

SECTION HAC

HEATER & AIR CONDITIONING CONTROL SYSTEM

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PRECAUTION

PRECAUTIONS

Precaution for Technicians Using Medical Electric

INFOID:000000007631639

OPERATION PROHIBITION

WARNING:

- Parts with strong magnet is used in this vehicle.
- Technicians using a medical electric device such as pacemaker must never perform operation on the vehicle, as magnetic field can affect the device function by approaching to such parts.

NORMAL CHARGE PRECAUTION

WARNING:

- If a technician uses a medical electric device such as an implantable cardiac pacemaker or an implantable cardioverter defibrillator, the possible effects on the devices must be checked with the device manufacturer before starting the charge operation.
- As radiated electromagnetic wave generated by on board charger at normal charge operation may effect medical electric devices, a technician using a medical electric device such as implantable cardiac pacemaker or an implantable cardioverter defibrillator must not enter the vehicle compartment (including luggage room) during normal charge operation.

PRECAUTION AT TELEMATICS SYSTEM OPERATION

WARNING:

- If a technician uses implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), avoid the device implanted part from approaching within approximately 220 mm (8.66 in) from interior/exterior antenna.
- The electromagnetic wave of TCU might affect the function of the implantable cardiac pacemaker or the implantable cardioverter defibrillator (ICD), when using the service, etc.
- If a technician uses other medical electric devices than implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), the electromagnetic wave of TCU might affect the function of the device. The possible effects on the devices must be checked with the device manufacturer before TCU use.

PRECAUTION AT INTELLIGENT KEY SYSTEM OPERATION

WARNING:

- If a technician uses implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), avoid the device implanted part from approaching within approximately 220 mm (8.66 in) from interior/exterior antenna.
- The electromagnetic wave of Intelligent Key might affect the function of the implantable cardiac pacemaker or the implantable cardioverter defibrillator (ICD), at door operation, at each request switch operation, or at engine starting.
- If a technician uses other medical electric devices than implantable cardiac pacemaker or implantable cardioverter defibrillator (ICD), the electromagnetic wave of Intelligent Key might affect the function of the device. The possible effects on the devices must be checked with the device manufacturer before Intelligent Key use.

Point to Be Checked Before Starting Maintenance Work

INFOID:000000007631640

The high voltage system may starts automatically. It is required to check that the timer air conditioner and timer charge (during EVSE connection) are not set before starting maintenance work.

NOTE:

If the timer air conditioner or timer charge (during EVSE connection) is set, the high voltage system starts automatically even when the power switch is in OFF state.

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PRECAUTIONS

< PRECAUTION >

[AUTOMATIC AIR CONDITIONING]

Precautions for Removing Battery Terminal

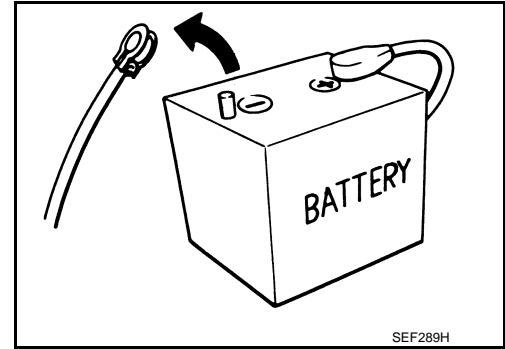
INFOID:000000007631641

- When removing the 12V battery terminal, turn OFF the power switch and wait at least 5 minutes.

NOTE:

ECU may be active for several minutes after the power switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.

- Always disconnect the battery terminal within 60 minutes after turning OFF the power switch. Even when the power switch is OFF, the 12V battery automatic charge control may automatically start after a lapse of 60 minutes from power switch OFF.
- Disconnect 12V battery terminal according to the following steps.



WORK PROCEDURE

1. Check that EVSE is not connected.

NOTE:

If EVSE is connected, the air conditioning system may be automatically activated by the timer A/C function.

2. Turn the power switch OFF → ON → OFF. Get out of the vehicle. Close all doors (including back door).
3. Check that the charge status indicator lamp does not blink and wait for 5 minutes or more.

NOTE:

If the battery is removed within 5 minutes after the power switch is turned OFF, plural DTCs may be detected.

4. Remove 12V battery terminal within 60 minutes after turning the power switch OFF → ON → OFF.

CAUTION:

- After all doors (including back door) are closed, if a door (including back door) is opened before battery terminals are disconnected, start over from Step 1.
- After turning the power switch OFF, if "Remote A/C" is activated by user operation, stop the air conditioner and start over from Step 1.

NOTE:

Once the power switch is turned ON → OFF, the 12V battery automatic charge control does not start for approximately 1 hour.

- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the power switch.

NOTE:

If the power switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.

- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.

NOTE:

The removal of 12V battery may cause a DTC detection error.

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000007631642

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted.

Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.

PRECAUTIONS

< PRECAUTION >

[AUTOMATIC AIR CONDITIONING]

- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see "SRS AIR BAG".
- Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

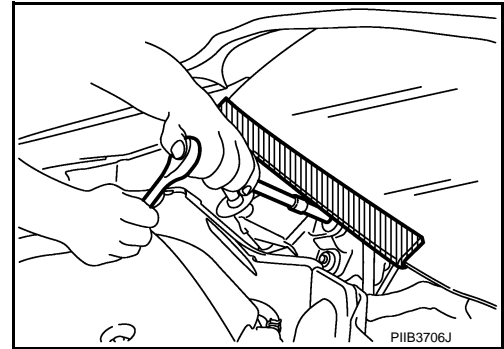
Always observe the following items for preventing accidental activation.

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the power switch ON, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the power switch OFF, disconnect the 12V battery, and wait at least 3 minutes before performing any service.

Precaution for Procedure without Cowl Top Cover

INFOID:000000007631643

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



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SYSTEM DESCRIPTION

DESCRIPTION

Outline

INFOID:000000007631644

- This vehicle is equipped with an ozone-safe fully automatic air conditioning system.
- In order to facilitate diagnosis, the system uses an A/C auto amp. which is compatible with CONSULT.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

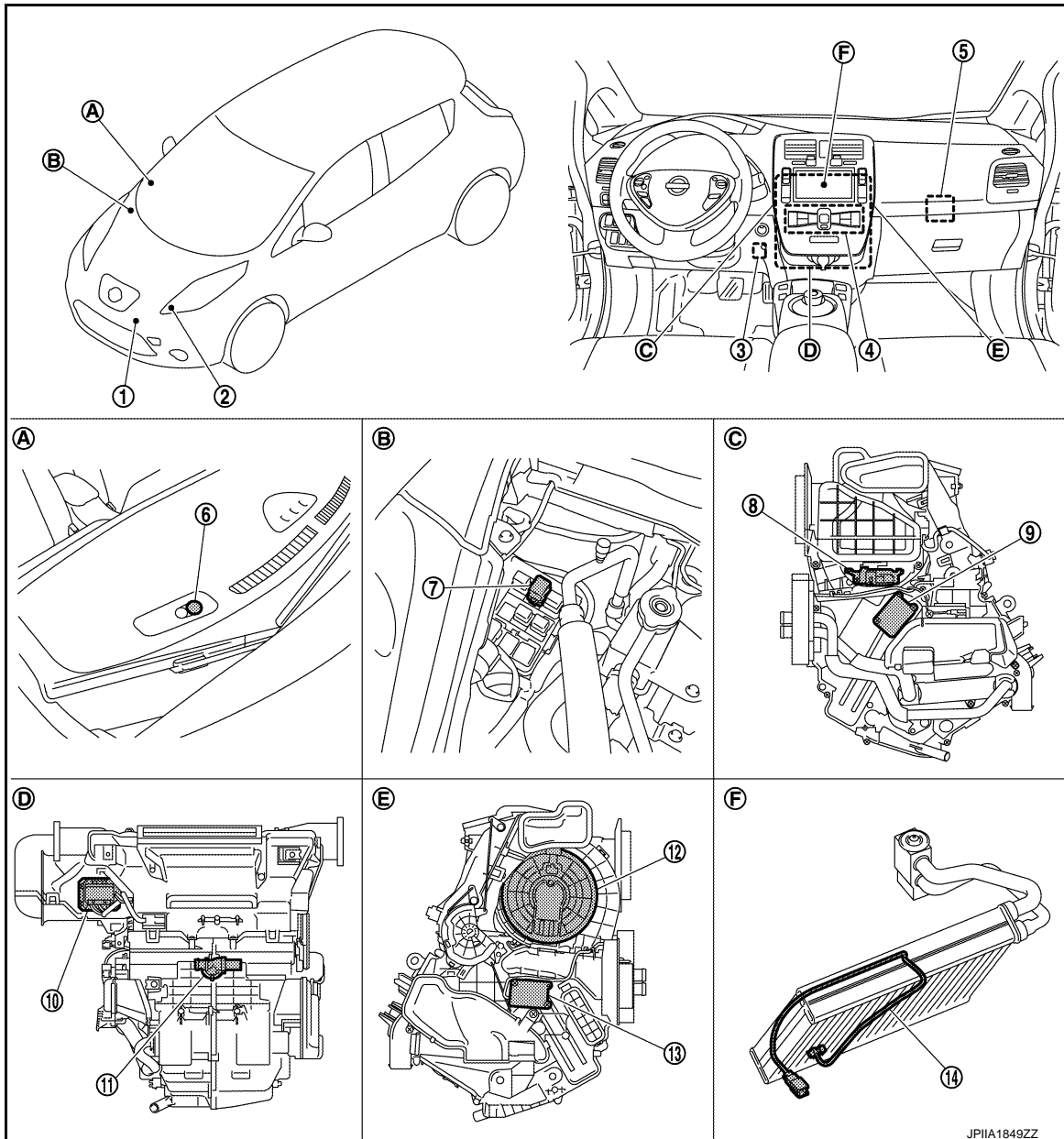
[AUTOMATIC AIR CONDITIONING]

COMPONENT PARTS

AUTOMATIC AIR CONDITIONING SYSTEM

AUTOMATIC AIR CONDITIONING SYSTEM : Component Parts Location INFOID:000000007631645

COMPONENT PARTS LOCATION



A. Top right of instrument panel

B. Right side of motor room

C. Left side of A/C unit

D. Rear of A/C unit

E. Right side of A/C unit

F. Evaporator

COMPONENT DESCRIPTION

No.	Part name	Refer to
1.	Ambient sensor	HAC-13
2.	Refrigerant pressure sensor	HAC-14
3.	In-vehicle sensor	HAC-13
4.	A/C auto amp.	HAC-13

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

No.	Part name	Refer to
5.	VCM	EVC-19
6.	Sunload sensor	HAC-14
7.	A/C relay	HAC-14
8.	Intake door motor	HAC-11
9.	Air mix door motor	HAC-10
10.	Power transistor	HAC-13
11.	Aspirator	HAC-10
12.	Blower fan motor	HAC-12
13.	Mode door motor	HAC-11
14.	Intake sensor	HAC-10

Details for other component parts information is as per the following items.

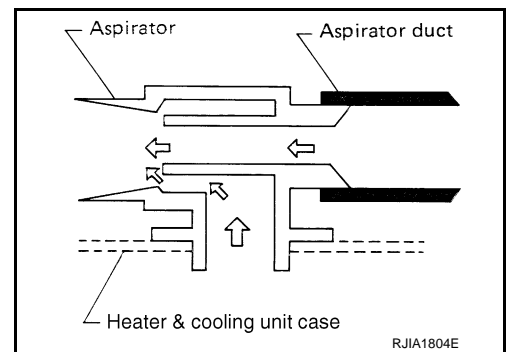
- Refrigeration system: [HA-18, "REFRIGERATION SYSTEM : Component Parts Location"](#)
- Heating system: [HA-19, "HEATING SYSTEM : Component Parts Location"](#)

A/C UNIT ASSEMBLY

A/C UNIT ASSEMBLY : Aspirator

INFOID:000000007631646

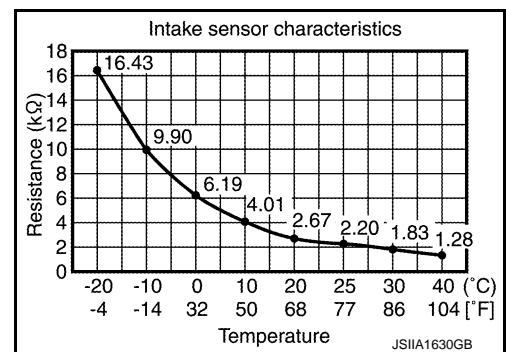
The aspirator generates vacuum by the air blown from the A/C unit and draws the air of the passenger room into the in-vehicle sensor via the aspirator duct.



A/C UNIT ASSEMBLY : Intake Sensor

INFOID:000000007631647

Intake sensor measures evaporator fin temperature. This sensor uses thermistor that decreases electrical resistance as temperature increases.



A/C UNIT ASSEMBLY : Air Mix Door Motor

INFOID:000000007631648

DESCRIPTION

- The step motor type motor is adopted for air mix door motor.
- When the drive signal from the A/C auto amp. is input into the motor, the step motor inside the motor rotates by the number of steps corresponding to the drive signal and stops at the target door position.
- The rotational movement of the motor is transmitted via the rod and lever to the air mix doors (upper air mix door, lower air mix door), changing the discharge air temperature.

AIR MIX DOOR MOTOR DRIVE METHOD

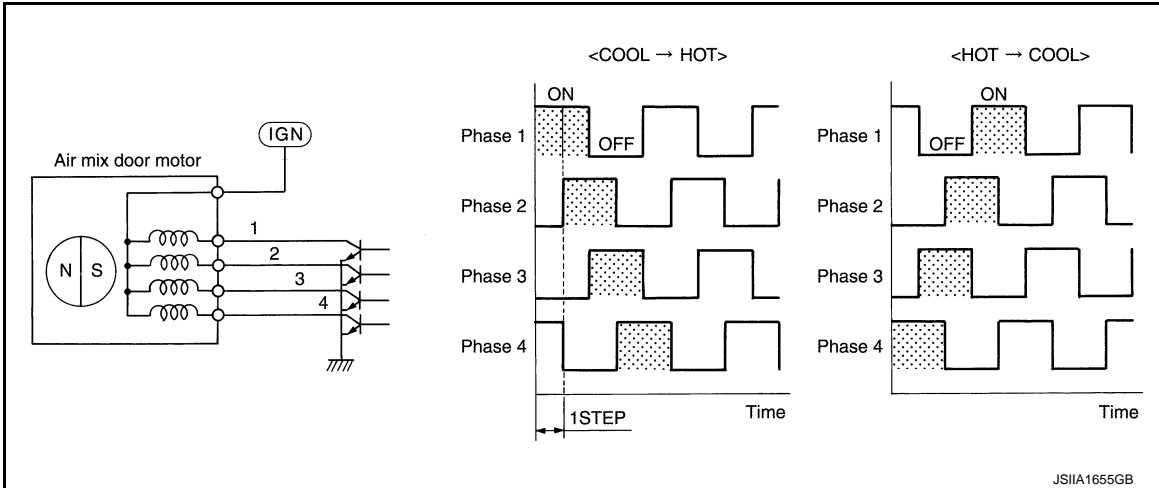
- The four drive coils are excited in sequence in order to drive the motor.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

- Direction of rotation is changeable by recomposing pattern of excitation.



A/C UNIT ASSEMBLY : Mode Door Motor

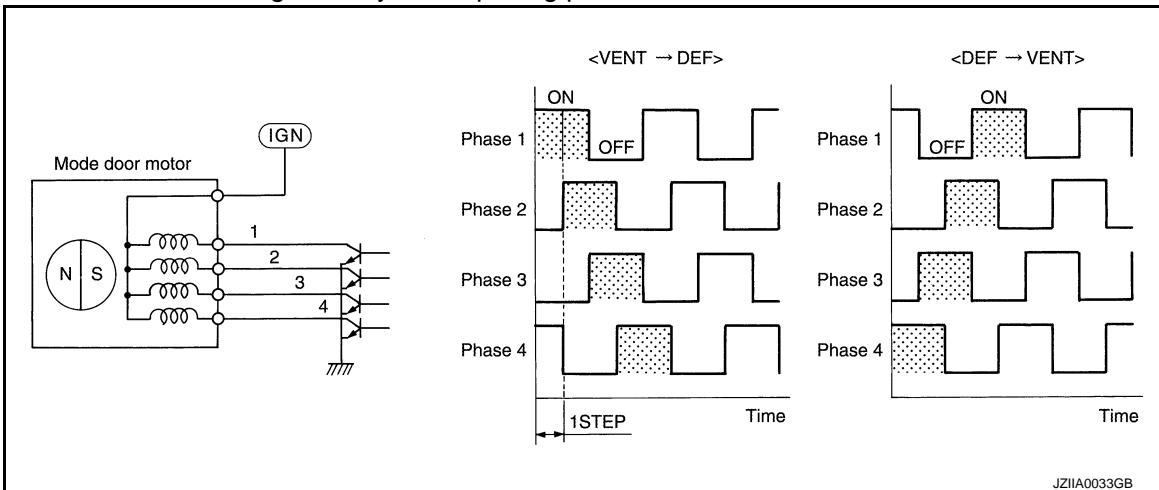
INFOID:000000007631649

DESCRIPTION

- A step motor type motor is used for the mode door motor.
- When the drive signal from the A/C auto amp. is input into the motor, the step motor inside the motor rotates by the number of steps corresponding to the drive signal and stops at the target door position.
- The rotational movement of the motor is transmitted via the rod, link, and lever to the mode doors (center ventilator, defrost door, sub-defrost door, side ventilator door, and foot door), changing the air outlets.

MODE DOOR MOTOR DRIVE METHOD

- The four drive coils are excited in sequence in order to drive the motor.
- Direction of rotation is changeable by recomposing pattern of excitation.



A/C UNIT ASSEMBLY : Intake Door Motor

INFOID:000000007631650

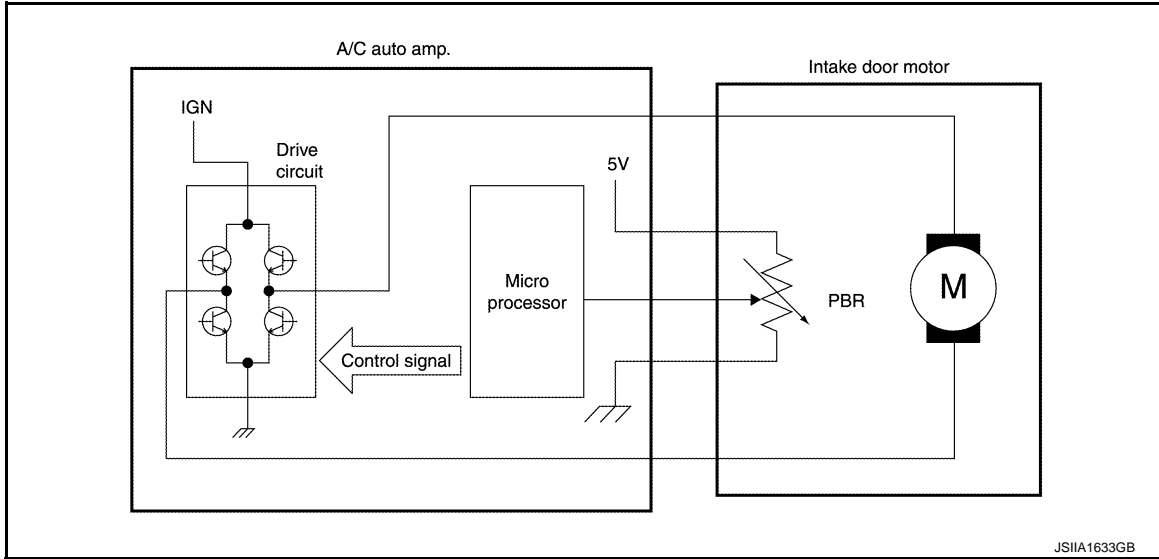
- Intake door motor consists of a motor that drives door and PBR (Potentiometer Balance Resister) that detects door position.
- Motor operates according to drive signal from A/C auto amp.
- Motor rotational movement is transmitted via the lever to the intake door, changing the air inlet.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

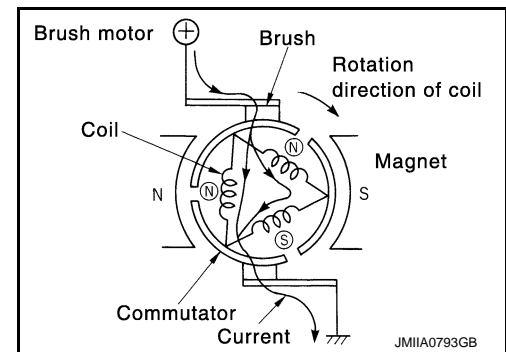
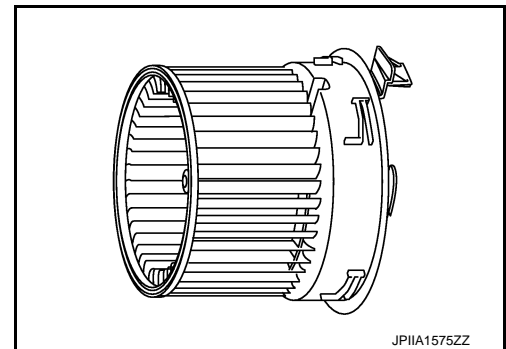
- The A/C auto amp. monitors the door position based on the PBR signal that changes in coordination with the rotation of the motor.



A/C UNIT ASSEMBLY : Blower Fan Motor

INFOID:000000007631651

Brush motor, that rotates coil while brush functions as contact points, is adopted for blower motor. Rotation speed changes according to voltage from power transistor.



COMPONENT PARTS

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

A/C UNIT ASSEMBLY : Power Transistor

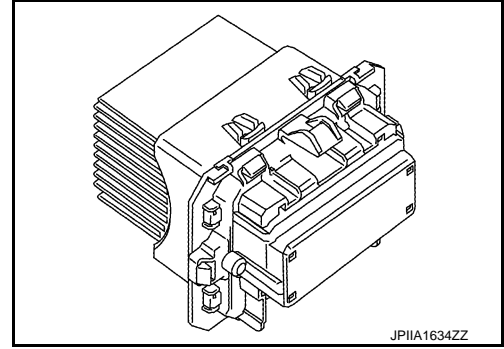
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- Power transistor, that uses MOS field effect transistor, is adopted for blower fan motor speed control.

NOTE:

A MOS field effect transistor is a transistor in which the gate is composed of a metal-oxide-semiconductor (MOS). Field effect transistor is controlled by voltage, while ordinary transistor is controlled by current. Electrode of field effect transistor is called source, drain, or gate, while electrode of ordinary transistor is called emitter, collector, or base.

- Power transistor continuously controls voltage to blower fan motor (approximately 0 to 16 V), according to gate voltage from A/C auto amp.
- This power transistor does not require HI relay even when the maximum voltage is applied to blower fan motor at HI status, because voltage drop is nominal.



A/C Auto Amp.

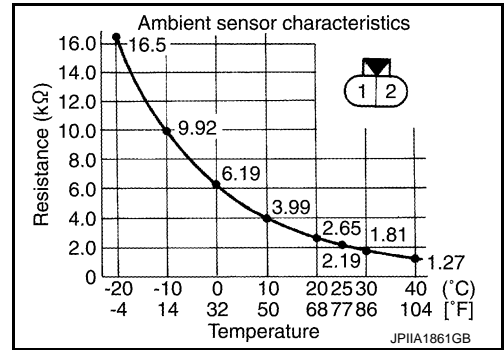
INFOID:000000007631653

A/C auto amp. controls A/C by calculations based on signals input from each sensor and switch. A/C auto amp. a self-diagnosis function is integrated in A/C auto amp. allowing diagnosis of automatic air conditioning system to be performed quickly.

Ambient Sensor

INFOID:000000007631654

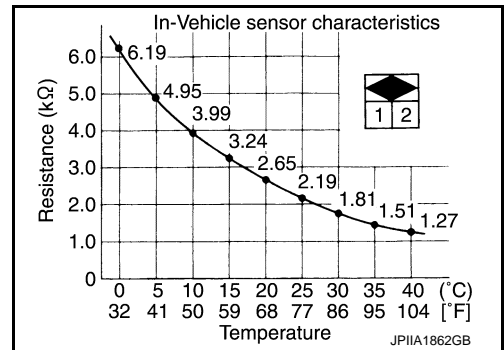
Ambient sensor measures ambient air temperature. This sensor uses thermistor that decreases electrical resistance as temperature increases.



In-Vehicle Sensor

INFOID:000000007631655

In-vehicle sensor measures temperature of interior air that is sucked into the aspirator. This sensor uses thermistor that decreases electrical resistance as temperature increases.



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COMPONENT PARTS

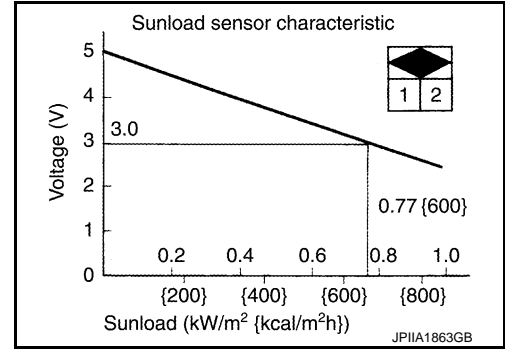
< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

Sunload Sensor

INFOID:000000007631656

Sunload sensor measures sunload amount. This sensor converts the sunload to a voltage signal by photodiode and transmits the signal to the A/C auto amp.

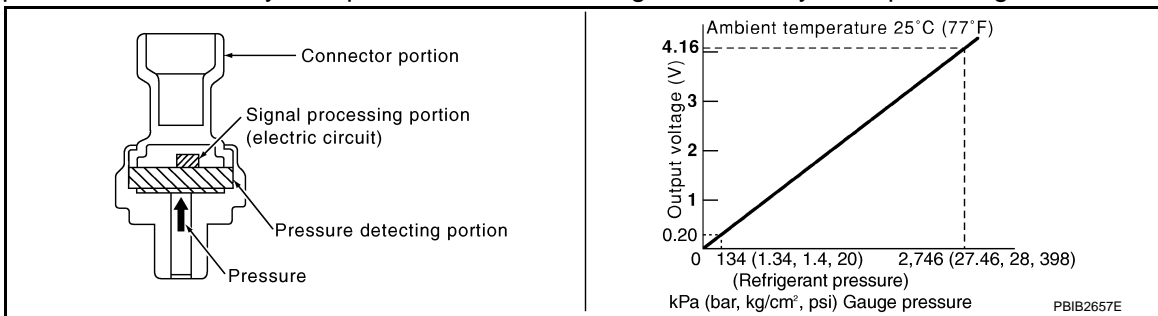


Refrigerant Pressure Sensor

INFOID:000000007631657

DESCRIPTION

- The refrigerant pressure sensor converts high-pressure side refrigerant pressure into voltage and outputs it to VCM.
- VCM performs the cooler system protection and each engine control by the input voltage.



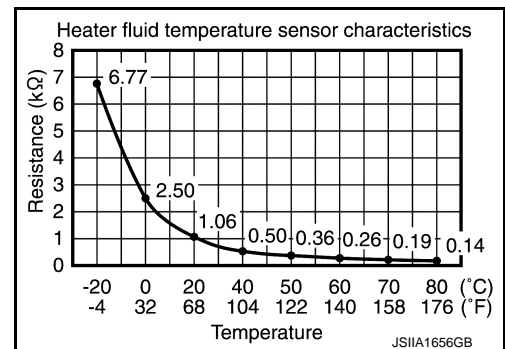
STRUCTURE AND OPERATION

- The refrigerant pressure sensor is a capacitance type sensor. It consists of a pressure detection area and a signal processing area.
- The pressure detection area is the variable capacity compressor. It changes the internal capacitance according to the pressure.
- The signal processing area detects the capacitance of pressure detection area, converts it into the voltage, and outputs it to VCM.

Heater Fluid Temperature Sensor

INFOID:000000007631658

The heater fluid temperature sensor measures the heater fluid temperature. This sensor uses thermistor that decreases electrical resistance as temperature increases.



A/C relay

INFOID:000000007631659

A/C relay, that operates A/C-Heater Timer (Climate Ctrl. Timer) and remote climate control while power switch is in the OFF position, is adopted. Refer to [HAC-9, "AUTOMATIC AIR CONDITIONING SYSTEM : Component Parts Location"](#).

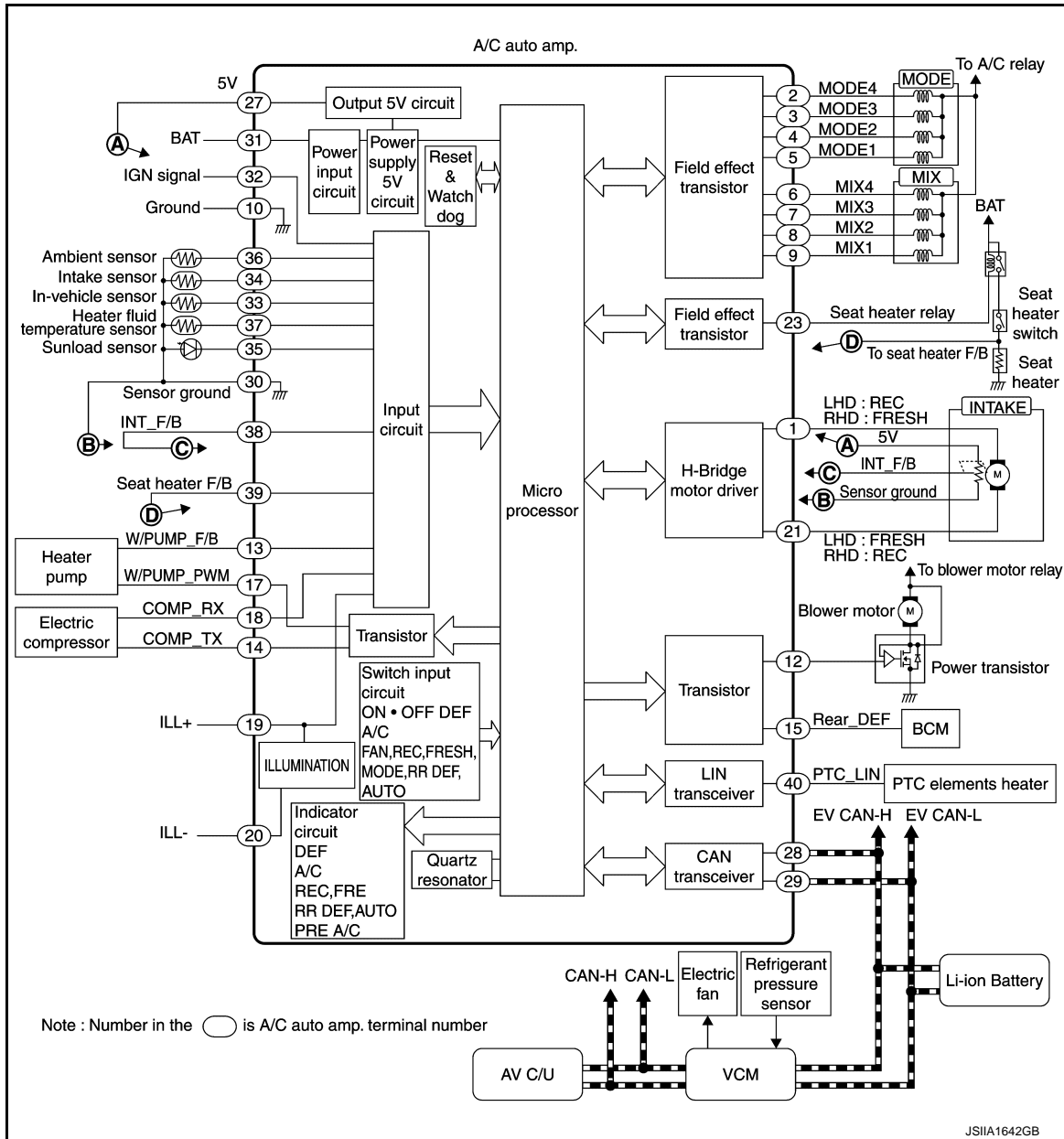
SYSTEM

AUTOMATIC AIR CONDITIONING SYSTEM

AUTOMATIC AIR CONDITIONING SYSTEM : System Description

INFOID:000000007631660

SYSTEM DIAGRAM



DESCRIPTION

- The automatic air conditioning system is controlled by the control functions of the A/C auto amp., VCM, and AV control unit.
- The A/C system operations are input from the A/C auto amp. switches.
- The A/C auto amp. sends various display information to VCM via EV CAN communication.
- VCM sends information received from the A/C auto amp. to the AV control unit via CAN communication.
- AV control unit displays the A/C status on the display, based on the information received from VCM.

CONTROL BY A/C AUTO AMP.

- [HAC-17. "AUTOMATIC AIR CONDITIONING SYSTEM : Temperature Control"](#)
- [HAC-17. "AUTOMATIC AIR CONDITIONING SYSTEM : Air Outlet Control"](#)
- [HAC-18. "AUTOMATIC AIR CONDITIONING SYSTEM : Air Flow Control"](#)
- [HAC-19. "AUTOMATIC AIR CONDITIONING SYSTEM : Air Inlet Control"](#)

SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

- [HAC-21. "AUTOMATIC AIR CONDITIONING SYSTEM : Compressor Control"](#)
- [HAC-21. "AUTOMATIC AIR CONDITIONING SYSTEM : PTC Element Heater Control"](#)
- [HAC-22. "AUTOMATIC AIR CONDITIONING SYSTEM : Heater Pump Control"](#)
- Input data processing
 - Ambient temperature correction
- The A/C auto amp. inputs the temperature detected with the ambient sensor as the ambient temperature.
- The A/C auto amp. internally processes the ambient temperature data in two data types: data for A/C control and data for ambient temperature display.
- When the vehicle speed is 30 km/h or less, if the effects of radiator heat and other factors result in a sudden increase in detected ambient temperature, the A/C auto amp. performs delay correction so that the recognized temperature rises slowly. Correction is performed so that the change is recognized quickly when the ambient temperature drops.
- When the temperature detected by the ambient sensor is less than approximately -20°C (-4°F), no correction is performed for the data for A/C control.
- When the temperature detected by the ambient sensor is less than approximately -29°C (-20°F), no correction is performed for the data for ambient temperature display.
- Interior air temperature correction
- The A/C auto amp. inputs the temperature detected by the in-vehicle sensor as the interior air temperature.
- In order to prevent effects from uneven temperatures inside the vehicle and from external disruptions, the A/C auto amp. performs correction so that the recognized interior air temperature changes slowly. The A/C auto amp. performs the correction so that the recognized interior temperature changes according to the difference between the detected interior temperature and the recognized interior temperature. If the difference is large, the changes occur quickly, and becomes slower as the difference becomes smaller.
- Intake temperature correction
- The A/C auto amp. inputs the temperature detected with the intake sensor as the air temperature after passing through the evaporator.
- In order to prevent effects from uneven intake temperatures and from external disruptions, the A/C auto amp. performs correction so that the recognized intake air temperature changes slowly. The A/C auto amp. performs the correction so that the recognized intake temperature changes according to the difference between the detected intake temperature and the recognized intake temperature. If the difference is large, the changes occur quickly, and becomes slower as the difference becomes smaller.
- Sunload amount correction
- The A/C auto amp. inputs the sunload detected by the sunload sensor.
- When the sunload suddenly changes, for example when entering and leaving a tunnel, correction is performed so that the recognized sunload of the A/C auto amp. changes slowly.
- Set temperature correction
- The A/C auto amp. controls the interior temperature so that it is always at the optimum level, and performs correction so that the temperature felt by the passengers matches the target temperature set with the temperature control dial, according to the ambient temperature detected by the ambient sensor.

CONTROL BY VCM

- For details of cooling fan control, refer to [EVC-43. "HIGH VOLTAGE SYSTEM COOLING CONTROL : System Description"](#).

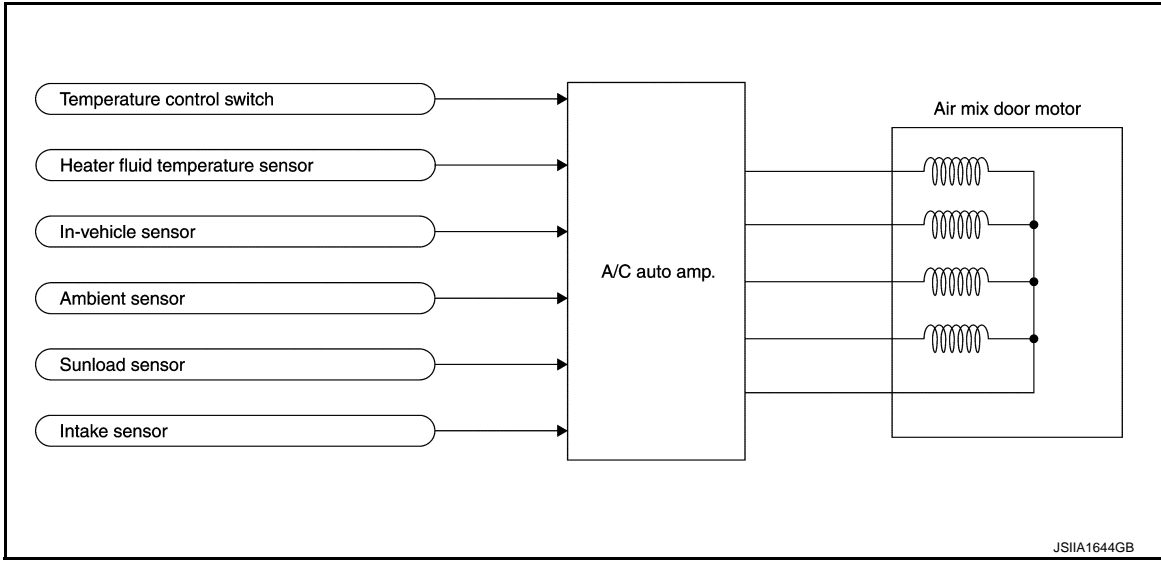
SYSTEM

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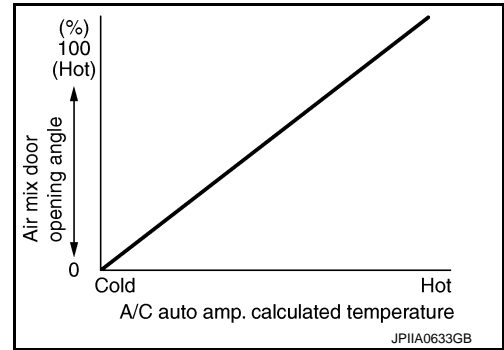
[AUTOMATIC AIR CONDITIONING]

AUTOMATIC AIR CONDITIONING SYSTEM : Temperature Control

INFOID:000000007631661

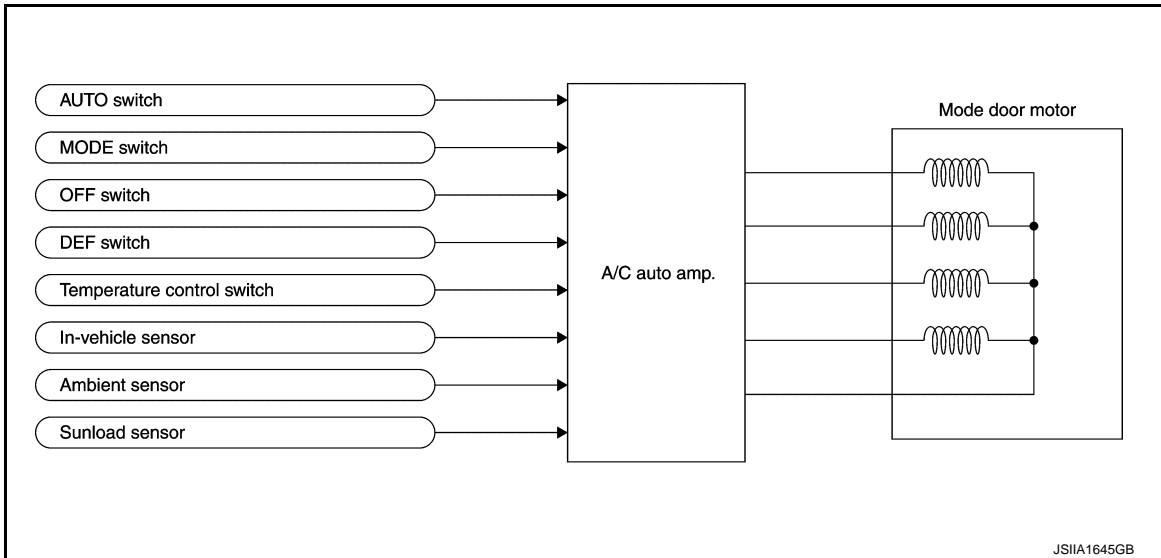


- When power switch is in the ON position, A/C auto amp. always automatically controls temperature regardless of air conditioner operational state.
- A/C auto amp. calculates the target air mix door opening angle according to set temperature, in-vehicle temperature, ambient temperature, and sunload.
- Air mix door is controlled according to the comparison of current air mix door opening angle and target air mix door opening angle.
- Regardless of in-vehicle temperature, ambient temperature, and sunload, air mix door is fixed at the fully cold position when set temperature is 18.0°C (60°F–61°F), and at the fully hot position when set temperature is 32.0°C (89°F–90°F).



AUTOMATIC AIR CONDITIONING SYSTEM : Air Outlet Control

INFOID:000000007631662

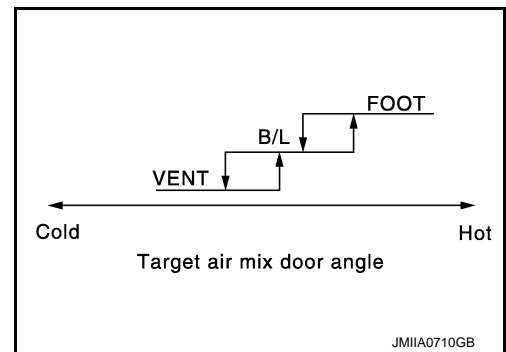


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< SYSTEM DESCRIPTION >

- While air outlet is in automatic control, A/C auto amp. selects the mode door position depending on a target air mix door angle and outlet air temperature calculated from sunload.
- When FOOT is set for the air outlet, the outlet is set to D/F to prevent windshield fogging only when the ambient temperature is extremely low [-13°C (8.6°F) or less].
- If the OFF switch is pressed, the outlet is fixed at FOOT.

[AUTOMATIC AIR CONDITIONING]

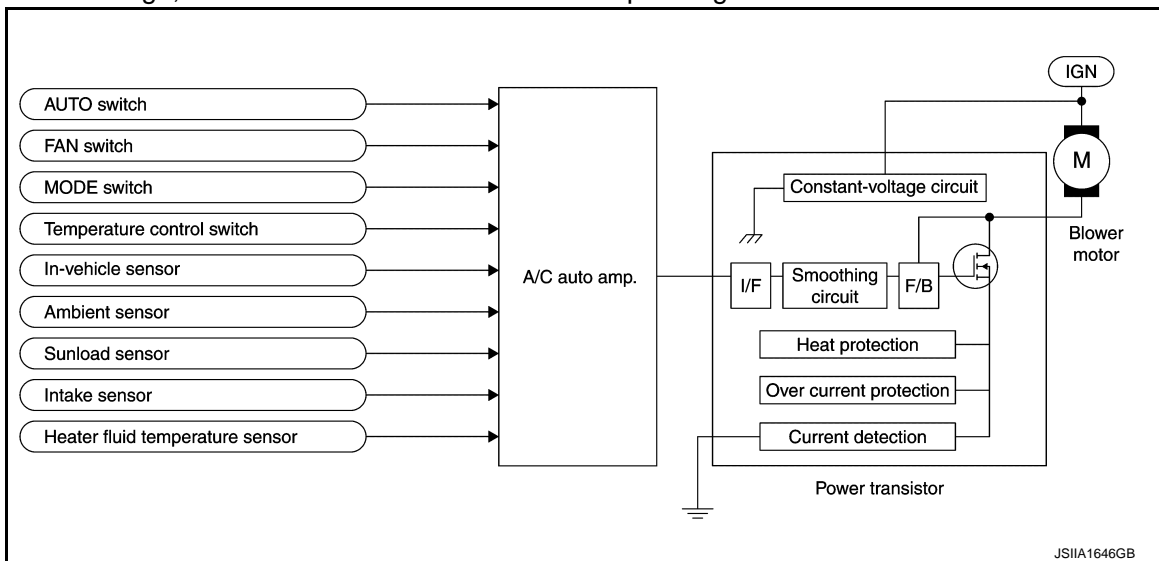


AUTOMATIC AIR CONDITIONING SYSTEM : Air Flow Control

INFOID:000000007631663

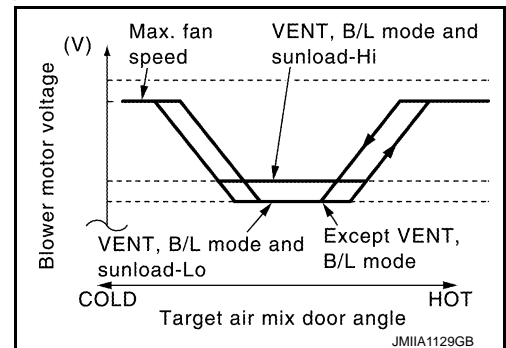
DESCRIPTION

- In addition to manual air flow control and automatic air flow control, air flow control also includes starting air flow control, starting air flow control when coolant temperature is low, starting air flow control when interior temperature is high, and air flow control when motor is operating.



AUTOMATIC AIR FLOW CONTROL

- A/C auto amp. determines target air flow according to target air mix door opening angle.
- A/C auto amp. changes voltage to power transistor gate and controls air flow in a continuous range (no steps) so that target air flow is achieved. At this time, the voltage applied to the blower fan motor is changed at the rate of 1.0 V per second in order to prevent any sudden changes in air flow.
- When air outlet is VENT or B/L, the minimum air flow is changed depending on sunload.



STARTING AIR FLOW CONTROL

SYSTEM

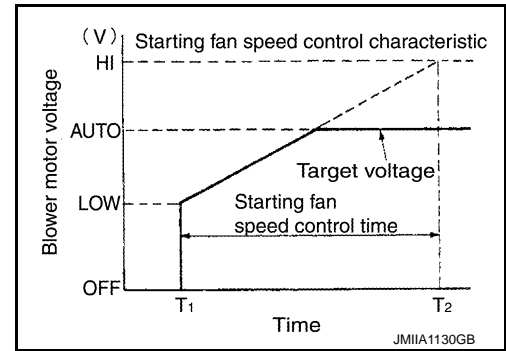
< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

When blower fan motor is activated, A/C auto amp. changes the voltage to the power transistor gate, and gradually increases the voltage to the blower fan motor, in order to prevent a sudden increase in discharge air flow (approximately 10.5 seconds for air flow to reach HI from LOW).

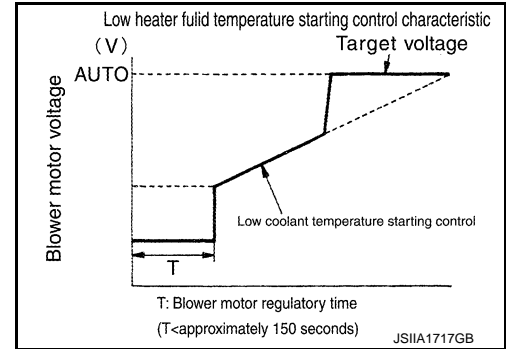
NOTE:

When outlet is DEF, air flow control at motor start is not performed.



STARTING AIR FLOW CONTROL AT LOW HEATER FLUID TEMPERATURE

When blower fan motor starts, the A/C auto amp. suspends blower motor activation for a maximum of 150 seconds, according to the target air mix door position. This prevents cold air from being discharged. After this, voltage applied to power transistor gate is increased gradually, and the blower fan motor starts.



STARTING AIR FLOW CONTROL AT HIGH INTERIOR AIR TEMPERATURE

When evaporator temperature is high [intake air temperature sensor value is 35°C (95°F) or more], to prevent a hot discharged air flow, A/C auto amp. suspends blower motor activation for approximately three seconds so that evaporator is cooled by refrigerant.

AIR FLOW CONTROL AT MOTOR OPERATION

If the mode door motor starts when the air flow corresponds to a voltage of 8.6 V or more applied to the blower fan motor, the A/C auto amp. performs control that fixes the voltage applied to the blower fan motor at 8.5 V, temporarily decreasing the air flow and ensuring that the mode door operates smoothly.

MANUAL AIR FLOW CONTROL

When the fan switch is operated, automatic control is cancelled and the desired fan speed (1 – 7) can be selected.

		Voltage applied to blower fan motor (V)		
		Mode switch		
		VENT, B/L	FOOT, D/F	DEF
Fan speed (When manual control is selected)	1st	4.0	4.0	4.0
	2nd	5.4	5.1	5.1
	3rd	6.8	6.2	6.3
	4th	8.3	7.3	7.4
	5th	9.7	8.3	8.5
	6th	11.1	9.4	9.7
	7th	12.5	10.5	11.2

AUTOMATIC AIR CONDITIONING SYSTEM : Air Inlet Control

INFOID:000000007631664

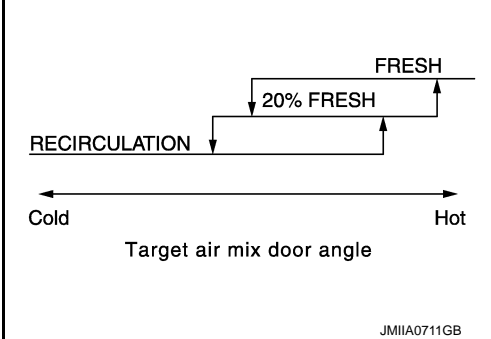
- Manual control by the REC switch and FRE switch is given priority for inlet selection.
- When the DEF switch is pressed, the inlet is fixed at fresh air intake.
- During automatic inlet control, when the electric compressor is ON and the ambient temperature is high, the intake is fixed at recirculation.

SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

- During automatic inlet control when the ambient temperature is other than above, the A/C auto amp. changes the intake control status according to the ambient temperature and the operating status of the electric compressor, discharge air flow, and outlet operating status.

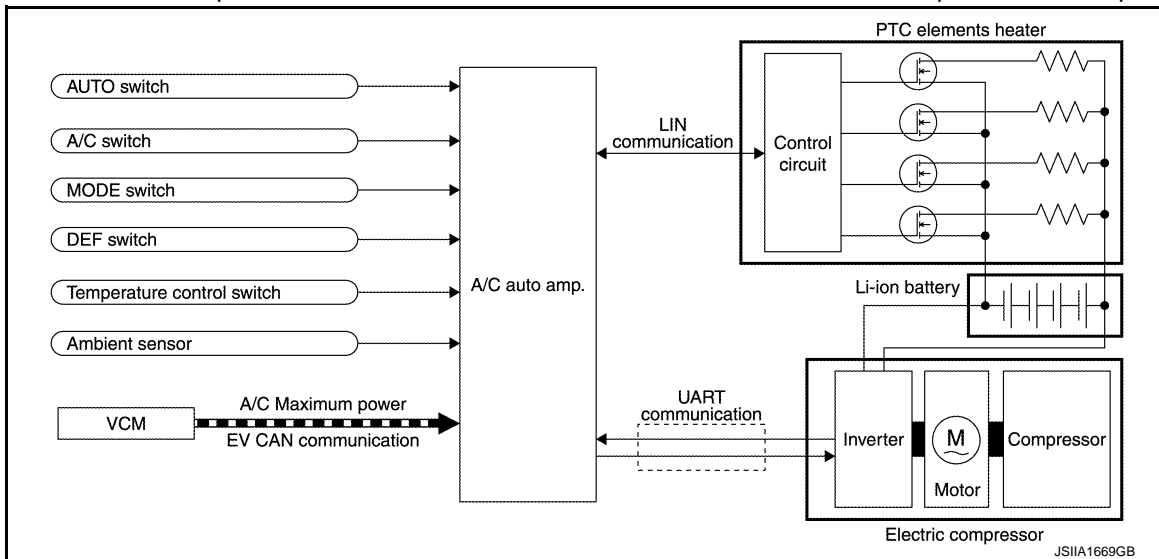
Compressor	Mode switch	Ambient temperature (temperature detected by ambient sensor)	
		14°C (57.2°F) or less	15°C (59°F) or more
ON	VENT B/L	30% recirculation	Control according to the target air mix door position 
	FOOT		
	D/F	Fresh air intake	
OFF	VENT B/L	30% recirculation	Fresh air intake
	FOOT		
	D/F	Fresh air intake	

AUTOMATIC AIR CONDITIONING SYSTEM : Electric Power Distribution Control

INFOID:000000007631665

DESCRIPTION

- Based on the vehicle status, battery remaining energy, and other factors, VCM calculates the electrical power needed to operate the A/C system, and sends this value to the A/C auto amp. via EV CAN communication.
- Based on the ambient sensor signal, inlet position, outlet position, target air mix door position, and other information, the A/C auto amp. calculates the electrical power used by the electric compressor and PTC element heater. If the total exceeds the electric power consumption permitted by the VCM, then the operating rate of the electric compressor and PTC element heater are reduced to lower the power consumption.



WARM-UP AND COOL-DOWN CONTROL

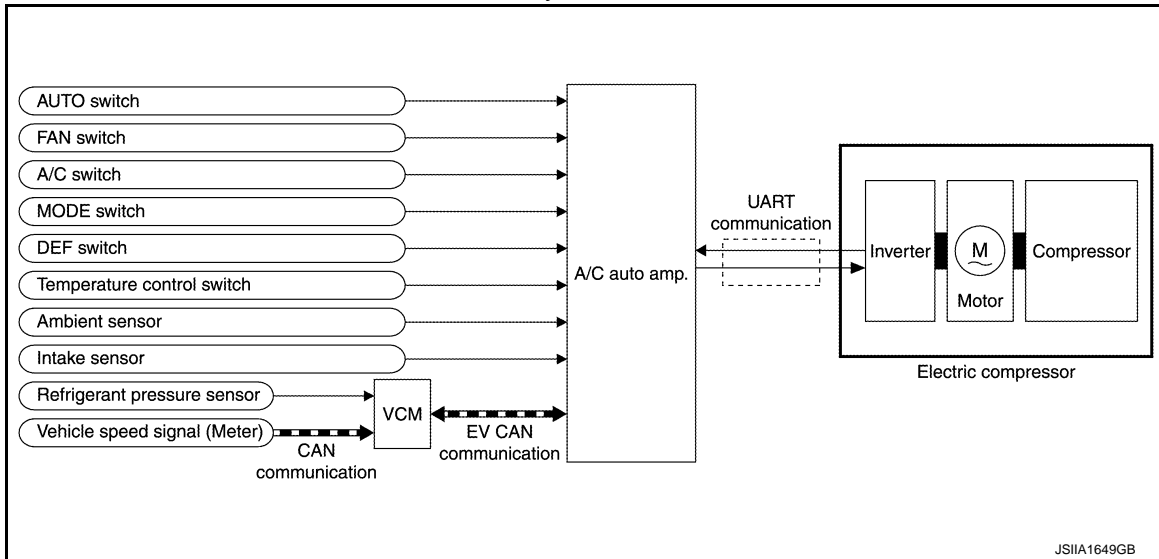
- For the first 10 minutes after the power switch is turned ON, heating/cooling operation at maximum capacity is possible based on a judgment by the A/C auto amp. (however this does not occur in ECO mode).

AUTOMATIC AIR CONDITIONING SYSTEM : Compressor Control

INFOID:000000007631666

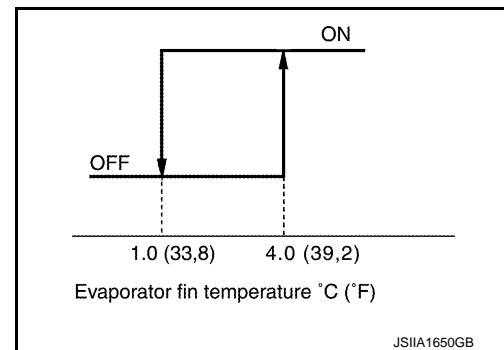
DESCRIPTION

- If the conditions for electric compressor operation are met while the blower fan motor is operating, then based on the various input signals, the A/C auto amp. calculates the compressor target speed that produces the target temperature [4°C – 12°C (39.2°F – 53.6°F)] for the evaporator outlet temperature, and sends a speed command to the electric compressor via a communications signal.
- The electric compressor receives the A/C auto amp. command and controls the motor speed by means of its built-in inverter circuit, then transmits this status by communications.



Evaporator Cryoprotective Protection Control

- When intake air temperature sensor detects that air temperature after passing through evaporator is 1°C (33.8°F) or less, A/C auto amp. sends a request to the electric compressor for a speed of 0 rpm, stopping compressor operation.
- When the air temperature after passing through evaporator reaches 4°C (39.2°F) or more, operation of the electric compressor is resumed.



Compressor Protection Control at Pressure Malfunction

- When the refrigerant pressure on the high-pressure side (detected by the refrigerant pressure sensor) that is received from the VCM via EV system CAN communication is as shown below, the A/C auto amp. stops the compressor.
 - Approximately 2.65 MPa (Approximately 27.0 kg/cm²) or more
 - Approximately 0.14 MPa (Approximately 1.4 kg/cm²) or less
- When the refrigerant pressure on the high-pressure side returns to the range below, the A/C auto amp. resumes operation of the electric compressor.
 - Approximately 1.55 MPa (Approximately 15.8 kg/cm²) or less
 - Approximately 0.16 MPa (Approximately 1.6 kg/cm²) or more

AUTOMATIC AIR CONDITIONING SYSTEM : PTC Element Heater Control

INFOID:000000007631667

DESCRIPTION

- Based on the air mix door position and signals input from each sensor, the A/C auto amp. calculates the target coolant temperature [ambient temperature – approximately 70°C (158°F)].
- A/C auto amp. transmits the operating rate to the PTC element heater via LIN communications so that the calculated target coolant temperature is achieved.

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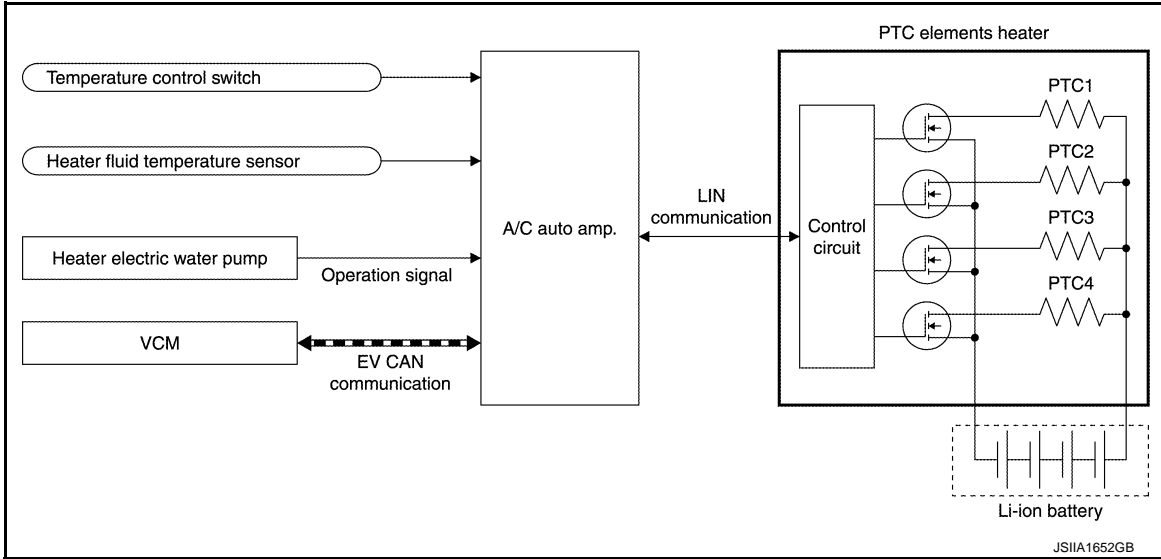
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SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

- Based on the A/C auto amp. command, the control circuit inside the PTC element heater controls the heater output by the PWM method.

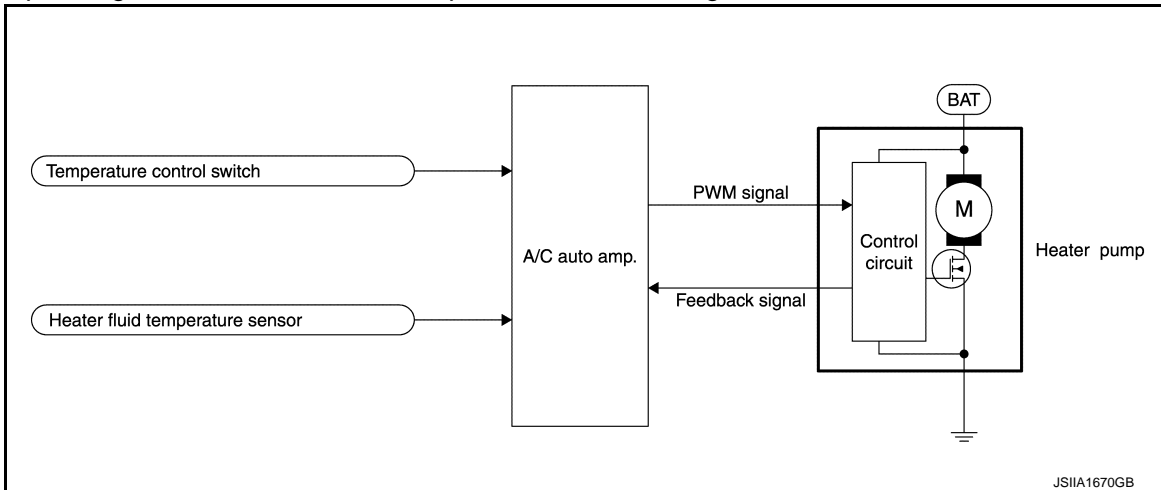


AUTOMATIC AIR CONDITIONING SYSTEM : Heater Pump Control

INFOID:000000007631668

DESCRIPTION

- Based on the signals input from the sensors and the air mix door position, the A/C auto amp. calculates the operating rate for the heater electric water pump.
- The A/C automatic amplifier outputs the target operating rate to the heater electric water pump via the PWM signal.
- Based on the A/C auto amp. command, the heater electric water pump activates the pump and outputs pump operating status to the A/C auto amp. as the feedback signal.



AUTOMATIC AIR CONDITIONING SYSTEM : ECO Mode Control

INFOID:000000007631669

DESCRIPTION

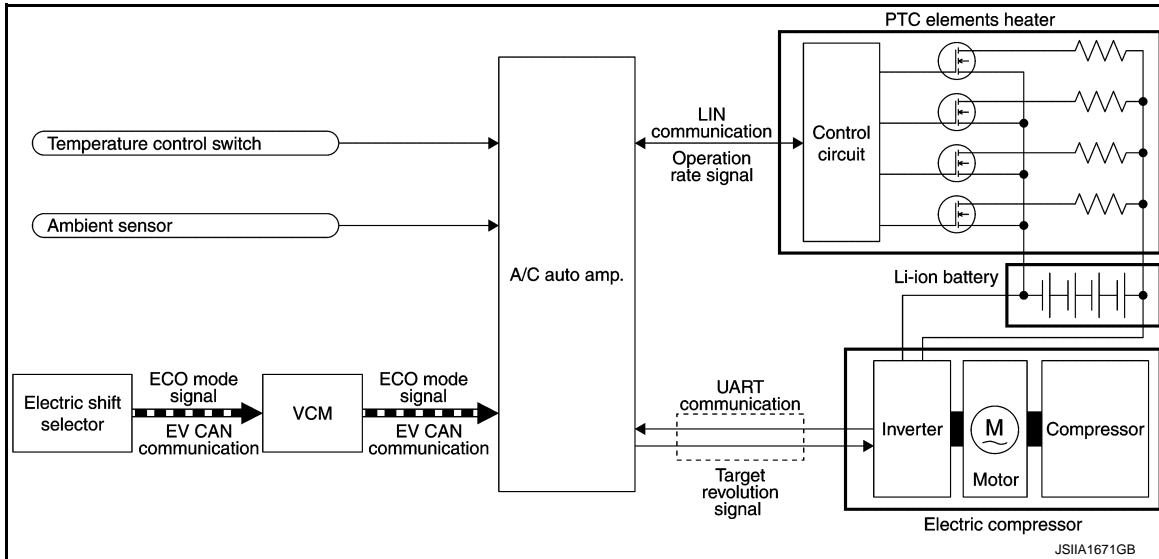
- When ECO mode is selected with the electric shift selector, VCM transmits the ECO mode request signal to the A/C auto amp.

SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

- When the A/C auto amp. receives the ECO mode request signal, it performs control that reduces the power consumption of the A/C system.



ECO MODE CONTROL

- When ECO mode is selected, warm-up/cool-down control (refer to [HAC-20. "AUTOMATIC AIR CONDITIONING SYSTEM : Electric Power Distribution Control!"](#)) is cancelled and the special ECO mode power distribution control is performed.
- The A/C auto amp. determines the A/C system power consumption based on the ambient temperature and set temperature.

NOTE:

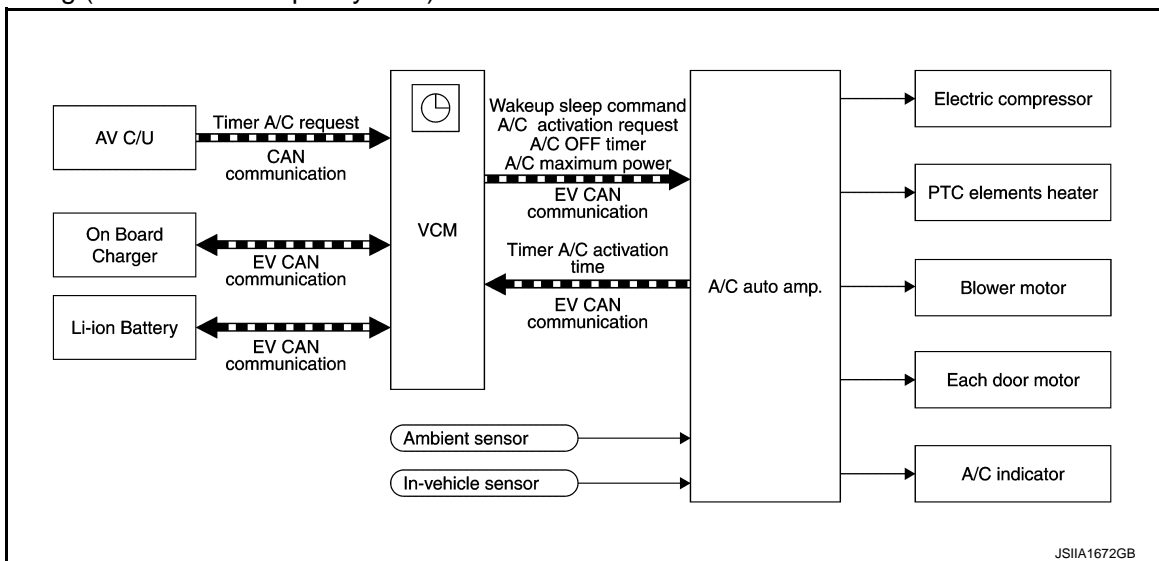
When ECO mode control is activated, there is a noticeable decrease in A/C capacity when temperatures are hot or cold.

AUTOMATIC AIR CONDITIONING SYSTEM : A/C-Heater Timer (Climate Ctrl. Timer)

INFOID:000000007631670

DESCRIPTION

- When A/C-Heater Timer (Climate Ctrl. Timer) is set on the navigation system, the navigation system transmits the A/C-Heater Timer (Climate Ctrl. Timer) request signal and A/C-Heater Timer (Climate Ctrl. Timer) time setting (set vehicle occupancy time) to VCM.



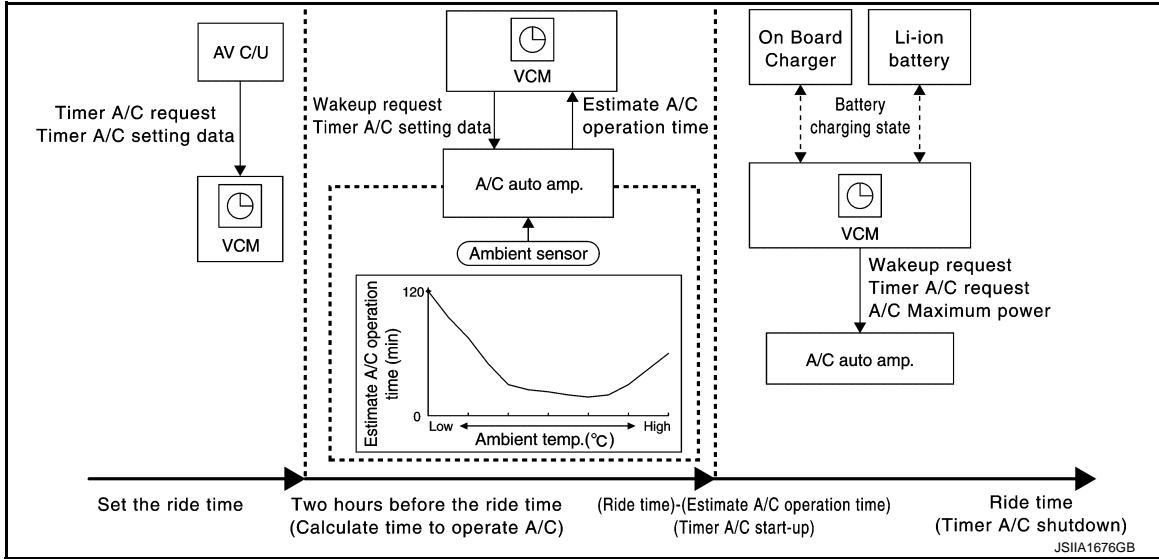
- VCM starts two hours before the set A/C-Heater Timer (Climate Ctrl. Timer) time, and sends a request to the A/C auto amp. for calculation of the A/C operation time required to achieve the target temperature, and receives the results.

SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

- When the operation time calculated by the A/C auto amp. has been reached, VCM starts the A/C auto amp. and starts pre-A/C.



A/C OPERATION DURING A/C-HEATER TIMER (CLIMATE CTRL. TIMER)

- During A/C-Heater Timer (Climate Ctrl. Timer), the A/C auto amp. operates the A/C under the following conditions.

Temperature setting	Intake door position	Mode door position	Electric compressor
25°C (75°F)	Recirculation	D/F (during heating)	Max. 3500 rpm
		Auto (during cooling)	

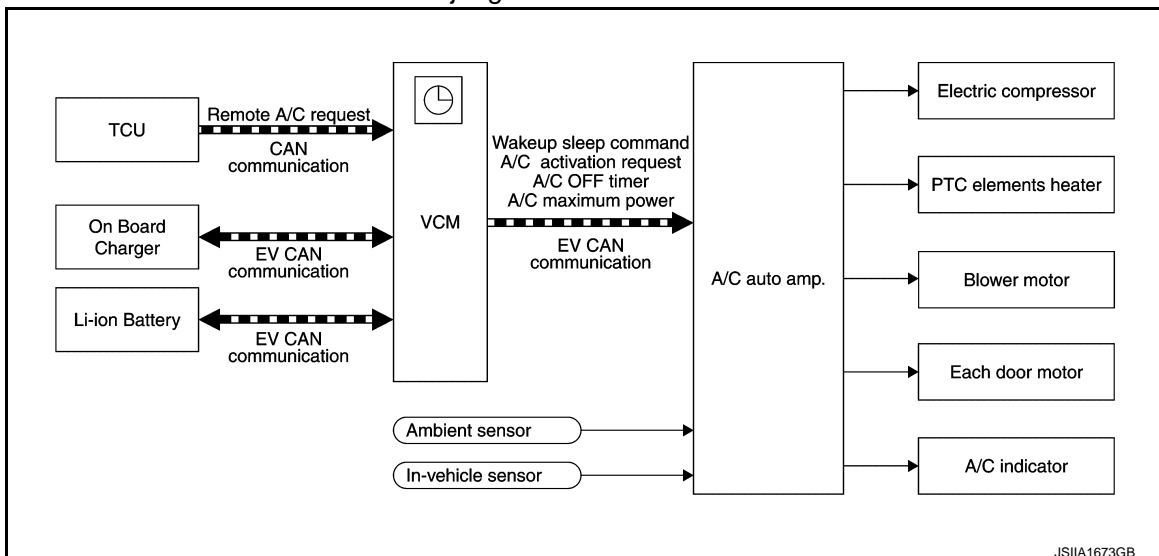
- If the charging plug is not inserted into the charging port at the time of A/C-Heater Timer (Climate Ctrl. Timer) start, A/C-Heater Timer (Climate Ctrl. Timer) operation does not start. If the charging plug is disconnected during A/C-Heater Timer (Climate Ctrl. Timer) operation, A/C-Heater Timer (Climate Ctrl. Timer) operation is stopped.

AUTOMATIC AIR CONDITIONING SYSTEM : Remote Climate Control

INFOID:000000007631671

DESCRIPTION

- When the user selects remote climate control, VCM starts the A/C auto amp.
- During remote climate control, the A/C auto amp. performs remote climate control.
- VCM ends remote climate control when it judges remote climate control end.



A/C OPERATION STATUS DURING REMOTE CLIMATE CONTROL

- During remote climate control, the A/C auto amp. operates the A/C under the following conditions.

SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

Temperature setting	Intake door position	Mode door position	Electric compressor
25°C (75°F)	Recirculation	D/F (during heating)	Max. 3500 rpm
		Auto (during cooling)	

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AUTOMATIC AIR CONDITIONING SYSTEM : Motor Zero Position Reset INFOID:000000007631672

A step motor is used for the mode door motor and air mix door motor.

Because the step motors do not have position detection mechanisms, there may be a deviation between the door position recognized by the A/C auto amp. and the actual door position. Therefore, the A/C auto amp. performs motor zero position reset in order to align its recognized door position with the actual door position.

When either of the conditions below is satisfied, the A/C auto amp. performs motor zero position reset when the power switch next turns ON or when pre-A/C turns ON.

- The 12V battery terminal is disconnected and then is reconnected.
- The power switch is turned OFF during operation of the mode door motor or air mix door motor a total of 60 times.

During zero position reset operation, the DEF switch indicator flashes for several seconds. No switch operations are accepted during this time.

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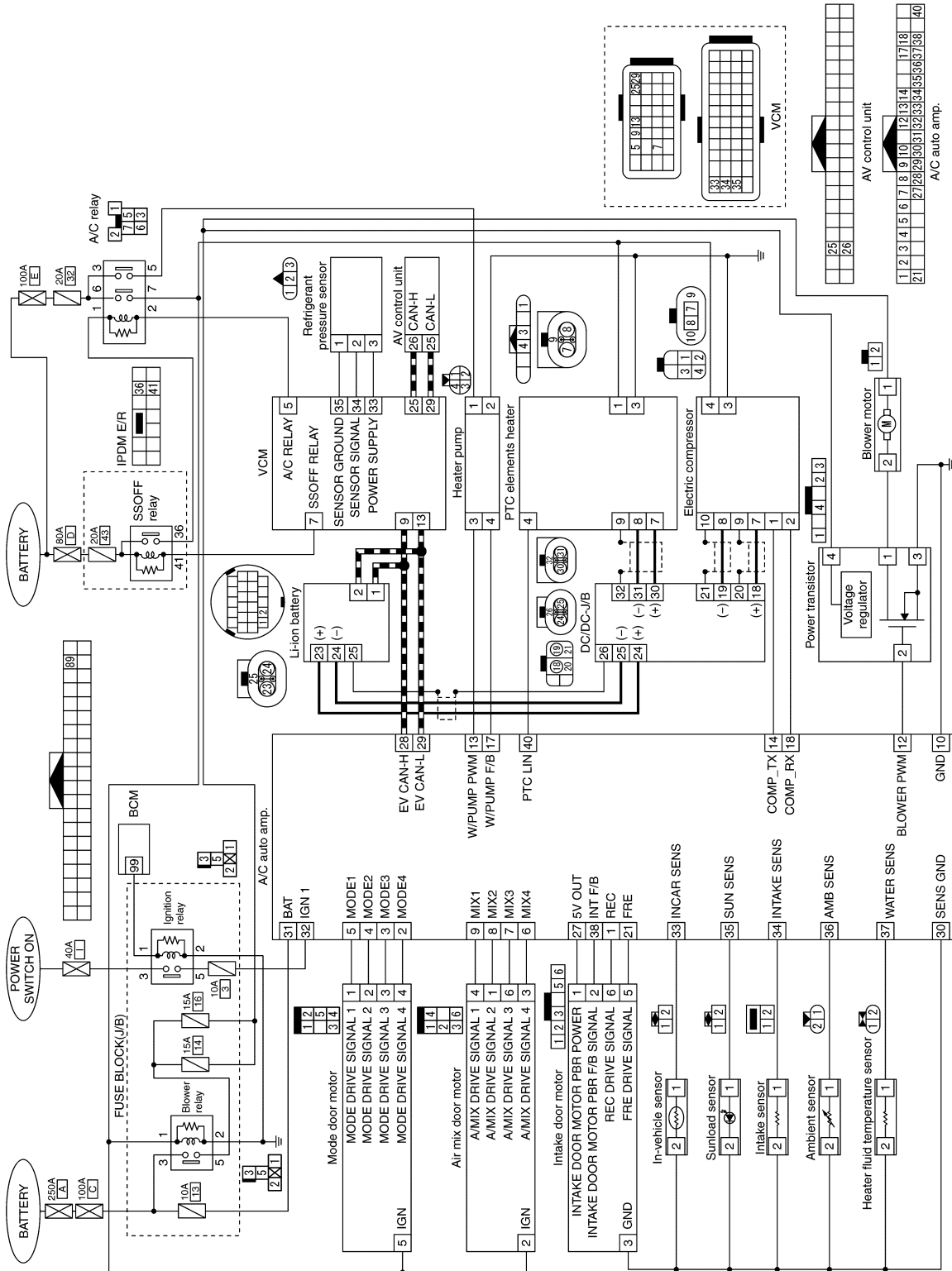
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[AUTOMATIC AIR CONDITIONING]

AUTOMATIC AIR CONDITIONING SYSTEM : Circuit Diagram

INFOID:000000007631673



JMIIA2408GB

AUTOMATIC AIR CONDITIONING SYSTEM : Fail-safe

INFOID:000000007631674

- When the A/C auto amp. detects the conditions shown below, it stops operation of the electric compressor.

SYSTEM

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

Malfunction judgment item	Description	Recovery condition
UART communication malfunction (Electric compressor → A/C auto amp.)	A/C auto amp. judges that there is a UART communications malfunction.	UART communications occur normally for two seconds or more.
Intake sensor malfunction	Open circuit or short circuit is detected in the intake sensor circuit.	Voltage value of intake sensor circuit returns to normal.
Ambient sensor malfunction	Open circuit or short circuit is detected in the ambient sensor circuit.	Voltage value of ambient sensor circuit returns to normal.

- When the electric compressor detects the following conditions, compressor operation is restricted.

Malfunction judgment item	Description	Compressor operation	Recovery condition
Compressor discharge temperature overheat	Compressor discharge refrigerant temperature (estimated value) is more than 130°C (266°F).	Stopped	Compressor stops for five minutes then restarts.
Compressor IPM overheat	IPM temperature is more than 125°C (257°F) within one minute after start.	Stopped	IPM temperature drops to 123°C (253.4°F) or less.
	IPM temperature is more than 88°C (190.4°F) at least one minute after start.		IPM temperature drops to 86°C (186.8°F) or less.
Compressor voltage saturation	Inverter output voltage is 140% or more.	Compressor speed is limited.	Inverter output voltage drops to under 140%.
Compressor overcurrent	Start failed three times because current of 35.1 A or more flowed within 90 seconds after start.	Stopped	IGN_OFF
	Current of 35.1 A or more flows when compressor is stopped.		
Compressor overload	DC input is more than 13.5 A.	Compressor speed is limited.	DC input drops to 13.5 A or less for 15 seconds.
Compressor low-voltage malfunction	High voltage is below 230 V.	Stopped	High voltage rises to 235 V or more.
Compressor high-voltage malfunction	High voltage is more than 420 V.	Stopped	High voltage drops to 415 V or less.
Compressor IPM temperature sensor malfunction	It is judged that an IPM temperature sensor open circuit or short circuit is occurred.	Stopped	The IPM temperature sensor open circuit or short circuit judgment is cancelled.
Compressor shunt signal offset malfunction	It is judged that an unexpected shunt signal value is occurred.	Stopped	IGN_OFF
Compressor ROM, RAM, AD malfunction	A data malfunction is detected in the ROM area or RAM area. It is judged that an unexpected AD value is occurred.	Stopped	IGN_OFF
Compressor discharge temperature restriction	Estimated discharge temperature exceeded 110°C (230°F).	Compressor speed is limited.	IPM temperature drops to 108°C (226.4°F) or less.
Compressor IPM temperature restriction	IPM temperature exceeded 83°C (181.4°F).	Compressor speed is limited.	IPM temperature drops to 81°C (177.8°F) or less.
Compressor low-speed overload	Compressor is not operating at command speed.	Compressor speed increase	Current is decreased and compressor became able to operate at command speed.
UART communication malfunction (Electric compressor → A/C auto amp.)	Electric compressor judges that a UART communication malfunction is occurred.	Stopped	UART communications occur normally for two seconds or more.

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OPERATION

Description

INFOID:000000007631675

- This A/C uses various sensors to detect temperature changes in the interior caused by factors such as changes in ambient temperature and sunload. When the desired temperature is set, the discharge air temperature, discharge air flow, and inlet/outlet changes are controlled automatically to maintain a constant interior temperature at all times.
- The air flow volume and switching of air inlets and air outlets can be selected manually without auto function. While using auto function, it is still possible to select a particular item manually.
- It is possible to use A/C-Heater Timer (Climate Ctrl. Timer) or remote climate control to adjust the interior to a comfortable temperature before entering the vehicle.

TABLE OF OPERATION CONDITIONS OF A/C SYSTEM FUNCTION OPERATED BY POWER SWITCH OPERATION

Each of the A/C system functions is operative under the following conditions.

×:Operate —: Does not operate

Power supply position	OFF	ACC	ON	READY
Ventilation function	—	—	×	×
Cooling/heating function	—	—	× (Only during charging)	×
A/C-Heater Timer (Climate Ctrl. Timer) function	× (Only when EVSE is connected)	—	—	—
Remote climate control function	×	—	—	—

NOTE:

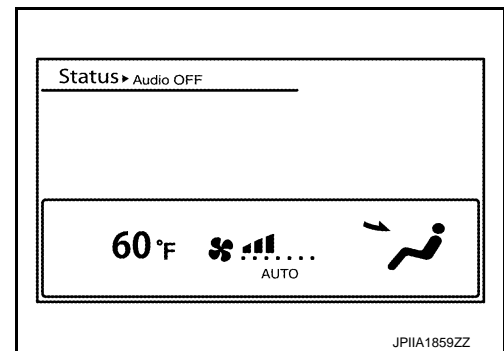
- Connecting EVSE when the vehicle is in READY state cancels READY state (ready indicator lamp turns OFF), and power supply position changes to ON. At this time, cooling/heating function of A/C system stops, and only ventilation function operates. When using cooling/heating function, turn power switch OFF, check that charging is started, and then turn power switch ON again.
- If cooling/heating function is used during charging, and when charging is completed, cooling/heating function stops, and only ventilation function operates.

Switch Name and Function

INFOID:000000007631676

AUTO A/C SYSTEM OPERATIONS AND DISPLAYS

A/C Status Display (Inside Display)

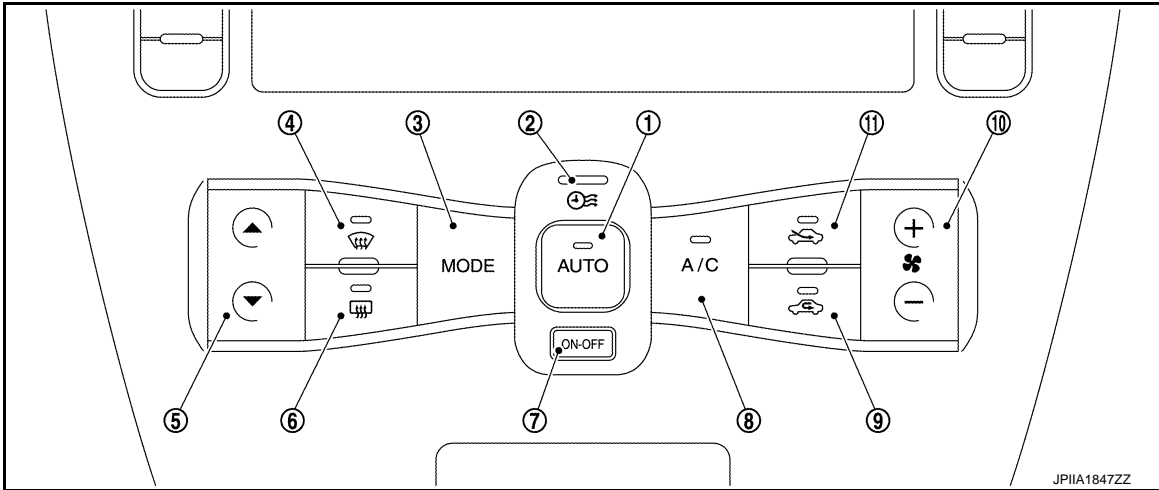


A/C Controller

OPERATION

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]



- | | | |
|------------------------|---------------------------------|--------------------------------|
| 1. AUTO switch | 2. A/C indicator | 3. MODE switch |
| 4. DEF switch | 5. Temperature control switches | 6. Rear window defogger switch |
| 7. ON-OFF switch | 8. A/C switch | 9. REC switch |
| 10. Fan control switch | 11. FRE switch | |

<p>AUTO switch</p>	<ul style="list-style-type: none"> If the switch is pressed while the A/C is stopped, the switch indicator lamp turns ON, "AUTO" appears on the display, and the A/C system status is as per the following items. <ul style="list-style-type: none"> - Air inlet: Automatic control - Air outlet: Automatic control - Air flow: Automatic control - Compressor: Automatic control If the switch is pressed while the A/C is operating and "AUTO" is OFF, the switch indicator lamp turns ON, "AUTO" appears on the display, and all control switches to automatic control. <p>NOTE: When air outlet or air flow is manually operated while "AUTO" is indicated on display, "AUTO" indication turns OFF. However, automatic control continues for functions other than air outlet or air flow.</p>
<p>A/C indicator</p>	<p>While the A/C-Heater Timer (Climate Ctrl.Timer) operates, the indicator flashes. If the A/C-Heater Timer (Climate Ctrl. Timer) is set to activate, the indicator illuminates.</p>
<p>MODE switch</p>	<p>When each MODE switch is pressed, air outlet is switched and VENT, B/L, FOOT, or D/F can be selected manually.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Air outlet can be changed when air conditioner system is in the OFF position. When MODE switch is pressed while "AUTO" is indicated on display, air outlet automatic control is released ("AUTO" turns OFF).

OPERATION

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

DEF switch	<p>DEF mode (switch indicator lamp) changes between ON ⇔ OFF each time DEF switch is pressed</p> <p>When switch is pressed while air conditioning system is in the ON position</p> <ul style="list-style-type: none"> • When DEF mode turns ON, air conditioning system changes to the following status. <ul style="list-style-type: none"> - Air outlet: DEF - Air flow: Automatic control (If an air flow other than AUTO is selected before pressing DEF switch, blower fan is manual control.) - Air inlet: Fresh air intake - A/C switch: ON • When DEF mode turns OFF, air conditioner system state returns to the previous state before DEF mode is selected. <p>When switch is pressed while air conditioner system is in the OFF position</p> <ul style="list-style-type: none"> • Air conditioning system turns ON and changes to the following status. <ul style="list-style-type: none"> - Air outlet: DEF - Air flow: Automatic control - Air inlet: Fresh air intake - A/C switch: ON • When DEF mode turns OFF, entire air conditioner system turns OFF. <p>NOTE: When DEF mode is turned ON while "AUTO" is indicated on display, "AUTO" indication turns OFF. However, airflow automatic control continues. (This operation is excluded when airflow is set before DEF switch is pressed.)</p>
Temperature control switches	<p>Operation of this switch sets the temperature setting in increments of 0.5°C (1°F) within the range of 18.0°C (60°F) to 32.0°C (90°F).</p> <ul style="list-style-type: none"> • ▲: Increase temperature setting. • ▼: Decrease temperature setting. <p>NOTE: When A/C system is OFF, the set temperature can be selected only while the temperature setting is shown on the display (several seconds after MODE switch is pressed).</p>
Rear window defogger switch	<p>Refer to DEF-8, "System Description".</p>
ON/OFF switch	<ul style="list-style-type: none"> • If the switch is pressed while the A/C is operating, the compressor and blower fan motor stop, and the outlets and inlets are set as shown below. <ul style="list-style-type: none"> - Air outlet: FOOT - Air inlet: Fresh air intake (during automatic inlet control) • If the switch is pressed while A/C is stopped, the A/C turns ON with the same settings as before it is stopped.
A/C switch	<ul style="list-style-type: none"> • If the A/C switch is pressed while the compressor is ON, "A/C OFF" appears in the A/C section of the display, the A/C switch indicator lamp turns OFF (orange), and the compressor turns OFF. • When the A/C switch is pressed again, "A/C ON" appears in the A/C display, the A/C switch indicator lamp (orange) turns ON, and the compressor turns ON. • If the switch is operated while "AUTO" is shown on the display, automatic compressor control is cancelled (AUTO turns OFF). <p>NOTE: When blower fan motor is OFF, compressor control cannot be activated.</p>
REC switch	<ul style="list-style-type: none"> • When the REC switch is pressed, the inlet changes to REC (recirculation) and the REC indicator lamp turns ON. • If the REC switch is pressed and held for approximately two seconds or more when the inlet is REC (recirculation), the REC and FRE indicator lamps (orange) flash twice, and the inlet switches to automatic control. During automatic control, the air inlet status (FRE, REC) is indicated by the indicator lamp. • If the switch is operated while "AUTO" is shown on the display, automatic intake control is cancelled (AUTO turns OFF). <p>NOTE: Air inlet can be changed when air conditioning system is in OFF status.</p>

OPERATION

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

Fan control switch	<p>Air flow can be manually set within the range of speeds 1 – 7 using the fan control dial.</p> <ul style="list-style-type: none"> • +: Increase air flow. • -: Decrease air flow. <p>NOTE:</p> <ul style="list-style-type: none"> • When this switch is operated while A/C system is OFF, A/C system turns ON. • If the switch is operated while "AUTO" is shown on the display, automatic air flow control is cancelled ("AUTO" turns OFF). 	A B
FRE switch	<ul style="list-style-type: none"> • When the FRE switch is pressed, the inlet changes to FRE (fresh air intake) and the FRE indicator lamp turns ON. • If the FRE switch is pressed and held for approximately two seconds or more when the inlet is FRE (fresh air intake), the REC and FRE indicator lamps (orange) flash twice, and the inlet switches to automatic control. During automatic control, the air inlet status (FRE, REC) is indicated by the indicator lamp. • If the switch is operated while "AUTO" is shown on the display, automatic intake control is cancelled (AUTO turns OFF). <p>NOTE: Air inlet can be changed when air conditioning system is in OFF status.</p>	C D E

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DIAGNOSIS SYSTEM (A/C AUTO AMP.)

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

DIAGNOSIS SYSTEM (A/C AUTO AMP.)

Description

INFOID:000000007631677

Air conditioning system performs self-diagnosis, operation check, function diagnosis, and various settings using diagnosis function of each control unit.

Unit name	Diagnosis item (CONSULT display)	
A/C auto amplifier	HVAC	Self-diagnosis results
		Data Monitor
		Work Support
		ACTIVE TEST
AV control unit	AV	Self-diagnosis results
		Data Monitor
		ACTIVE TEST
VCM	EV/HEV	Self-diagnosis results
		Data Monitor

CONSULT Function

INFOID:000000007631678

APPLICABLE ITEM

CONSULT performs the following functions via communication with the A/C auto amp.

Diagnosis mode	FUNCTION DESCRIPTION
ECU identification information	Displays part number of A/C auto amp.
Self-diagnosis results	Displays diagnosis results that are judged by A/C auto amp.
Data Monitor	Displays I/O signals of A/C auto amp.
ACTIVE TEST	Forces supply of the signals which operate each load from the A/C auto amp.
Work Support	Changes the settings of various setting functions and performs automatic adjustment of components.

ECU IDENTIFICATION INFORMATION

Part number of A/C auto amp. can be checked.

SELF-DIAGNOSIS RESULTS

Diagnosis results that are judged by A/C auto amp. can be checked. [HAC-40, "DTC Index"](#).

DATA MONITOR

Communication signals of A/C auto amp. can be checked.

Display Item List

Monitor item [STATUS or UNIT]	DESCRIPTION
AMB TEMP SEN [°C/°F]	Value of ambient sensor detection value (voltage), converted to ambient temperature
IN-VEH TEMP [°C/°F]	Value of in-vehicle sensor detection value (voltage), converted to interior temperature
INT TEMP SEN [°C/°F]	Value of intake sensor detection value (voltage), converted to intake temperature
SUNLOAD SEN [W/m ²]	Value of sunload sensor detection value (voltage), converted to sunload
AMB SEN CAL [°C/°F]	Value of ambient temperature calculated by A/C auto amp.
IN-VEH CAL [°C/°F]	Value of interior temperature calculated by A/C auto amp.
INT TEMP CAL [°C/°F]	Value of intake temperature calculated by A/C auto amp.
SUNL SEN CAL [W/m ²]	Value of sunload calculated by A/C auto amp.
COMP REQ SIG [On/Off]	A/C ON signal ON/OFF status
FAN REQ SIG [On/Off]	Blower fan ON signal ON/OFF status

DIAGNOSIS SYSTEM (A/C AUTO AMP.)

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

Monitor item [STATUS or UNIT]	DESCRIPTION
FAN DUTY*	Target value of voltage (applied voltage) applied to Blower fan motor by A/C auto amp.
XM	Target discharge air temperature judged by A/C auto amp. according to the temperature setting and the value from each sensor
COMPR RPM [rpm]	Rotation speed of electric compressor
COMPR INPUT POWER SIG [W]	Power consumption value of electric compressor
COMPR INPUT VOLT SIG [V]	Input voltage value of electric compressor
PTC HEATER REQUEST [%]	Operating rate sent to the PTC element heater by the A/C auto amp.
COMP USE PERMIT POWER [W]	Calculated value of electrical power available to operate the A/C system received from VCM via EV CAN communication
REFRIGERANT PRE SEN [Mpa]	Refrigerant pressure sensor detection value sent from VCM
FORCED Off SIGNAL [ON/OFF]	State of input signal to A/C auto amp.
FORCED INTAKE REC SIG [ON/OFF]	State of input signal to A/C auto amp.
PRE-CLIMATE SIGNAL [ON/OFF]	State of input signal to A/C auto amp.
HV SPLY/BLOCK CMPL FLAG [ON/OFF]	State of input signal to A/C auto amp.
PTC CONSUMPTION VOLT [W]	Power consumption value of PTC element heater
WATER TEMPESENSOR [°C/°F]	Value of heater fluid temperature sensor detection value (voltage), converted to temperature
PUMP RPM (DIRECTION) [rpm]	Value sent to heater pump by A/C auto amp.
PUMP RPM (EFFECTIVE) [rpm]	Actual rotation speed of heater pump

*: "DUTY" is displayed however the voltage is indicated. Or value is not displayed, but unit is (V).

ACTIVE TEST

The signals used to activate each device forcibly supplied from A/C auto amp. operation check of air conditioning system can be performed.

NOTE:

When the active test is performed, the vehicle is set to READY.

Test item	DESCRIPTION
ALL SEG	ALL switch indicator indications are turned ON.
HVAC TEST	The operation check of A/C system can be performed by selecting the mode. Refer to the following table for the conditions of each mode.

HVAC Test

	Test item						
	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5	Mode 6	Mode 7
Mode door motor position	VENT	VENT	B/L	B/L	FOOT*	D/F	DEF
Intake door motor position	REC	REC	REC	20%FRE	FRE	FRE	FRE
Air mix door motor position	FULL COLD	FULL COLD	FULL COLD	Halfway	Halfway	FULL HOT	FULL HOT
Blower fan motor (applied voltage)	5 V	8.5 V	10.5 V	8.5 V	8.5 V	8.5 V	5 V
Electric compressor (rpm)	ON (2000)	ON (2000)	ON (3000)	ON (2000)	OFF (0)	OFF (0)	OFF (0)
PTC element heater operating rate	0%	0%	0%	50%	50%	50%	0%
Heater electric water pump operating rate	10%	10%	10%	20%	20%	50%	40%

*In FOOT mode, position of mode door motor (driver side) is set to the status that is selected for blow setting to DEF. Refer to [HAC-52. "Foot Position Setting Trimmer"](#).

WORK SUPPORT

Setting change of various setting functions and automatic adjustment of components can be performed.

DIAGNOSIS SYSTEM (A/C AUTO AMP.)

< SYSTEM DESCRIPTION >

[AUTOMATIC AIR CONDITIONING]

Work item	DESCRIPTION	Refer to
TEMP SET CORRECT	If the temperature experienced by the passenger is different than the discharge air temperature controlled by the temperature setting, the A/C auto amplifier control temperature can be corrected with regards to the temperature setting.	HAC-51. "Temperature Setting Trimmer"
REC MEMORY SET	REC memory function setting can be performed.	HAC-51. "Inlet Port Memory Function (REC)"
FRE MEMORY SET	FRE memory function setting can be performed.	HAC-52. "Inlet Port Memory Function (FRE)"
BLOW SET	In FOOT mode, the air blow to DEF can be turned ON/OFF.	HAC-52. "Foot Position Setting Trimmer"
TARGET MAX RPM ADJ AT PRE-CLIMATE	Compressor MAX rotation in Pre Air Condition is compensated.	HAC-52. "Setting of Compressor Maximum Rotation Speed During Pre Air Conditioning"
TARGET MAX RPM ADJ AT IDL	Compressor MAX rotation when vehicle stopped is compensated.	HAC-53. "Setting of Compressor Maximum Rotation Speed During Idling"
Door Motor Starting Position Re-set	Zero position reset of air mix door motor and mode door motor can be performed.	HAC-54. "Work Procedure"

ECU DIAGNOSIS INFORMATION

A/C AUTO AMP.

Reference Value

INFOID:000000007631679

CONSULT DATA MONITOR REFERENCE VALUES

Monitor item	Condition		Value/Status
AMB TEMP SEN	Power switch ON		Equivalent to ambient temperature
IN-VEH TEMP	Power switch ON		Equivalent to in-vehicle temperature
INT TEMP SEN	Power switch ON		Equivalent to evaporator fin temperature
SUNLOAD SEN	Power switch ON		Equivalent to sunload amount
AMB SEN CAL	Power switch ON		Equivalent to ambient temperature
IN-VEH CAL	Power switch ON		Equivalent to in-vehicle temperature
INT TEMP CAL	Power switch ON		Equivalent to evaporator fin temperature
SUNL SEN CAL	Power switch ON		Equivalent to sunload amount
COMP REQ SIG	Power switch READY	A/C switch: ON (Compressor operation status)	On
		A/C switch: OFF	Off
FAN REQ SIG	Power switch READY	Blower motor: ON	On
		Blower motor: OFF	Off
FAN DUTY*	Power switch READY	Blower motor: ON	4 – 13
		Blower motor: OFF	0
XM	Power switch ON		Value according to target air flow temperature
COMPR RPM	Power switch READY	A/C switch: ON (Compressor operation status)	Rotation speed of electric compressor
COMPR INPUT POWER SIG	Power switch READY	A/C switch: ON (Compressor operation status)	Power consumption value of electric compressor
COMPR INPUT VOLT SIG	Power switch READY	A/C switch: ON (Compressor operation status)	Input voltage value of electric compressor
PTC HEATER REQUEST	Power switch READY	Heater FULL HOT operation	Operating rate sent to the PTC element heater by the A/C auto amp.
COMP USE PERMIT POWER	Power switch ON	A/C switch: ON (Compressor operation status)	Value calculation for electric compressor consumption power by A/C auto amp.
REFRIGERANT PRE SEN	Power switch READY	A/C switch: ON (Compressor operation status)	Equivalent to refrigerant pressure
FORCED Off SIGNAL	Power switch ON	A/C switch: ON (Compressor operation status)	OFF
FORCED INTAKE REC SIG	Power switch READY	When the coolant temperature of the high voltage system is high	ON
		Except the above	OFF
PRE-CLIMATE SIGNAL	Power switch ON	When the A/C-Heater Timer (Climate Ctrl. Timer) or remote climate control is operate	ON

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A/C AUTO AMP.

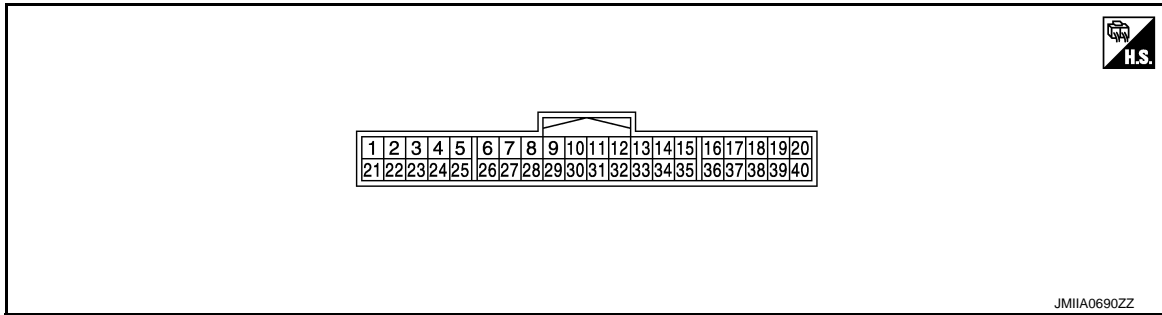
< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

Monitor item	Condition		Value/Status
HV SPLY/BLOCK CMPL FLAG	Power switch READY	A/C switch: ON (Compressor operation status)	When VCM supplies a high voltage: ON When VCM stops the supply of the high voltage: OFF
PTC CONSUMPTION VOLT	Power switch READY	Heater FULL HOT operation	Value calculation for PTC elements heater consumption power by A/C auto amp.
WATER TEMPESENSOR	Power switch ON		Equivalent to heater fluid temperature
PUMP RPM (DIRECTION)	Power switch READY	Heater FULL HOT operation	Value sent to electric compressor by A/C auto amp.
PUMP RPM (EFFECTIVE)	Power switch READY	Heater FULL HOT operation	Actual rotation speed of electric compressor

*: "DUTY" is displayed, but voltage is indicated. Or unit is not displayed but unit is (V).

TERMINAL LAYOUT



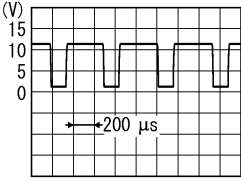
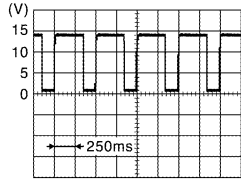
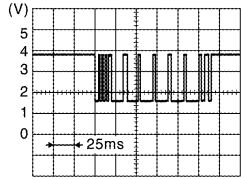
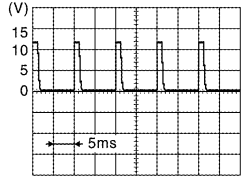
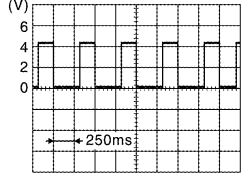
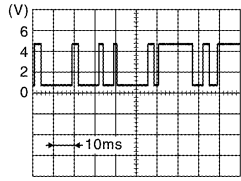
INPUT/OUTPUT SIGNAL STANDARD

Terminal No. (Wire color)		Item		Test condition	Standard
+	-	Signal name	Input/ Output		
1 (V)	10 (B)	REC	Intake door motor drive signal	Output	• Power switch ON • Intake switch: FRE→REC 9.5 – 13.5 V
					• Power switch ON • Intake switch: REC→FRE 0 – 1 V
2 (R)	10 (B)	MODE drive 4	Mode door motor drive signal	Output	<ul style="list-style-type: none"> • Power switch ON • Immediately after mode switch is operated
3 (P)	10 (B)	MODE drive 3			
4 (Y)	10 (B)	MODE drive 2			
5 (V)	10 (B)	MODE drive 1			
6 (BR)	10 (B)	A/MIX drive 4	Air mix door motor drive signal	Output	<ul style="list-style-type: none"> • Power switch ON • Immediately after temperature control dial is operated
7 (SB)	10 (B)	A/MIX drive 3			
8 (LG)	10 (B)	A/MIX drive 2			
9 (L)	10 (B)	A/MIX drive 1			
10 (B)	Ground	Ground	—	Power switch ON	0 – 0.1 V

A/C AUTO AMP.

< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

Terminal No. (Wire color)		Item		Test condition	Standard
+	-	Signal name	Input/ Output		
12 (GR)	10 (B)	Power transistor control signal	Output	<ul style="list-style-type: none"> Power switch ON Fan speed: Manual speed 1 	 <p>ZJIA0863J</p>
13 (V)	10 (B)	Heater water pump control signal	Output	<ul style="list-style-type: none"> Power switch READY Heater FULL HOT operation 	 <p>JSIIA1657ZZ</p>
14 (L)	10 (B)	COMP_TX	Output	<ul style="list-style-type: none"> Power switch READY FULL COLD Electric compressor operation 	 <p>JSIIA1658ZZ</p>
15 (W)	10 (B)	Rear defogger switch	Output	<ul style="list-style-type: none"> Power switch ON Rear window defogger switch OFF 	 <p>JSIIA1668ZZ</p>
				<ul style="list-style-type: none"> Power switch ON Rear defogger switch is pressed. 	0 V
17 (R)	10 (B)	Heater water pump feedback signal	Input	<ul style="list-style-type: none"> Power switch READY Heater FULL HOT operation 	 <p>JSIIA1659ZZ</p>
18 (W)	10 (B)	COMP_RX	Input	<ul style="list-style-type: none"> Power switch READY FULL COLD Electric compressor operation 	 <p>JSIIA1660ZZ</p>

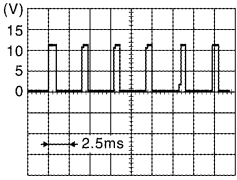
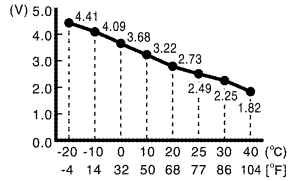
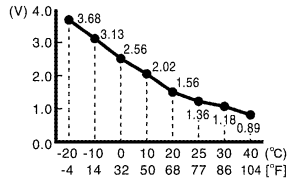
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A/C AUTO AMP.

< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

Terminal No. (Wire color)		Item		Test condition	Standard
+	-	Signal name	Input/ Output		
19 (W)	10 (B)	Illumination +	Input	<ul style="list-style-type: none"> Power switch ON Lighting switch 1st 	12 V
				<ul style="list-style-type: none"> Power switch ON Lighting switch OFF 	0 V
20 (B)	10 (B)	Illumination -	—	<ul style="list-style-type: none"> Power switch ON Lighting switch 1st 	 JSIIA1661ZZ
				<ul style="list-style-type: none"> Power switch ON Lighting switch OFF 	0 V
21 (G)	10 (B)	FRE	Intake door motor drive signal	<ul style="list-style-type: none"> Power switch ON Intake switch: REC→FRE 	9.5 – 13.5 V
				<ul style="list-style-type: none"> Power switch ON Intake switch: FRE→REC 	0 – 1 V
27 (W)	10 (B)	Sensor power (5 V)		Power switch ON	5 V
28 (L)	—	EV CAN-H		—	—
29 (G)	—	EV CAN-L		—	—
30 (R)	10 (B)	Sensor ground		Power switch ON	0 – 0.1 V
31 (W)	10 (B)	Battery power supply		Power switch OFF	11 – 14 V
32 (Y)	10 (B)	Ignition power		Power switch ON	11 – 14 V
33 (LG)	10 (B)	In-vehicle sensor signal	Input	<ul style="list-style-type: none"> Power switch ON When air Conditioner is operating 	 JSIIA1662ZZ
34 (G)	10 (B)	Intake sensor signal	Input	<ul style="list-style-type: none"> Power switch ON When air Conditioner is operating 	 JSIIA1663ZZ

A/C AUTO AMP.

< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

Terminal No. (Wire color)		Item		Test condition	Standard																											
+	-	Signal name	Input/ Output																													
35 (P)	10 (B)	Sunload sensor signal	Input	<ul style="list-style-type: none"> Power switch ON When air Conditioner is operating 	<table border="1"> <caption>Sunload sensor signal data</caption> <thead> <tr> <th>Sunload (W/m²)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr><td>200</td><td>4.44</td></tr> <tr><td>400</td><td>3.88</td></tr> <tr><td>600</td><td>3.31</td></tr> <tr><td>800</td><td>2.75</td></tr> <tr><td>1000</td><td>2.19</td></tr> <tr><td>1200</td><td>1.63</td></tr> </tbody> </table> <p>JSIIA1664ZZ</p>	Sunload (W/m²)	Voltage (V)	200	4.44	400	3.88	600	3.31	800	2.75	1000	2.19	1200	1.63													
Sunload (W/m²)	Voltage (V)																															
200	4.44																															
400	3.88																															
600	3.31																															
800	2.75																															
1000	2.19																															
1200	1.63																															
36 (GR)	10 (B)	Ambient sensor signal	Input	<ul style="list-style-type: none"> Power switch ON When air Conditioner is operating 	<table border="1"> <caption>Ambient sensor signal data</caption> <thead> <tr> <th>Temp (°C)</th> <th>Temp (°F)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr><td>-20</td><td>-4</td><td>4.42</td></tr> <tr><td>-10</td><td>14</td><td>4.11</td></tr> <tr><td>0</td><td>32</td><td>3.71</td></tr> <tr><td>10</td><td>50</td><td>3.25</td></tr> <tr><td>20</td><td>68</td><td>2.76</td></tr> <tr><td>25</td><td>77</td><td>2.52</td></tr> <tr><td>30</td><td>86</td><td>2.29</td></tr> <tr><td>40</td><td>104</td><td>1.85</td></tr> </tbody> </table> <p>JSIIA1665ZZ</p>	Temp (°C)	Temp (°F)	Voltage (V)	-20	-4	4.42	-10	14	4.11	0	32	3.71	10	50	3.25	20	68	2.76	25	77	2.52	30	86	2.29	40	104	1.85
Temp (°C)	Temp (°F)	Voltage (V)																														
-20	-4	4.42																														
-10	14	4.11																														
0	32	3.71																														
10	50	3.25																														
20	68	2.76																														
25	77	2.52																														
30	86	2.29																														
40	104	1.85																														
37(BR)	10 (B)	Heater fluid temperature sensor	Input	<ul style="list-style-type: none"> Power switch ON When air Conditioner is operating 	<table border="1"> <caption>Heater fluid temperature sensor data</caption> <thead> <tr> <th>Temp (°C)</th> <th>Temp (°F)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr><td>-20</td><td>-4</td><td>4.71</td></tr> <tr><td>0</td><td>32</td><td>4.28</td></tr> <tr><td>20</td><td>68</td><td>3.57</td></tr> <tr><td>40</td><td>104</td><td>2.71</td></tr> <tr><td>50</td><td>122</td><td>2.28</td></tr> <tr><td>60</td><td>140</td><td>1.89</td></tr> <tr><td>70</td><td>158</td><td>1.56</td></tr> <tr><td>80</td><td>176</td><td>1.27</td></tr> </tbody> </table> <p>JSIIA1666ZZ</p>	Temp (°C)	Temp (°F)	Voltage (V)	-20	-4	4.71	0	32	4.28	20	68	3.57	40	104	2.71	50	122	2.28	60	140	1.89	70	158	1.56	80	176	1.27
Temp (°C)	Temp (°F)	Voltage (V)																														
-20	-4	4.71																														
0	32	4.28																														
20	68	3.57																														
40	104	2.71																														
50	122	2.28																														
60	140	1.89																														
70	158	1.56																														
80	176	1.27																														
38 (SB)	10 (B)	Intake door motor PBR feedback signal	Input	<ul style="list-style-type: none"> Power switch ON Intake switch: REC 	0.2 – 0.8 V																											
				<ul style="list-style-type: none"> Power switch ON Intake switch: FRE 	4.2 – 4.8 V																											
40(SB)	10 (B)	LIN (PTC)	Input/ Output	<ul style="list-style-type: none"> Power switch READY Heater FULL HOT operation 	<p>JSIIA1667ZZ</p>																											

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Fail-safe

INFOID:000000007631680

- When the A/C auto amp. detects the conditions shown below, it stops operation of the electric compressor.

Malfunction judgment item	Description	Recovery condition
UART communication malfunction (Electric compressor → A/C auto amp.)	A/C auto amp. judges that there is a UART communications malfunction.	UART communications occur normally for two seconds or more.
Intake sensor malfunction	Open circuit or short circuit is detected in the intake sensor circuit.	Voltage value of intake sensor circuit returns to normal.
Ambient sensor malfunction	Open circuit or short circuit is detected in the ambient sensor circuit.	Voltage value of ambient sensor circuit returns to normal.

- When the electric compressor detects the following conditions, compressor operation is restricted.

A/C AUTO AMP.

< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

Malfunction judgment item	Description	Compressor operation	Recovery condition
Compressor discharge temperature overheat	Compressor discharge refrigerant temperature (estimated value) is more than 130°C (266°F).	Stopped	Compressor stops for five minutes then restarts.
Compressor IPM overheat	IPM temperature is more than 125°C (257°F) within one minute after start.	Stopped	IPM temperature drops to 123°C (253.4°F) or less.
	IPM temperature is more than 88°C (190.4°F) at least one minute after start.		IPM temperature drops to 86°C (186.8°F) or less.
Compressor voltage saturation	Inverter output voltage is 140% or more.	Compressor speed is limited.	Inverter output voltage drops to under 140%.
Compressor overcurrent	Start failed three times because current of 35.1 A or more flowed within 90 seconds after start.	Stopped	IGN_OFF
	Current of 35.1 A or more flows when compressor is stopped.		
Compressor overload	DC input is more than 13.5 A.	Compressor speed is limited.	DC input drops to 13.5 A or less for 15 seconds.
Compressor low-voltage malfunction	High voltage is below 230 V.	Stopped	High voltage rises to 235 V or more.
Compressor high-voltage malfunction	High voltage is more than 420 V.	Stopped	High voltage drops to 415 V or less.
Compressor IPM temperature sensor malfunction	It is judged that an IPM temperature sensor open circuit or short circuit is occurred.	Stopped	The IPM temperature sensor open circuit or short circuit judgment is cancelled.
Compressor shunt signal offset malfunction	It is judged that an unexpected shunt signal value is occurred.	Stopped	IGN_OFF
Compressor ROM, RAM, AD malfunction	A data malfunction is detected in the ROM area or RAM area. It is judged that an unexpected AD value is occurred.	Stopped	IGN_OFF
Compressor discharge temperature restriction	Estimated discharge temperature exceeded 110°C (230°F).	Compressor speed is limited.	IPM temperature drops to 108°C (226.4°F) or less.
Compressor IPM temperature restriction	IPM temperature exceeded 83°C (181.4°F).	Compressor speed is limited.	IPM temperature drops to 81°C (177.8°F) or less.
Compressor low-speed overload	Compressor is not operating at command speed.	Compressor speed increase	Current is decreased and compressor became able to operate at command speed.
UART communication malfunction (Electric compressor → A/C auto amp.)	Electric compressor judges that a UART communication malfunction is occurred.	Stopped	UART communications occur normally for two seconds or more.

DTC Index

INFOID:000000007631681

DTC	Items (CONSULT screen terms)	Reference
U1000	CAN COMM CIRCUIT	HAC-55, "DTC Logic"
U1010	CONTROL UNIT(CAN)	HAC-56, "DTC Logic"
B2578	IN-VEHICLE SENSOR	HAC-57, "DTC Logic"
B2579	IN-VEHICLE SENSOR	HAC-57, "DTC Logic"
B257B	AMBIENT SENSOR	HAC-60, "DTC Logic"
B257C	AMBIENT SENSOR	HAC-60, "DTC Logic"
B2581	INTAKE SENSOR	HAC-63, "DTC Logic"
B2582	INTAKE SENSOR	HAC-63, "DTC Logic"

A/C AUTO AMP.

< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

DTC	Items (CONSULT screen terms)	Reference
B2630*	SUNLOAD SENSOR	HAC-66, "DTC Logic"
B2631*	SUNLOAD SENSOR	HAC-66, "DTC Logic"
B2770	PTC HEATER CIRCUIT	HAC-69, "DTC Logic"
B2771	PTC HEATER OVERHEAT PROTECT	HAC-69, "DTC Logic"
B2772	PTC HEATER VOLTAGE	HAC-69, "DTC Logic"
B2773	PTC HEATER CIRCUIT 1	HAC-69, "DTC Logic"
B2774	PTC HEATER CIRCUIT 2	HAC-69, "DTC Logic"
B2775	PTC HEATER CIRCUIT 3	HAC-69, "DTC Logic"
B2776	PTC HEATER CIRCUIT 4	HAC-69, "DTC Logic"
B2777	PTC HEATER LIN COMMUNICATION	HAC-78, "DTC Logic"
B2779	PTC HEATER COMMUNICATION	HAC-78, "DTC Logic"
B277A	PTC HEATER CONNECTOR	HAC-80, "DTC Logic"
B277B	HVAC LIN COMMUNICATION	HAC-78, "DTC Logic"
B277C	HEATER TEMPERATURE SENSOR	HAC-82, "DTC Logic"
B277D	HEATER TEMPERATURE SENSOR	HAC-82, "DTC Logic"
B2780	COMPRESSOR ROM, RAM, AD	HAC-85, "DTC Logic"
B2781	COMP IPM TEMP SENSOR	HAC-86, "DTC Logic"
B2782	COMP SHUNT SIGNAL OFFSET	HAC-87, "DTC Logic"
B2783	COMP DISCHARGE TEMP OVER HEAT	HAC-88, "DTC Logic"
B2784	COMP DISCHARGE TEMP LIMIT	HAC-88, "DTC Logic"
B2785	COMP IPM OVER HEAT	HAC-90, "DTC Logic"
B2786	COMP IPM DISCHARGE TEMP LIMIT	HAC-90, "DTC Logic"
B2787	COMP VOLTAGE SATURATION	HAC-92, "DTC Logic"
B2788	COMP OVER CURRENT	HAC-93, "DTC Logic"
B2789	COMP OVER LOADED	HAC-94, "DTC Logic"
B278A	COMP LOW VOLTAGE	HAC-95, "DTC Logic"
B278B	COMP HIGH VOLTAGE	HAC-95, "DTC Logic"
B278C	COMP COMM ERROR HVAC→COMP	HAC-97, "DTC Logic"
B278D	COMP COMM ERROE COMP→HVAC	HAC-97, "DTC Logic"
B278F	HEATER PUMP COMM HVAC→H/P	HAC-101, "DTC Logic"
B2790	HEATER PUMP COMM H/P→HVAC	HAC-101, "DTC Logic"
B2791	COMP LOW SPEED HIGH LOAD	HAC-104, "DTC Logic"
B2792	HEATER PUMP OPERATION LIMIT	HAC-106, "DTC Logic"
B2793	HEATER PUMP VOLTAGE	HAC-107, "DTC Logic"
B2794	HEATER PUMP	HAC-108, "DTC Logic"
B27A0	INTAKE DOOR MOTOR	HAC-109, "DTC Logic"
B27A1	INTAKE DOOR MOTOR	HAC-109, "DTC Logic"
B27A2	AIR MIX DOOR MOTOR	HAC-113, "DTC Logic"
B27A3	AIR MIX DOOR MOTOR	HAC-113, "DTC Logic"
B27A4	AIR MIX DOOR MOTOR	HAC-113, "DTC Logic"
B27A5	AIR MIX DOOR MOTOR	HAC-113, "DTC Logic"
B27A6	MODE DOOR MOTOR	HAC-115, "DTC Logic"
B27A7	MODE DOOR MOTOR	HAC-115, "DTC Logic"

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A/C AUTO AMP.

< ECU DIAGNOSIS INFORMATION >

[AUTOMATIC AIR CONDITIONING]

DTC	Items (CONSULT screen terms)	Reference
B27A8	MODE DOOR MOTOR	HAC-115. "DTC Logic"
B27A9	MODE DOOR MOTOR	HAC-115. "DTC Logic"

*: Perform self-diagnosis under sunshine. When performing indoors, aim a light (more than 60 W) at sunload sensor, otherwise self-diagnosis indicates even though the sunload sensor is functioning normally.

AUTOMATIC AIR CONDITIONING SYSTEM

< WIRING DIAGRAM >


[AUTOMATIC AIR CONDITIONING]

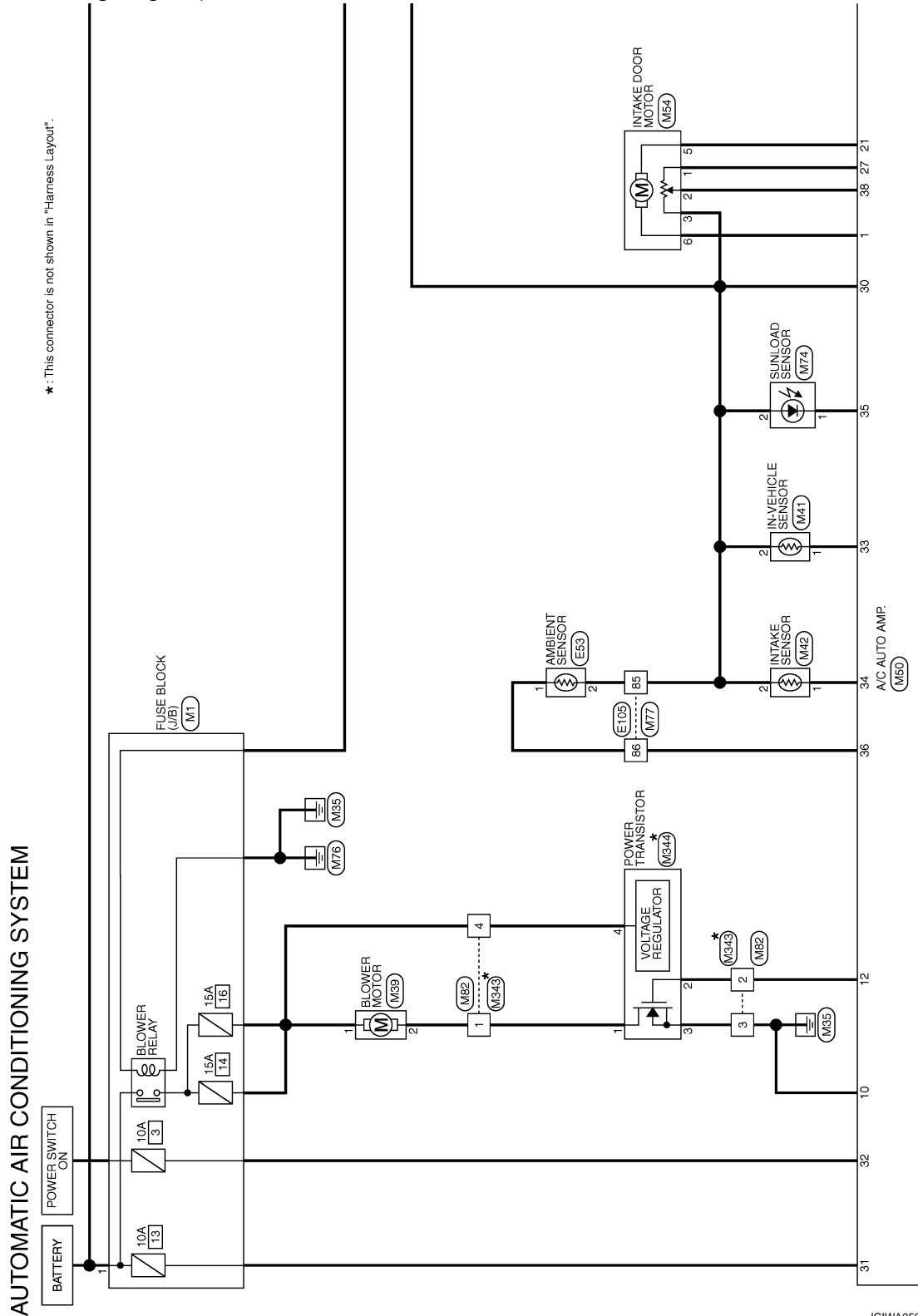
WIRING DIAGRAM

AUTOMATIC AIR CONDITIONING SYSTEM

Wiring Diagram

INFOID:000000007631682

For connector terminal arrangements, harness layouts, and alphabets in a  (option abbreviation; if not described in wiring diagram), refer to [GI-12, "Connector Information"](#).



*: This connector is not shown in "Harness Layout".

AUTOMATIC AIR CONDITIONING SYSTEM

2010/10/29

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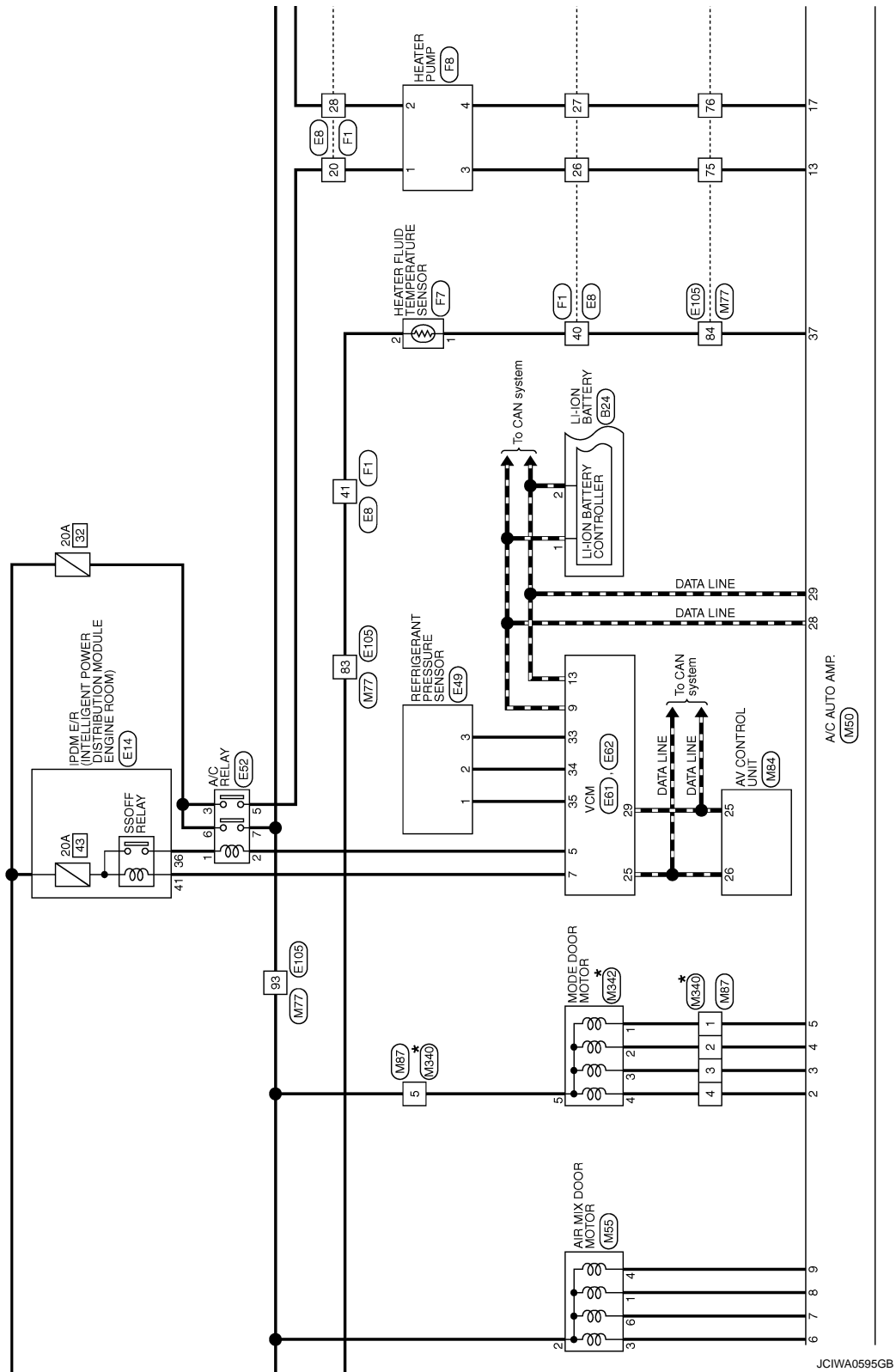
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AUTOMATIC AIR CONDITIONING SYSTEM

< WIRING DIAGRAM >

[AUTOMATIC AIR CONDITIONING]

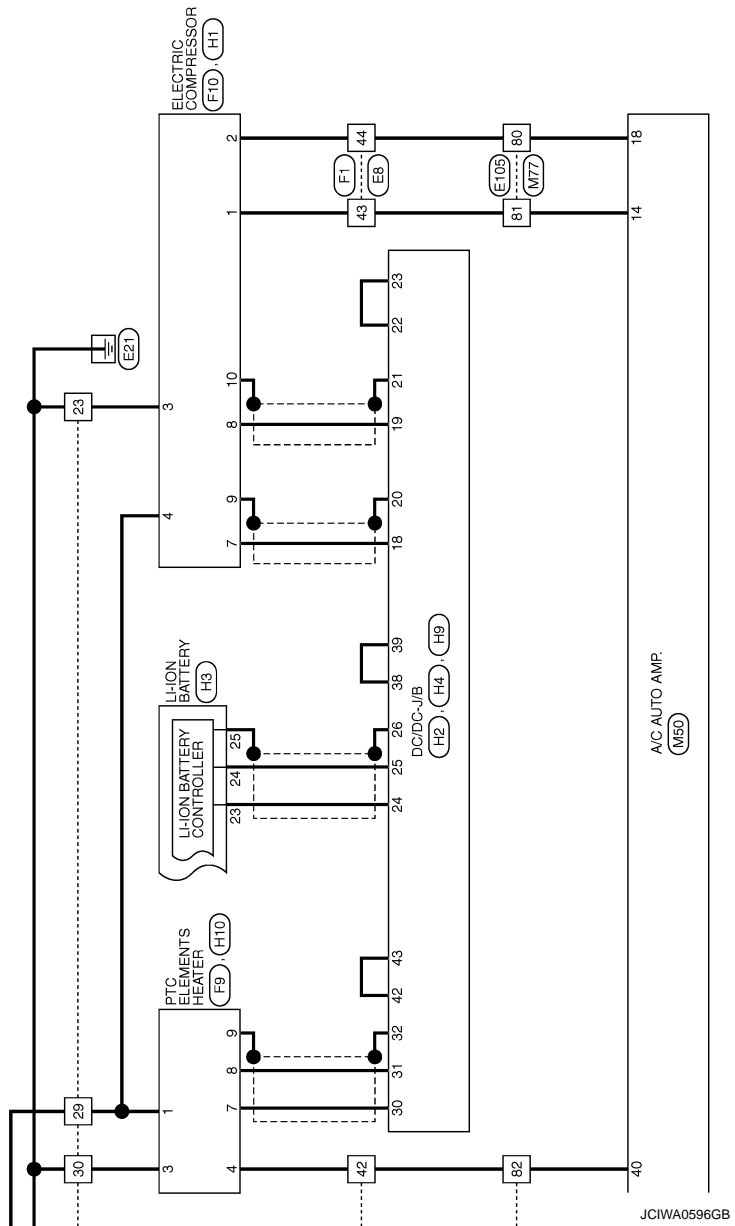


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AUTOMATIC AIR CONDITIONING SYSTEM

< WIRING DIAGRAM >

[AUTOMATIC AIR CONDITIONING]



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DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

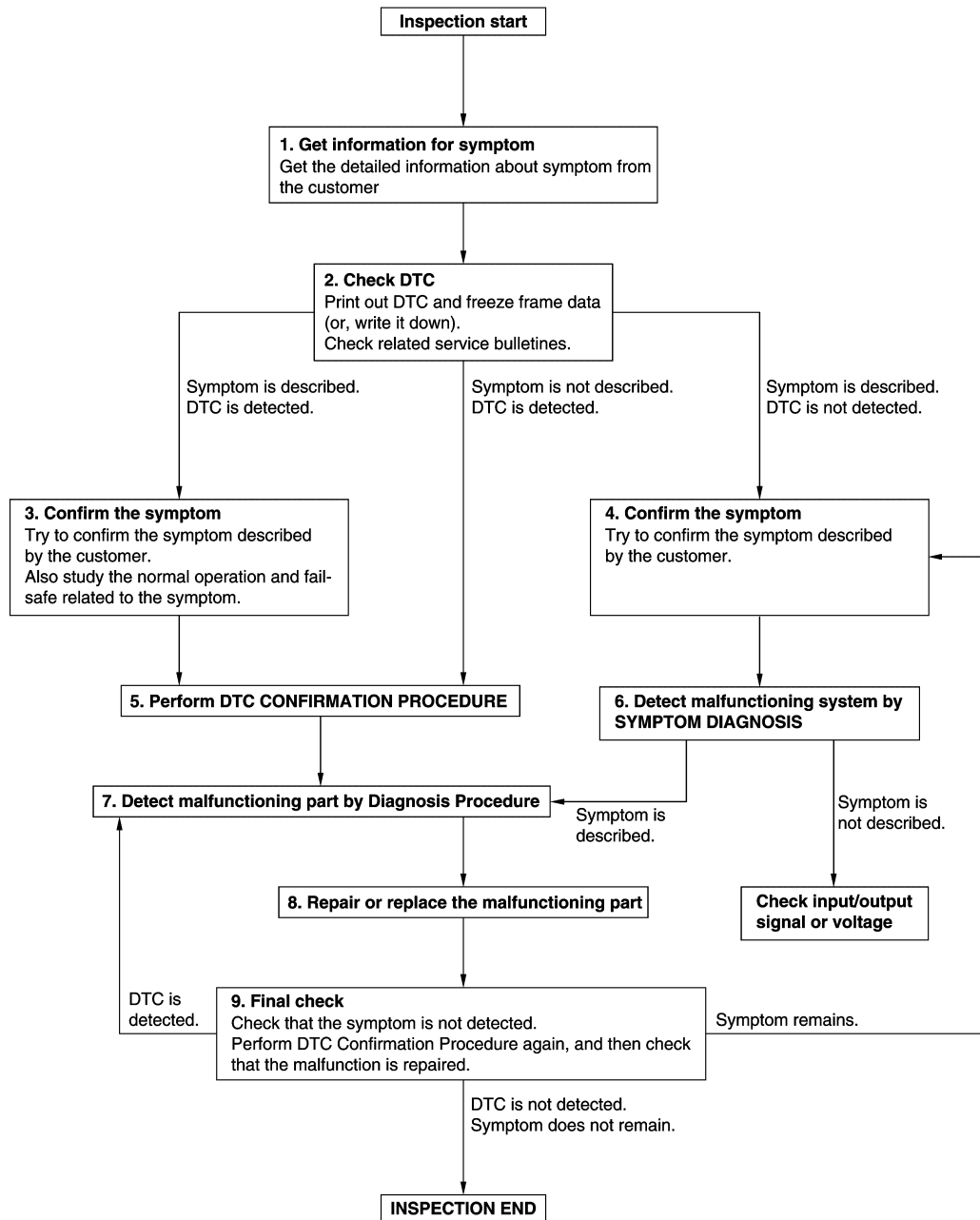
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:000000007631683

OVERALL SEQUENCE



JMKIA8652GB

DETAILED FLOW

Revision: 2014 June

HAC-46

2012 LEAF

DIAGNOSIS AND REPAIR WORK FLOW

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

1. GET INFORMATION FOR SYMPTOM

1. Get detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurs).
2. Check operation condition of the function that is malfunctioning.

>> GO TO 2.

2. CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is detected.
 - Record DTC and freeze frame data (Print them out using CONSULT.)
 - Erase DTC.
 - Study the relationship between the cause detected by DTC and the symptom described by the customer.
3. Check related service bulletins for information.

Are any symptoms described and any DTC detected?

Symptom is described, DTC is detected>>GO TO 3.

Symptom is described, DTC is not detected>>GO TO 4.

Symptom is not described, DTC is detected>>GO TO 5.

3. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Also study the normal operation and fail-safe related to the symptom.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5. PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the detected DTC, and then check that DTC is detected again. At this time, always connect CONSULT to the vehicle, and check self diagnostic results in real time. If two or more DTCs are detected, refer to DTC INSPECTION PRIORITY CHART, and determine trouble diagnosis order.

NOTE:

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.

If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

YES >> GO TO 7.

NO >> Check according to [GI-51. "Intermittent Incident"](#).

6. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM DIAGNOSIS

Detect malfunctioning system according to SYMPTOM DIAGNOSIS based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

Is the symptom described?

YES >> GO TO 7.

NO >> Monitor input data from related sensors or check voltage of related module terminals using CONSULT.

7. DETECT MALFUNCTIONING PART BY DIAGNOSTIC PROCEDURE

DIAGNOSIS AND REPAIR WORK FLOW

[AUTOMATIC AIR CONDITIONING]

< BASIC INSPECTION >

Inspect according to Diagnostic Procedure of the system.

Is malfunctioning part detected?

YES >> GO TO 8.

NO >> Check according to [GI-51. "Intermittent Incident"](#).

8. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnostic Procedure again after repair and replacement.
3. Check DTC. If DTC is detected, erase it.

>> GO TO 9.

9. FINAL CHECK

When DTC is detected in step 2, perform DTC CONFIRMATION PROCEDURE again, and then check that the malfunction is repaired securely.

When symptom is described by the customer, refer to confirmed symptom in step 3 or 4, and check that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 7.

YES-2 >> Symptom remains: GO TO 4.

NO >> Before returning the vehicle to the customer, always erase DTC.

OPERATION INSPECTION

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

OPERATION INSPECTION

Work Procedure

INFOID:000000007631684

The purpose of the operational check is to check that the individual system operates normally.

1.CHECK MEMORY FUNCTION

1. Set temperature to 32.0°C (90°F) by operating the temperature control switch.
2. Press OFF switch.
3. Turn ignition switch OFF.
4. Turn ignition switch ON.
5. Press AUTO switch.
6. Check that set temperature is maintained.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> GO TO 10.

2.CHECK AIR FLOW

1. Operate fan control switch.
2. Check that air flow changes. Check operation for all fan speeds.

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 10.




3.CHECK AIR OUTLET

1. Operate fan control switch to set the fan speed to maximum speed.
2. Operate MODE switch and DEF switch.
3. Check that air outlets change according to each indicated air outlet by placing a hand in front of the air outlets. Refer to [VTL-11, "VENTILATION SYSTEM : System Description"](#).

Is the inspection result normal?

- YES >> GO TO 4.
NO >> GO TO 10.

4.CHECK AIR INLET

1. Press intake switch to set the air inlet to recirculation. [Intake switch indicator ( side) turns ON.]
2. Listen to intake sound and confirm air inlets change.
3. Press intake switch again to set the air inlet to fresh air intake. [Intake switch indicator ( side) turns OFF and ( side) turns ON.]
4. Listen to intake sound and confirm air inlets change.

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 10.

5.CHECK COMPRESSOR

1. Press A/C switch. The A/C switch indicator is turns ON.
2. Check visually and by sound that the compressor operates.
3. Press A/C switch again The A/C switch indicator is turns OFF.
4. Check that compressor stops.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 10.

6.CHECK DISCHARGE AIR TEMPERATURE

1. Operate temperature control switch.
2. Check that discharge air temperature changes.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> GO TO 10.

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OPERATION INSPECTION

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

7. CHECK TEMPERATURE DECREASE

1. Operate compressor.
2. Operate temperature control switch and lower the set temperature to 18.0°C (60°F).
3. Check that cool air blows from the air outlets.

Is the inspection result normal?

- YES >> GO TO 8.
NO >> GO TO 10.
-

8. CHECK TEMPERATURE INCREASE

1. Operate temperature control switch and raise the set temperature to 32.0°C (90°F).
2. Check that warm air blows from the air outlets.

Is the inspection result normal?

- YES >> GO TO 9.
NO >> GO TO 10.
-

9. CHECK AUTO MODE

1. Press AUTO switch to confirm that "AUTO" is indicated on the display.
2. Operate temperature control switch to check that air outlet or air flow changes (the air outlet or air flow varies depending on the ambient temperature, in-vehicle temperature, set temperature, and etc.).

Is the inspection result normal?

- YES >> INSPECTION END
NO >> GO TO 10.
-

10. CHECK SELF-DIAGNOSIS WITH CONSULT

1. Perform self-diagnosis with CONSULT.
2. Check that any DTC is detected.

Is any DTC detected?

- YES >> Refer to [HAC-40, "DTC Index"](#) and perform the appropriate diagnosis.
NO >> Refer to [HAC-130, "Symptom Table"](#) and perform the appropriate diagnosis.

SYSTEM SETTING

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

SYSTEM SETTING

Temperature Setting Trimmer

INFOID:000000007631685

DESCRIPTION

If the temperature felt by the customer is different from the air flow temperature controlled by the temperature setting, the A/C auto amp. control temperature can be adjusted to compensate for the temperature setting.

HOW TO SET

☑ With CONSULT

Perform "TEMP SET CORRECT" of HVAC work support item.

Work support items	Display (°C)	Display (°F)
TEMP SET CORRECT	3.0	6
	2.5	5
	2.0	4
	1.5	3
	1.0	2
	0.5	1
	0 (initial status)	0 (initial status)
	-0.5	-1
	-1.0	-2
	-1.5	-3
	-2.0	-4
	-2.5	-5
	-3.0	-6

NOTE:

- When -3.0°C (-6°F) is corrected on the temperature setting set as 25.0°C (77°F) the temperature controlled by A/C auto amp. is 25.0°C (77°F) -3.0°C (-6°F) = 22.0°C (72°F) and the temperature becomes lower than the temperature setting.
- When the 12V battery cable is disconnected from the negative terminal or when the 12V battery voltage becomes 10 V or less, the setting of the difference between the set temperature and control temperature may be cancelled.

Inlet Port Memory Function (REC)

INFOID:000000007631686

DESCRIPTION

- If the ignition switch is turned to the OFF position while the intake switch is set to ON (recirculation), "Perform the memory" or "Do not perform the memory" of intake switch ON (recirculation) condition can be selected.
- If "Perform the memory" is set, the intake switch is ON (recirculation) when turning the ignition switch to the ON position again.
- If "Do not perform the memory" is set, the air inlets is controlled automatically when turning the ignition switch to the ON position again.

HOW TO SET

☑ With CONSULT

Perform the "REC MEMORY SET" of HVAC work support item.

Work support items	Display	Setting
REC MEMORY SET	WITHOUT (initial status)	Perform the memory of manual REC
	WITH	Do not perform the memory of manual REC (auto control)

NOTE:

SYSTEM SETTING

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

When the 12V battery cable is disconnected from the negative terminal or when the 12V battery voltage becomes 10 V or less, the setting of the REC memory function may be cancelled.

Inlet Port Memory Function (FRE)

INFOID:000000007631687

DESCRIPTION

- If the ignition switch is turned to the OFF position while the intake switch is set to OFF (fresh air intake), "Perform the memory" or "Do not perform the memory" of intake switch OFF (fresh air intake) condition can be selected.
- If "Perform the memory" is set, the intake switch is OFF (fresh air intake) when turning the ignition switch to the ON position again.
- If "Do not perform the memory" is set, the air inlets is controlled automatically when turning the ignition switch to the ON position again.

HOW TO SET

 With CONSULT

Perform the "FRE MEMORY SET" of HVAC work support item.

Work support items	Display	Setting
FRE MEMORY SET	WITHOUT	Perform the memory of manual FRE
	WITH (initial status)	Do not perform the memory of manual FRE (auto control)

NOTE:

When the 12V battery cable is disconnected from the negative terminal or when the 12V battery voltage becomes 10 V or less, the setting of the FRE memory function may be cancelled.

Foot Position Setting Trimmer

INFOID:000000007631688

DESCRIPTION

In FOOT mode, the air blowing to DEF can change ON/OFF.

HOW TO SET

 With CONSULT

Perform the "BLOW SET" of HVAC work support item.

Work support items	Display	Defroster door position	
		Audio control	Manual control
BLOW SET	Mode1 (initial status)	OPEN	CLOSE
	Mode2	OPEN	OPEN
	Mode3	CLOSE	OPEN
	Mode4	CLOSE	CLOSE

NOTE:

When the 12V battery cable is disconnected from the negative terminal or when the 12V battery voltage becomes 10 V or less, the setting of the discharge air mix ratio in FOOT mode may be cancelled.

Setting of Compressor Maximum Rotation Speed During Pre Air Conditioning

INFOID:000000007631689

DESCRIPTION

The compressor maximum rotation speed during remote or timer air conditioning can be adjusted.

How to set

Using CONSULT, select "TARGET MAX RPM ADJ AT PRE-CLIMATE" from "WORK SUPPOR" for "HVAC".

Work support items	Note
TARGET MAX RPM ADJ AT PRE-CLIMATE	Raising set value: Improve the cooling performance. Lowering set value: Reduce the operation noise level.

SYSTEM SETTING

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

Setting of Compressor Maximum Rotation Speed During Idling

INFOID:000000007631690

DESCRIPTION

The electric compressor maximum rotation speed during idling can be adjusted.

How to set

Using CONSULT, select "TARGET MAX RPM ADJ AT IDL" from "WORK SUPPOR" for "HVAC".

Work support items	Note
TARGET MAX RPM ADJ AT IDL	Raising set value: Improve the cooling performance. Lowering set value: Reduce the operation noise level.

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DOOR MOTOR STARTING POSITION RESET

< BASIC INSPECTION >

[AUTOMATIC AIR CONDITIONING]

DOOR MOTOR STARTING POSITION RESET

Description

INFOID:000000007631691

- Reset signal is transmitted from A/C auto amp. to air mix door motor and mode door motor. Starting position reset can be performed.

NOTE:

During reset, DEF switch indicator blinks.

- When air mix door motor or mode door motor is removed and installed, always perform door motor starting position reset.

Work Procedure

INFOID:000000007631692

1. PERFORM DOOR MOTOR STARTING POSITION RESET

④ With CONSULT

1. Turn ignition switch ON.
2. Select "Door Motor Starting Position Reset" in "WORK SUPPORT" mode of "HVAC" using CONSULT.
3. Touch "Start" and wait a few seconds.
4. Make sure the "COMPLETED" is displayed on CONSULT screen.

>> INSPECTION END

U1000 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

DTC/CIRCUIT DIAGNOSIS

U1000 CAN COMM CIRCUIT

Description

INFOID:000000007631693

CAN (Controller Area Network) is a serial communication line for real time applications. It is an on-board multiplex communication line with high data communication speed and excellent error detection ability. A modern vehicle is equipped with many ECMs, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, 2 control units are connected with 2 communication lines (CAN-L line and CAN-H line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Refer to [LAN-33, "CAN COMMUNICATION SYSTEM : CAN Communication Signal Chart"](#) for details of the communication signal.

DTC Logic

INFOID:000000007631694

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
U1000	CAN COMM CIRCUIT	When A/C auto amp. is not transmitting or receiving CAN communication signal for 2 or more seconds.	CAN communication system

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

④With CONSULT

1. Turn power switch ON and wait at least 2 seconds or more.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

YES >> Refer to [HAC-55, "Diagnosis Procedure"](#).

NO >> Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Diagnosis Procedure

INFOID:000000007631695

1.CHECK CAN COMMUNICATION SYSTEM

Check CAN communication system. Refer to [LAN-15, "Trouble Diagnosis Flow Chart"](#).

>> INSPECTION END

U1010 CONTROL UNIT (CAN)

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

U1010 CONTROL UNIT (CAN)

Description

INFOID:000000007631696

Initial diagnosis of A/C auto amp.

DTC Logic

INFOID:000000007631697

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
U1010	CONTROL UNIT(CAN)	When detecting error during the initial diagnosis of CAN controller of A/C auto amp.	A/C auto amp.

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-56, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631698

1.REPLACE A/C CONTROL (A/C AUTO AMP.)

Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

>> INSPECTION END

B2578, B2579 IN-VEHICLE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2578, B2579 IN-VEHICLE SENSOR

DTC Logic

INFOID:000000007631699

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2578	IN-VEHICLE SENSOR	The in-vehicle sensor recognition temperature is too high [more than 100°C (212°F)].	<ul style="list-style-type: none"> • In-vehicle sensor • A/C auto amp. • Harness or connectors (The sensor circuit is open or shorted.)
B2579		The in-vehicle sensor recognition temperature is too low [less than -42°C (-44°F)].	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-57, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

HAC

Diagnosis Procedure

INFOID:000000007631700

1. CHECK IN-VEHICLE SENSOR VOLTAGE SIGNAL

1. Turn power switch ON.
2. Operate the automatic air conditioning system.
3. Read voltage signal between A/C auto amp. harness connector terminals.

connector	A/C auto amp.		Test condition	Voltage signal																											
	+	-																													
	Terminal																														
M50	33	30	<ul style="list-style-type: none"> • Power switch ON • When air conditioner is operating 	<table border="1"> <caption>Voltage Signal vs Temperature</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Temperature (°F)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr><td>-20</td><td>-4</td><td>4.41</td></tr> <tr><td>-10</td><td>14</td><td>4.09</td></tr> <tr><td>0</td><td>32</td><td>3.68</td></tr> <tr><td>10</td><td>50</td><td>3.22</td></tr> <tr><td>20</td><td>68</td><td>2.73</td></tr> <tr><td>25</td><td>77</td><td>2.49</td></tr> <tr><td>30</td><td>86</td><td>2.25</td></tr> <tr><td>40</td><td>104</td><td>1.82</td></tr> </tbody> </table> <p>JSIIA1662ZZ</p>	Temperature (°C)	Temperature (°F)	Voltage (V)	-20	-4	4.41	-10	14	4.09	0	32	3.68	10	50	3.22	20	68	2.73	25	77	2.49	30	86	2.25	40	104	1.82
Temperature (°C)	Temperature (°F)	Voltage (V)																													
-20	-4	4.41																													
-10	14	4.09																													
0	32	3.68																													
10	50	3.22																													
20	68	2.73																													
25	77	2.49																													
30	86	2.25																													
40	104	1.82																													

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 2.

2. CHECK IN-VEHICLE SENSOR POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect in-vehicle sensor connector.
3. Turn power switch ON.
4. Check voltage between in-vehicle sensor harness connector and ground.

B2578, B2579 IN-VEHICLE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

+		-	Voltage (Approx.)
In-vehicle sensor			
Connector	Terminal		
M41	1	Ground	5 V

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 5.

3.CHECK IN-VEHICLE SENSOR GROUND CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between in-vehicle sensor harness connector and A/C auto amp harness connector.

In-vehicle sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M41	2	M50	30	Existed

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair harness or connector.

4.CHECK IN-VEHICLE SENSOR

Check in-vehicle sensor. Refer to [HAC-59, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
NO >> Replace in-vehicle sensor. Refer to [HAC-137, "Removal and Installation"](#).

5.CHECK IN-VEHICLE SENSOR POWER SUPPLY CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between in-vehicle sensor harness connector and A/C auto amp. harness connector.

In-vehicle sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M41	1	M50	33	Existed

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair harness or connector.

6.CHECK IN-VEHICLE SENSOR POWER SUPPLY CIRCUIT FOR SHORT

Check continuity between in-vehicle sensor harness connector and ground.

In-vehicle sensor		—	Continuity
Connector	Terminal		
M41	1	Ground	Not existed

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
NO >> Repair harness or connector.

7.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

B2578, B2579 IN-VEHICLE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

NO >> Repair or replace malfunctioning parts.

Component Inspection

INFOID:000000007631701

1. CHECK IN-VEHICLE SENSOR

1. Remove in-vehicle sensor. Refer to [HAC-137, "Removal and Installation"](#).
2. Check resistance between in-vehicle sensor terminals. Refer to applicable table for the normal value.

Terminal		Condition	Resistance: kΩ
		Temperature: °C (°F)	
1	2	-20 (-4)	16.43
		-10 (14)	9.90
		0 (32)	6.19
		10 (50)	4.01
		20 (68)	2.67
		25 (77)	2.20
		30 (86)	1.83
		40 (104)	1.28

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace in-vehicle sensor. Refer to [HAC-137, "Removal and Installation"](#).

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HAC

B257B, B257C AMBIENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B257B, B257C AMBIENT SENSOR

DTC Logic

INFOID:000000007631702

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B257B	AMBIENT SENSOR	The ambient sensor recognition temperature is too high [more than 100°C (212°F)].	<ul style="list-style-type: none"> • Ambient sensor • A/C auto amp. • Harness or connectors (The sensor circuit is open or shorted.)
B257C		The ambient sensor recognition temperature is too low [less than -42°C (-44°F)].	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-60, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631703

1. CHECK AMBIENT SENSOR VOLTAGE SIGNAL

1. Turn power switch ON.
2. Operate the automatic air conditioning system.
3. Read voltage signal between A/C auto amp. harness connector terminals.

connector	A/C auto amp.		Test condition	Voltage signal																											
	+	-																													
	Terminal																														
M50	36	30	<ul style="list-style-type: none"> • Power switch ON • When air conditioner is operating 	<table border="1"> <caption>Voltage Signal vs Temperature</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Temperature (°F)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr><td>-20</td><td>-4</td><td>4.42</td></tr> <tr><td>-10</td><td>14</td><td>4.11</td></tr> <tr><td>0</td><td>32</td><td>3.71</td></tr> <tr><td>10</td><td>50</td><td>3.25</td></tr> <tr><td>20</td><td>68</td><td>2.76</td></tr> <tr><td>25</td><td>77</td><td>2.52</td></tr> <tr><td>30</td><td>86</td><td>2.29</td></tr> <tr><td>40</td><td>104</td><td>1.85</td></tr> </tbody> </table> <p>JSIIA1665ZZ</p>	Temperature (°C)	Temperature (°F)	Voltage (V)	-20	-4	4.42	-10	14	4.11	0	32	3.71	10	50	3.25	20	68	2.76	25	77	2.52	30	86	2.29	40	104	1.85
Temperature (°C)	Temperature (°F)	Voltage (V)																													
-20	-4	4.42																													
-10	14	4.11																													
0	32	3.71																													
10	50	3.25																													
20	68	2.76																													
25	77	2.52																													
30	86	2.29																													
40	104	1.85																													

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 2.

2. CHECK AMBIENT SENSOR POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect ambient sensor connector.
3. Turn power switch ON.
4. Check voltage between ambient sensor harness connector and ground.

B257B, B257C AMBIENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

+		-	Voltage (Approx.)
Ambient sensor			
Connector	Terminal		
E53	1	Ground	5 V

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 5.

3.CHECK AMBIENT SENSOR GROUND CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between ambient sensor harness connector and A/C auto amp harness connector.

Ambient sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
E53	2	M50	30	Existed

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair harness or connector.

4.CHECK AMBIENT SENSOR

Check ambient sensor. Refer to [HAC-62, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
- NO >> Replace ambient sensor. Refer to [HAC-136, "Removal and Installation"](#).

5.CHECK AMBIENT SENSOR POWER SUPPLY CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between ambient sensor harness connector and A/C auto amp. harness connector.

Ambient sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
E53	1	M50	36	Existed

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair harness or connector.

6.CHECK AMBIENT SENSOR POWER SUPPLY CIRCUIT FOR SHORT

Check continuity between ambient sensor harness connector and ground.

Ambient sensor		—	Continuity
Connector	Terminal		
E53	1	Ground	Not existed

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
- NO >> Repair harness or connector.

7.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

B257B, B257C AMBIENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

NO >> Repair or replace malfunctioning parts.

Component Inspection

INFOID:000000007631704

1. CHECK AMBIENT SENSOR

1. Remove ambient sensor. Refer to [HAC-136. "Removal and Installation"](#).
2. Check resistance between ambient sensor terminals. Refer to applicable table for the normal value.

Terminal		Condition	Resistance: k Ω
		Temperature: °C (°F)	
1	2	-20 (-4)	16.50
		-10 (14)	9.92
		0 (32)	6.19
		10 (50)	3.99
		20 (68)	2.65
		25 (77)	2.19
		30 (86)	1.81
		40 (104)	1.27

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ambient sensor. Refer to [HAC-136. "Removal and Installation"](#).

B2581, B2582 INTAKE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2581, B2582 INTAKE SENSOR

DTC Logic

INFOID:000000007631705

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2581	INTAKE SENSOR	The intake sensor recognition temperature is too high [more than 100°C (212°F)].	<ul style="list-style-type: none"> • Intake sensor • A/C auto amp. • Harness or connectors (The sensor circuit is open or shorted.)
B2582		The intake sensor recognition temperature is too low [less than -42°C (-44°F)].	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-63, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631706

1. CHECK INTAKE SENSOR VOLTAGE SIGNAL

1. Turn power switch ON.
2. Operate the automatic air conditioning system.
3. Read voltage signal between A/C auto amp. harness connector terminals.

connector	A/C auto amp.		Test condition	Voltage signal																											
	+	-																													
	Terminal																														
M50	34	30	<ul style="list-style-type: none"> • Power switch ON • When air conditioner is operating 	<table border="1"> <caption>Voltage Signal vs Temperature</caption> <thead> <tr> <th>Temperature (°C)</th> <th>Temperature (°F)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr><td>-20</td><td>-4</td><td>3.68</td></tr> <tr><td>-10</td><td>14</td><td>3.13</td></tr> <tr><td>0</td><td>32</td><td>2.56</td></tr> <tr><td>10</td><td>50</td><td>2.02</td></tr> <tr><td>20</td><td>68</td><td>1.56</td></tr> <tr><td>25</td><td>77</td><td>1.36</td></tr> <tr><td>30</td><td>86</td><td>1.18</td></tr> <tr><td>40</td><td>104</td><td>0.89</td></tr> </tbody> </table> <p>JSIIA1663ZZ</p>	Temperature (°C)	Temperature (°F)	Voltage (V)	-20	-4	3.68	-10	14	3.13	0	32	2.56	10	50	2.02	20	68	1.56	25	77	1.36	30	86	1.18	40	104	0.89
Temperature (°C)	Temperature (°F)	Voltage (V)																													
-20	-4	3.68																													
-10	14	3.13																													
0	32	2.56																													
10	50	2.02																													
20	68	1.56																													
25	77	1.36																													
30	86	1.18																													
40	104	0.89																													

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 2.

2. CHECK INTAKE SENSOR POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect intake sensor connector.
3. Turn power switch ON.
4. Check voltage between intake sensor harness connector and ground.

B2581, B2582 INTAKE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

+		-	Voltage (Approx.)
Intake sensor			
Connector	Terminal		
M42	1	Ground	5 V

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 5.

3.CHECK INTAKE SENSOR GROUND CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between intake sensor harness connector and A/C auto amp harness connector.

Intake sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M42	2	M50	30	Existed

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair harness or connector.

4.CHECK INTAKE SENSOR

Check intake sensor. Refer to [HAC-65, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
- NO >> Replace intake sensor. Refer to [HAC-139, "Removal and Installation"](#).

5.CHECK INTAKE SENSOR PLY CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between intake sensor harness connector and A/C auto amp. harness connector.

Intake sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M42	1	M50	34	Existed

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair harness or connector.

6.CHECK INTAKE SENSOR POWER SUPPLY CIRCUIT FOR SHORT

Check continuity between intake sensor harness connector and ground.

Intake sensor		-	Continuity
Connector	Terminal		
M42	1	Ground	Not existed

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
- NO >> Repair harness or connector.

7.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

B2581, B2582 INTAKE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

NO >> Repair or replace malfunctioning parts.

Component Inspection

INFOID:000000007631707

1. CHECK INTAKE SENSOR

1. Remove intake sensor. Refer to [HAC-139, "Removal and Installation"](#).
2. Check resistance between intake sensor terminals. Refer to applicable table for the normal value.

Terminal		Condition	Resistance: kΩ
		Temperature: °C (°F)	
1	2	-20 (-4)	16.50
		-10 (14)	9.92
		0 (32)	6.19
		10 (50)	3.99
		20 (68)	2.65
		25 (77)	2.19
		30 (86)	1.81
		40 (104)	1.27

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake sensor. Refer to [HAC-139, "Removal and Installation"](#).

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HAC

B2630, B2631 SUNLOAD SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2630, B2631 SUNLOAD SENSOR

DTC Logic

INFOID:000000007631708

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).
- Sunload sensor may register a malfunction when indoors, at dusk, or at other times when light is insufficient. When performing the diagnosis indoors, use a lamp (60 W or more) that is pointed at the sunload sensor.

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2630	SUNLOAD SENSOR	Detected calorie at sunload sensor 1677 W/m ² (1442 kcal/m ² ·h) or more.	<ul style="list-style-type: none"> • Sunload sensor • A/C auto amp. • Harness or connectors (The sensor circuit is open or shorted.)
B2631		Detected calorie at sunload sensor 33 W/m ² (28 kcal/m ² ·h) or less.	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-66, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631709

1. CHECK SUNLOAD SENSOR VOLTAGE SIGNAL

1. Turn power switch ON.
2. Operate the automatic air conditioning system.
3. Move 60 W lamp to or from the sunload sensor to check that a voltage signal between A/C auto amp. harness connector terminals changes.

connector	A/C auto amp.		Test condition	Voltage signal														
	+	-																
Terminal																		
M50	35	30	<ul style="list-style-type: none"> • Power switch ON • When air conditioner is operating 	<table border="1"> <caption>Voltage signal vs. Sunload sensor</caption> <thead> <tr> <th>Sunload sensor (W/m²)</th> <th>Voltage signal (V)</th> </tr> </thead> <tbody> <tr><td>200</td><td>4.44</td></tr> <tr><td>400</td><td>3.88</td></tr> <tr><td>600</td><td>3.31</td></tr> <tr><td>800</td><td>2.75</td></tr> <tr><td>1000</td><td>2.19</td></tr> <tr><td>1200</td><td>1.63</td></tr> </tbody> </table>	Sunload sensor (W/m ²)	Voltage signal (V)	200	4.44	400	3.88	600	3.31	800	2.75	1000	2.19	1200	1.63
Sunload sensor (W/m ²)	Voltage signal (V)																	
200	4.44																	
400	3.88																	
600	3.31																	
800	2.75																	
1000	2.19																	
1200	1.63																	

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 2.

2. CHECK SUNLOAD SENSOR POWER SUPPLY

1. Turn power switch OFF.

B2630, B2631 SUNLOAD SENSOR

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect sunload sensor connector.
3. Turn power switch ON.
4. Check voltage between sunload sensor harness connector and ground.

+		-	Voltage (Approx.)
Sunload sensor			
Connector	Terminal		
M74	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 5.

3. CHECK SUNLOAD SENSOR GROUND CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between sunload sensor harness connector and A/C auto amp harness connector.

Sunload sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M74	2	M50	30	Existed

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

4. REPLACE SUNLOAD SENSOR

1. Replace sunload sensor. Refer to [HAC-138, "Removal and Installation"](#).
2. Perform DTC confirmation procedure. Refer to [HAC-66, "DTC Logic"](#).
3. Check DTC.

Is DTC detected?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> INSPECTION END

5. CHECK SUNLOAD SENSOR POWER SUPPLY CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between sunload sensor harness connector and A/C auto amp. harness connector.

Sunload sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M74	1	M50	35	Existed

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair harness or connector.

6. CHECK SUNLOAD SENSOR POWER SUPPLY CIRCUIT FOR SHORT

Check continuity between sunload sensor harness connector and ground.

Sunload sensor		-	Continuity
Connector	Terminal		
M74	1	Ground	Not existed

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> Repair harness or connector.

B2630, B2631 SUNLOAD SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

7. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
- NO >> Repair or replace malfunctioning parts.

B2770, B2773, B2774, B2775, B2776 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2770, B2773, B2774, B2775, B2776 PTC ELEMENTS HEATER

DTC Logic

INFOID:000000007631710

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2770	PTC HEATER CIRCUIT	When PTC elements heater circuit system malfunction is detected	<ul style="list-style-type: none">• PTC elements heater• DC/DC-J/B• High voltage harness or connectors (PTC elements heater high voltage circuit is open or shorted.)• Harness or connectors (PTC elements heater circuit is open or shorted.)
B2773	PTC HEATER CIRCUIT 1	When PTC elements heater circuit system (PTC 1) malfunction is detected	
B2774	PTC HEATER CIRCUIT 2	When PTC elements heater circuit system (PTC 2) malfunction is detected	
B2775	PTC HEATER CIRCUIT 3	When PTC elements heater circuit system (PTC 3) malfunction is detected	
B2776	PTC HEATER CIRCUIT 4	When PTC elements heater circuit system (PTC 4) malfunction is detected	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full hot and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

YES >> Refer to [HAC-69, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631711

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

DIAGNOSIS PROCEDURE

CAUTION:

Erase DTC after the work is completed.

B2770, B2773, B2774, B2775, B2776 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).

Check voltage in high voltage circuit. (Check that condenser are discharged.)

1. Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).
2. Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
3. Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

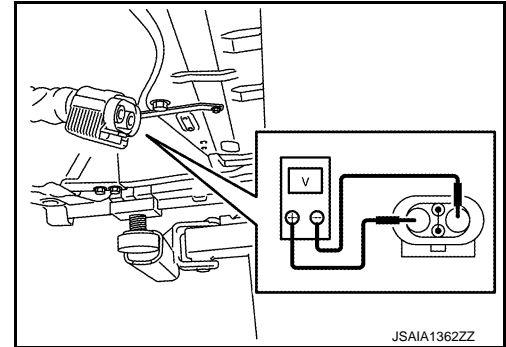


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500V or higher.



>> GO TO 2.

2. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE POWER SUPPLY CIRCUIT

1. Disconnect PTC elements heater and DC/DC-J/B connector.

NOTE:

DC/DC-J/B H9 connector do not disconnect.

2. Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B.

PTC elements heater		DC/DC-J/B	Continuity
Connector	Terminal	Terminal	
H10	7	24	Existed

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE GROUND CIRCUIT

Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B.

PTC elements heater		DC/DC-J/B	Continuity
Connector	Terminal	Terminal	
H10	8	25	Existed

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 5.

4. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE HARNESS POWER SUPPLY CIRCUIT

1. Disconnect DC/DC-J/B connector.
2. Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B high voltage harness connector.

NOTE:

Check for any adhering foreign substances, cracking, or damage on the PTC elements heater high voltage harness connector terminal and DC/DC-J/B high voltage harness connector terminal.

B2770, B2773, B2774, B2775, B2776 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

PTC elements heater		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H10	7	H9	30	Existed

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace high voltage harness between PTC elements heater and DC/DC-J/B.

5. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE HARNESS GROUND CIRCUIT

1. Disconnect DC/DC-J/B connector.
2. Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B high voltage harness connector.

NOTE:

Check for any adhering foreign substances, cracking, or damage on the PTC elements heater high voltage harness connector terminal and DC/DC-J/B high voltage harness connector terminal.

PTC elements heater		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H10	8	H9	31	Existed

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace high voltage harness between PTC elements heater and DC/DC-J/B.

6. CHECK DC/DC-J/B INTERNAL CIRCUIT

Check continuity between DC/DC-J/B terminals.

NOTE:

Check for any adhering foreign substances, cracking, or damage on the DC/DC-J/B terminals.

DC/DC-J/B		Continuity
Terminal		
30	24	Existed
31	25	

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

NO >> Replace DC/DC-J/B and PTC elements heater. Refer to [EVC-361, "Removal and Installation"](#) (DC/DC-J/B) and [HA-68, "Removal and Installation"](#) (PTC elements heater).

7. CHECK PTC ELEMENTS HEATER POWER SUPPLY

1. Disconnect PTC elements heater.
2. Connect 12V battery negative terminal.
3. Turn power switch ON.
4. Check voltage between PTC elements heater harness connector and ground.

+		-	Voltage (Approx.)
PTC elements heater			
Connector	Terminal		
F9	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 9.

8. CHECK PTC ELEMENTS HEATER GROUND CIRCUIT

1. Turn power switch OFF.

B2770, B2773, B2774, B2775, B2776 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

2. Check continuity between PTC elements heater harness connector and ground.

PTC elements heater		-	Continuity
Connector	Terminal		
F9	3	Ground	Existed

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair harness or connector.

9. CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Repair harness or connector between A/C relay and PTC elements heater.

NO >> Repair or replace error-detected parts.

10. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace PTC elements heater. Refer to [HA-68, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

B2771 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2771 PTC ELEMENTS HEATER

DTC Logic

INFOID:000000007631712

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC B278F or B2790, first perform the trouble diagnosis for DTC B278F or B2790. Refer to [HAC-101, "DTC Logic"](#).
- If DTC is displayed along with DTC B2792, first perform the trouble diagnosis for DTC B2792. Refer to [HAC-106, "DTC Logic"](#).
- If DTC is displayed along with DTC B2793, first perform the trouble diagnosis for DTC B2793. Refer to [HAC-107, "DTC Logic"](#).
- If DTC is displayed along with DTC B2794, first perform the trouble diagnosis for DTC B2794. Refer to [HAC-108, "DTC Logic"](#).

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2771	PTC HEATER OVERHEAT PROTECT	When the PTC elements heater circuit board internal temperature is 115°C (239°F) or more	<ul style="list-style-type: none">• PTC elements heater• Heater pump• Heater fluid leaks

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full hot and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-73, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631713

1. CHECK HEATER FLUID FOR LEAK

Check heater fluid for leak. Refer to [HA-43, "Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK HEATER PUMP

Ⓜ With CONSULT

1. Set the vehicle to READY.
2. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32, "CONSULT Function"](#).
3. When the test items are being conducted, check that the heater pump operates normally for each mode.

Is the inspection result normal?

- YES >> Replace PTC elements heater. Refer to [HA-68, "Removal and Installation"](#).
NO >> Replace heater pump. Refer to [HA-74, "Removal and Installation"](#).

B2772 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2772 PTC ELEMENTS HEATER

DTC Logic

INFOID:000000007631714

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2772	PTC HEATER VOLTAGE	When the supply voltage input to the PTC elements heater is the specified voltage value or less	<ul style="list-style-type: none">• PTC elements heater• DC/DC-J/B• High voltage harness or connectors (PTC elements heater high voltage circuit is open or shorted.)• Harness or connectors (PTC elements heater circuit is open or shorted.)

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full hot and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-74, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631715

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

DIAGNOSIS PROCEDURE

CAUTION:

Erase DTC after the work is completed.

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).

B2772 PTC ELEMENTS HEATER

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

Check voltage in high voltage circuit. (Check that condenser are discharged.)

1. Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).
2. Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
3. Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

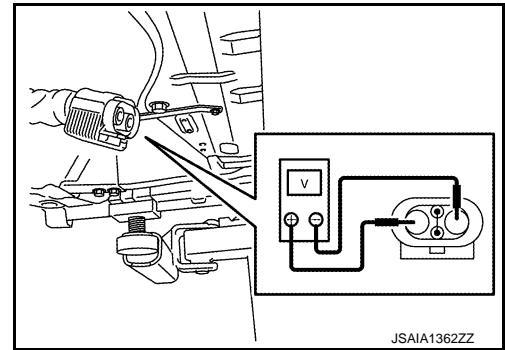


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500V or higher.



>> GO TO 2.

2. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE POWER SUPPLY CIRCUIT

1. Disconnect PTC elements heater and DC/DC-J/B connector.

NOTE:

DC/DC-J/B H9 connector do not disconnect.

2. Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B.

PTC elements heater		DC/DC-J/B	Continuity
Connector	Terminal	Terminal	
H10	7	24	Existed

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE GROUND CIRCUIT

Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B.

PTC elements heater		DC/DC-J/B	Continuity
Connector	Terminal	Terminal	
H10	8	25	Existed

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 5.

4. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE HARNESS POWER SUPPLY CIRCUIT

1. Disconnect DC/DC-J/B connector.
2. Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B high voltage harness connector.

NOTE:

Check for any adhering foreign substances, cracking, or damage on the PTC elements heater high voltage harness connector terminal and DC/DC-J/B high voltage harness connector terminal.

PTC elements heater		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H10	7	H9	30	Existed

B2772 PTC ELEMENTS HEATER

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace high voltage harness between PTC elements heater and DC/DC-J/B.

5. CHECK PTC ELEMENTS HEATER HIGH VOLTAGE HARNESS GROUND CIRCUIT

1. Disconnect DC/DC-J/B connector.
2. Check continuity between PTC elements heater high voltage harness connector and DC/DC-J/B high voltage harness connector.

NOTE:

Check for any adhering foreign substances, cracking, or damage on the PTC elements heater high voltage harness connector terminal and DC/DC-J/B high voltage harness connector terminal.

PTC elements heater		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H10	8	H9	31	Existed

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace high voltage harness between PTC elements heater and DC/DC-J/B.

6. CHECK DC/DC-J/B INTERNAL CIRCUIT

Check continuity between DC/DC-J/B terminals.

NOTE:

Check for any adhering foreign substances, cracking, or damage on the DC/DC-J/B terminals.

DC/DC-J/B		Continuity
Terminal		
30	24	Existed
31	25	

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

NO >> Replace DC/DC-J/B and PTC elements heater. Refer to [EVC-361, "Removal and Installation"](#) (DC/DC-J/B) and [HA-68, "Removal and Installation"](#) (PTC elements heater).

7. CHECK PTC ELEMENTS HEATER POWER SUPPLY

1. Disconnect PTC elements heater.
2. Connect 12V battery negative terminal.
3. Turn power switch ON.
4. Check voltage between PTC elements heater harness connector and ground.

+		-	Voltage (Approx.)
PTC elements heater			
Connector	Terminal		
F9	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 9.

8. CHECK PTC ELEMENTS HEATER GROUND CIRCUIT

1. Turn power switch OFF.
2. Check continuity between PTC elements heater harness connector and ground.

B2772 PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

PTC elements heater		-	Continuity
Connector	Terminal		
F9	3	Ground	Existed

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair harness or connector.

9.CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Repair harness or connector between A/C relay and PTC elements heater.

NO >> Repair or replace error-detected parts.

10.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace PTC elements heater. Refer to [HA-68, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

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B2777, B2779, B277B PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2777, B2779, B277B PTC ELEMENTS HEATER

DTC Logic

INFOID:000000007631716

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2777	PTC HEATER LIN COMMUNICATION	When there is an error in the signal sent from the PTC elements heater	<ul style="list-style-type: none">• PTC elements heater• A/C auto amp.• Harness or connectors (PTC elements heater circuit is open or shorted.)
B2779	PTC HEATER COMMUNICATION	When there is an error in the signal sent from the A/C auto amp. or there is an error in the signal received by the PTC elements heater	
B277B	HVAC LIN COMMUNICATION	When there is an error in the signal send from the A/C auto amp.	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-78, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631717

1. CHECK PTC ELEMENTS HEATER COMMUNICATION LINE FOR OPEN

1. Turn power switch OFF.
2. Disconnect PTC elements heater and A/C auto amp. connector.
3. Check continuity between PTC elements heater harness connector and A/C auto amp harness connector.

PTC elements heater		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
F9	4	M50	40	Existed

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair harness or connector.

2. CHECK PTC ELEMENTS HEATER COMMUNICATION LINE FOR SHORT

Check continuity between PTC elements heater harness connector and ground.

PTC elements heater		-	Continuity
Connector	Terminal		
F9	4	Ground	Not existed

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair harness or connector.

3. CHECK A/C AUTO AMP.

Ⓟ With CONSULT

1. Set the vehicle to READY.

B2777, B2779, B277B PTC ELEMENTS HEATER

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

2. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32. "CONSULT Function"](#).
3. Check that the PTC elements heater operates normally.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace A/C control (A/C auto amp.). (Refer to [HAC-135. "Removal and Installation"](#)). Then GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC confirmation procedure. Refer to [HAC-78. "DTC Logic"](#).

Is DTC B2777, B2779 or B277B detected?

YES >> Replace PTC elements heater. Refer to [HA-68. "Removal and Installation"](#).

NO >> Check intermittent incident. Refer to [GI-51. "Intermittent Incident"](#).

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B277A PTC ELEMENTS HEATER

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B277A PTC ELEMENTS HEATER

DTC Logic

INFOID:000000007631718

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B277A	PTC HEATER CONNECTOR	The high voltage harness connector of the PTC elements heater is connected improperly.	<ul style="list-style-type: none">• PTC elements heater• Connection-detecting signal harness or connectors (PTC elements heater connection-detecting signal circuit is open or shorted.)

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full hot and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-80, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631719

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

DIAGNOSIS PROCEDURE

CAUTION:

Erase DTC after the work is completed.

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).

Check voltage in high voltage circuit. (Check that condenser are discharged.)

1. Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).

B277A PTC ELEMENTS HEATER

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
3. Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

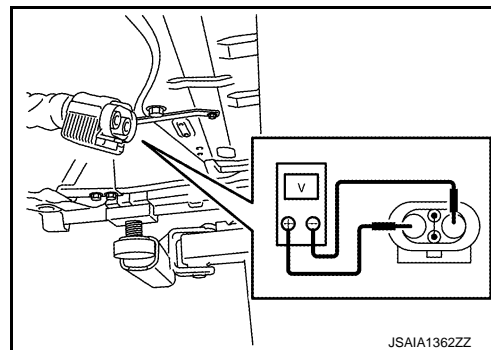


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500V or higher.



>> GO TO 2.

2.CHECK THE CONNECTION-DETECTING OF PTC ELEMENTS HEATER HIGH VOLTAGE HARNESS CONNECTOR

1. Connect 12V battery negative terminal.
2. Visually check the connection-detecting state of PTC elements heater high voltage harness connector.

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK CONNECTION-DETECTING TERMINAL OF PTC ELEMENTS HEATER HIGH VOLTAGE HARNESS CONNECTOR

1. Disconnect PTC elements heater high voltage harness connector.
2. Visually check that there is no deformation in the connection-detecting terminal of the PTC elements heater high voltage harness connector.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace high voltage harness between DC/DC-J/B and PTC elements heater.

4.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Connect PTC elements heater high voltage harness connector.
2. Perform DTC confirmation procedure. Refer to [HAC-80, "DTC Logic"](#).
3. Check DTC.

Is DTC detected?

YES >> GO TO 5.

NO >> INSPECTION END

5.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn power switch OFF.
2. Repeat step 3 and 4.
3. Check DTC.

Is DTC detected?

YES >> Replace PTC elements heater. Refer to [HA-68, "Removal and Installation"](#).

NO >> INSPECTION END

B277C, B277D HEATER FLUID TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B277C, B277D HEATER FLUID TEMPERATURE SENSOR

DTC Logic


INFOID:000000007631720

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B277C	HEATER TEMPERATURE SENSOR	Open circuit in the heater fluid temperature sensor	<ul style="list-style-type: none">• Heater fluid temperature sensor• A/C auto amp.• Harness or connectors (Heater fluid temperature sensor circuit is open or shorted.)
B277D		Short circuit in the heater fluid temperature sensor	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

 With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

YES >> Refer to [HAC-82. "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631721

1. CHECK HEATER FLUID TEMPERATURE SENSOR POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect heater fluid temperature sensor connector.
3. Turn power switch ON.
4. Check voltage between heater fluid temperature sensor harness connector and ground.

+		-	Voltage (Approx.)
Connector	Terminal		
F7	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2. CHECK HEATER FLUID TEMPERATURE SENSOR POWER SUPPLY CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between heater fluid temperature sensor harness connector and A/C auto amp harness connector.

Heater fluid temperature sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
F7	1	M50	37	Existed

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair harness or connector.

3. CHECK HEATER FLUID TEMPERATURE SENSOR POWER SUPPLY CIRCUIT FOR SHORT

B277C, B277D HEATER FLUID TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

Check continuity between heater fluid temperature sensor harness connector and ground.

Heater fluid temperature sensor		—	Continuity
Connector	Terminal		
F7	1	Ground	Not existed

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

4.CHECK HEATER FLUID TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between heater fluid temperature sensor harness connector and A/C auto amp harness connector.

Heater fluid temperature sensor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	M50	30	Existed

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair harness or connector.

5.CHECK HEATER FLUID TEMPERATURE SENSOR

Check heater fluid temperature sensor. Refer to [HAC-83, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace heater fluid temperature sensor. Refer to [HAC-146, "Removal and Installation"](#).

6.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

Component Inspection

INFOID:000000007631722

1.CHECK HEATER FLUID TEMPERATURE SENSOR

1. Remove heater fluid temperature sensor. Refer to [HAC-146, "Removal and Installation"](#).
2. Check resistance between heater fluid temperature sensor terminals by heating with hot water. Refer to applicable table for the normal value.

Terminals		Condition	Resistance: kΩ
		Temperature: °C (°F)	
1	2	-20 (-4)	6.77
		0 (32)	2.50
		20 (68)	1.06
		40 (104)	0.50
		50 (122)	0.36
		60 (140)	0.26
		70 (158)	0.19
		80 (176)	0.14

Is the inspection result normal?

B277C, B277D HEATER FLUID TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

YES >> INSPECTION END

NO >> Replace heater fluid temperature sensor. Refer to [HAC-146, "Removal and Installation"](#).

B2780 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2780 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631723

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2780	COMPRESSOR ROM, RAM, AD	<ul style="list-style-type: none">When an error is detected in the ROM and RAM area dataWhen an error is detected in the AD value (circuit that converts the analog value to a digital value)	Electric compressor

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

- Turn power switch OFF.
- Set the vehicle to READY.
- Operate the automatic air conditioning system.
- Set the temperature to full cold and wait at least 2 seconds.
- Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
- Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-85, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631724

HAC

1. REPLACE ELECTRIC COMPRESSOR

Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).

>> INSPECTION END

B2781 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2781 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631725

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2781	COMP IPM TEMP SENSOR	IPM temp sensor is open or shorted.	Electric compressor

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-86, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631726

1. REPLACE ELECTRIC COMPRESSOR

Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).

>> INSPECTION END

B2782 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2782 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631727

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2782	COMP SHUNT SIGNAL OFFSET	When an error is detected in the shunt signal (current value in the A/C inverter)	Electric compressor

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

 With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-87, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631728

1.REPLACE ELECTRIC COMPRESSOR

Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).

>> INSPECTION END

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HAC

B2783, B2784 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2783, B2784 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631729

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2783	COMP DISCHARGE TEMP OVER HEAT	When the estimated refrigerant temperature discharged from the electric compressor 130°C (266°F) or more	<ul style="list-style-type: none">• Electric compressor (Discharge pressure increase)• Cooling fan
B2784	COMP DISCHARGE TEMP LIMIT	When the estimated refrigerant temperature discharged from the electric compressor 110°C (230°F) or more	<ul style="list-style-type: none">• Refrigerant leakage• Refrigerant insufficient

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

YES >> Refer to [HAC-88, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631730

1.CHECK REFRIGERANT FOR LEAKAGES

Check refrigerant for leakages. Refer to [HA-31, "Check Refrigerant Leakage"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace malfunctioning parts.

2.CHECK COOLING FAN OPERATION

1. Set the vehicle to READY.
2. Operate the automatic air conditioning system.
3. Check that the cooling fan is operating.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Check cooling fan. Refer to [EVC-323, "Component Function Check"](#).

3.CHECK REFRIGERANT CYCLE

Check refrigerant cycle. Refer to [HA-37, "Inspection"](#).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace malfunctioning parts.

4.CHECK AIR CONDITIONING SYSTEM BY RE-FILLING REFRIGERANT

1. Collect refrigerant, and charge the air conditioning system from a new service can with the specified amount refrigerant.
2. After operate air conditioning system 15 minutes or more, perform DTC confirmation procedure, and check that DTC [B2783] or DTC [B2784] is not detected.

Is the inspection result normal?

B2783, B2784 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

-
- YES >> Replace electric compressor. Refer to [HA-46. "Removal and Installation"](#).
 - NO >> Repair or replace malfunctioning parts.

- A
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B2785, B2786 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2785, B2786 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631731

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2785	COMP IPM OVER HEAT	<ul style="list-style-type: none">When the IPM temperature 125°C (257°F) or more within 1 minute after starting the electric compressorWhen the IPM temperature 88°C (190°F) or more after 1 minute or longer after starting the electric compressor	<ul style="list-style-type: none">Electric compressor (Discharge pressure increase)Cooling fanRefrigerant leakageRefrigerant insufficient
B2786	COMP IPM DISCHARGE TEMP LIMIT	When the IPM temperature 83°C (181°F) or more	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

- Turn power switch OFF.
- Set the vehicle to READY.
- Operate the automatic air conditioning system.
- Set the temperature to full cold and wait at least 2 seconds.
- Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
- Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-90, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631732

1. CHECK REFRIGERANT FOR LEAKAGES

Check refrigerant for leakages. Refer to [HA-31, "Check Refrigerant Leakage"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK COOLING FAN OPERATION

- Set the vehicle to READY.
- Operate the automatic air conditioning system.
- Check that the cooling fan is operating.

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Check cooling fan. Refer to [EVC-323, "Component Function Check"](#).

3. CHECK REFRIGERANT CYCLE

Check refrigerant cycle. Refer to [HA-37, "Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace malfunctioning parts.

4. CHECK AIR CONDITIONING SYSTEM BY RE-FILLING REFRIGERANT

- Collect refrigerant, and charge the air conditioning system from a new service can with the specified amount refrigerant.
- After operate air conditioning system 15 minutes or more, perform DTC confirmation procedure, and check that DTC [B2785] or DTC [B2786] is not detected.

B2785, B2786 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

Is the inspection result normal?

YES >> Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

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B2787 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2787 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631733

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2787	COMP VOLTAGE SATURATION	When the motor voltage 140% or more relative to the inverter output voltage	<ul style="list-style-type: none">• Li-ion battery• Electric compressor (Discharge pressure increase)• Cooling fan• Overfilled refrigerant

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-92, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631734

1. CHECK LI-ION BATTERY

Check Li-ion battery. Refer to [EVB-59, "Work Flow"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK REFRIGERANT FOR LEAKAGES

Check refrigerant for leakages. Refer to [HA-31, "Check Refrigerant Leakage"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace malfunctioning parts.

3. CHECK COOLING FAN OPERATION

1. Set the vehicle to READY.
2. Operate the automatic air conditioning system.
3. Check that the cooling fan is operating.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Check cooling fan. Refer to [EVC-323, "Component Function Check"](#).

4. CHECK REFRIGERANT CYCLE

Check refrigerant cycle. Refer to [HA-37, "Inspection"](#).

Is the inspection result normal?

- YES >> Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).
NO >> Repair or replace malfunctioning parts.

B2788 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2788 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631735

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2788	COMP OVER CURRENT	When the electric compressor is not operated under the following conditions: <ul style="list-style-type: none">• Within 90 seconds after starting• Motor current is 35.1 A or more• 3 times in a 5 second interval	<ul style="list-style-type: none">• Electric compressor (Discharge pressure increase) (Inverter internal short-circuit) (Stuck compressor)• Cooling fan

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-93, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631736

HAC

1. CHECK REFRIGERANT FOR LEAKAGES

Check refrigerant for leakages. Refer to [HA-31, "Check Refrigerant Leakage"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK COOLING FAN OPERATION

1. Set the vehicle to READY.
2. Operate the automatic air conditioning system.
3. Check that the cooling fan is operating.

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Check cooling fan. Refer to [EVC-323, "Component Function Check"](#).

3. CHECK ELECTRIC COMPRESSOR OPERATION

Check electric compressor operation.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).

4. CHECK REFRIGERANT CYCLE

Check refrigerant cycle. Refer to [HA-37, "Inspection"](#).

Is the inspection result normal?

- YES >> Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).
NO >> Repair or replace malfunctioning parts.

B2789 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2789 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631737

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2789	COMP OVER LOADED	When a current of 13.5 A or more is input to the electric compressor	<ul style="list-style-type: none">• Electric compressor (Discharge pressure increase)• Cooling fan

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-94, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631738

1. CHECK REFRIGERANT FOR LEAKAGES

Check refrigerant for leakages. Refer to [HA-31, "Check Refrigerant Leakage"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK COOLING FAN OPERATION

1. Set the vehicle to READY.
2. Operate the automatic air conditioning system.
3. Check that the cooling fan is operating.

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Check cooling fan. Refer to [EVC-323, "Component Function Check"](#).

3. CHECK REFRIGERANT CYCLE

Check refrigerant cycle. Refer to [HA-37, "Inspection"](#).

Is the inspection result normal?

- YES >> Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).
NO >> Repair or replace malfunctioning parts.

B278A, B278B ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B278A, B278B ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631739

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B278A	COMP LOW VOLTAGE	When the high voltage system input voltage is less than 230 V	<ul style="list-style-type: none">• Electric compressor• Li-ion battery• DC/DC-J/B• High voltage harness or connectors (Electric compressor high voltage circuit is open or shorted.)
B278B	COMP HIGH VOLTAGE	When the high voltage system input voltage is more than 420 V	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-95, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631740

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

DIAGNOSIS PROCEDURE

CAUTION:

Erase DTC after the work is completed.

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).

Check voltage in high voltage circuit. (Check that condenser are discharged.)

1. Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).

B278A, B278B ELECTRIC COMPRESSOR

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
3. Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

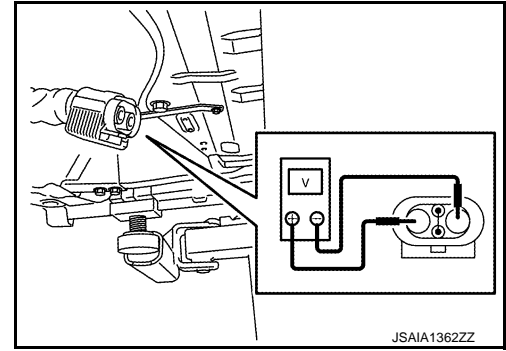


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500V or higher.



>> GO TO 2.

2.CHECK ELECTRIC COMPRESSOR HIGH VOLTAGE HARNESS POWER SUPPLY CIRCUIT FOR OPEN

1. Disconnect electric compressor and DC/DC-J/B connector.
2. Check continuity between Electric compressor high voltage harness connector and DC/DC-J/B high voltage harness connector.

Electric compressor		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H1	7	H2	18	Existed

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace high voltage harness between electric compressor and DC/DC-J/B.

3.CHECK ELECTRIC COMPRESSOR HIGH VOLTAGE HARNESS GROUND CIRCUIT

Check continuity between Electric compressor high voltage harness connector and DC/DC-J/B high voltage harness connector.

Electric compressor		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H1	8	H2	19	Existed

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace high voltage harness between electric compressor and DC/DC-J/B.

4.CHECK LI-ION BATTERY

1. Connect 12V battery negative terminal.
2. Check Li-ion battery. Refer to [EVB-59, "Work Flow"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace malfunctioning parts.

5.CHECK DC/DC-J/B

Check DC/DC-J/B. Refer to [EVC-92, "Work Flow"](#).

Is the inspection result normal?

YES >> Replace electric compressor. Refer to [HA-46, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

B278C, B278D ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B278C, B278D ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631741

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B278C	COMP COMM ERROR HVAC→COMP	When the electric compressor cannot receive the signal sent from the A/C auto amp.	<ul style="list-style-type: none">• Electric compressor• A/C auto amp.• DC/DC-J/B• Harness or connectors (Electric compressor circuit is open or shorted.)• High voltage harness or connectors (Electric compressor high voltage circuit is open or shorted.)
B278D	COMP COMM ERROE COMP→HVAC	When the A/C auto amp. cannot receive the signal sent from the electric compressor	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-97, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631742

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

DIAGNOSIS PROCEDURE

CAUTION:

Erase DTC after the work is completed.

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).
Check voltage in high voltage circuit. (Check that condenser are discharged.)

B278C, B278D ELECTRIC COMPRESSOR

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

- Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).
- Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
- Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

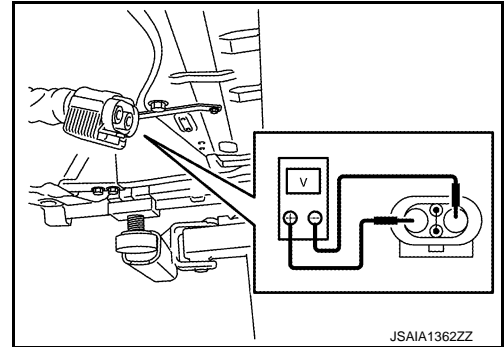


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500 V or higher.



>> GO TO 2.

2. CHECK ELECTRIC COMPRESSOR COMMUNICATION LINE FOR OPEN

- Turn power switch OFF.
- Disconnect electric compressor and A/C auto amp. connector.
- Check continuity between electric compressor harness connector and A/C auto amp. harness connector.

Electric compressor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
F10	1	M50	14	Existed
	2		18	

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair harness or connector.

3. CHECK ELECTRIC COMPRESSOR COMMUNICATION LINE FOR SHORT

Check continuity between electric compressor harness connector and ground.

Electric compressor		Ground	Continuity
Connector	Terminal		
F10	1		Not existed
	2		

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

4. CHECK ELECTRIC COMPRESSOR POWER SUPPLY

- Turn power switch ON.
- Check voltage between electric compressor harness connector and ground.

+		-	Voltage (Approx.)
Electric compressor			
Connector	Terminal		
F10	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.

B278C, B278D ELECTRIC COMPRESSOR

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 6.

5. CHECK ELECTRIC COMPRESSOR GROUND CIRCUIT

1. Turn power switch OFF.
2. Check continuity between electric compressor harness connector and ground.

Electric compressor		Ground	Continuity
Connector	Terminal		
F10	3		Existed

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair harness or connector.

6. CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Repair harness or connector between A/C relay and electric compressor.

NO >> Repair or replace error-detected parts.

7. CHECK ELECTRIC COMPRESSOR HIGH VOLTAGE HARNESS POWER SUPPLY CIRCUIT FOR OPEN

1. Disconnect DC/DC-J/B connector.
2. Check continuity between electric compressor high voltage harness connector and DC/DC-J/B high voltage harness connector.

Electric compressor		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H1	7	H2	18	Existed

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace high voltage harness between electric compressor and DC/DC-J/B.

8. CHECK ELECTRIC COMPRESSOR HIGH VOLTAGE HARNESS GROUND CIRCUIT

Check continuity between electric compressor high voltage harness connector and DC/DC-J/B high voltage harness connector.

Electric compressor		DC/DC-J/B		Continuity
Connector	Terminal	Connector	Terminal	
H1	8	H2	19	Existed

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace high voltage harness between electric compressor and DC/DC-J/B.

9. CHECK DC/DC-J/B INTERNAL CIRCUIT

Check continuity between DC/DC-J/B terminals.

DC/DC-J/B		Continuity
Terminal		
18	24	Existed
19	25	

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace DC/DC-J/B. Refer to [EVC-361, "Removal and Installation"](#).

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B278C, B278D ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

10. CHECK A/C AUTO AMP.

Ⓜ With CONSULT

1. Reconnect all harness connectors disconnected.
2. Set the vehicle to READY.
3. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32. "CONSULT Function"](#).
4. Check that the electric compressor operates normally.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace A/C control (A/C auto amp.). (Refer to [HAC-135. "Removal and Installation"](#)). Then GO TO 11.

11. PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC confirmation procedure. Refer to [HAC-97. "DTC Logic"](#).

Is DTC B278C or B278D detected?

YES >> Replace electric compressor. Refer to [HA-46. "Removal and Installation"](#).

NO >> Check intermittent incident. Refer to [GI-51. "Intermittent Incident"](#).

B278F, B2790 HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B278F, B2790 HEATER PUMP

DTC Logic

INFOID:000000007631743

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B278F	HEATER PUMP COMM HVAC→H/P	When there is an error in the DUTY signal sent from the A/C auto amp.	<ul style="list-style-type: none"> • Heater pump • A/C auto amp. • Harness or connectors (Heater pump circuit is open or shorted.)
B2790	HEATER PUMP COMM H/ P→HVAC	When there is an error in the DUTY signal sent from the heater pump.	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

④ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

YES >> Refer to [HAC-101, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631744

1. INSPECTION START

Confirm the detected DTC. Refer to [HAC-101, "DTC Logic"](#).

Which DTC is detected?

B278F >> GO TO 2.

B2790 >> GO TO 6.

2. CHECK HEATER PUMP COMMUNICATION LINE FOR OPEN

1. Turn power switch OFF.
2. Disconnect heater pump and A/C auto amp. connector.
3. Check continuity between heater pump harness connector and A/C auto amp. harness connector.

Heater pump		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
F8	3	M50	13	Existed

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair harness or connector.

3. CHECK HEATER PUMP COMMUNICATION LINE FOR SHORT

Check continuity between heater pump harness connector and ground.

Heater pump		-	Continuity
Connector	Terminal		
F8	3	Ground	Not existed

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

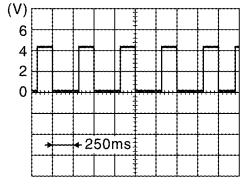
B278F, B2790 HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

4. CHECK A/C AUTO AMP. INPUT SIGNAL

1. Connect heater pump and A/C auto amp. connector.
2. Turn power switch ON.
3. Check signal between A/C auto amp. harness connector and ground with oscilloscope.

A/C auto amp.			Condition	Condition (Reference value)
Connector	+	-		
Terminal				
M50	13	10	<ul style="list-style-type: none"> • Power switch ON • Set temperature: Full hot 	 <p style="text-align: right; font-size: small;">JSIIA1659ZZ</p>

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

5. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace heater pump. Refer to [HA-74, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

6. CHECK HEATER PUMP COMMUNICATION LINE FOR OPEN

1. Turn power switch OFF.
2. Disconnect heater pump and A/C auto amp. connector.
3. Check continuity between heater pump harness connector and A/C auto amp. harness connector.

Heater pump		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
F8	4	M50	17	Existed

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair harness or connector.

7. CHECK HEATER PUMP COMMUNICATION LINE FOR SHORT

Check continuity between heater pump harness connector and ground.

Heater pump		-	Continuity
Connector	Terminal		
F8	4	Ground	Not existed

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair harness or connector.

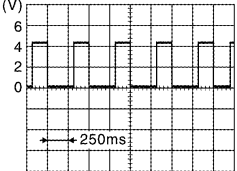
8. CHECK A/C AUTO AMP. INPUT SIGNAL

1. Connect heater pump and A/C auto amp. connector.
2. Turn power switch ON.
3. Check signal between A/C auto amp. harness connector and ground with oscilloscope.

B278F, B2790 HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

A/C auto amp.			Condition	Condition (Reference value)
Connector	+	-		
	Terminal			
M50	17	10	<ul style="list-style-type: none"> Power switch ON Set temperature: Full hot 	 <p style="text-align: right; font-size: small;">JS1IA1659ZZ</p>

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace heater pump. Refer to [HA-74, "Removal and Installation"](#).

9. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

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B2791 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2791 ELECTRIC COMPRESSOR

DTC Logic

INFOID:000000007631745

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2791	COMP LOW SPEED HIGH LOAD	When the driving load of the electric compressor reaches a maximum value during slow rotation.	<ul style="list-style-type: none">• Electric compressor• Cooling fan• Li-ion battery• DC/DC-J/B• Overfilled refrigerant

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Operate the automatic air conditioning system.
4. Set the temperature to full cold and wait at least 2 seconds.
5. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
6. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-104, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631746

1. CHECK REFRIGERANT FOR LEAKAGES

Check refrigerant for leakages. Refer to [HA-31, "Check Refrigerant Leakage"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK COOLING FAN OPERATION

1. Set the vehicle to READY.
2. Operate the automatic air conditioning system.
3. Check that the cooling fan is operating.

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Check cooling fan. Refer to [EVC-323, "Component Function Check"](#).

3. CHECK REFRIGERANT CYCLE

Check refrigerant cycle. Refer to [HA-37, "Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace malfunctioning parts.

4. CHECK LI-ION BATTERY

Check Li-ion battery. Refer to [EVB-59, "Work Flow"](#).

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Repair or replace malfunctioning parts.

5. CHECK DC/DC-J/B

B2791 ELECTRIC COMPRESSOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

Check DC/DC-J/B. Refer to [EVC-92. "Work Flow"](#).

Is the inspection result normal?

YES >> Replace electric compressor. Refer to [HA-46. "Removal and Installation"](#).

NO >> Repair or replace malfunctioning parts.

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B2792 HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2792 HEATER PUMP

DTC Logic

INFOID:000000007631747

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2792	HEATER PUMP OPERATION LIMIT	When the heater pump does not operate normally and is restarted	<ul style="list-style-type: none">• Stuck heater pump• Element temperature malfunction• Over current malfunction

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-106, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631748

1. CHECK HEATER PUMP

Ⓟ With CONSULT

1. Set the vehicle to READY.
2. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32, "CONSULT Function"](#).
3. When the test items are being conducted, check that the heater pump operates normally for each mode.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).
NO >> Replace heater pump. Refer to [HA-74, "Removal and Installation"](#).

B2793 HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2793 HEATER PUMP

DTC Logic

INFOID:000000007631749

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2793	HEATER PUMP VOLTAGE	When a supply voltage of 8.0 V or less or 15.0 V or more being input to the heater pump is detected	Voltage malfunction

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

ⓂWith CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-107. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631750

1.CHECK HEATER PUMP POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect heater pump connector.
3. Turn power switch ON.
4. Check voltage between heater pump harness connector and ground.

+		-	Voltage (Approx.)
Heater pump			
Connector	Terminal		
F8	1	Ground	Battery voltage

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> GO TO 3.

2.CHECK HEATER PUMP GROUND CIRCUIT

Check continuity between heater pump harness connector and ground.

Heater pump		-	Continuity
Connector	Terminal		
F8	2	Ground	Existed

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-51. "Intermittent Incident"](#).
 NO >> Repair harness or connector.

3.CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338. "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Repair harness or connector between A/C relay and heater pump.
 NO >> Repair or replace error-detected parts.

B2794 HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B2794 HEATER PUMP

DTC Logic

INFOID:000000007631751

DTC DETECTION LOGIC

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B2794	HEATER PUMP	When the heater pump is not operating	<ul style="list-style-type: none">• Stuck heater pump• Element temperature malfunction• Over current malfunction

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
4. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-108, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631752

1. CHECK HEATER PUMP

Ⓟ With CONSULT

1. Set the vehicle to READY.
2. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32, "CONSULT Function"](#).
3. When the test items are being conducted, check that the heater pump operates normally for each mode.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).
NO >> Replace heater pump. Refer to [HA-74, "Removal and Installation"](#).

B27A0, B27A1 INTAKE DOOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B27A0, B27A1 INTAKE DOOR MOTOR

DTC Logic

INFOID:000000007631753

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).

DTC	Items (CONSULT screen terms)	DTC detection condition*	Possible cause
B27A0	INTAKE DOOR MOTOR	PBR opening angle of intake door motor is 50% or more. (PBR feedback signal voltage of intake door motor is 2.5 V or more)	<ul style="list-style-type: none"> • Intake door motor • Intake door motor system installation condition • A/C auto amp. • Harness or connectors (The motor circuit is open or shorted.)
B27A1		PBR opening angle of intake door motor is 30% or less. (PBR feedback signal voltage of intake door motor is 1.5 V or less)	

*: A/C auto amp. operates intake door motor according to target value of PBR opening angle at 40% when performing self-diagnosis.

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

 With CONSULT

1. Set the vehicle to READY.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-109, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631754

1. CHECK INTAKE DOOR MOTOR OPERATION

1. Turn power switch ON.
2. Operate intake switch and check by operation sound that intake door motor operates.

Does the intake door motor operate?

- YES >> GO TO 2.
 NO >> GO TO 8.

2. CHECK INTAKE DOOR MOTOR PBR POWER SUPPLY

1. Disconnect intake door motor connector.
2. Turn power switch ON.
3. Check voltage between intake door motor harness connector and ground.

+		-	Voltage (Approx.)
Intake door motor			
Connector	Terminal	Ground	5 V
M54	1		

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 7.

3. CHECK INTAKE DOOR MOTOR PBR GROUND CIRCUIT FOR OPEN

B27A0, B27A1 INTAKE DOOR MOTOR

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between intake door motor harness connector and A/C auto amp. harness connector.

Intake door motor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M54	3	M50	30	Existed

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

4.CHECK INTAKE DOOR MOTOR PBR FEEDBACK SIGNAL CIRCUIT FOR OPEN

Check continuity between intake door motor harness connector and A/C auto amp. harness connector.

Intake door motor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M54	2	M50	38	Existed

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair harness or connector.

5.CHECK INTAKE DOOR MOTOR PBR FEEDBACK SIGNAL CIRCUIT FOR SHORT

Check continuity between intake door motor harness connector and ground.

Intake door motor		—	Continuity
Connector	Terminal		
M54	2	Ground	Not existed

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair harness or connector.

6.CHECK INTAKE DOOR MOTOR PBR

Check intake door motor PBR. Refer to [HAC-111, "Component Inspection \(PBR\)"](#).

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> Replace intake door motor. Refer to [HAC-143, "INTAKE DOOR MOTOR : Removal and Installation"](#).

7.CHECK INTAKE DOOR MOTOR PBR POWER SUPPLY CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between intake door motor harness connector and A/C auto amp. harness connector.

Intake door motor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M54	1	M50	27	Existed

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> Repair harness or connector.

8.CHECK INTAKE DOOR MOTOR DRIVE SIGNAL CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect intake door motor connector, and A/C auto amp. connector.

B27A0, B27A1 INTAKE DOOR MOTOR

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

3. Check continuity between intake door motor harness connector and A/C auto amp. harness connector.

Intake door motor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M54	5	M50	21	Existed
	6		1	

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair harness or connector.

9.CHECK INTAKE DOOR MOTOR DRIVE SIGNAL CIRCUIT FOR SHORT

Check continuity between intake door motor harness connector and ground.

Intake door motor		—	Continuity
Connector	Terminal		
M54	5	Ground	Not existed
	6		

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair harness or connector.

10.CHECK INTAKE DOOR MOTOR

1. Turn power switch OFF.

2. Check intake door motor. Refer to [HAC-111. "Component Inspection \(Motor\)".](#)

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace intake door motor. Refer to [HAC-143. "INTAKE DOOR MOTOR : Removal and Installation".](#)

11.CHECK INSTALLATION OF INTAKE DOOR MOTOR SYSTEM

Check intake door motor system is properly installed. Refer to [HAC-142. "Exploded View".](#)

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135. "Removal and Installation".](#)

NO >> Repair or replace malfunctioning parts.

Component Inspection (PBR)

INFOID:000000007631755

1.CHECK INTAKE DOOR MOTOR PBR

Check resistance between intake door motor terminals.

Terminal	Resistance (Ω)
1	2
	3

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake door motor. Refer to [HAC-143. "INTAKE DOOR MOTOR : Removal and Installation".](#)

Component Inspection (Motor)

INFOID:000000007631756

1.CHECK INTAKE DOOR MOTOR

Supply intake door motor terminals with battery voltage and check by visually and operation sound that intake door motor operates.

B27A0, B27A1 INTAKE DOOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

Terminal		Operation direction
+	-	
5	6	FRE
6	5	REC

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace intake door motor. Refer to [HAC-143. "INTAKE DOOR MOTOR : Removal and Installation"](#).

B27A2, B27A3, B27A4, B27A5 AIR MIX DOOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B27A2, B27A3, B27A4, B27A5 AIR MIX DOOR MOTOR

DTC Logic

INFOID:000000007631757

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).
- If air mix door motors DTC (B27A2 – B27A5) are detected, there is probably a disconnected connector or an open circuit in air mix door motor drive power supply harness.

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B27A2	AIR MIX DOOR MOT	Short or open circuit of air mix door motor drive signal terminal 1.	<ul style="list-style-type: none"> • Air mix door motor • A/C auto amp. • Harness or connectors (The motor circuit is open or shorted.)
B27A3		Short or open circuit of air mix door motor drive signal terminal 2.	
B27A4		Short or open circuit of air mix door motor drive signal terminal 3.	
B27A5		Short or open circuit of air mix door motor drive signal terminal 4.	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-113, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631758

1. CHECK AIR MIX DOOR MOTOR POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect air mix door motor connector.
3. Turn power switch ON.
4. Check voltage between air mix door motor harness connector and ground.

+		-	Voltage
Air mix door motor			
Connector	Terminal		
M55	2	Ground	Battery voltage

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

2. CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Repair harness or connector between A/C relay and air mix door motor.
 NO >> Repair or replace error-detected parts.

B27A2, B27A3, B27A4, B27A5 AIR MIX DOOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

3. CHECK AIR MIX DOOR MOTOR DRIVE SIGNAL CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between air mix door motor harness connector and A/C auto amp. harness connector.

Air mix door motor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M55	3	M50	6	Existed
	6		7	
	1		8	
	4		9	

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

4. CHECK AIR MIX DOOR MOTOR DRIVE SIGNAL CIRCUIT FOR SHORT

Check continuity between air mix door motor harness connector and A/C auto amp. harness connector.

Air mix door motor		—	Continuity
Connector	Terminal		
M55	3	Ground	Not existed
	6		
	1		
	4		

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair harness or connector.

5. CHECK AIR MIX DOOR MOTOR

Check air mix door motor. Refer to [HAC-114. "Component Inspection"](#).

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135. "Removal and Installation"](#).

NO >> Replace air mix door motor. Refer to [HAC-144. "AIR MIX DOOR MOTOR : Removal and Installation"](#).

Component Inspection

INFOID:000000007631759

1. CHECK AIR MIX DOOR MOTOR

1. Remove air mix door motor. Refer to [HAC-144. "AIR MIX DOOR MOTOR : Removal and Installation"](#).
2. Check resistance between air mix door motor terminals. Refer to applicable table for the normal value.

Terminal		Resistance (Ω) (Approx.)
2	1	90
	3	
	4	
	6	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace air mix door motor. Refer to [HAC-144. "AIR MIX DOOR MOTOR : Removal and Installation"](#).

B27A6, B27A7, B27A8, B27A9 MODE DOOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

B27A6, B27A7, B27A8, B27A9 MODE DOOR MOTOR

DTC Logic

INFOID:000000007631760

DTC DETECTION LOGIC

NOTE:

- If DTC is displayed along with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to [HAC-55, "DTC Logic"](#).
- If DTC is displayed along with DTC U1010, first perform the trouble diagnosis for DTC U1010. [HAC-56, "DTC Logic"](#).
- If mode door motors DTC (B27A6 – B27A9) are detected, there is probably a disconnected connector or an open circuit in mode door motor drive power supply harness.

DTC	Items (CONSULT screen terms)	DTC detection condition	Possible cause
B27A6	MODE DOOR MOTOR	Short or open circuit of mode door motor drive signal terminal 1.	<ul style="list-style-type: none"> • Mode door motor • A/C auto amp. • Harness or connectors (The motor circuit is open or shorted.)
B27A7		Short or open circuit of mode door motor drive signal terminal 2.	
B27A8		Short or open circuit of mode door motor drive signal terminal 3.	
B27A9		Short or open circuit of mode door motor drive signal terminal 4.	

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn power switch ON.
2. Select "Self Diagnostic Result" mode of "HVAC" using CONSULT.
3. Check DTC.

Is DTC detected?

- YES >> Refer to [HAC-115, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000007631761

1. CHECK MODE DOOR MOTOR POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect mode door motor connector.
3. Turn power switch ON.
4. Check voltage between mode door motor harness connector and ground.

+		-	Voltage
Mode door motor			
Connector	Terminal		
M342	5	Ground	Battery voltage

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

2. CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Repair harness or connector between A/C relay and mode door motor.
 NO >> Repair or replace error-detected parts.

B27A6, B27A7, B27A8, B27A9 MODE DOOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

3. CHECK MODE DOOR MOTOR DRIVE SIGNAL CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between mode door motor harness connector and A/C auto amp. harness connector.

Mode door motor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M342	4	M50	2	Existed
	3		3	
	2		4	
	1		5	

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair harness or connector.

4. CHECK MODE DOOR MOTOR DRIVE SIGNAL CIRCUIT FOR SHORT

Check continuity between mode door motor harness connector and A/C auto amp. harness connector.

Mode door motor		—	Continuity
Connector	Terminal		
M342	4	Ground	Not existed
	3		
	2		
	1		

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair harness or connector.

5. CHECK MODE DOOR MOTOR

Check mode door motor. Refer to [HAC-116, "Component Inspection"](#).

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).

NO >> Replace mode door motor. Refer to [HAC-144, "MODE DOOR MOTOR : Removal and Installation"](#).

Component Inspection

INFOID:000000007631762

1. CHECK MODE DOOR MOTOR

1. Remove mode door motor. Refer to [HAC-144, "MODE DOOR MOTOR : Removal and Installation"](#).
2. Check resistance between mode door motor terminals. Refer to applicable table for the normal value.

Terminal		Resistance (Ω) (Approx.)
5	1	90
	2	
	3	
	4	

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mode door motor. Refer to [HAC-144, "MODE DOOR MOTOR : Removal and Installation"](#).

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

POWER SUPPLY AND GROUND CIRCUIT

A/C AUTO AMP.

A/C AUTO AMP. : Diagnosis Procedure

INFOID:000000007631763

1.CHECK SYMPTOM

Check symptom (A or B).

Symptom	
A	<ul style="list-style-type: none">Air conditioning system does not activate.Air conditioning system does cannot be controlled.Operation status of air conditioning system is not indicated on display. NOTE: Fail-safe does not activate.
B	<ul style="list-style-type: none">Memory function does not operate normally.The setting is not maintained. (It returns to the initial condition)

Which symptom is detected?

- A >> GO TO 2.
- B >> GO TO 4.

2.CHECK FUSE

- Turn power switch OFF.
- Check 10A fuse [No. 3, located in fuse block (J/B)].

NOTE:

Refer to [PG-37. "Fuse, Connector and Terminal Arrangement"](#).

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace the blown fuse after repairing the affected circuit if a fuse is blown.

3.CHECK A/C AUTO AMP. POWER SWITCH POWER SUPPLY

- Disconnect A/C auto amp. connector.
- Turn power switch ON.
- Check voltage between A/C auto amp. harness connector and ground.

+		-	Voltage
A/C auto amp.			
Connector	Terminal		
M50	32	Ground	Battery voltage

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair harness or connector between A/C auto amp. and fuse.

4.CHECK FUSE

- Turn power switch OFF.
- Check 10A fuse [No.13, located in fuse block (J/B)].

NOTE:

Refer to [PG-37. "Fuse, Connector and Terminal Arrangement"](#).

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Replace the blown fuse after repairing the affected circuit if a fuse is blown.

5.CHECK A/C AUTO AMP. BATTERY POWER SUPPLY

- Disconnect A/C auto amp. connector.
- Check voltage between A/C auto amp. harness connector and ground.

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

+		-	Voltage
A/C auto amp.			
Connector	Terminal		
M50	31	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair harness or connector between A/C auto amp. and fuse.

6. CHECK A/C AUTO AMP. GROUND CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Check continuity between A/C auto amp. harness connector and ground.

A/C auto amp.		—	Continuity
Connector	Terminal		
M50	10	Ground	Existed

Is the inspection result normal?

YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135. "Removal and Installation"](#).

NO >> Repair harness or connector.

BLOWER MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

BLOWER MOTOR

Component Function Check

INFOID:000000007631764

1.CHECK BLOWER MOTOR

Ⓜ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32. "CONSULT Function"](#).
4. When the test items are being conducted, check that the blower motor operates normally for each mode. Refer to Active Test in [HAC-32. "CONSULT Function"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Refer to [HAC-119. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007631765

1.CHECK FUSE

1. Turn power switch OFF.
2. Check 15A fuses [Nos. 14 and 16, located in fuse block (J/B)].

NOTE:

Refer to [PG-37. "Fuse, Connector and Terminal Arrangement"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace the blown fuse after repairing the affected circuit if a fuse is blown.

2.CHECK BLOWER MOTOR POWER SUPPLY

1. Disconnect blower motor connector.
2. Turn power switch ON.
3. Check voltage between blower motor harness connector and ground.

+		-	Voltage (Approx.)
Blower motor			
Connector	Terminal		
M39	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.CHECK BLOWER RELAY

1. Turn power switch OFF.
2. Check blower relay. Refer to [HAC-122. "Component Inspection \(Blower Relay\)"](#).

Is the inspection result normal?

YES >> Repair harness or connector between blower motor and fuse.

NO >> Replace blower relay.

4.CHECK BLOWER MOTOR CONTROL CIRCUIT

1. Turn power switch OFF.
2. Connect blower motor connector.
3. Disconnect power transistor connector.
4. Turn power switch ON.
5. Check voltage between power transistor harness connector and ground.

BLOWER MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

+		-	Voltage (Approx.)
Power transistor			
Connector	Terminal		
M82	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. CHECK BLOWER MOTOR CONTROL CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect blower motor connector.
3. Check continuity between power transistor harness connector and blower motor harness connector.

Power transistor		Blower motor		Continuity
Connector	Terminal	Connector	Terminal	
M82	1	M39	2	Existed

Is the inspection result normal?

YES >> Replace blower motor. Refer to [VTL-22. "Removal and Installation"](#).

NO >> Repair harness or connector.

6. CHECK POWER TRANSISTOR POWER SWITCH POWER SUPPLY

Check voltage between power transistor harness connector and ground.

+		-	Voltage (Approx.)
Power transistor			
Connector	Terminal		
M82	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair harness or connector between power transistor and fuse.

7. CHECK POWER TRANSISTOR GROUND CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Check continuity between power transistor harness connector and ground.

Power transistor		-	Continuity
Connector	Terminal		
M82	3		

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair harness or connector.

8. CHECK POWER TRANSISTOR CONTROL SIGNAL

1. Connect blower motor connector and A/C auto amp. connector.
2. Turn power switch ON.
3. Set air outlet to VENT.
4. Change fan speed from 1st – 7th, and check duty ratios between blower motor harness connector and ground by using an oscilloscope.

NOTE:

Calculate the drive signal duty ratio as shown in the figure.

T2 = Approx. 1.6 ms

BLOWER MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

+		-	Condition Fan speed (manual) Air outlet: VENT	Duty ratio (Approx.)	Output waveform
Connector	Terminal				
M82	2	Ground	1st	26%	
			2nd	34%	
			3rd	41%	
			4th	51%	
			5th	62%	
			6th	73%	
			7th	82%	

Is the inspection result normal?

- YES >> Replace power transistor. Refer to [HAC-141. "Removal and Installation"](#).
- NO >> GO TO 9.

9. CHECK POWER TRANSISTOR CONTROL SIGNAL CIRCUIT FOR OPEN

1. Turn power switch OFF.
2. Disconnect power transistor connector and A/C auto amp. connector.
3. Check continuity between power transistor harness connector and A/C auto amp. harness connector.

Power transistor		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
M82	2	M50	12	Existed

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> Repair harness or connector.

10. CHECK POWER TRANSISTOR CONTROL SIGNAL CIRCUIT FOR SHORT

Check continuity between power transistor harness connector and ground.

Power transistor		—	Continuity
Connector	Terminal		
M82	2	Ground	Not existed

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135. "Removal and Installation"](#).
- NO >> Repair harness or connector.

Component Inspection (Blower Motor)

INFOID:000000007631766

1. CHECK BLOWER MOTOR

1. Remove blower motor. Refer to [VTL-22. "Removal and Installation"](#).
2. Check that there is not any mixing foreign object in the blower motor.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace blower motor. Refer to [VTL-22. "Removal and Installation"](#).

2. CHECK BLOWER MOTOR

Check that there is not breakage or damage in the blower motor.

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace blower motor. Refer to [VTL-22. "Removal and Installation"](#).

BLOWER MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

3. CHECK BLOWER MOTOR

Check that blower motor turns smoothly.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace blower motor. Refer to [VTL-22. "Removal and Installation"](#).

Component Inspection (Blower Relay)

INFOID:000000007631767

1. CHECK BLOWER RELAY

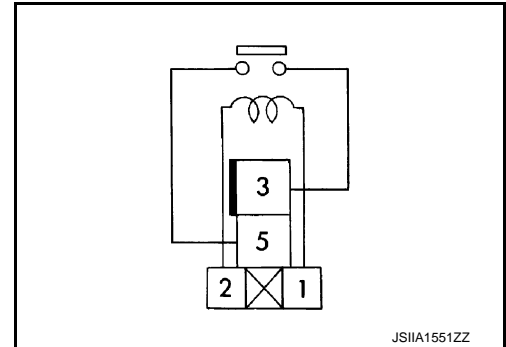
1. Remove blower relay. Refer to [PG-37. "Fuse, Connector and Terminal Arrangement"](#).
2. Check continuity between blower relay terminal 3 and 5 when the voltage is supplied between terminal 1 and 2.

Terminal		Voltage	Continuity
3	5	ON	Existed
		OFF	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace blower relay.



HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

HEATER PUMP

Component Function Check

INFOID:000000007631768

1.CHECK HEATER PUMP OPERATING CONDITION

Ⓜ With CONSULT

1. Turn power switch OFF.
2. Set the vehicle to READY.
3. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32, "CONSULT Function"](#).
4. Confirm heater pump operation by the sound or hose pulsation.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Refer to [HAC-123, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000007631769

1.CHECK HEATER PUMP POWER SUPPLY

1. Turn power switch OFF.
2. Disconnect heater pump connector.
3. Turn power switch ON.
4. Check voltage between heater pump harness connector and ground.

+		-	Voltage (Approx.)
Heater pump			
Connector	Terminal		
E8	1	Ground	Battery voltage

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

2.CHECK A/C RELAY CIRCUIT

Check A/C relay circuit. Refer to [EVC-338, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Repair harness or connector between A/C relay and heater pump.
 NO >> Repair or replace error-detected parts.

3.CHECK HEATER PUMP GROUND CIRCUIT

Check continuity between heater pump harness connector and ground.

Heater pump		—	Continuity
Connector	Terminal		
E8	2	Ground	Existed

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Repair harness or connector.

4.CHECK HEATER PUMP COMMUNICATION LINE FOR OPEN-I

1. Turn power switch OFF.
2. Disconnect A/C auto amp. connector.
3. Check continuity between heater pump harness connector and A/C auto amp. harness connector.

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HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

Heater pump		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
E8	3	M50	13	Existed

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> Repair harness or connector.

5. CHECK HEATER PUMP COMMUNICATION LINE FOR SHORT-I

Check continuity between heater pump harness connector and ground.

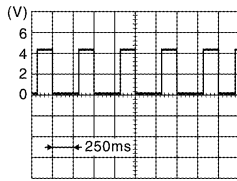
Heater pump		-	Continuity
Connector	Terminal		
E8	3	Ground	Not existed

Is the inspection result normal?

- YES >> GO TO 6.
 NO >> Repair harness or connector.

6. CHECK A/C AUTO AMP. INPUT SIGNAL-I

1. Connect heater pump and A/C auto amp. connector.
2. Turn power switch ON.
3. Check signal between A/C auto amp. harness connector and ground with oscilloscope.

Connector	A/C auto amp.		Condition	Condition (Reference value)
	+	-		
	Terminal			
M50	13	10	<ul style="list-style-type: none"> Power switch ON Set temperature: Full hot 	 <p style="text-align: right; font-size: small;">JSIIA1659ZZ</p>

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> Replace A/C auto amp. Refer to [HAC-135. "Removal and Installation"](#).

7. CHECK HEATER PUMP COMMUNICATION LINE FOR OPEN-II

1. Turn power switch OFF.
2. Disconnect heater pump and A/C auto amp. connector.
3. Check continuity between heater pump harness connector and A/C auto amp. harness connector.

Heater pump		A/C auto amp.		Continuity
Connector	Terminal	Connector	Terminal	
E8	4	M50	17	Existed

Is the inspection result normal?

- YES >> GO TO 8.
 NO >> Repair harness or connector.

8. CHECK HEATER PUMP COMMUNICATION LINE FOR SHORT-II

Check continuity between heater pump harness connector and ground.

HEATER PUMP

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

Heater pump		-	Continuity
Connector	Terminal		
E8	4	Ground	Not existed

Is the inspection result normal?

- YES >> GO TO 9.
 NO >> Repair harness or connector.

9. CHECK A/C AUTO AMP. INPUT SIGNAL-II

1. Connect heater pump and A/C auto amp. connector.
2. Turn power switch ON.
3. Check signal between A/C auto amp. harness connector and ground with oscilloscope.

Connector	A/C auto amp.		Condition	Condition (Reference value)
	+	-		
		Terminal		
M50	17	10	<ul style="list-style-type: none"> • Power switch ON • Set temperature: Full hot 	

Is the inspection result normal?

- YES >> GO TO 10.
 NO >> Replace heater pump. Refer to [HA-74, "Removal and Installation"](#).

10. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-51, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace A/C control (A/C auto amp.). Refer to [HAC-135, "Removal and Installation"](#).
 NO >> Repair or replace malfunctioning parts.

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ELECTRIC COMPRESSOR INSULATION RESISTANCE CHECK

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

ELECTRIC COMPRESSOR INSULATION RESISTANCE CHECK

Component Inspection

INFOID:000000007631770

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).

Check voltage in high voltage circuit. (Check that condenser are discharged.)

1. Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).
2. Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
3. Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

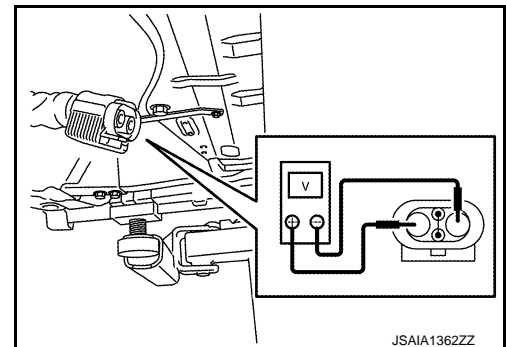


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500V or higher.



>> GO TO 2.

2. CHECK ELECTRIC COMPRESSOR INSULATION RESISTANCE

1. Disconnect high voltage harness connector from electric compressor.

ELECTRIC COMPRESSOR INSULATION RESISTANCE CHECK

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

2. Check the insulation resistance of the electric compressor with an insulation resistance tester.

CAUTION:

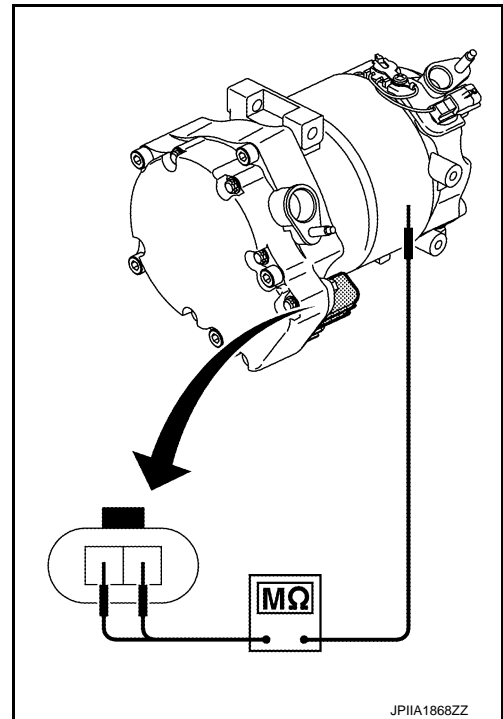
- Unlike the ordinary tester, the insulation resistance tester applies 500V when measuring. If used incorrectly, there is the danger of electric shock. If used in the vehicle 12V system, there is the danger of damage to electronic devices. Read the insulation resistance tester instruction manual carefully and be sure to work safely.
- Use 500V range of insulation resistance tester to measure insulation resistance. Wait for 30 seconds until the value becomes stable.

+	-	Resistance
Electric compressor	Aluminum part on side of electric compressor	1 MΩ or more
Terminal		
7		
8		

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric compressor. Refer to [HA-46. "Removal and Installation"](#).



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PTC ELEMENTS HEATER INSULATION RESISTANCE CHECK

< DTC/CIRCUIT DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

PTC ELEMENTS HEATER INSULATION RESISTANCE CHECK

Component Inspection

INFOID:000000007631771

WARNING:

- Because hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents if the high voltage component and vehicle are handled incorrectly. Be sure to follow the correct work procedures when performing inspection and maintenance.
- Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.
- To prevent the removed service plug from being connected by mistake during the procedure, always carry it in your pocket or put it in the tool box.
- Be sure to wear insulating protective equipment consisting of glove, shoes, face shield and glasses before beginning work on the high voltage system.
- Clearly identify the persons responsible for high voltage work and ensure that other persons do not touch the vehicle. When not working, cover high voltage parts with an insulating cover sheet or similar item to prevent other persons from contacting them.
- Refer to [GI-33, "High Voltage Precautions"](#).

CAUTION:

There is the possibility of a malfunction occurring if the vehicle is changed to READY status while the service plug is removed. Therefore do not change the vehicle to READY status unless instructed to do so in the Service Manual.

1. PRECONDITIONING

WARNING:

Disconnect the high voltage. Refer to [GI-31, "How to Disconnect High Voltage"](#).

Check voltage in high voltage circuit. (Check that condenser are discharged.)

1. Lift up the vehicle and remove the Li-ion battery under covers. Refer to [EVB-161, "Exploded View"](#).
2. Disconnect high voltage connector from front side of Li-ion battery. Refer to [EVB-161, "Removal and Installation"](#).
3. Measure voltage between high voltage harness terminals.

DANGER:



Touching high voltage components without using the appropriate protective equipment will cause electrocution.

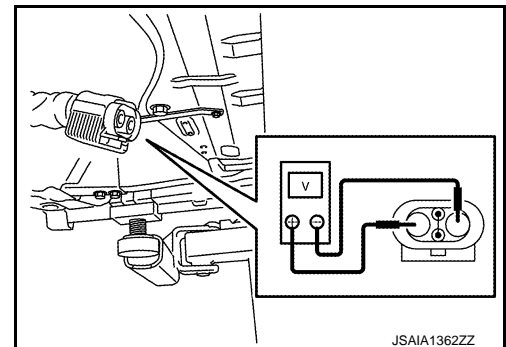


Standard

: 5 V or less

CAUTION:

For voltage measurements, use a tester which can measure to 500V or higher.



JSAIA1362ZZ

>> GO TO 2.

2. CHECK PTC ELEMENTS HEATER INSULATION RESISTANCE

1. Disconnect 12V battery negative terminal. Refer to [HAC-6, "Precautions for Removing Battery Terminal"](#).
2. Disconnect high voltage harness connector from PTC elements heater.

PTC ELEMENTS HEATER INSULATION RESISTANCE CHECK

[AUTOMATIC AIR CONDITIONING]

< DTC/CIRCUIT DIAGNOSIS >

- Check the insulation resistance of the PTC elements heater with an insulation resistance tester.

CAUTION:

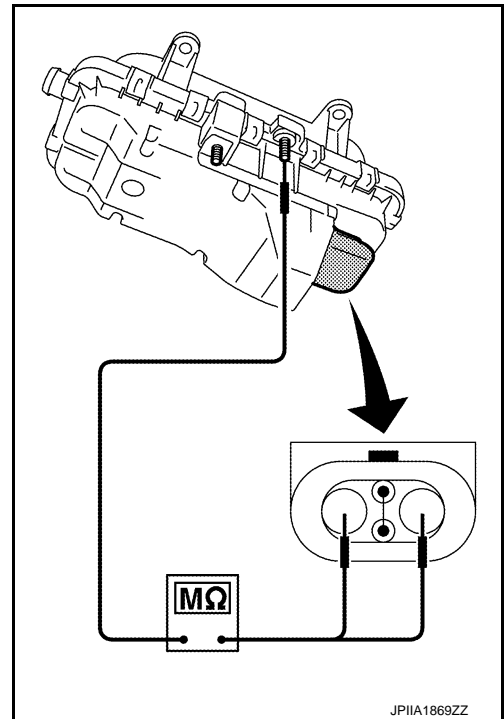
- Unlike the ordinary tester, the insulation resistance tester applies 500V when measuring. If used incorrectly, there is the danger of electric shock. If used in the vehicle 12V system, there is the danger of damage to electronic devices. Read the insulation resistance tester instruction manual carefully and be sure to work safely.
- Use 500V range of insulation resistance tester to measure insulation resistance. Wait for 30 seconds until the value becomes stable.

+	-	Resistance
PTC elements		
Terminal		
7	Bonding wire stud bolt	1 MΩ or more
8		

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace PTC elements heater. Refer to [HA-68](#).
["Removal and Installation"](#).



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HAC

AUTOMATIC AIR CONDITIONING SYSTEM

< SYMPTOM DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

SYMPTOM DIAGNOSIS

AUTOMATIC AIR CONDITIONING SYSTEM

Symptom Table

INFOID:000000007631772

NOTE:

Perform self-diagnoses with CONSULT before performing the symptom diagnosis. If any DTC is detected, perform the corresponding diagnosis.

Symptom	Corresponding malfunction part	Check item/Reference
<ul style="list-style-type: none"> Air conditioning system does not activate. Air conditioning system cannot be controlled. 	<ul style="list-style-type: none"> A/C auto amp. ignition power supply and ground circuit A/C auto amp. 	HAC-117, "A/C AUTO AMP. : Diagnosis Procedure"
Discharge air temperature does not change.	Air mix door motor system installation condition	Check air mix door motor system is properly installed. Refer to HAC-142, "Exploded View" .
Air outlet does not change.	Mode door motor system installation condition	Check mode door motor system is properly installed. Refer to HAC-142, "Exploded View" .
Air inlet does not change.	Intake door motor system installation condition	Check intake door motor system is properly installed. Refer to HAC-142, "Exploded View" .
Blower motor does not operate or operation speed is not normal.	<ul style="list-style-type: none"> Blower motor power supply circuit Blower motor control circuit A/C auto amp. ignition power supply circuit Power transistor power supply and ground circuit Power transistor control signal circuit Blower motor Power transistor A/C auto amp. 	HAC-119, "Diagnosis Procedure"
Compressor does not operate.	<ul style="list-style-type: none"> The circuit between VCM and refrigerant pressure sensor Refrigerant pressure sensor Blower fan ON signal circuit A/C auto amp. 	HAC-134, "Diagnosis Procedure"
<ul style="list-style-type: none"> Insufficient cooling. No cool air comes out. (Air flow volume is normal.) 	<ul style="list-style-type: none"> Cooler cycle Air leakage from each duct A/C auto amp. connection recognition signal circuit Temperature setting trimmer 	HAC-131, "Diagnosis Procedure"
<ul style="list-style-type: none"> Insufficient heating. No warm air comes out. (Air flow volume is normal.) 	<ul style="list-style-type: none"> Heater hose Heater core PTC elements heater Heater pump Air leakage from each duct Temperature setting trimmer A/C auto amp. connection 	HAC-132, "Diagnosis Procedure"
Noise is heard when the A/C system operates.	During compressor operation.	Cooler cycle HA-40, "Symptom Table"
	During blower motor operation.	<ul style="list-style-type: none"> Mixing any foreign object in blower motor Blower motor fan breakage Blower motor rotation inferiority
<ul style="list-style-type: none"> Memory function does not operate normally. The setting is not maintained. (It returns to initial condition.) 	<ul style="list-style-type: none"> A/C auto amp. battery power supply circuit A/C auto amp. 	HAC-117, "A/C AUTO AMP. : Diagnosis Procedure"

INSUFFICIENT COOLING

< SYMPTOM DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

INSUFFICIENT COOLING

Description

INFOID:000000007631773

Symptom

- Insufficient cooling
- No cold air comes out. (Air flow volume is normal.)

Diagnosis Procedure

INFOID:000000007631774

NOTE:

Perform the self-diagnosis with CONSULT before performing the diagnosis by symptom. Perform the diagnosis by DTC if DTC is detected.

1.CHECK ELECTRIC COMPRESSOR OPERATION

Check the electric compressor operation state while the air conditioner system is operated.

Does electric compressor operate?

YES >> GO TO 2.

NO >> Perform diagnosis for "COMPRESSOR DOES NOT OPERATE" in the diagnosis by symptom. Refer to [HAC-134, "Diagnosis Procedure"](#).

2.CHECK REFRIGERANT CYCLE

Connect recovery/recycling/recharging equipment (for HFC-134a) to the vehicle and perform the refrigerant system diagnosis. Refer to [HA-40, "Symptom Table"](#).

Is the check result normal?

YES >> GO TO 3.

NO >> Repair or replace malfunctioning part according to diagnosis result.

3.CHECK FOR AIR LEAKAGE FROM DUCT

Check duct and nozzle, etc. of A/C system for air leakage.

Is the check result normal?

YES >> GO TO 4.

NO >> Repair or replace parts according to the inspection results.

4.CHECK SETTING OF DIFFERENCE BETWEEN SET TEMPERATURE AND CONTROL TEMPERATURE

With CONSULT

1. Using CONSULT, check the setting of "TEMP SET CORRECT" on "WORK SUPPORT" of "HVAC". Refer to [HAC-51, "Temperature Setting Trimmer"](#).
2. Check that the difference between set temperature and control temperature is set to "+ direction".

NOTE:

The control temperature can be set with a setting difference between the set temperature and control temperature.

3. Change the set temperature correction value to "0".

Are the symptoms solved?

YES >> Perform the setting separately if necessary. Inspection End.

NO >> Replace A/C auto amp. Refer to [HAC-135, "Removal and Installation"](#).

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HAC

INSUFFICIENT HEATING**Description**

INFOID:000000007631775

Symptom

- Insufficient heating
- No warm air comes out. (Air flow volume is normal.)

Diagnosis Procedure

INFOID:000000007631776

NOTE:

Perform the self-diagnosis with CONSULT before performing the diagnosis by symptom. Perform the diagnosis by DTC if DTC is detected.

1.CHECK HEATING SYSTEM

1. Check the heater level and check for leakage. Refer to [HA-43, "Inspection"](#).
2. Check the water flow sounds on coolant. Refer to [HA-43, "Draining and Refilling"](#).

Is the check result normal?

- YES >> GO TO 2.
NO >> Refill the heater fluid and repair or replace the parts according to the inspection results.

2.CHECK HEATER PUMP

Check the heater pump operation. Refer to [HAC-123, "Component Function Check"](#).

Is the check result normal?

- YES >> GO TO 3.
NO >> Repair or replace malfunctioning part according to diagnosis result.

3.CHECK HEATER HOSE INSTALLATION CONDITION

Check the heater hose installation condition visually (for twist, crush, etc.).

Is the check result normal?

- YES >> GO TO 4.
NO >> Repair or replace malfunctioning part according to diagnosis result.

4.CHECK HEATER CORE

1. Check the temperature of inlet hose and outlet hose of heater core.
2. Check that the inlet side of heater core is hot and the outlet side is slightly lower than/almost equal to the inlet side.

CAUTION:

The temperature inspection should be performed after a short time because the engine coolant temperature is too hot.

Is the check result normal?

- YES >> GO TO 5.
NO >> Replace the heater core.

5.CHECK FOR AIR LEAKAGE FROM DUCT

Check duct and nozzle, etc. of A/C system for air leakage.

Is the check result normal?

- YES >> GO TO 6.
NO >> Repair or replace malfunctioning part according to diagnosis result.

6.CHECK SETTING OF DIFFERENCE BETWEEN SET TEMPERATURE AND CONTROL TEMPERATURE**Ⓜ** With CONSULT

1. Using CONSULT, check the setting of "TEMP SET CORRECT" on "WORK SUPPORT" of "HVAC". Refer to [HAC-51, "Temperature Setting Trimmer"](#).
2. Check that the difference between set temperature and control temperature is set to "– direction".

NOTE:

The control temperature can be set with a setting difference between the set temperature and control temperature.

INSUFFICIENT HEATING

< SYMPTOM DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

3. Change the set temperature correction value to "0".

Are the symptoms solved?

YES >> Perform the setting separately if necessary. Inspection End.

NO >> Replace A/C auto amp. Refer to [HAC-135. "Removal and Installation"](#).

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HAC

COMPRESSOR DOES NOT OPERATE

< SYMPTOM DIAGNOSIS >

[AUTOMATIC AIR CONDITIONING]

COMPRESSOR DOES NOT OPERATE

Description

INFOID:000000007631777

SYMPTOM

Compressor does not operate.

Diagnosis Procedure

INFOID:000000007631778

NOTE:

- Perform self-diagnoses with CONSULT before performing symptom diagnosis. If any DTC is detected, perform the corresponding diagnosis.
- Check that refrigerant is enclosed in cooler cycle normally. If refrigerant amount is shortage from proper amount, perform the inspection of refrigerant leakage.

1. CHECK REFRIGERANT PRESSURE SENSOR

Check refrigerant pressure sensor. Refer to [EVC-316, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning parts.

2. CHECK A/C AUTO AMP. INPUT SIGNAL

 With CONSULT

1. Select "DATA MONITOR" mode of "HVAC" using CONSULT.
2. Select "FORCED Off SIGNAL", and check status under the following conditions.

Monitor item	Condition		Status
FORCED Off SIGNAL	Power switch ON	A/C switch ON (A/C compressor activate)	Normal condition: OFF Except above: ON

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Check for the VCM. Refer to [EVC-46, "AIR CONDITIONER CONTROL : System Description"](#).

3. CHECK A/C AUTO AMP. OUTPUT SIGNAL

 With CONSULT

1. Set the vehicle to READY.
2. Using CONSULT, perform "HVAC TEST" on "ACTIVE TEST" of "HVAC". Refer to [HAC-32, "CONSULT Function"](#).
3. Check the electric compressor operations in each mode.

Is the inspection result normal?

- YES >> Replace A/C auto amp.
NO >> Replace electric compressor.

REMOVAL AND INSTALLATION


A/C CONTROL (A/C AUTO AMP.)

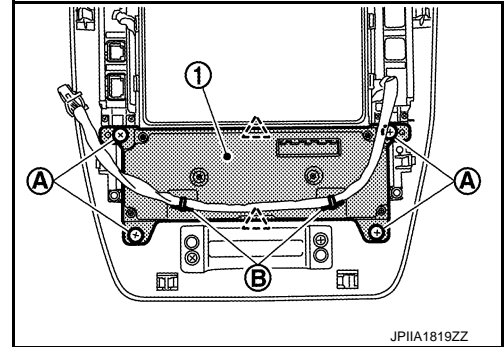
Removal and Installation

INFOID:000000007631779

REMOVAL

1. Remove cluster lid C. Refer to [IP-14. "Removal and Installation"](#).
2. Remove fixing screws (A) and harness clips (B).
3. Disengage fixing pawls, and then remove A/C control (1) from cluster lid C.

 : Pawl



INSTALLATION

Install in the reverse order of removal.

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AMBIENT SENSOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]


AMBIENT SENSOR

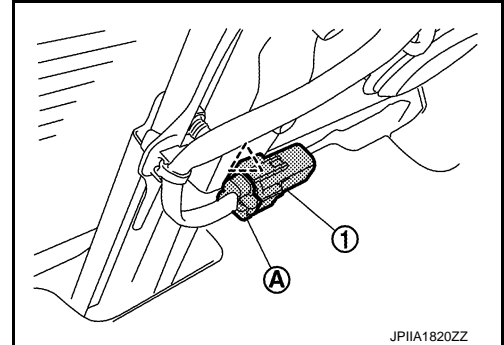
Removal and Installation

INFOID:000000007631780

REMOVAL

1. Remove front under cover. Refer to [EXT-23, "FRONT UNDER COVER : Removal and Installation"](#).
2. Disconnect ambient sensor connector (A).
3. Disengage fixing pawl, and then remove ambient sensor (1) from the vehicle.

 : Pawl



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INSTALLATION

Install in the reverse order of removal.

IN-VEHICLE SENSOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

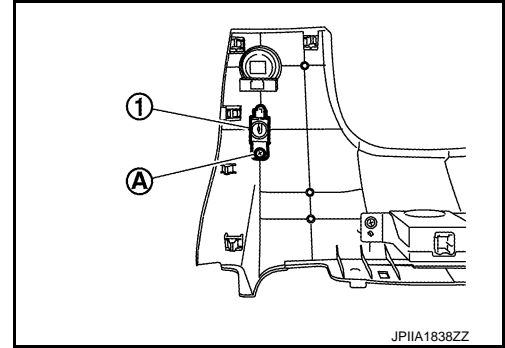
IN-VEHICLE SENSOR

Removal and Installation

INFOID:000000007631781

REMOVAL

1. Remove instrument lower panel LH. Refer to [IP-14, "Removal and Installation"](#).
2. Remove fixing screw (A), and then remove in-vehicle sensor (1) from instrument lower panel.



INSTALLATION

Install in the reverse order of removal.

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SUNLOAD SENSOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]


SUNLOAD SENSOR

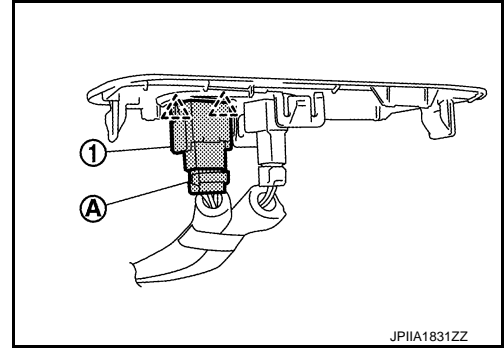
Removal and Installation

INFOID:000000007631782

REMOVAL

1. Remove switch panel. Refer to [IP-14, "Removal and Installation"](#).
2. Disconnect sunload sensor connector (A).
3. Disengage fixing pawls, and then remove sunload sensor (1) from switch panel.

 : Pawl



INSTALLATION

Install in the reverse order of removal.

INTAKE SENSOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

INTAKE SENSOR

Exploded View

INFOID:000000007631783

Refer to [HA-60, "Exploded View"](#).

Removal and Installation

INFOID:000000007631784

REMOVAL

1. Remove evaporator assembly. Refer to [HA-64, "EVAPORATOR : Removal and Installation"](#).
2. Remove intake sensor from evaporator.

INSTALLATION

Note the following items, and then install in the order of removal.

CAUTION:

- Mark the mounting position of intake sensor bracket prior to removal so that the reinstalled sensor can be located in the same position.
- When removing or installing the intake sensor, be sure not to rotate the bracket insertion part. Failure to do this may cause damage to the evaporator.

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REFRIGERANT PRESSURE SENSOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

REFRIGERANT PRESSURE SENSOR

Exploded View

INFOID:000000007631785

Refer to [HA-56. "Exploded View"](#).

Removal and Installation

INFOID:000000007631786

Refer to [HA-59. "REFRIGERANT PRESSURE SENSOR : Removal and Installation"](#).

POWER TRANSISTOR

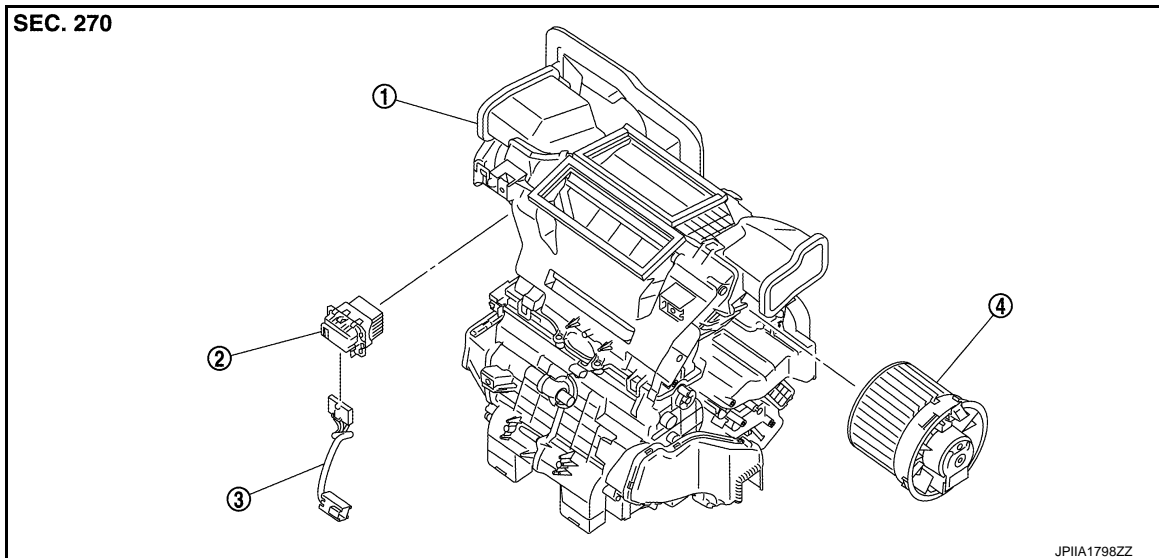
< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

POWER TRANSISTOR

Exploded View

INFOID:000000007631787



1. A/C unit assembly

2. Power transistor

3. Sub harness

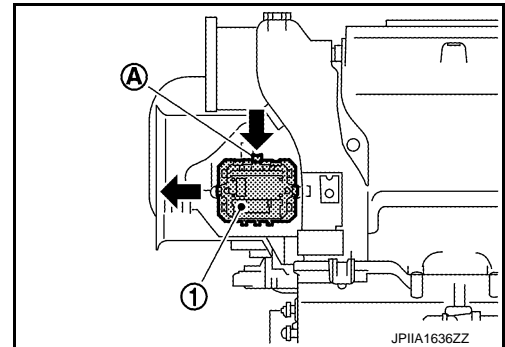
4. Blower motor

Removal and Installation

INFOID:000000007631788

REMOVAL

1. Remove instrument panel assembly. Refer to [IP-14, "Removal and Installation"](#).
2. Disconnect power transistor connector.
3. Slide power transistor (1) to the left while pressing lever (A), and then remove power transistor.



INSTALLATION

Install in the reverse order of removal.

DOOR MOTOR

< REMOVAL AND INSTALLATION >

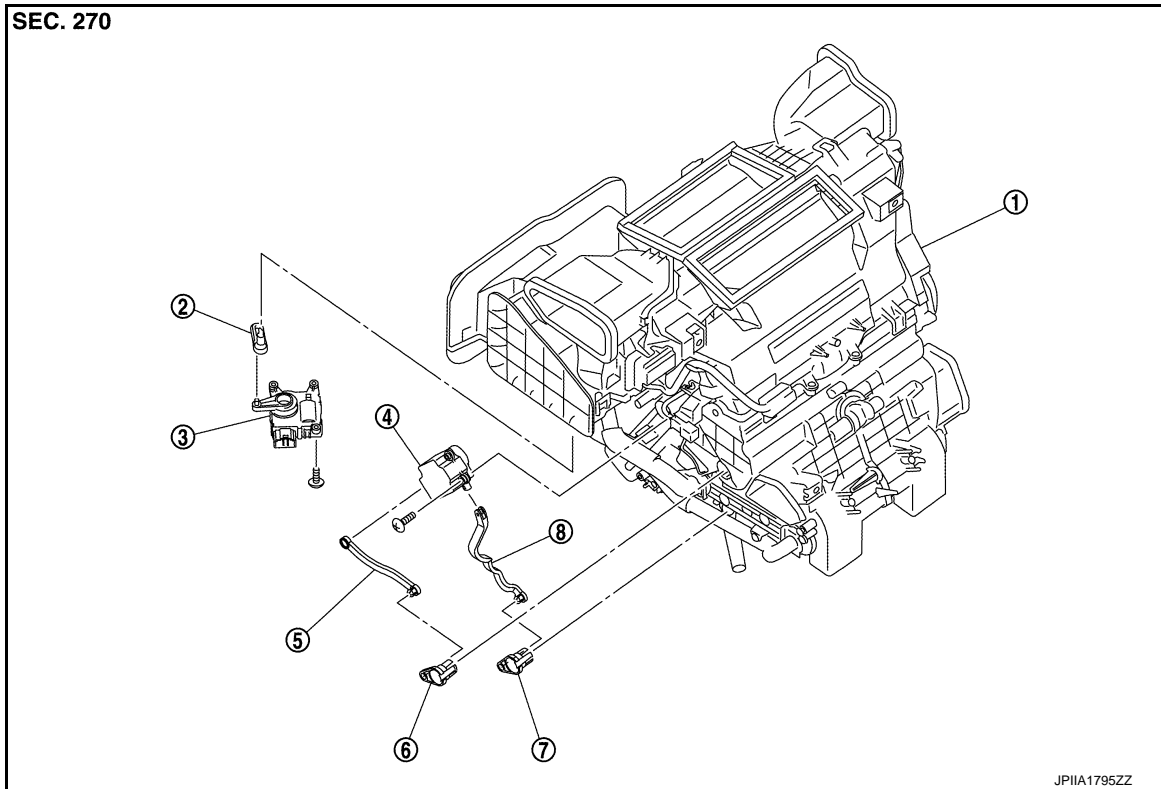
[AUTOMATIC AIR CONDITIONING]

DOOR MOTOR

Exploded View

INFOID:000000007631789

LEFT SIDE



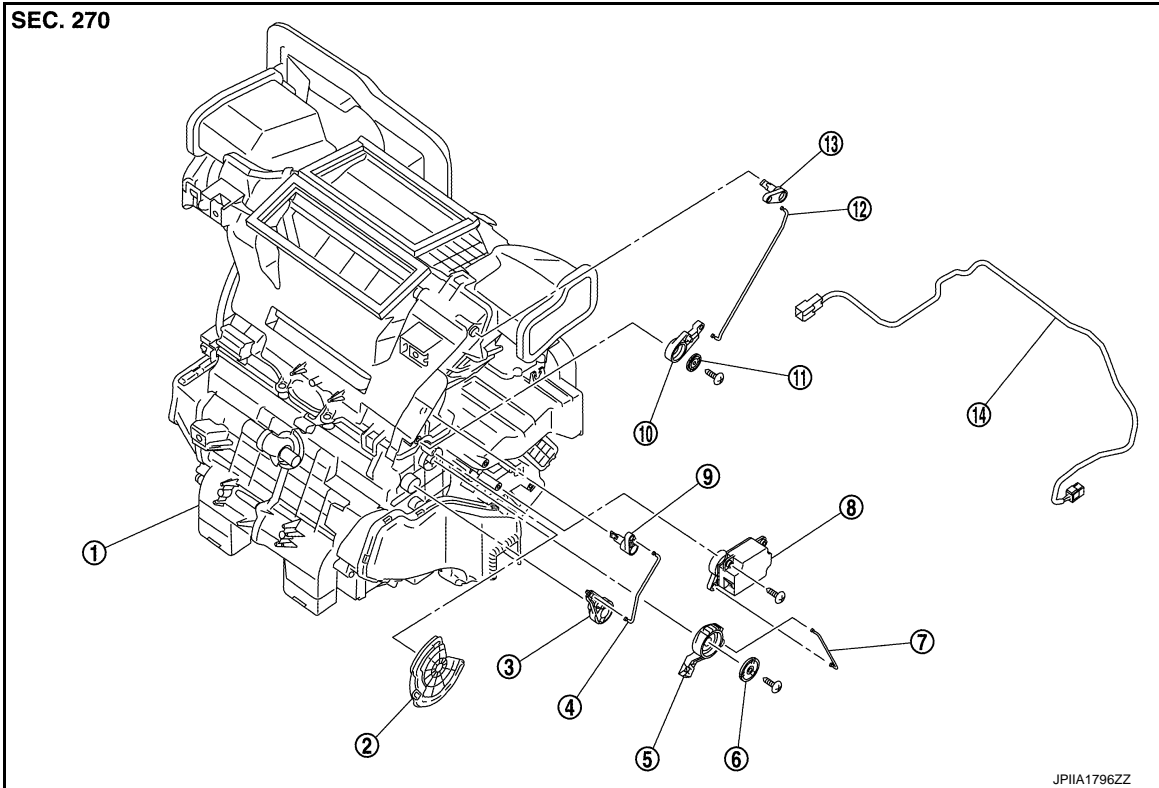
- | | | |
|-----------------------------|---------------------------|-----------------------------|
| 1. A/C unit assembly | 2. Intake door lever | 3. Intake door motor |
| 4. Air mix door motor | 5. Upper air mix door rod | 6. Upper air mix door lever |
| 7. Lower air mix door lever | 8. Lower air mix door rod | |

RIGHT SIDE

DOOR MOTOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]



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| 1. A/C unit assembly | 2. Main link | 3. Sub defroster door link |
| 4. Sub defroster door rod | 5. Mode link | 6. Plate |
| 7. Mode link rod | 8. Mode door motor | 9. Sub defroster door lever |
| 10. Center ventilator and defroster door link | 11. Plate | 12. Center ventilator and defroster door rod |
| 13. Center ventilator and defroster door lever | 14. Sub harness | |

HAC

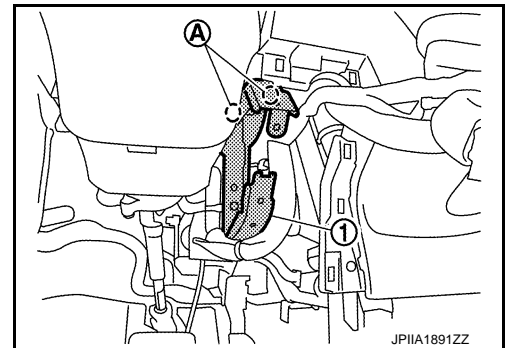
INTAKE DOOR MOTOR

INTAKE DOOR MOTOR : Removal and Installation

INFOID:000000007631790

REMOVAL

1. Remove instrument lower panel LH. Refer to [IP-14, "Removal and Installation"](#).
2. Remove knee protector.
3. Remove mounting nuts (A), and then remove knee protector bracket (1).



4. Remove brake pedal assembly. Refer to [BR-248, "Removal and Installation"](#).
5. Disconnect intake door motor connector.

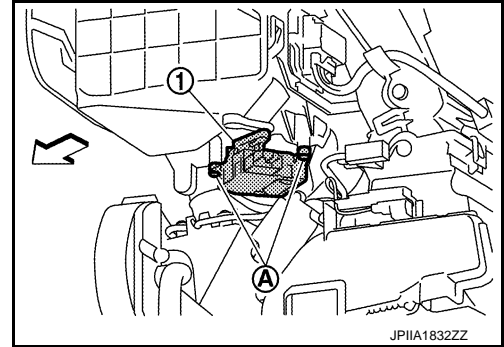
DOOR MOTOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

6. Remove fixing screws (A), and then remove intake door motor (1) from A/C unit assembly.

↶ : Vehicle front



INSTALLATION

Install in the reverse order of removal.

MODE DOOR MOTOR

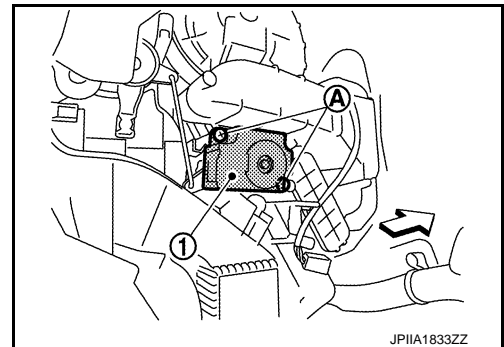
MODE DOOR MOTOR : Removal and Installation

INFOID:000000007631791

REMOVAL

1. Remove glove box cover assembly Refer to [IP-14, "Removal and Installation"](#).
2. Disconnect mode door motor connector.
3. Remove fixing screws (A), and then remove mode door motor (1) from A/C unit assembly.

↶ : Vehicle front



INSTALLATION

Note the following item, and then install in the order of removal.

CAUTION:

After installing door motor, perform door motor starting position. Refer to [HAC-54, "Work Procedure"](#).

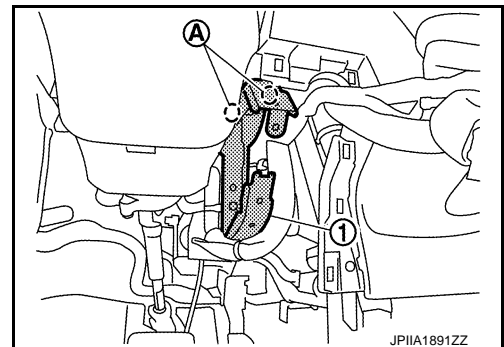
AIR MIX DOOR MOTOR

AIR MIX DOOR MOTOR : Removal and Installation

INFOID:000000007631792

REMOVAL

1. Remove instrument lower panel LH. Refer to [IP-14, "Removal and Installation"](#).
2. Remove knee protector.
3. Remove mounting nuts (A), and then remove knee protector bracket (1).



4. Remove brake pedal assembly. Refer to [BR-248, "Removal and Installation"](#).

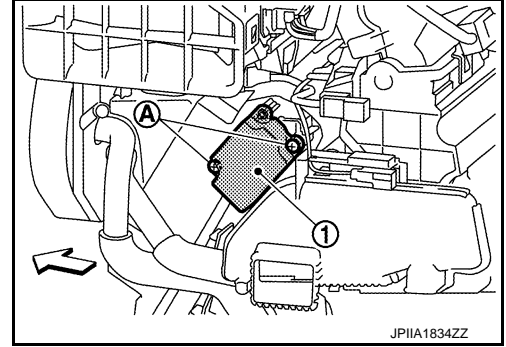
DOOR MOTOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

5. Disconnect air mix door motor connector.
6. Remove fixing screws (A), and then remove air mix door motor (1) from A/C unit assembly.

← : Vehicle front



INSTALLATION

Note the following item, and then install in the order of removal.

CAUTION:

After installing door motor, perform door motor starting position. Refer to [HAC-54, "Work Procedure"](#).

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HEATER FLUID TEMPERATURE SENSOR

< REMOVAL AND INSTALLATION >

[AUTOMATIC AIR CONDITIONING]

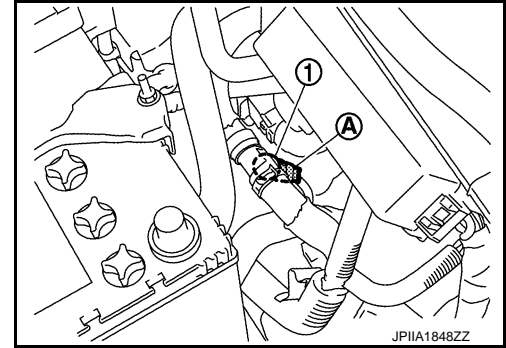
HEATER FLUID TEMPERATURE SENSOR

Removal and Installation

INFOID:000000007631793

REMOVAL

1. Drain out heater fluid. Refer to [HA-43. "Draining and Refilling"](#).
2. Disconnect heater fluid temperature sensor connector (A).
3. Disconnect heater hose, and then remove heater fluid temperature sensor adapter (1).



INSTALLATION

Note the following item, and then install in the reverse order of removal.

NOTE:

When adding heater fluid. Refer to [HA-43. "Draining and Refilling"](#).