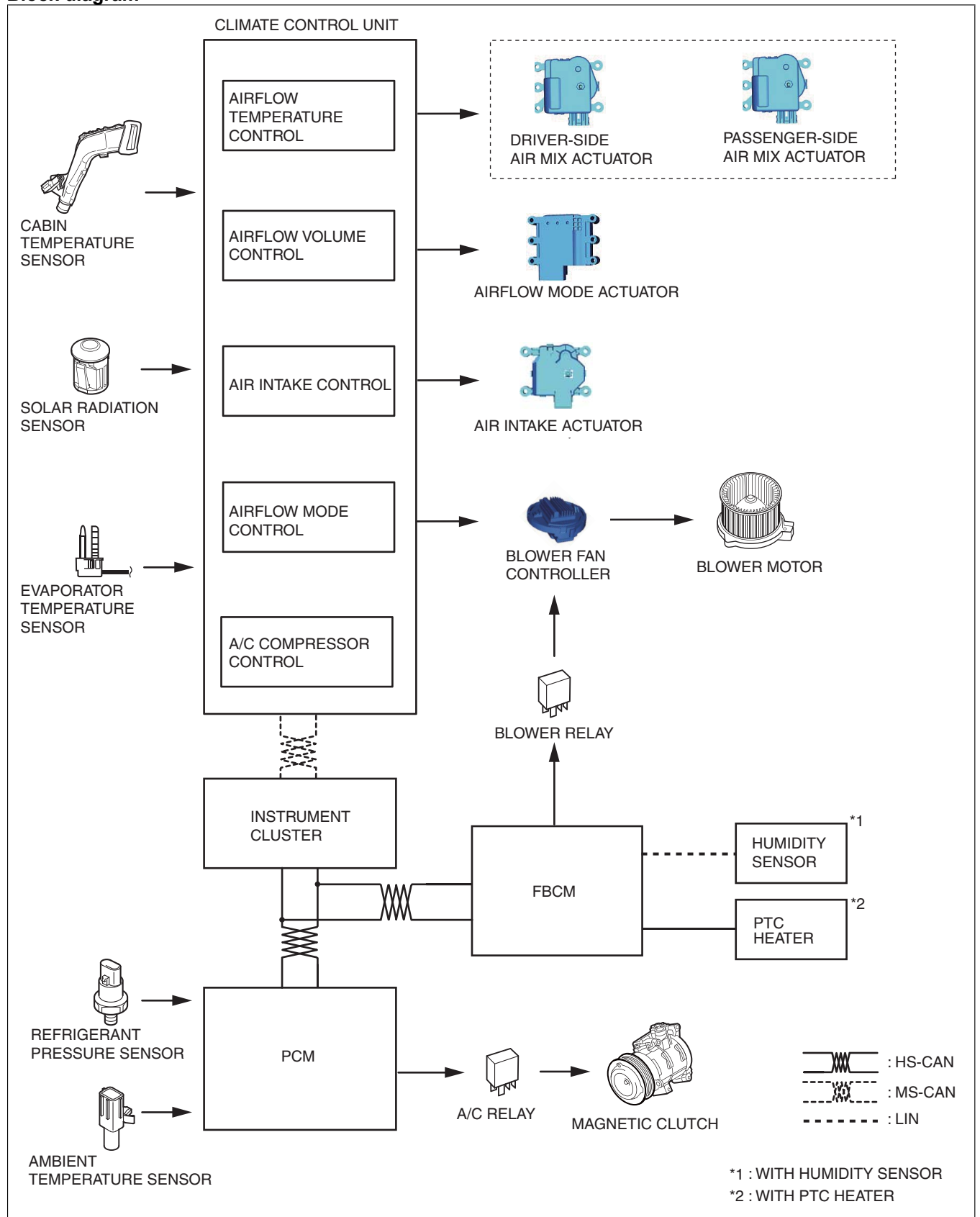
- If i-stop operates (engine stop control), the climate control unit operates the air mix actuator and controls the airflow temperature to decrease the engine coolant temperature or correct the temperature increase of the air passing through the evaporator.

Caution

- Occupants may hear the sound of the air mix actuator operating because there is no engine sound during the i-stop operation (engine stop control). The operation sound of the air mix actuator may be heard because the airflow temperature control is performed even during the i-stop operation (engine stop control), however, this does not indicate a system malfunction.

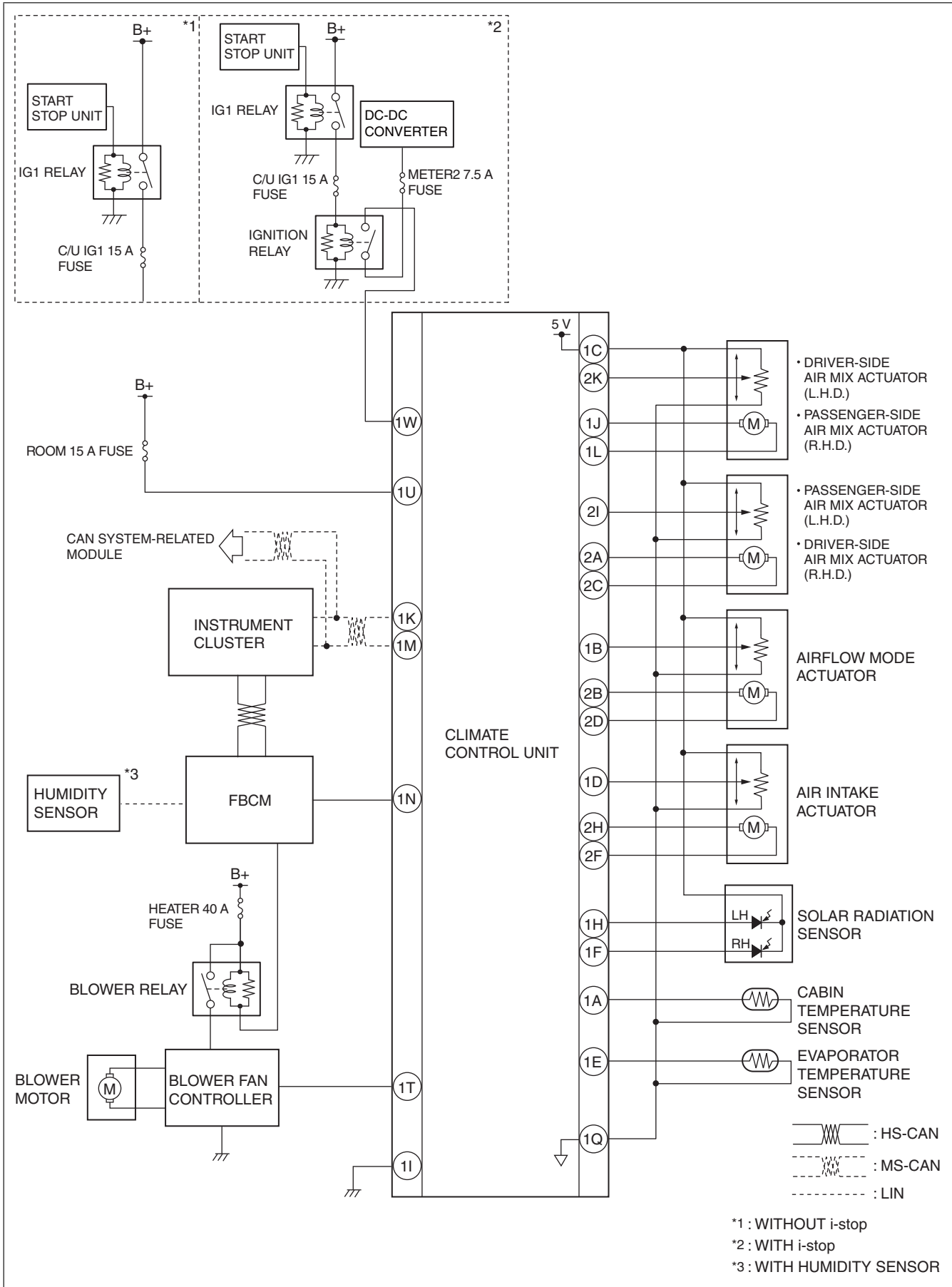
Structure/Construction

Block diagram

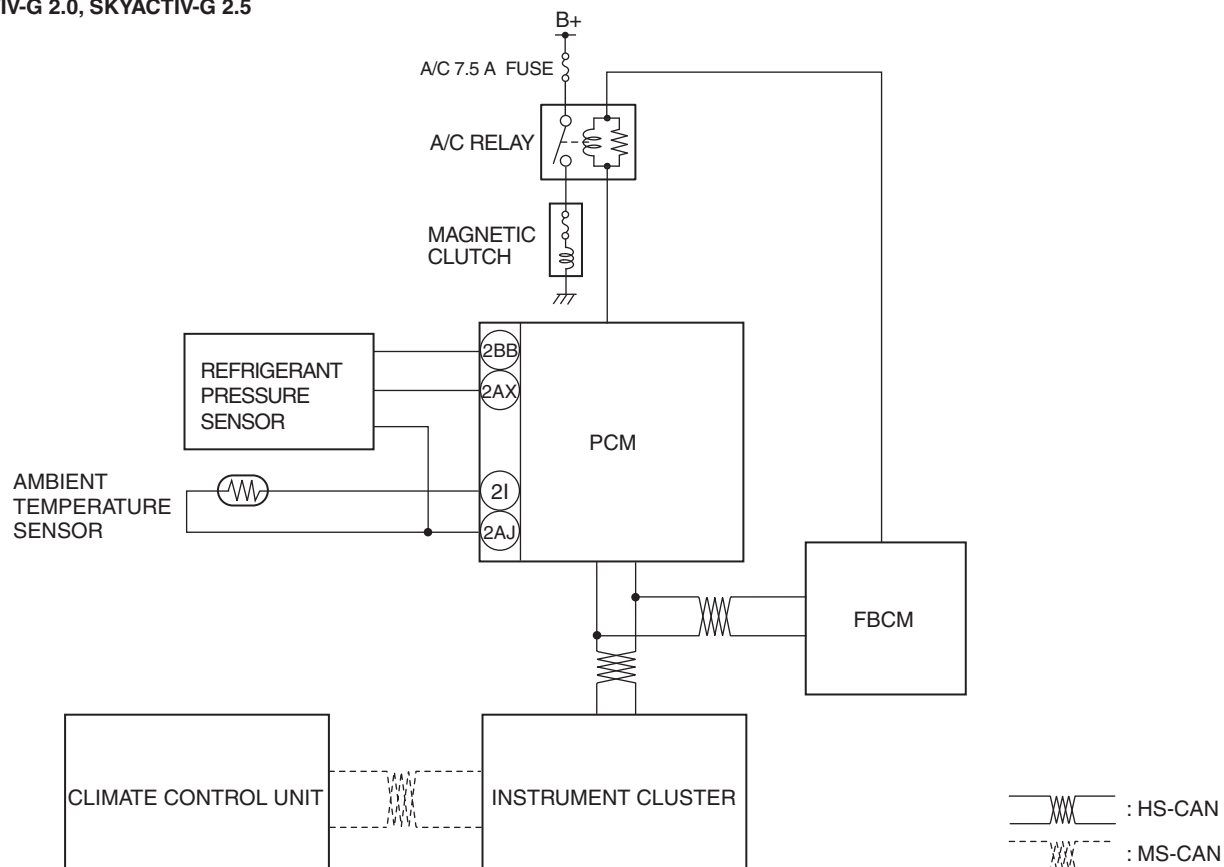


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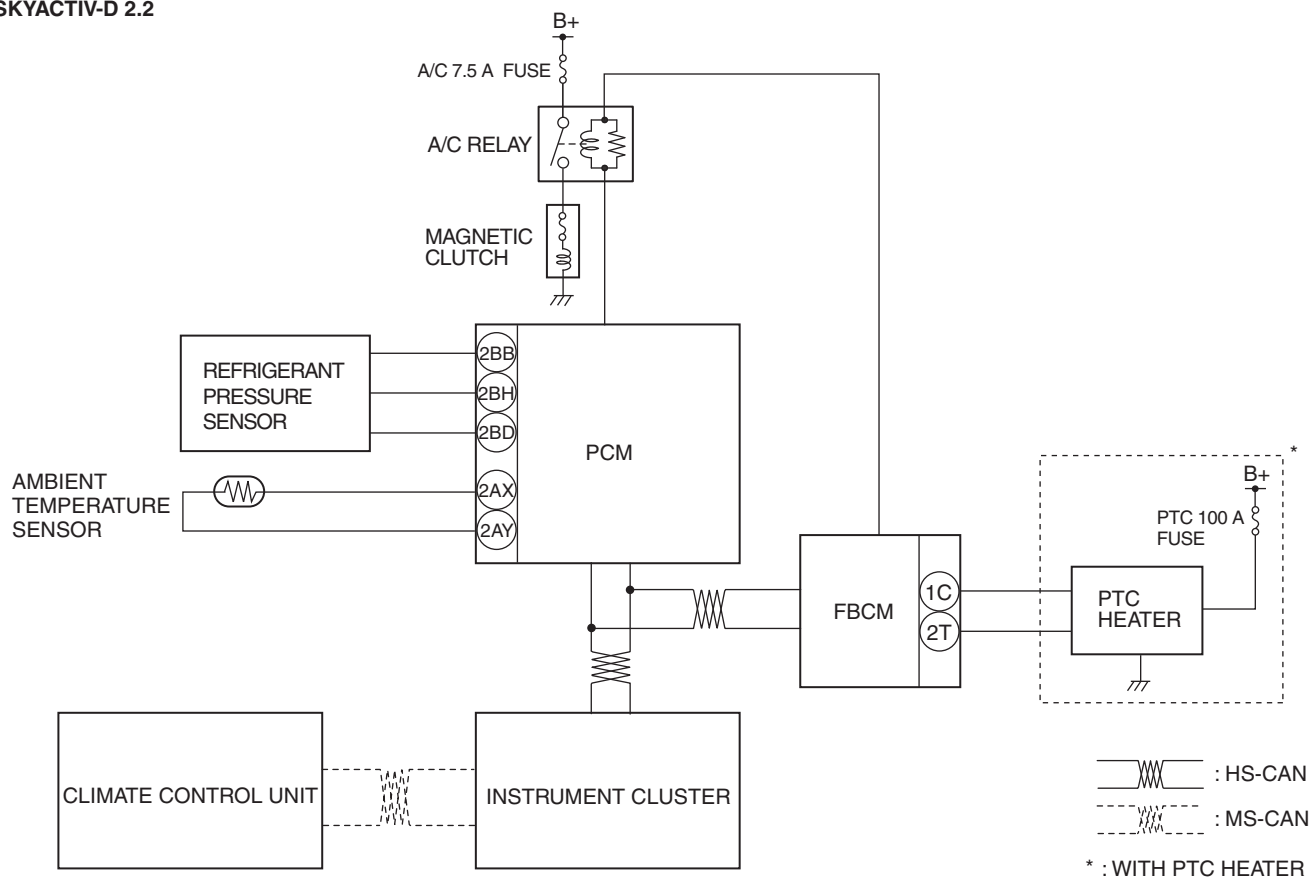
System wiring diagram



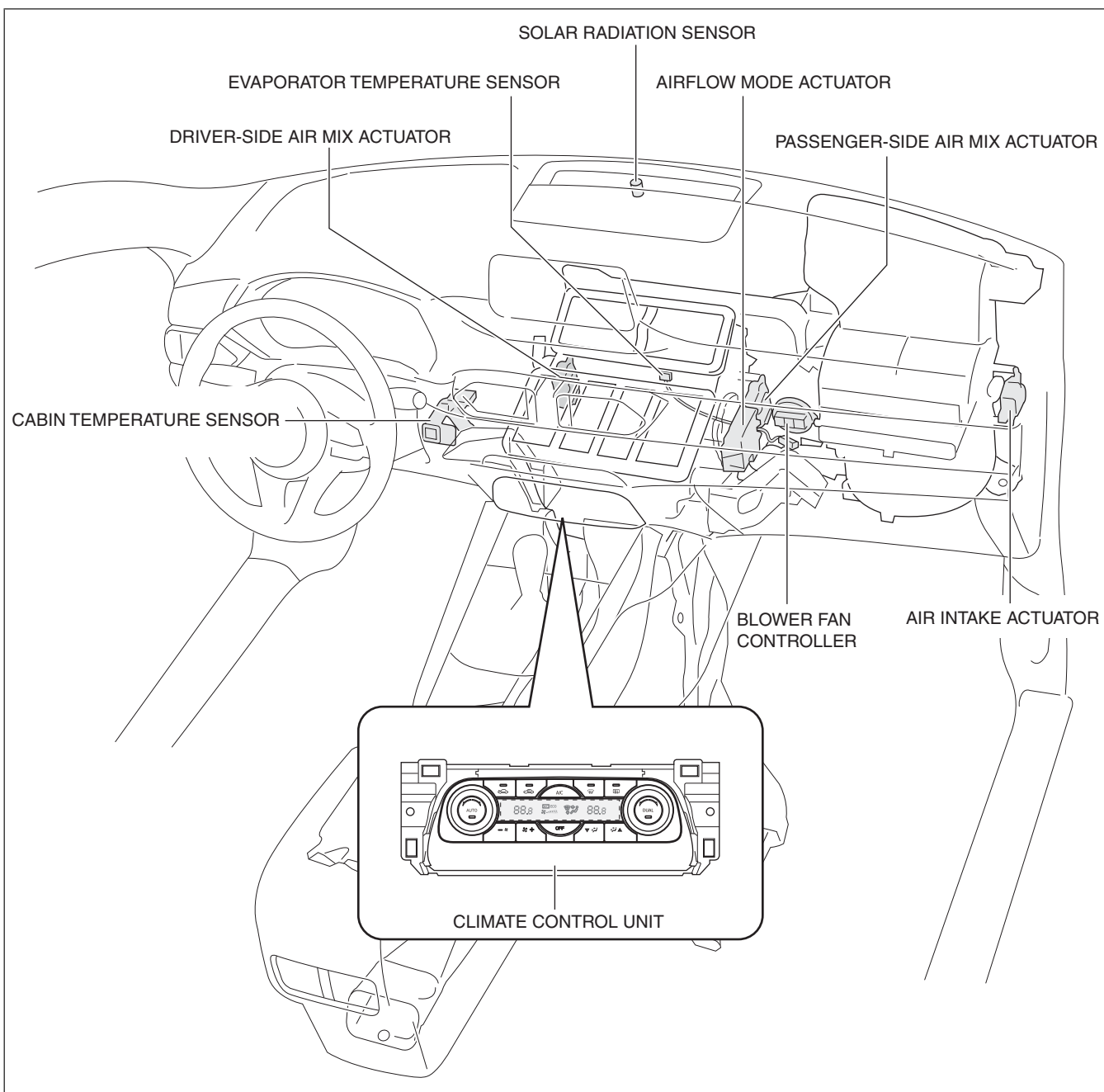
SKYACTIV-G 2.0, SKYACTIV-G 2.5

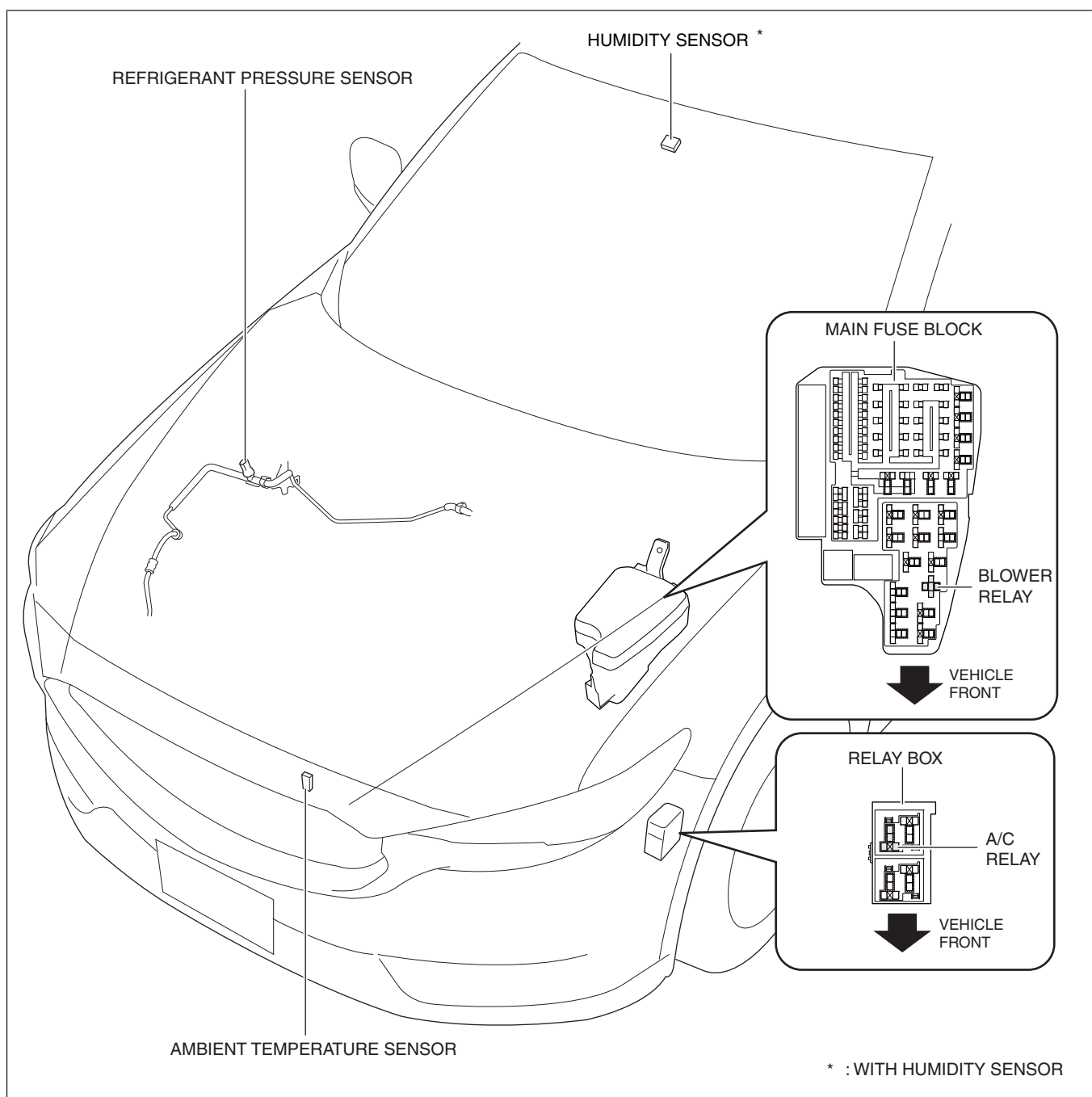


SKYACTIV-D 2.2



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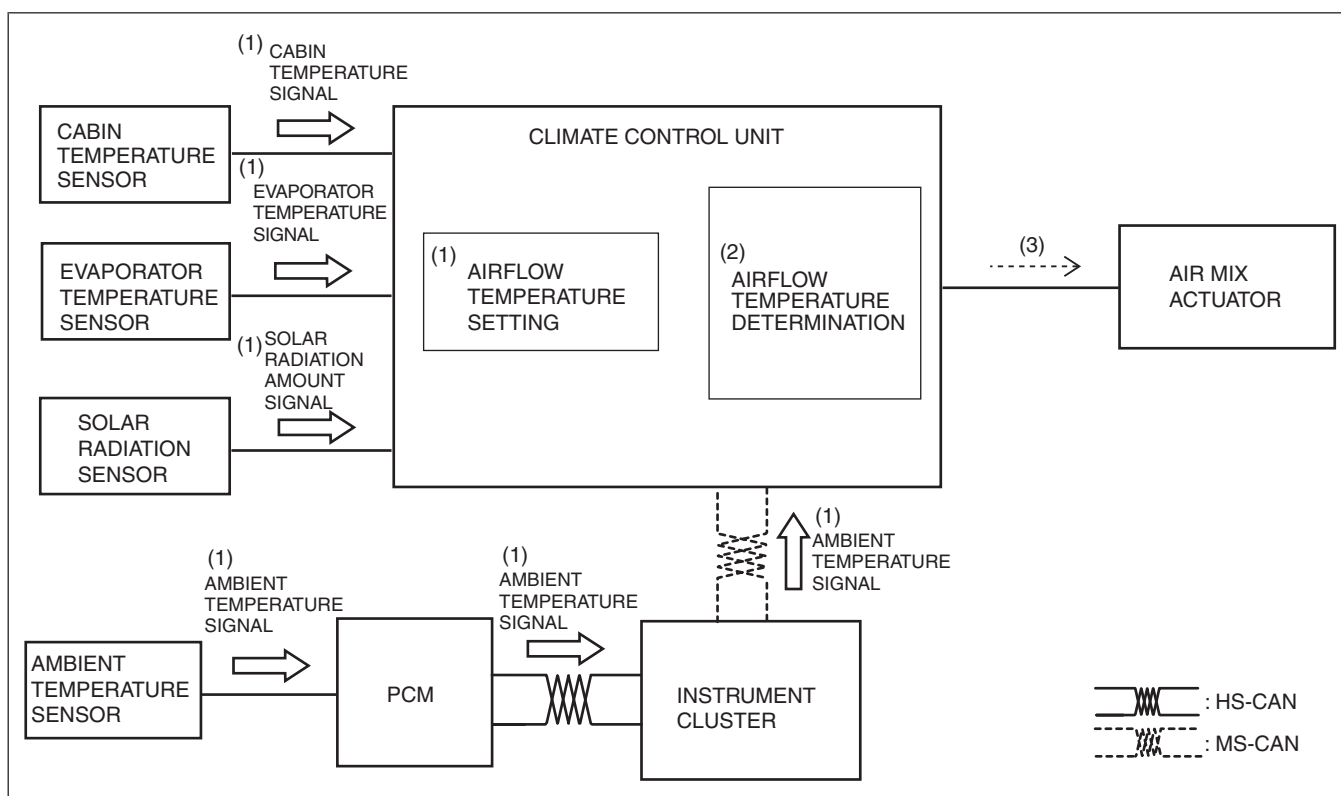


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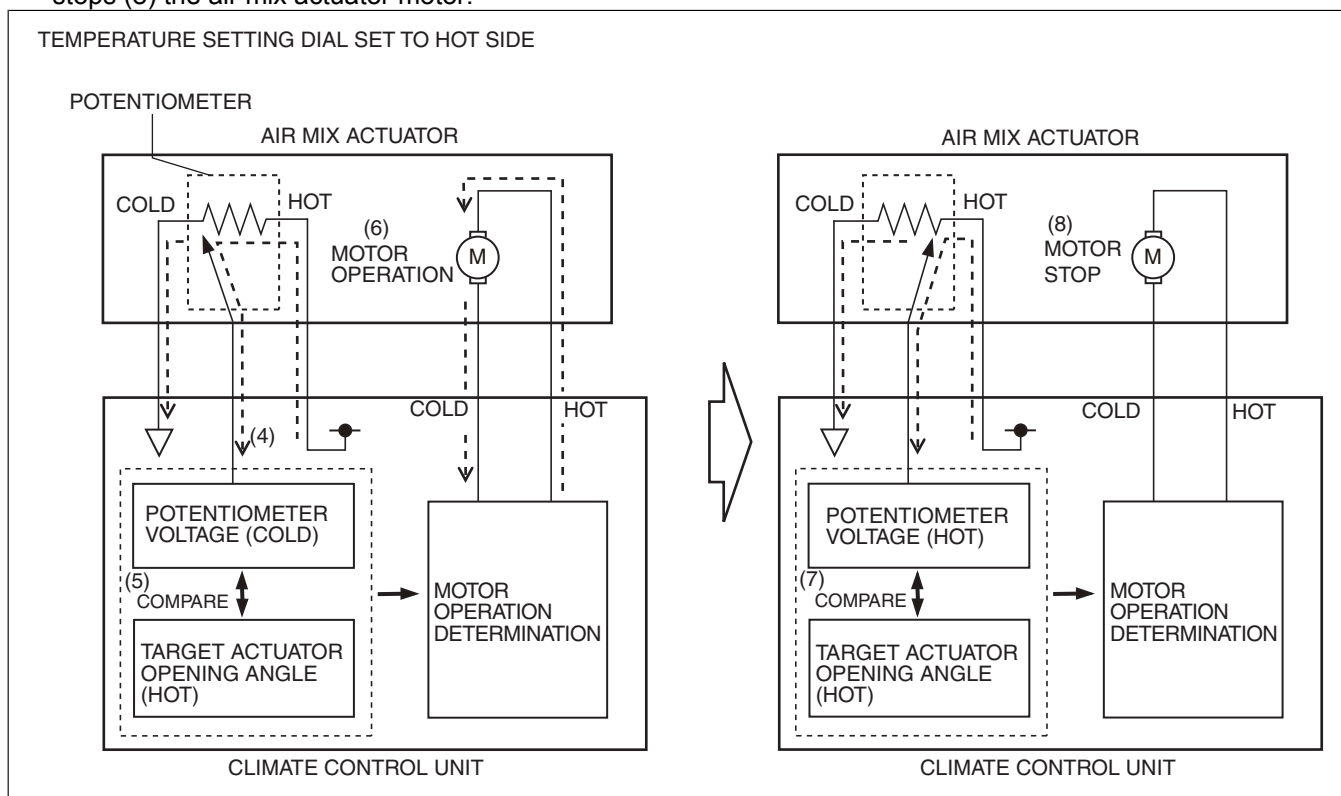
Operation

Airflow temperature control

1. The climate control unit performs airflow temperature determination (2) based on the signals (1) from each sensor which change according to the airflow temperature setting and the vehicle conditions.
2. The climate control unit drives (3) the air mix actuator based on the results of the airflow temperature determination and corrections.

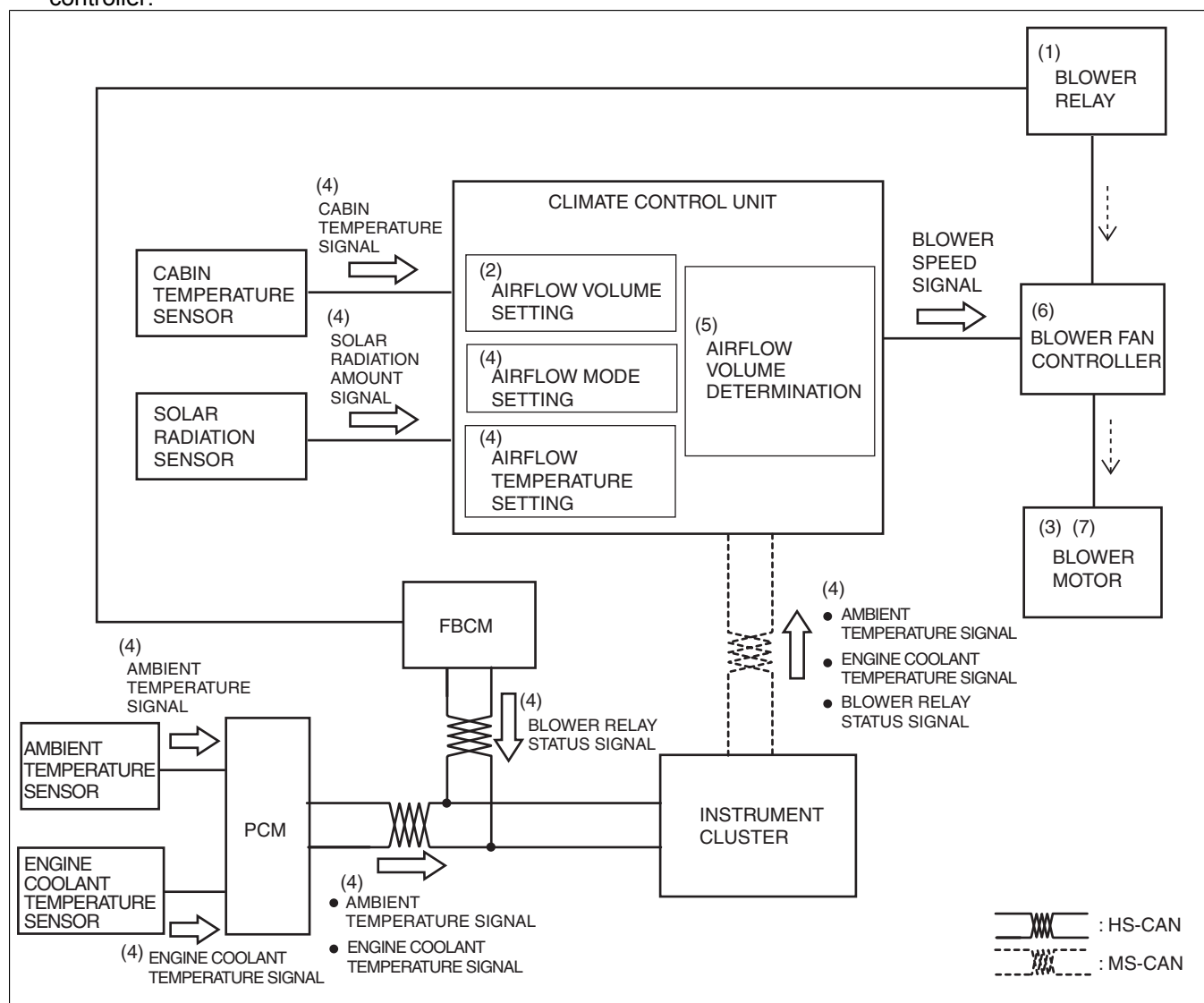


3. The climate control unit detects the current air mix actuator opening angle based on the potentiometer voltage (4).
4. The climate control unit compares (5) the target actuator opening angle with the voltage from the potentiometer.
5. When the potentiometer voltage value differs from the target actuator opening angle, the climate control unit drives (6) the air mix actuator motor.
6. When the potentiometer voltage value matches (7) the target actuator opening angle, the climate control unit stops (8) the air mix actuator motor.



Airflow volume control

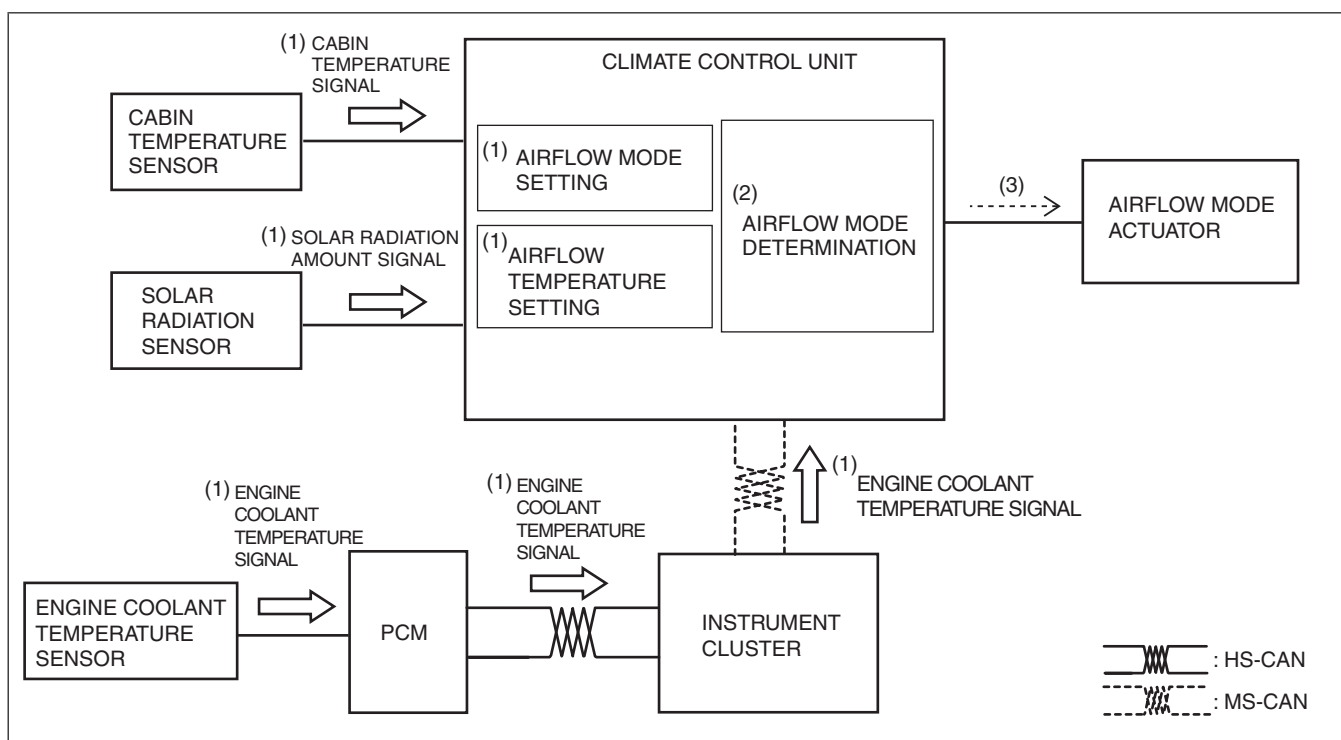
1. When the ignition is switched ON (engine off or on), the front body control module (FBCM) turns the blower relay on (1).
2. When the airflow volume setting on the climate control unit is turned on (2), the blower motor (3) rotates.
3. The climate control unit performs airflow volume determination (5) based on the airflow volume setting and the signals from each sensor (4).
4. Based on the result of the airflow volume determination and correction, the climate control unit control the blower fan controller (6) and changes the airflow volume (blower motor applied voltage).
5. The rotation speed of the blower motor (7) changes according to the applied voltage from the blower fan controller.



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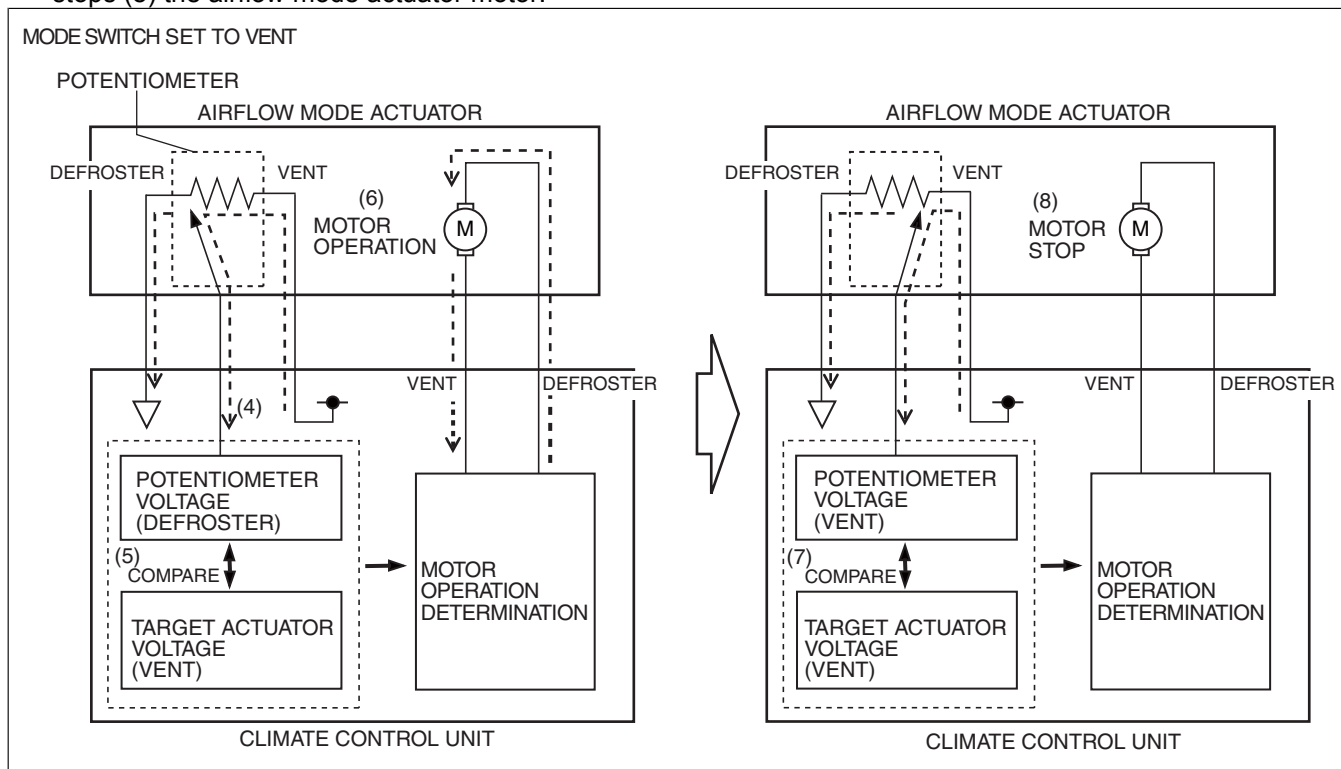
Airflow mode control

1. The climate control unit performs airflow mode determination (2) based on the signals (1) from each sensor which change according to the airflow mode setting and the vehicle conditions.
2. The climate control unit drives the airflow mode actuator (3) according to the results of the airflow mode determination and corrections.



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3. The climate control unit detects the current airflow mode actuator opening angle based on the potentiometer voltage (4).
4. The climate control unit compares (5) the target actuator voltage value with the voltage from the potentiometer.
5. When the potentiometer voltage value differs from the target actuator voltage value, the climate control unit drives (6) the airflow mode actuator motor.
6. When the potentiometer voltage value matches (7) the target actuator voltage value, the climate control unit stops (8) the airflow mode actuator motor.

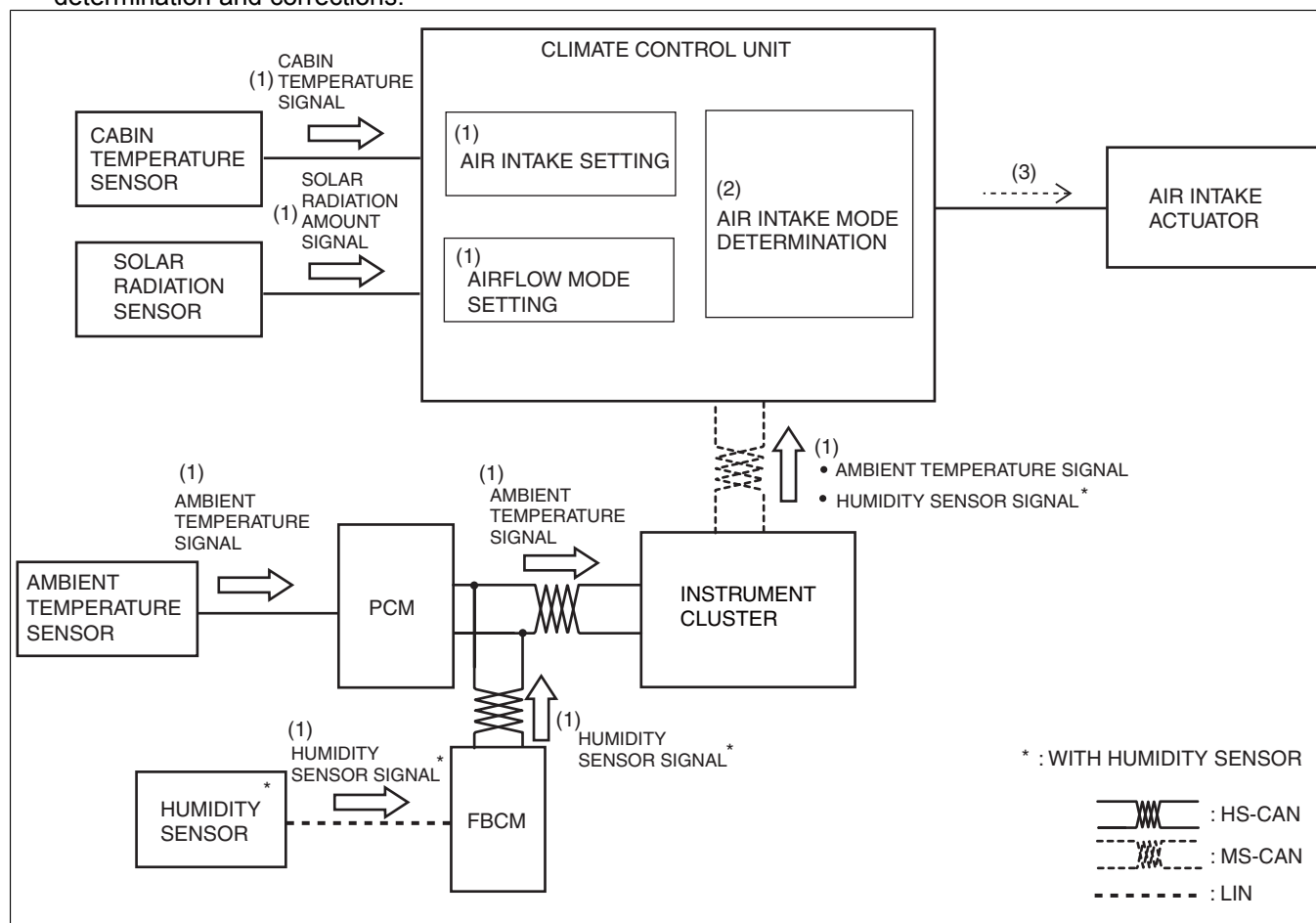


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Air intake control

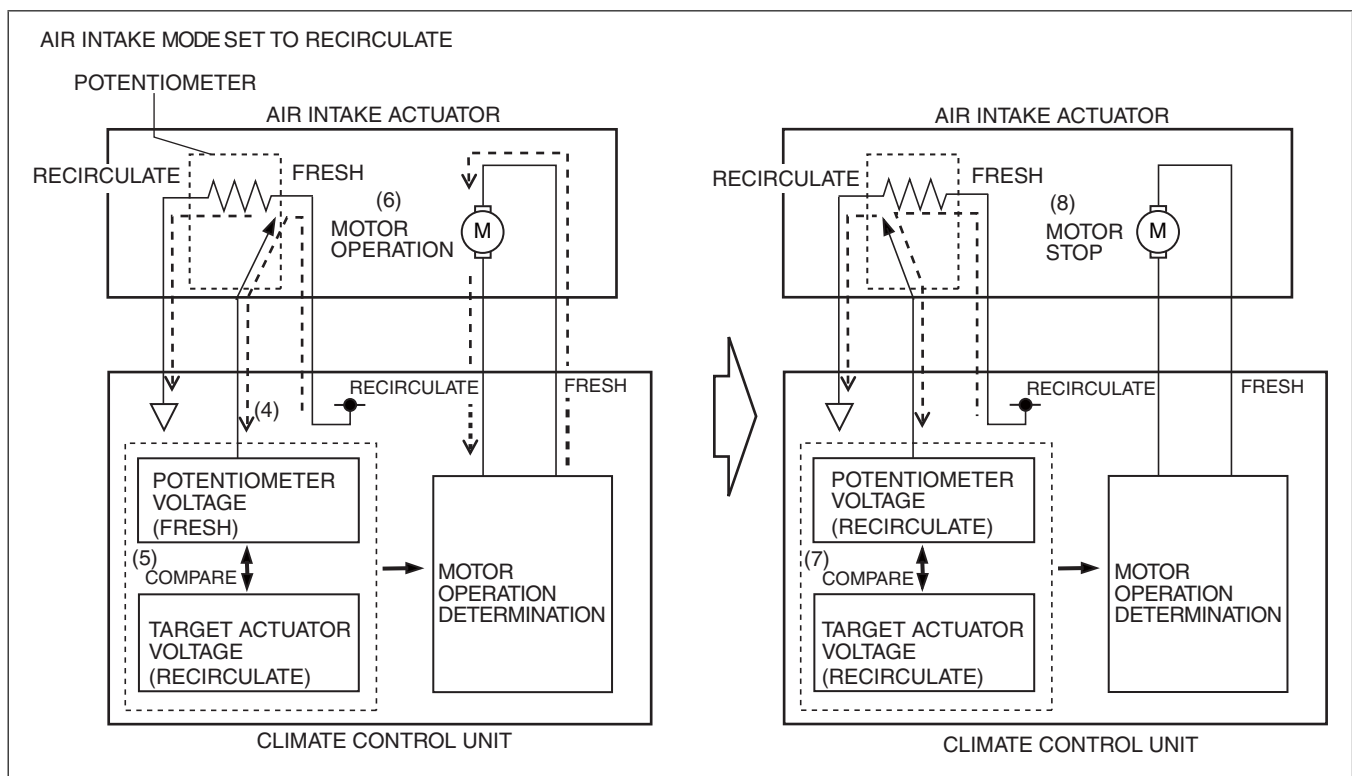
1. The climate control unit performs air intake mode determination (2) based on the signals (1) from the air intake setting and the vehicle conditions.

2. The climate control unit drives the air intake actuator (3) according to the result of the air intake mode determination and corrections.



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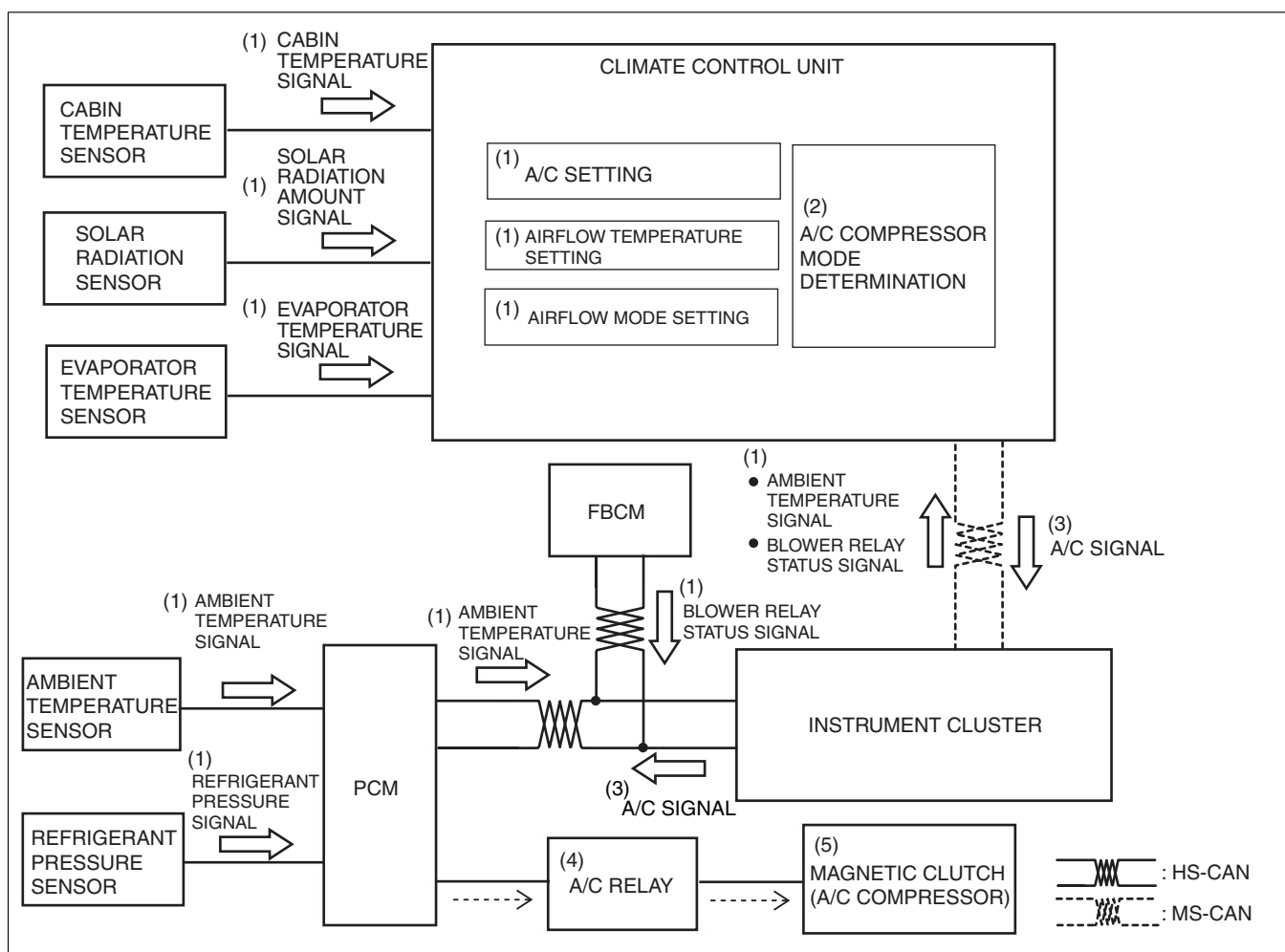
3. The climate control unit detects the current air intake actuator opening angle based on the potentiometer voltage (4).
4. The climate control unit compares (5) the target actuator voltage value with the voltage from the potentiometer.
5. When the potentiometer voltage value differs from the target actuator voltage value, the climate control unit drives (6) the air intake actuator motor.
6. When the potentiometer voltage value matches (7) the target actuator voltage value, the climate control unit stops (8) the air intake actuator motor.



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A/C compressor control

1. The climate control unit performs A/C compressor mode determination (2) based on the signals (1) from each sensor which change according to the A/C setting and the vehicle conditions.
2. The climate control unit sends (3) the A/C signal to the PCM according to the result of the A/C compressor mode determination and corrections.
3. The PCM turns the A/C relay on (4) based on the signals from each sensor which change according to the A/C signal and the vehicle conditions.
4. When the A/C relay turns on, the magnetic clutch turns on (5).



Air conditioner i-stop control (With i-stop)

i-stop request control (i-stop (engine stop control) permit/ i-stop (engine stop control) inhibit)

- The climate control unit sends i-stop (engine stop control) permit or i-stop (engine stop control) inhibit request signals to the PCM according to the operation condition of the air conditioner system.

i-stop (engine stop control) inhibit request

- The climate control unit sends an i-stop (engine stop control) inhibit request signal to the PCM when it detects any of the following conditions:

i-stop (engine stop control) inhibit conditions

No.	Item	Vehicle condition
1	Climate control unit malfunction determined	A DTC is detected in relation to the following parts: <ul style="list-style-type: none"> Solar radiation sensor Ambient temperature sensor Cabin temperature sensor Evaporator temperature sensor Engine coolant temperature sensor Airflow mode actuator Air mix actuator
2	CAN line error determined	Signal reception error occurs on climate control unit side in relation to the following signals: <ul style="list-style-type: none"> Ambient temperature signal Engine coolant temperature signal Engine operation status signal (i-stop status signal)
3	Ambient temperature	Ambient temperature is -10 °C {14 °F} or below , or 50 °C {122 °F} or more
4	Airflow mode control status	During manual defroster control
5	Set temperature, compressor control mode	MAX HOT or MAX COLD (A/C or ECO mode)

No.	Item	Vehicle condition
6	Auto air conditioner target temperature attainment status	If any of the following signals do not meet the i-stop (engine stop control) permit conditions (Comfortable cabin temperature control not performed): <ul style="list-style-type: none"> • Cabin temperature (cabin target temperature and cabin temperature relation) • Evaporator temperature • Heater core temperature

i-stop (engine stop control) permit request

- The climate control unit sends an i-stop (engine stop control) permit request signal to the PCM when it detects any of the following conditions:

i-stop (engine stop control) permit conditions

No.	Item	Vehicle condition
1	Blower motor control status	<ul style="list-style-type: none"> • Blower motor is off • However, i-stop (engine stop control) inhibit conditions No. 1 to 3 must not be in effect.
2	Set temperature, compressor control mode	<ul style="list-style-type: none"> • MAX COLD • Compressor control: Off • Blower motor is ON • However, i-stop (engine stop control) inhibit conditions No. 1 to 4 must not be in effect.
3	Auto air conditioner target temperature attainment status	<ul style="list-style-type: none"> • Blower motor is ON • Compressor control: ON • The relation between the cabin target temperature and cabin temperature meets the i-stop (engine stop control) permit conditions (comfortable cabin temperature control is performed) • However, i-stop (engine stop control) inhibit conditions No. 1 to 6 must not be in effect.

A/C control start during i-stop (engine stop control)

- When the A/C operation is stopped by the i-stop control, and while i-stop (engine stop control) permit condition No. 3 is met, the climate control unit starts A/C control corresponding to the engine-stop condition if it detects an engine-stop condition based on the i-stop condition signal sent from the PCM.
- If the engine is stopped during A/C control, the A/C compressor magnetic clutch turns off and the A/C indicator light remains in an illuminated condition. When the engine is restarted, the A/C compressor magnetic clutch turns on again.

Recovery to normal A/C control

- When recovery condition a or b is met while the engine is stopped by the i-stop control, the climate control unit sends an engine restart request signal to the PCM.
- It returns to the normal A/C control when the engine is restarted.

Recovery condition a:

- i-stop cancel determination condition is met

i-stop (engine stop control) cancel determination conditions

Compressor control mode	Airflow mode		
	VENT	BI-LEVEL	HEAT, DEF/HEAT, DEFROSTER
A/C, ECO, OFF	If the following conditions are met: <ul style="list-style-type: none"> • Evaporator temperature is at i-stop control specification or more 	If any one of the following conditions are met: <ul style="list-style-type: none"> • Evaporator temperature is at i-stop control specification or more • Heater core temperature is at i-stop control specification or less 	If the following conditions are met: <ul style="list-style-type: none"> • Heater core temperature is at i-stop control specification or less

Recovery condition b:

- Any one of the following i-stop (engine stop control) inhibit conditions is met
 - No.1 climate control unit malfunction determination
 - No.2 CAN transmission error determination
 - No.4 mode control status
 - No.5 set temperature, compressor control mode