

General Information

HA-3

General Information

Air condition

Item		Specification	
		3.8	4.6
Compressor	Type	10PA17	
	Oil type & Capacity	Front only	PAG 200± 15CC
		Front & Rear	PAG 200± 15CC
	Pulley type	7PK-TYPE	
	Displacement	178cc/rev	
Condenser	Heat rejection	15,000 - 5% kcal/hr	
A/C Pressure transducer	The method to measure the pressure	Voltage= 0.00878835 * Pressure (psig) + 0.5	
Expansion valve	Type	Block type	
Refrigerant	Type	R-134a	
	Capacity [oz.(g)]	Front only	600±25
		Front & Rear	700±25

Blower unit

Item		Specification
Fresh and recirculation	Operating method	Actuator
Blower	Type	Sirocco
	Speed step	Auto + 8 speed (Automatic), 1~8speed (Manual)
	Speed control	Power mosfet
Air filter	Type	Particle filter

Heater and evaporator unit

Item		Specification
Heater	Type	Pin & Tube type
	Heating capacity	4,700 - 5% kcal/hr
	Mode operating method	Actuator
	Temperature operating method	Actuator
Evaporator	Temperature control type	Evaporator temperature sensor
	A/C ON/OFF [°C(°F)]	ON : 2.1 ± 0.3 (34.7 ± 32.5), OFF: 1.0 ± 0.3 (33.8 ± 32.5)

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Heating, Ventilation, Air Conditioning

Problem symptoms table

Before replacing or repairing air conditioning components, first determine if the malfunction is due to the refrigerant charge, air flow or compressor.

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

After correcting the malfunction, check the complete system to ensure that performance is satisfactory.

STANDARD:

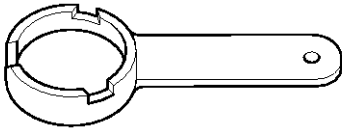
Symptom	Suspect Area
No blower operation	1. Blower fuse 2. Blower relay 3. Blower motor 4. Power mosfet 5. Blower speed control switch 6. Wire harness
No air temperature control	1. Engine coolant capacity 2. Heater control assembly
No compressor operation	1. Refrigerant capacity 2. A/C Fuse 3. Magnetic clutch 4. Compressor 5. Dual pressure switch 6. A/C switch 7. Evaporator temperature sensor 8. Wire harness
No cool comes out	1. Refrigerant capacity 2. Refrigerant pressure 3. Drive belt 4. Magnetic clutch 5. Compressor 6. Dual pressure switch 7. Evaporator temperature sensor 8. A/C switch 9. Heater control assembly 10. Wire harness
Insufficient cooling	1. Refrigerant capacity 2. Drive belt 3. Magnetic clutch 4. Compressor 5. Condenser 6. Expansion valve 7. Evaporator 8. Refrigerant lines 9. Triple pressure switch 10. Heater control assembly
No engine idle-up when A/C switch ON	1. Engine ECM 2. Wire harness

General Information

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Symptom	Suspect Area
No air inlet control	1. Heater control assembly
No mode control	1.Heater control assembly 2.Mode actuator
No cooling fan operation	1.Cooling fan fuse 2.Fan motor 3.Engine ECM 4.Wire harness

Special tools

Tool (Number and name)	Illustration	Use
09977-29000 Disc & hub assembly bolt remover	 EQA9002A	Removal and installation of disc & hub assembly

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Heating, Ventilation, Air Conditioning

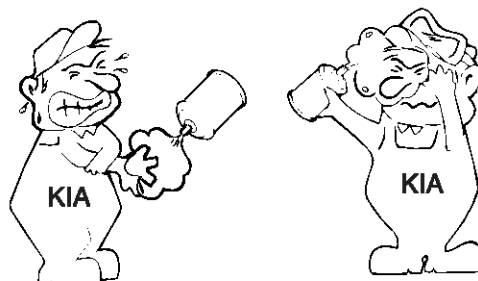
Air conditioning System

Instructions

When handling refrigerant

1. R-134a liquid refrigerant is highly volatile. A drop on the skin of your hand could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands. If the refrigerant splashes into your eyes, wash them with clean water immediately.
3. The R-134a container is highly pressurized. Never leave it in a hot place, and check that the storage temperature is below 52°C (126°F)
4. An electronic leak detector should be used to check the system for refrigerant leakage. Bear in mind that the R-134a, upon coming into contact with flame, produces phosgene, a highly toxic gas.
5. Use only recommended the lubricant for R-134a systems. If lubricants other than the recommended one used, system failure may occur.
6. PAG lubricant absorbs moisture from the atmosphere at a rapid rate, therefore the following precautions must be observed:
 - When removing refrigerant components from a vehicle, cap immediately the components to prevent from the entry of moisture.
 - When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
 - Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from taking on moisture.
 - Use the recommended lubricant from a sealed container only.

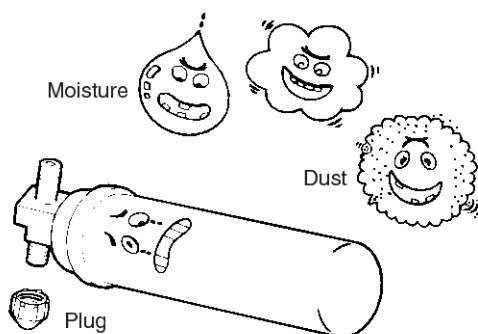
7. If an accidental discharge in the system occurs, ventilate the work area before resuming service.



LQAC003A

When replacing parts ON A/C system

1. Never open or loosen a connection before discharging the system.
2. Seal the open fittings of components with a cap or plug immediately to prevent intrusion of moisture or dust.
3. Do not remove the sealing caps from a Replacement component until it is ready to be installed.
4. Before connecting an open fitting, always install a new sealing ring. Coat the fitting and seal with refrigerant oil before making the connection.



LQAC003B

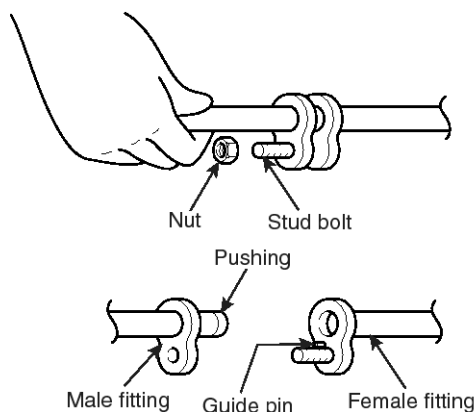
Air conditioning System

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When installing connecting parts

Flange with guide pin

Check the new O-ring for damage (use only the specified) and lubricate it using compressor oil. Tighten the nut to specified torque.



LQAC003C

Size	Tightening torque [N.m (kg.m, lbf.ft)]	
	General bolt, nut	
	4T	7T
M6	5 - 6(0.5 - 0.6, 3.6 - 4.3)	9 - 11(0.9 - 1.1, 6.5 - 7.9)
M8	12 - 14(1.2 - 1.4, 8.7 - 10)	20 - 26(2.0 - 2.6, 14 - 18)
M10	25 - 28(2.5 - 2.8, 18 - 20)	45 - 55(4.5 - 5.5, 32 - 39)
Size	Flange bolt, nut	
	4T	7T
	4T	7T
M6	5 - 7(0.5 - 0.7, 3.6 - 5.0)	8 - 12(0.8 - 1.2, 5.8 - 8.6)
M8	10 - 15(1.0 - 1.5, 7 - 10)	19 - 28(1.9 - 2.8, 14 - 20)
M10	21 - 31(2.1 - 3.1, 15 - 22)	39 - 60(3.9 - 6.0, 28 - 43)

NOTICE

T means tensile intensity, which is stamped on the head of bolt only numeral.

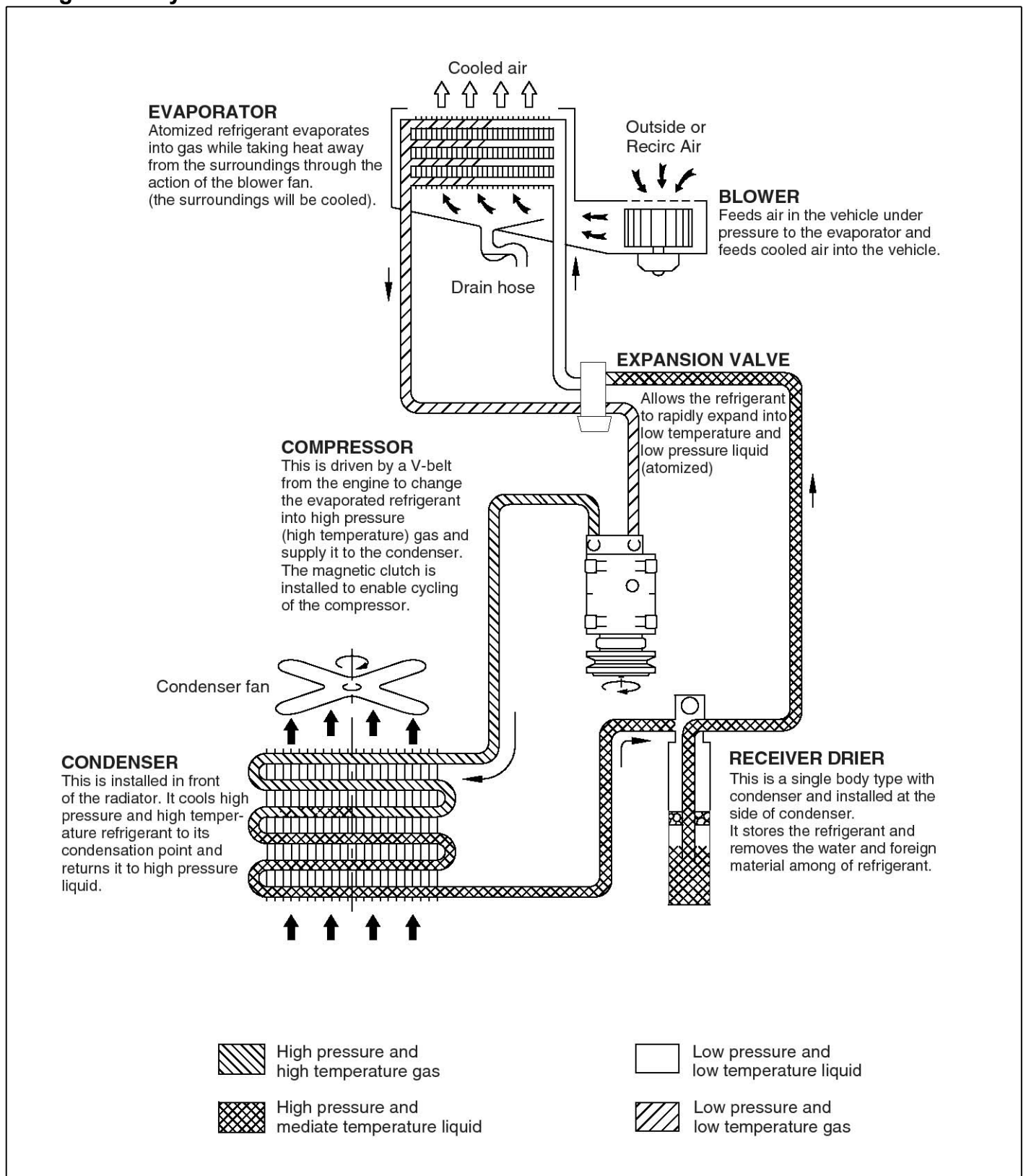
Handling tubing and Fittings

The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure moisture-free refrigerant and refrigerant oil are used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause problems or serious damage.

The following precautions must be observed

1. When it is necessary to open the refrigeration system, have everything you will need to service the system ready so the system will not be left open any longer than necessary.
2. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture.
3. All lines and components in parts stock should be capped or sealed until they are ready to be used.
4. Never attempt to rebind formed lines to fit. Use the correct line for the installation you are servicing.
5. All tools, including the refrigerant dispensing manifold, the gauge set manifold and test hoses, should be kept clean and dry.

Refrigeration cycle



EQR004A

Air conditioning System

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Refrigerant system service basics

Refrigerant recovery

Use only service equipment that is U.L.-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

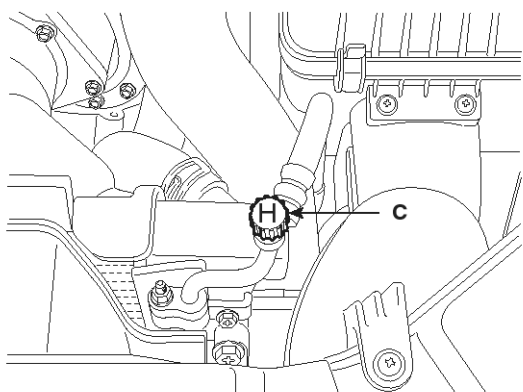
⚠ CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

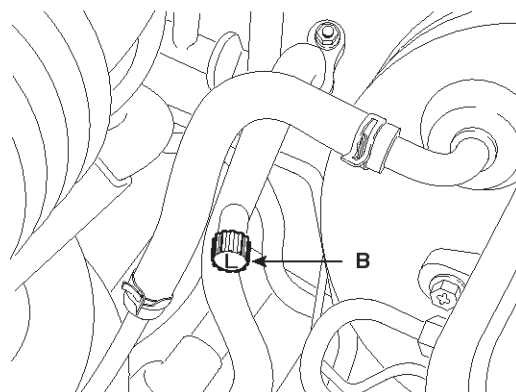
If accidental system discharge occurs, ventilate work area before resuming service.

Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

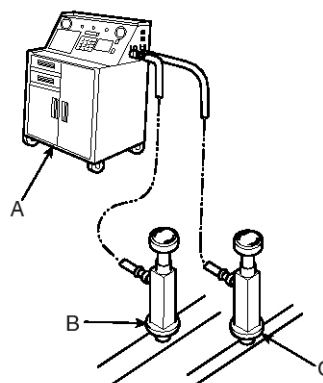
1. Connect an R-134a refrigerant Recovery/Recycling/Charging System (A) to the high-pressure service port (B) and the low-pressure service port (C) as shown, following the equipment manufacturer's instructions.



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2. Measure the amount of refrigerant oil removed from the A/C system after the recovery process is completed. Be sure to install the same amount of new refrigerant oil back into the A/C system before charging.

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Heating, Ventilation, Air Conditioning

System evacuation

Use only service equipment that is U.L.-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

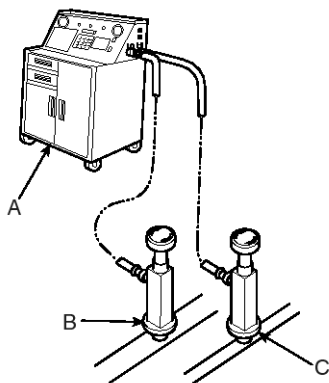
⚠CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resuming service.

Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

1. When an A/C System has been opened to the atmosphere, such as during installation or repair, it must be evacuated using an R-134a refrigerant Recovery/Recycling/Charging System. (If the system has been open for several days, the receiver/dryer should be replaced, and the system should be evacuated for several hours.)
2. Connect an R-134a refrigerant Recovery/Recycling/Charging System (A) to the high-pressure service port (B) and the low-pressure service port (C) as shown, following the equipment manufacturer's instructions.



EQKE004A

3. If the low-pressure does not reach more than 93.3 kPa (700 mmHg, 27.6 in.Hg) in 10 minutes, there is probably a leak in the system. Partially charge the system, and check for leaks (see Leak Test.).
4. Remove the low pressure valve from the low-pressure service port.

System evacuation

Use only service equipment that is U.L.-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

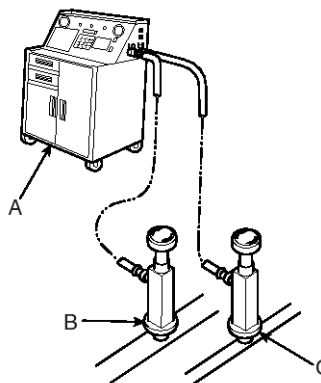
⚠CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resuming service.

Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

1. When an A/C System has been opened to the atmosphere, such as during installation or repair, it must be evacuated using an R-134a refrigerant Recovery/Recycling/Charging System. (If the system has been open for several days, the receiver/dryer should be replaced, and the system should be evacuated for several hours.)
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EQKE004A

3. If the low-pressure does not reach more than 93.3 kPa (700 mmHg, 27.6 in.Hg) in 10 minutes, there is probably a leak in the system. Partially charge the system, and check for leaks (see Leak Test.).
4. Remove the low pressure valve from the low-pressure service port.

Air conditioning System

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System charging

Use only service equipment that is U.L.-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

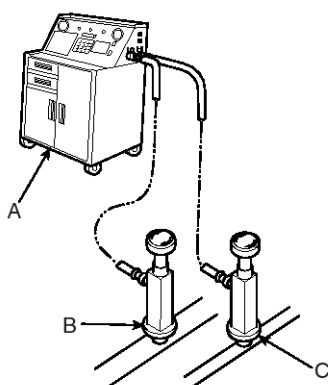
⚠CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resuming service.

Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

1. Connect an R-134a refrigerant Recovery/Recycling/Charging System (A) to the high-pressure service port (B) as shown, following the equipment manufacturer's instructions.



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2. Add the same amount of new refrigerant oil to system that was removed during recovery. Use only specified refrigerant oil. Charge the system with 18.0 ± 0.88 oz. (510 ± 25 g) of R-134a refrigerant. Do not overcharge the system the compressor will be damaged.

Refrigerant leak test

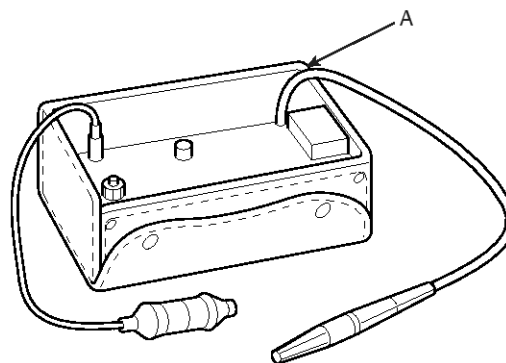
Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

📖NOTICE

In order to use the leak detector properly, read the manual supplied by the manufacturer.

If a gas leak is detected, proceed as follows:

1. Check the torque on the connection fittings and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector (A).
2. If leakage continues even after the fitting has been tightened, discharge the refrigerant from the system, disconnect the fittings, and check their seating faces for damage. Always replace, even if the damage is slight.
3. Check the compressor oil and add oil if required.
3. Charge the system and recheck for gas leaks. If no leaks are found, evacuate and charge the system again.

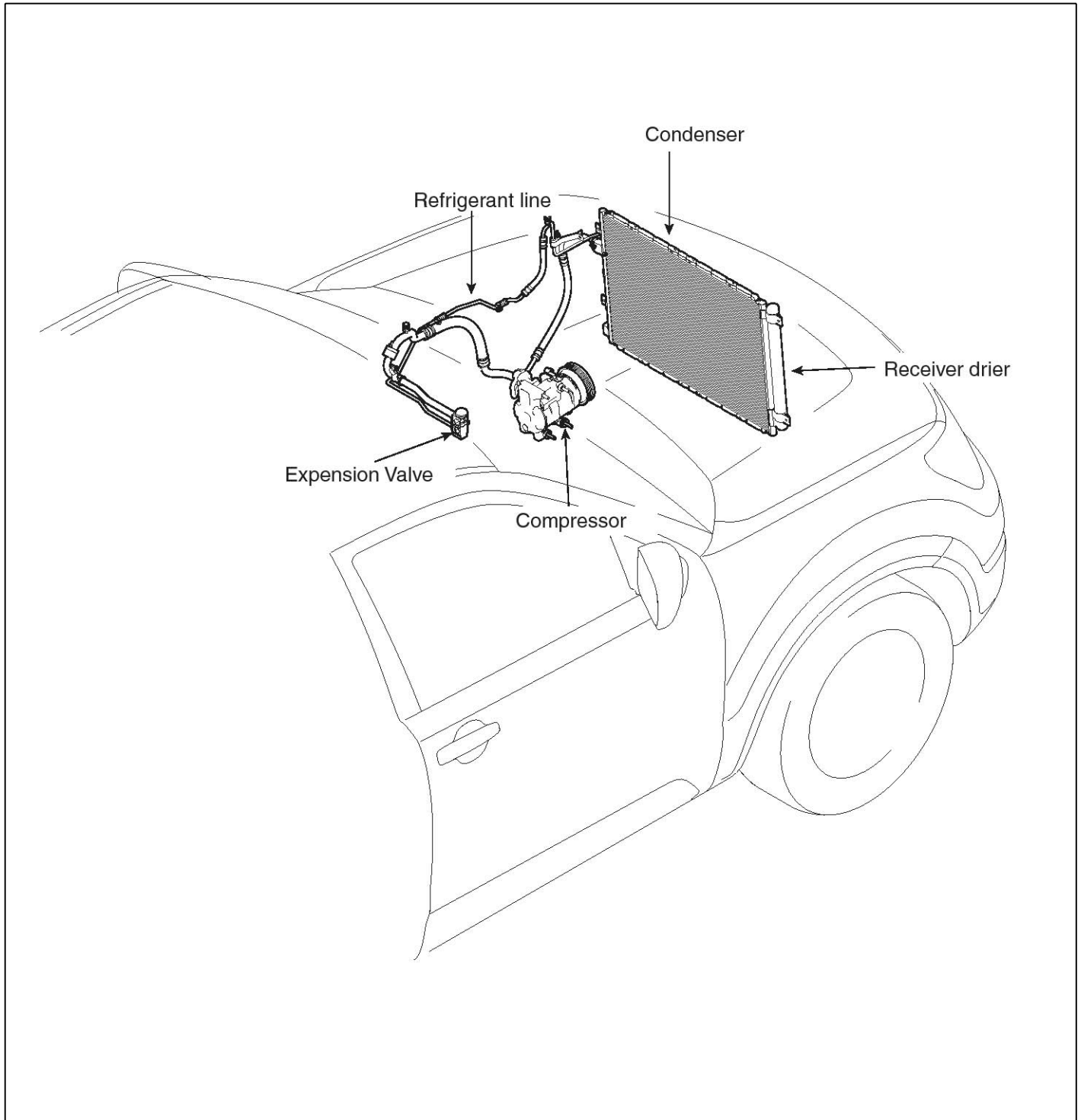


EQKE007A

HA-12

Heating, Ventilation, Air Conditioning

Component location index
Engine room

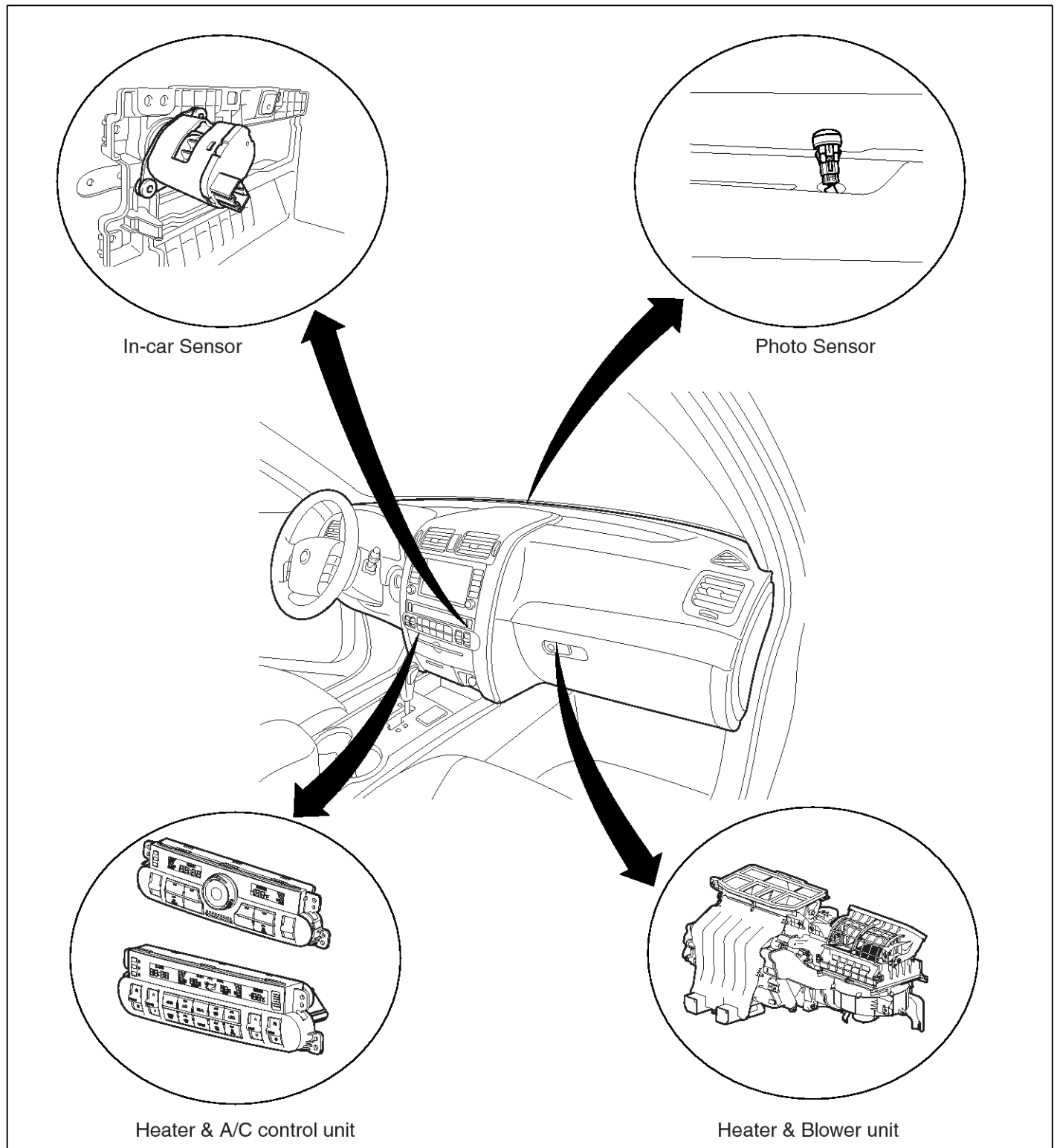


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Air conditioning System

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Interior



SHMHA7004L

HA-14

Heating, Ventilation, Air Conditioning

Compressor oil

Oil Specification

1. The HFC-134a system requires synthetic (PAG) compressor oil whereas the R-12 system requires mineral compressor oil. The two oils must never be mixed.
2. Compressor (PAG) oil varies according to compressor model. Be sure to use oil specified for the model of compressor.

Handling of Oil

1. The oil should be free from moisture, dust, metal powder, etc.
2. Do not mix with other oil.
3. The water content in the oil increases when exposed to the air. After use, seal oil from air immediately. (HFC-134a Compressor Oil absorbs moisture very easily.)
4. The compressor oil must be stored in steel containers, not in plastic containers.

Compressor oil check

The oil used to lubricate the compressor is circulating with the refrigerant.

Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

Oil total volume in system:

Front only : 150 ± 10

Front & Rear : 210 ± 10

Oil Return Operation

There is close affinity between the oil and the refrigerant.

During normal operation, part of the oil recirculates with the refrigerant in the system. When checking the amount of oil in the system, or replacing any component of the system, the compressor must be run in advance for oil return operation. The procedure is as follows:

1. Open all the doors and the engine hood.
2. Start the engine and air conditioning switch to "ON" and set the blower motor control knob at its highest position.
3. Run the compressor for more than 20 minutes between 800 and 1,000 rpm in order to operate the system.

4. Stop the engine.

Replacement of Component Parts

When replacing the system component parts, supply the following amount of oil to the component parts to be installed.

Component parts to be installed	Amount of Oil
Evaporator	50 cc (1.70 fl.oz)
Condenser	30 cc (1.02 fl.oz)
Receiver/dryer	30 cc (1.02 fl.oz)
Refrigerant line (One piece)	10 cc (0.34 fl.oz)

For compressor Replacement, subtract the volume of oil drained from the removed compressor from the specified volume, and drain the calculated volume of oil from the new compressor:

The specified volume - volume of removed compressor = volume to drain from the new compressor.

NOTICE

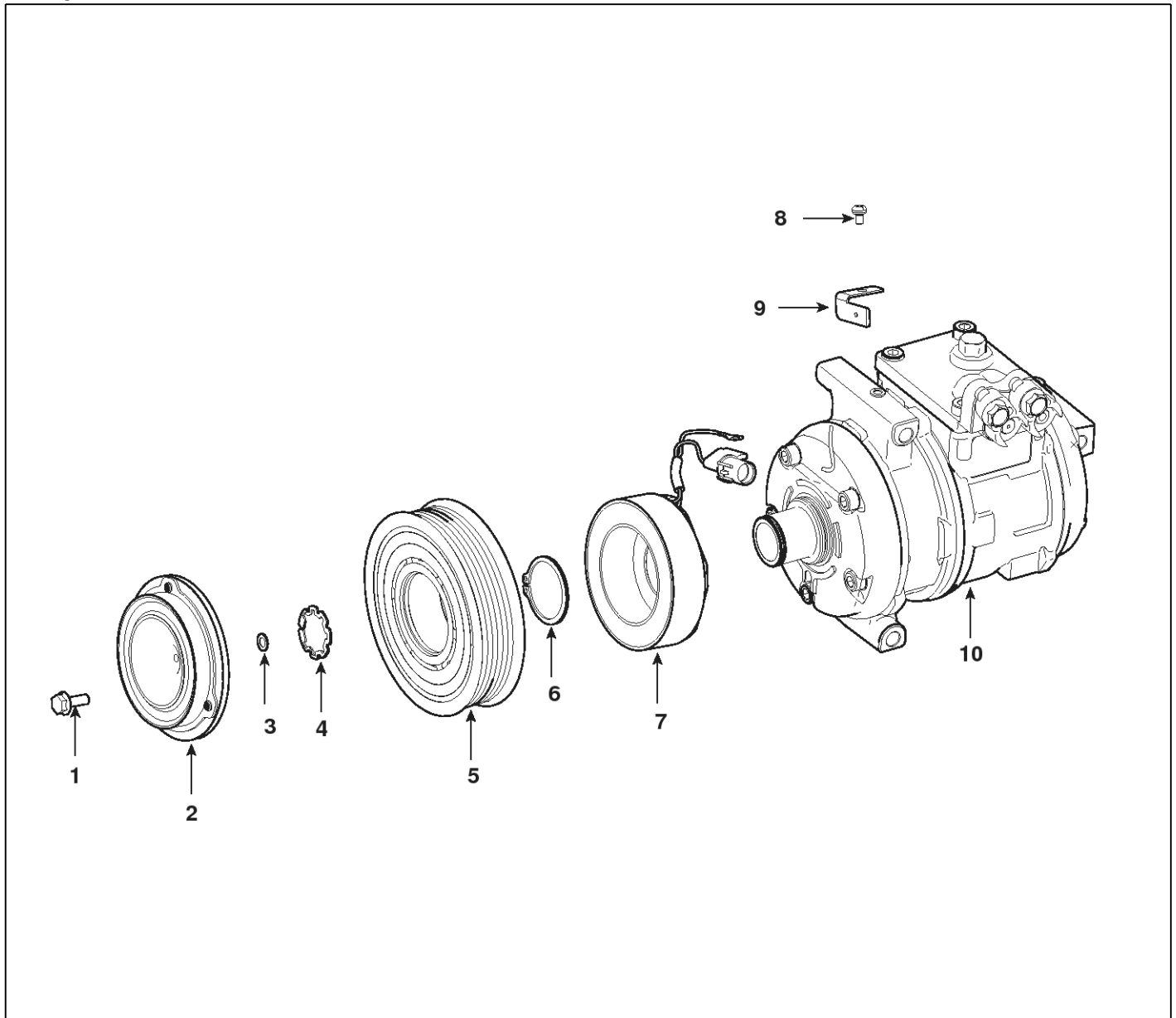
Even if no oil is drained from the removed compressor, don't drain more than 50cc from new compressor.

Air conditioning System

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Compressor

Components



SHMHA7007D

1. Bolt
2. Disc & Hub assembly
3. Shim (Gap washer)
4. Retainer ring (pulley)
5. Pulley

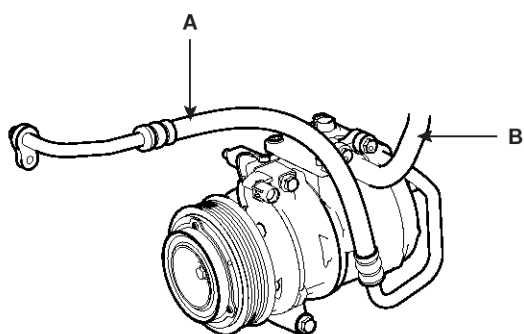
6. Retainer ring (Field coil)
7. Field coil
8. Screw
9. Connector bracket
10. Compressor assembly

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Heating, Ventilation, Air Conditioning

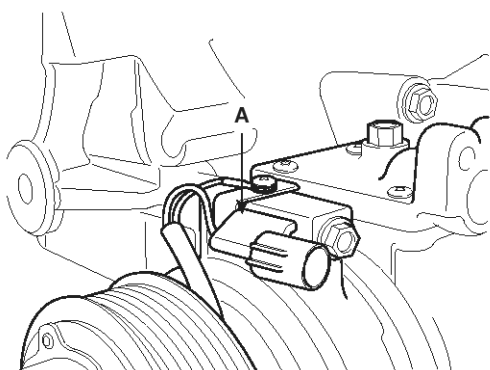
Removal

1. If the compressor is marginally operable, run the engine at idle speed, and let the air conditioning work for a few minutes, then shut the engine off.
2. Disconnect the negative cable from the battery.
3. Recover the refrigerant with a recovery/charging station.
4. Loosen the drive belt.
5. Remove the bolts, then disconnect the suction line (A) and discharge line (B) from the compressor. Plug (C) or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.

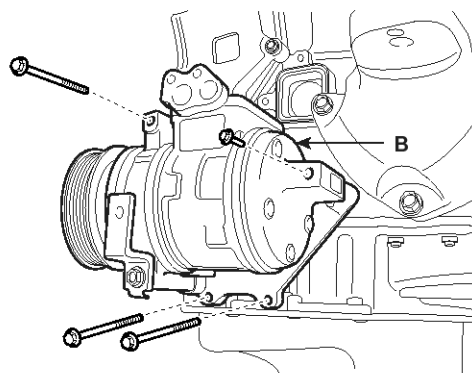


SHMHA7008D

6. Disconnect the compressor clutch connector (A), and then remove 4 mounting bolts and the compressor.



SHMHA7009D



SHMHA7087D

Installation

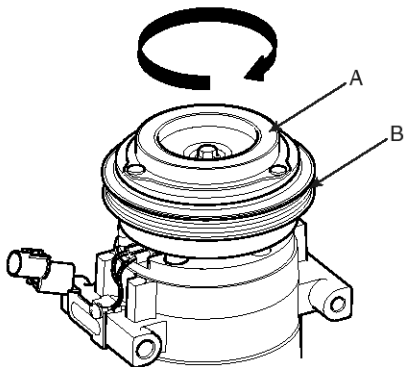
1. Make sure of the length of compressor mounting bolts, and then tighten it A→B→C order.
2. Install in the reverse order of removal, and note these items.
 - If you're installing a new compressor, drain all the refrigerant oil from the removed compressor, and measure its volume. Subtract the volume of drained oil from 120cc(4.20 oz.) the result is the amount of oil you should drain from the new compressor (through the suction fitting).
 - Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
 - To avoid contamination, do not return the oil to the container once dispensed, and never mix it with other refrigerant oils.
 - Immediately after using the oil, replace the cap on the container and seal it to avoid moisture absorption.
 - Do not spill the refrigerant oil on the vehicle; it may damage the paint; if the refrigerant oil contacts the paint, wash it off immediately.
 - Adjust the drive belt.
 - Charge the system and test its performance.

Air conditioning System

HA-17

Inspection

1. Check the plated parts of the disc & hub assembly (A) for color changes, peeling or other damage. If there is damage, replace the clutch set.
2. Check the pulley (B) bearing play and drag by rotating the pulley by hand. Replace the clutch set with a new one if it is noisy or has excessive play/drag.



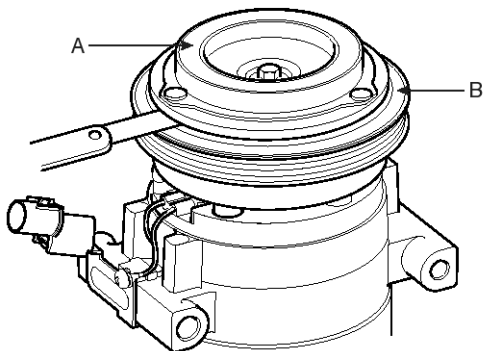
AQJF106A

3. Measure the clearance between the pulley (B) and disc & hub assembly (A) all the way around. If the clearance is not within specified limits, remove the disc & hub assembly and add or remove shim (gap washer) as needed to increase or decrease clearance.

Clearance: $0.45 \pm 0.1\text{mm}$ ($0.018 \pm 0.004\text{ in.}$)

NOTICE

The shims (gap washers) are available in seven thicknesses: 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm and 1.3mm.

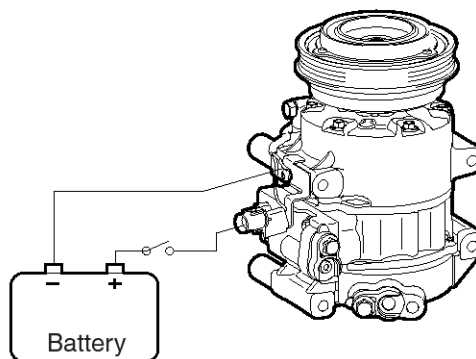


AQJF106B

4. Check operation of the magnetic clutch.

Connect the compressor side terminals to the battery (+) terminal and the ground battery (-) terminal to the compressor body.

Check the magnetic clutch operating noise to determine the condition.



AQJF106C

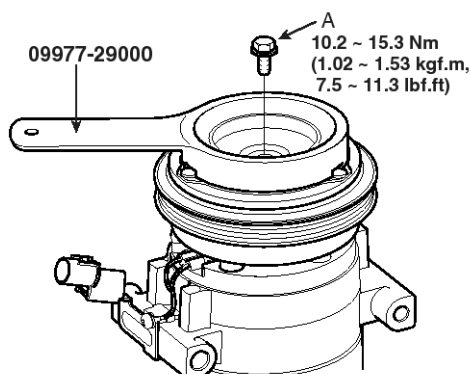
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Heating, Ventilation, Air Conditioning

Disassembly

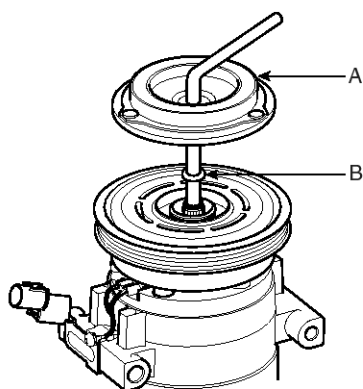
1. Remove center bolt (B) while is catching pulley outside order page by special tool (A).

TORQUE : 10~15N.m (1.02~1.53kgf.m, 7.37~11lbf.ft)



AQJF106D

2. Remove the disc & hub assembly (A) and shim (gap washer) (B), taking care not to lose the shims. If the clutch needs adjustment, increase or decrease the number and thickness of shims as necessary, then reinstall the disc & hub assembly, and recheck its clearance.

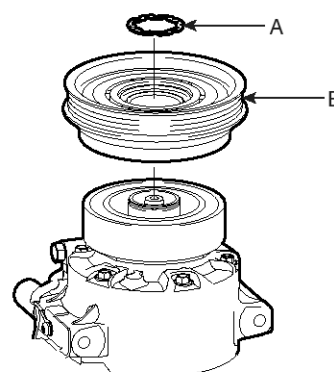


AQJF106E

3. If you removal the field coil, remove retainer ring (A) with retainer ring pliers.

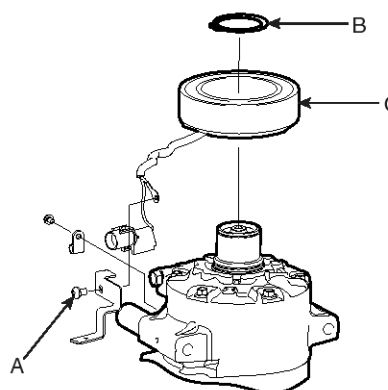
NOTICE

- Be careful not to damage the pulley (B) and compressor during removal/installation.
- Once retainer ring (A) is removed, replace it with a new one.



AQJF106F

4. Remove the screw (A) from the field coil ground terminal. Remove the retainer ring (B) and then remove the field coil (C) from the shaft with a puller. Be careful not to damage the coil and compressor.



AQJF106G

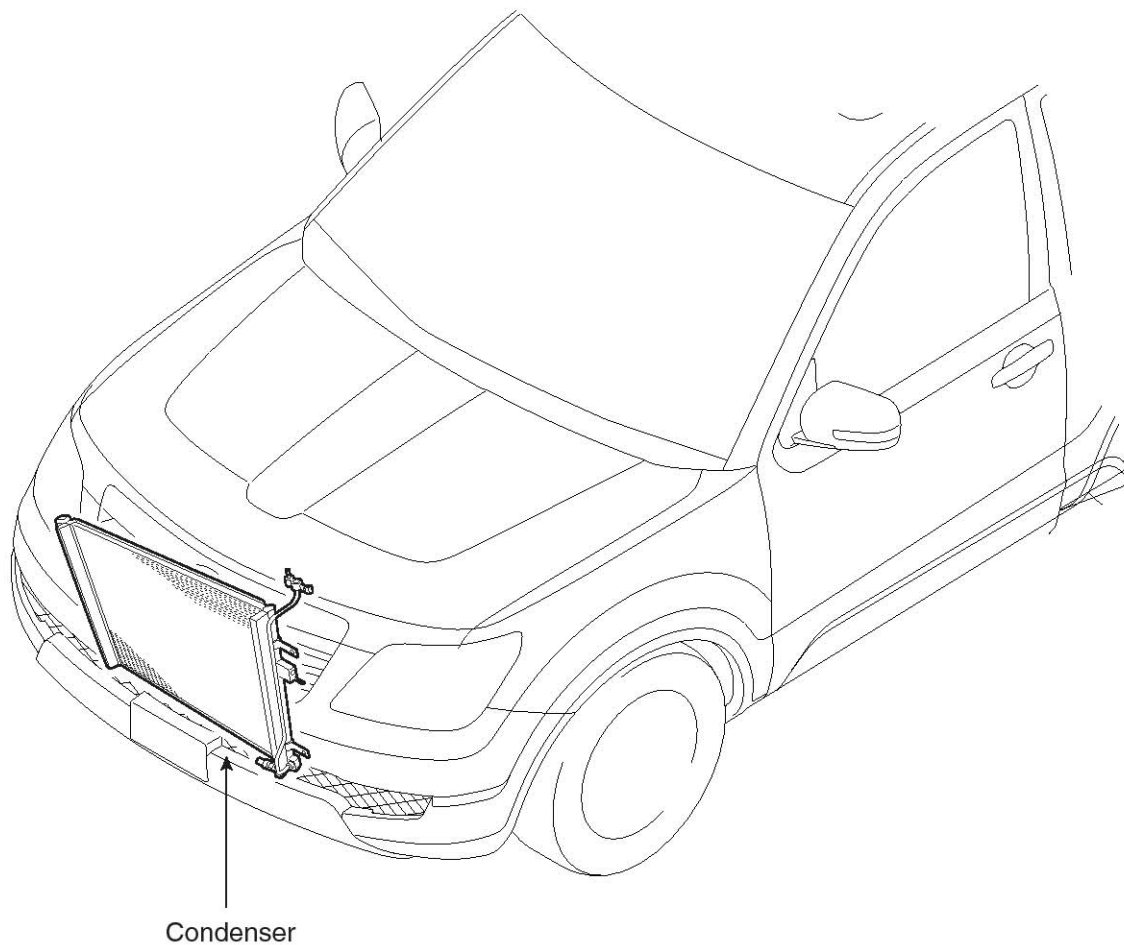
5. Reassemble the compressor clutch in the reverse order of disassembly, and note these items :
 - Clean the pulley and compressor sliding surfaces with non-petroleum solvent.
 - Install new retainer rings, and make sure they are fully seated in the groove.
 - Make sure that the pulley turns smoothly after its reassembled.

Air conditioning System

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Condenser

Component location



SHMHA7010L

HA-20

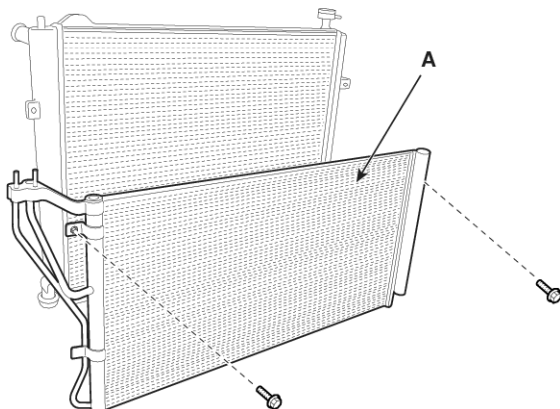
Heating, Ventilation, Air Conditioning

Inspection

1. Check the condenser fins for clogging and damage. If clogged, clean them with water, and blow them with compressed air. If bent, gently bend them using a appropriate tool.
2. Check the condenser connections for leakage, and repair or replace it, if required.

Replacement

1. Recover the refrigerant with a recovery/ recycling/ charging station .
2. Disconnect the negative (-) battery terminal.
3. Remove the front bumper(Refer to BD group-front bumper)
4. 4. Remove the radiator assembly(Refer to EM group-radiator)
5. Remove the condenser(A) from radiator.



SUNHA6011D

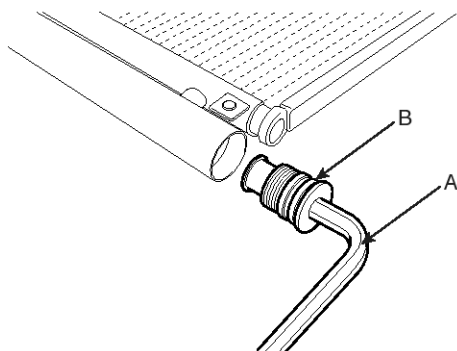
6. Install in the reverse order of removal, and note these items :
 - If you're installing a new condenser, add refrigerant oil ND-OIL8.
 - Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
 - Be careful not to damage the radiator and condenser fins when installing the condenser.
 - Be sure to install the lower mount cushions of condenser securely into the holes.
 - Charge the system, and test its performance.

Air conditioning System

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Desiccant Replacement

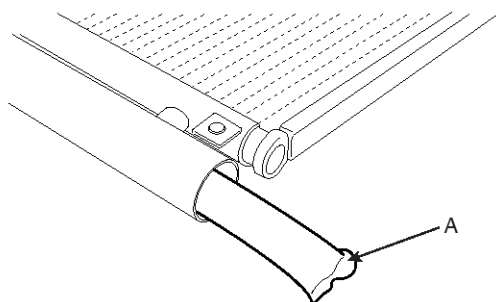
1. Remove the condenser, and then remove the bottom cap (B) with L wrench (A) from the condenser.



KQRE108D

TORQUE : 20~25N.m (2.0~2.5kgf•m, 14.5~18.2lb-ft)

2. Remove the desiccant (A) from condenser using a long nose plier. Check for crumbled desiccant and clogged bottom cap filter.



KQRE108E

3. Apply air conditioning compressor oil along the O-rings and threads of the new bottom cap.
4. Insert the new desiccant into the receiver drier tank. The desiccant must be sealed in vacuum before it is exposed to air for use.
5. Install the new bottom cap to the condenser.

NOTICE

- Always replace the desiccant and bottom cap at the same time.
- Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
- Be careful not to damage the radiator and condenser fins when installing the condenser.
- Be sure to install the lower mount cushions of condenser securely into the holes.
- Charge the system, and test its performance.

HA-22

Heating, Ventilation, Air Conditioning

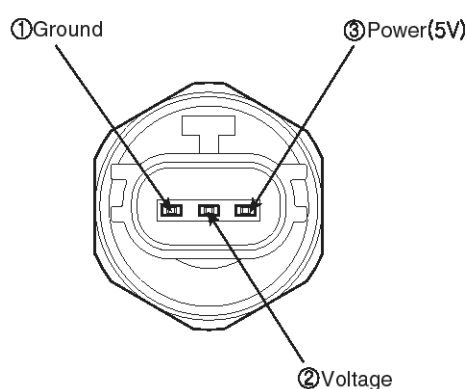
A/C pressure transducer

Description

A/C pressure transducer convert the pressure value of high pressure line into voltage value after measure it. By converted voltage value, engine ECU controls cooling fan by operating it high speed or low speed. Engine ECU stop the operation of compressor when the temperature of refrigerant line is so high or so low irregularly to optimize air conditioning system.

Inspection

1. Measure the pressure of high pressure line by voltage output between NO.1 and NO.2 terminals



EQR116B

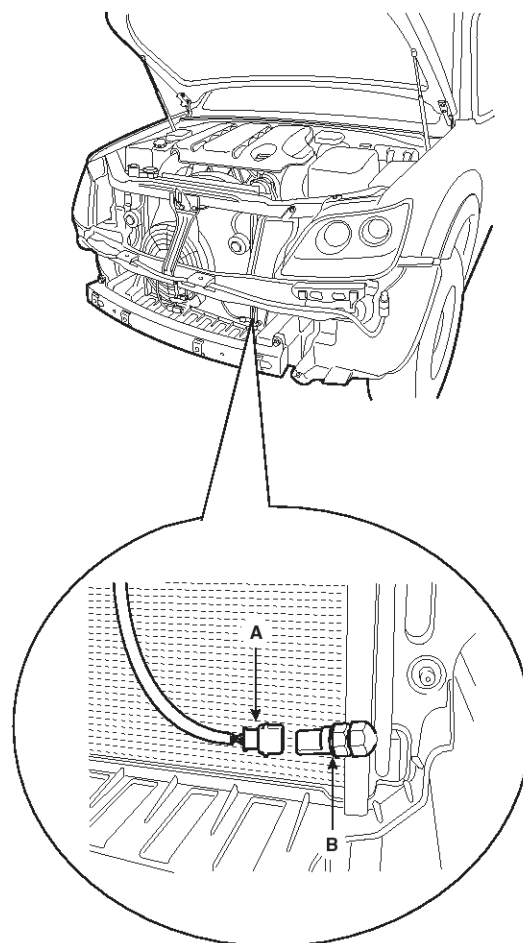
2. Inspect the voltage value whether it is sufficient to be regular value or not.

Voltage = $0.00878835 * \text{Pressure} + 0.37081095$ [PSIA]

3. If the measured voltage value is not specification, replace the A/C pressure transducer.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/charging station.
3. Disconnect the A/C pressure switch connector (A) and then remove the A/C pressure transducer (B).



SHMHA7014D

CAUTION

Take care that liquid & suction pipe are not bent.

4. Installation is the reverse order of removal.

TORQUE : 10~12N.m (1.0~1.2kgf.m, 7.4~8.8lbf.ft)

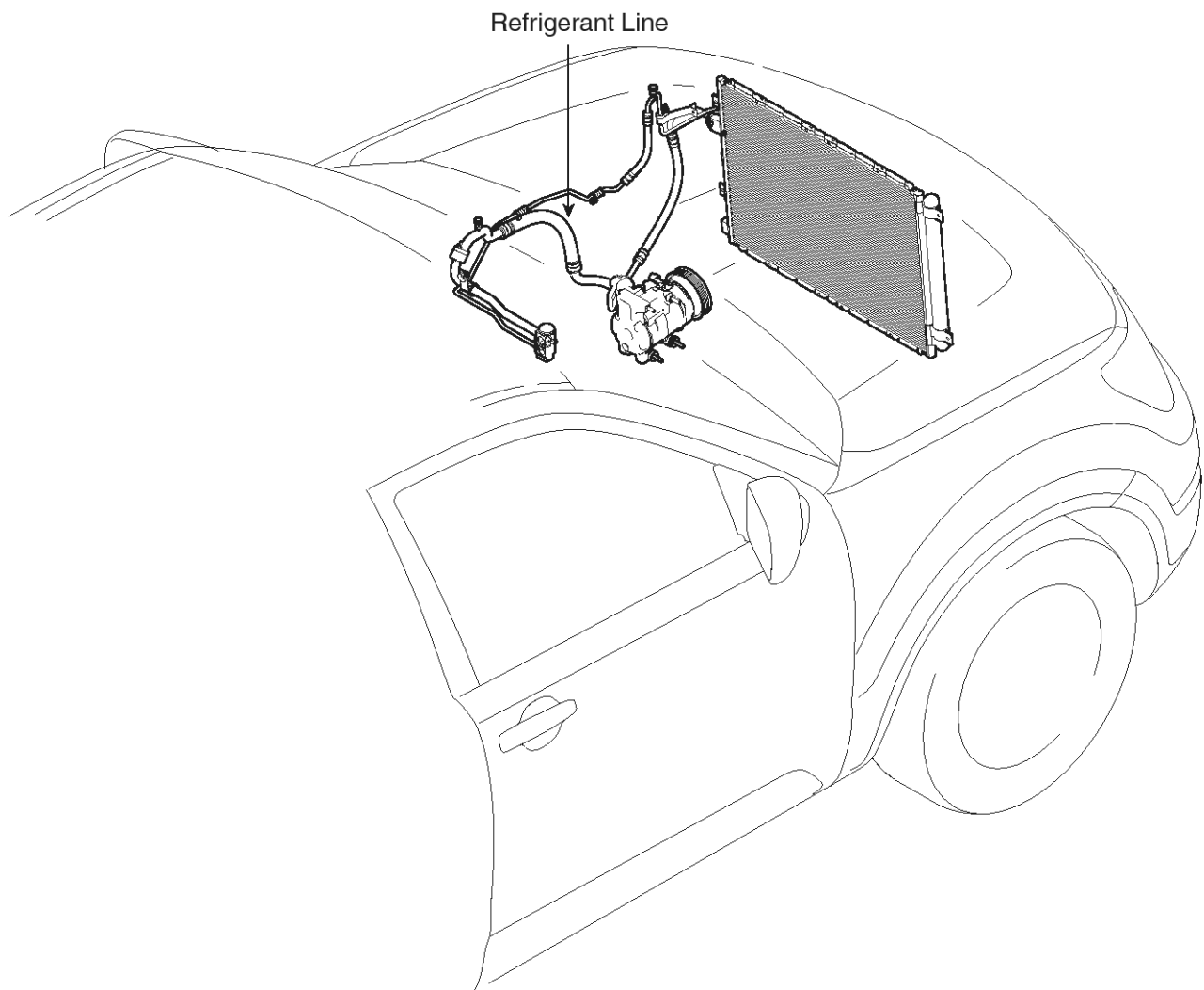
Air conditioning System

HA-23

Refrigerant line

Component location

[Front only]

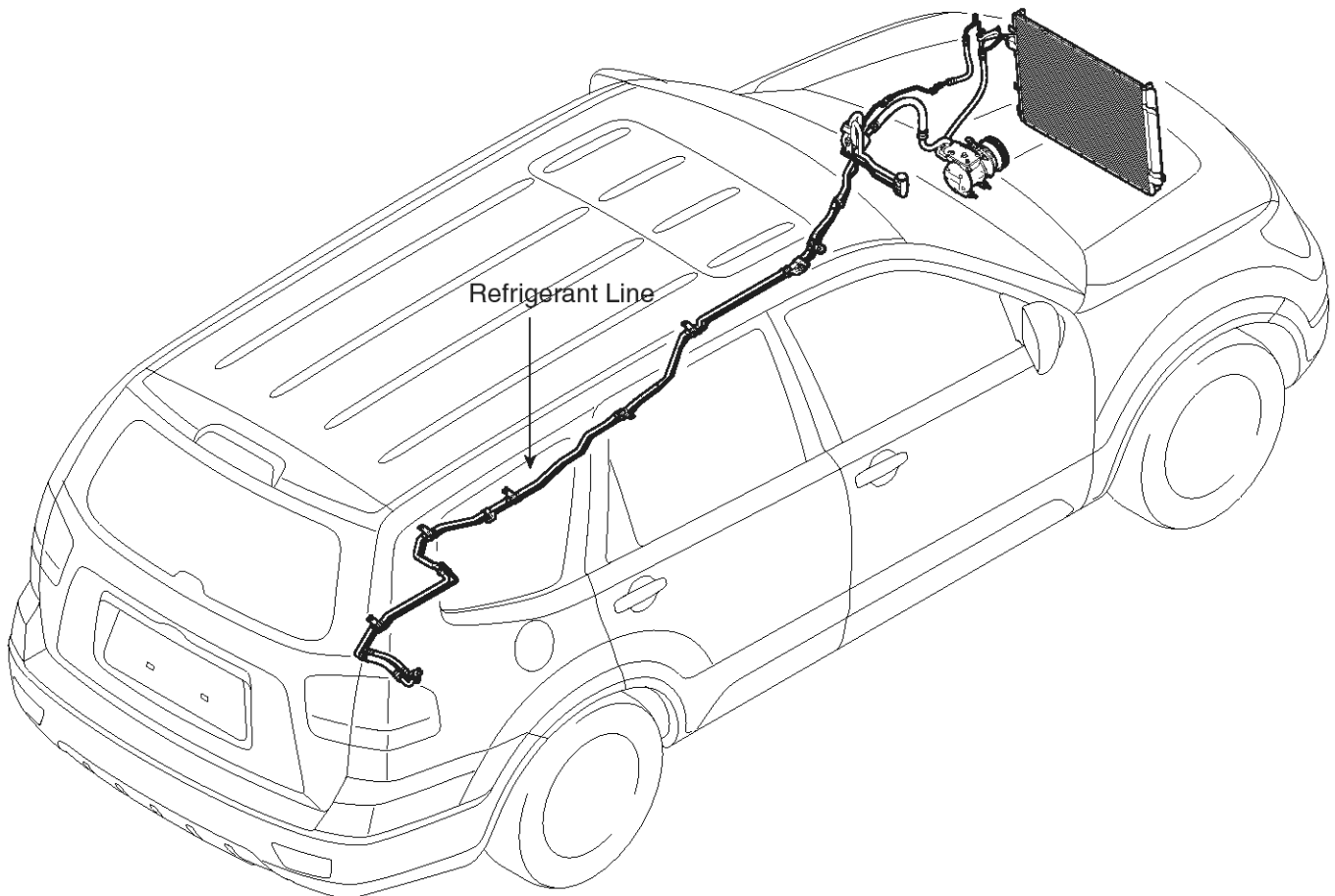


SHMHA7005L

HA-24

Heating, Ventilation, Air Conditioning

[Front & Rear]



SHMHA7102L

Air conditioning System

HA-25

Replacement

1. Discharge refrigerant from refrigeration system .
2. Replace faulty tube or hose.

CAUTION

- Cap the open fittings immediately to keep moisture or dirt out of the system.

3. Tighten joint of bolt or nut to specified torque

CAUTION

- Connections should not be torque tighter than the specified torque.

Part tighte - ned	N.m	Kgf.m	lbf.ft
Condenser - Discharge h- ose	4.9~5.9	0.5~0.6	3.6~4.3
Condenser - Liquid tube			
Compressor - Discharge hose	4.9~5.9	0.5~0.6	3.6~4.3
Compressor - Suction ho- se			
Expansion v- alve - Evap- orator	11.8~14.7	1.2~1.5	8.7~10.9

4. Evacuate air in refrigeration system and charge system with refrigerant.

Specified amount :

Front only : 600 ± 25g

Front & rear : 700 ± 25g

5. Inspect for leakage of refrigerant.
Using a gas leak detector, check for leakage of refrigerant .
6. Inspect A/C operation.

HA-26

Heating, Ventilation, Air Conditioning

Evaporator temperature sensor

Description

The evaporator temperature sensor will detect the evaporator core temperature and interrupt compressor relay power in order to prevent evaporator freezing by excessive cooling.

Inspection

1. Ignition "OFF"
2. Disconnect evaporator temperature sensor.
3. Using the multi-tester, Measure resistance between terminal "1" and "2" of evaporator temperature sensor.

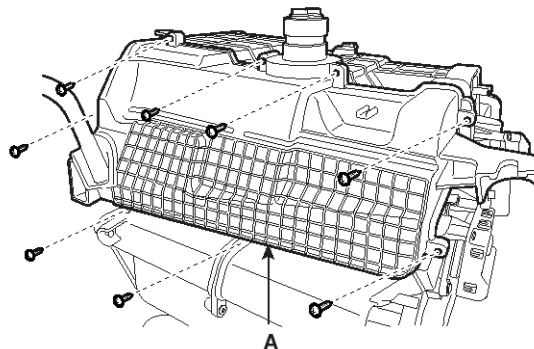
Specification

Temperature [°C]	Resistance [KΩ]
-20	70.04
-10	43.35
0	27.62
10	18.07
20	12.11
30	8.30
40	5.81
50	4.15

4. If the measured resistance is not specification, substitute with a known-good evaporator temperature sensor and check for proper operation.
5. If the problem is corrected, replace the evaporator temperature sensor.

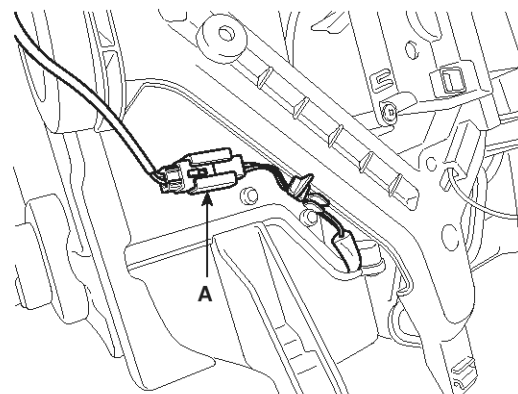
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad(refer to BD group-crashpad).
3. Remove the heater unit lower cover(A).



SHMHA7015D

4. Disconnect the evaporator sensor connector(A).

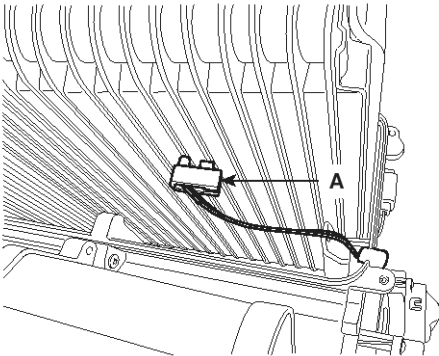


SHMHA7016D

Air conditioning System

HA-27

5. Remove the evaporator sensor(A) from evaporator core.



SHMHA7017D

⚠ CAUTION

Take care that evaporator core pins are not bent.

6. Installation is the reverse order of removal.

HA-28

Heating, Ventilation, Air Conditioning

In-car sensor

Description

1. In-car air temperature sensor is located at the center facia lower panel.
2. The sensor contains a thermistor which measures the temperature of the inside. The signal decided by the resistance value which changes in accordance with perceived inside temperature, is delivered to heater control unit and according to this signal the control unit regulates incar temperature to intended value.

Inspection

1. Ignition "ON"
2. Blow air with changing temperature to the in car sensor air inlet. Measure sensor resistance between 2 and 4 terminals

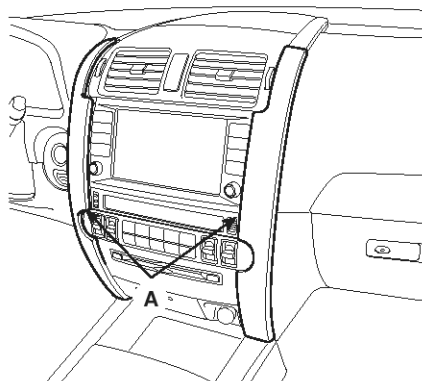
Temperature [°C(°F)]	Resistance between terminals 2 and 4 (kΩ)
-20(-4)	290.21
-10(14)	165.6
0 (32)	97.83
10(50)	59.67
20(68)	37.48
30(86)	24.17
40(104)	115.98
50(122)	10.81

NOTICE

In car sensor is negative type thermistor that resistance will rise with lower temperature, and reduce with higher temperature.

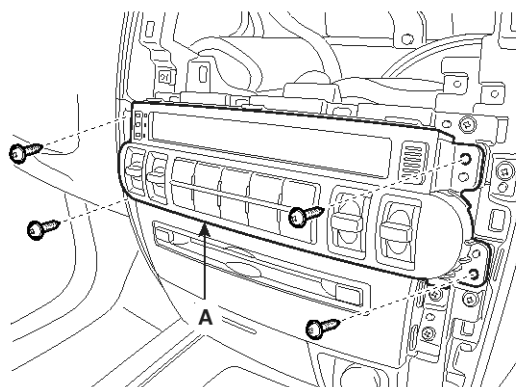
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel(A).



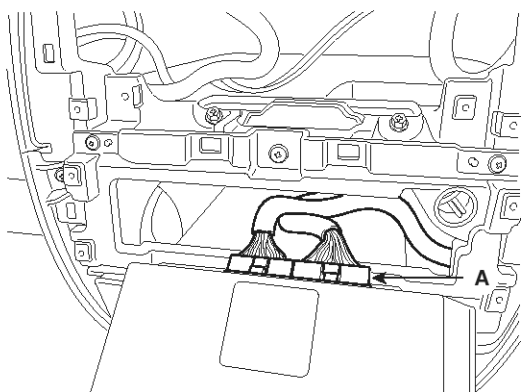
SHMBD8096D

3. Remove the audio assembly(refer to BD group-crash pad)
4. Loosen the heater controller(A) mounting screw.



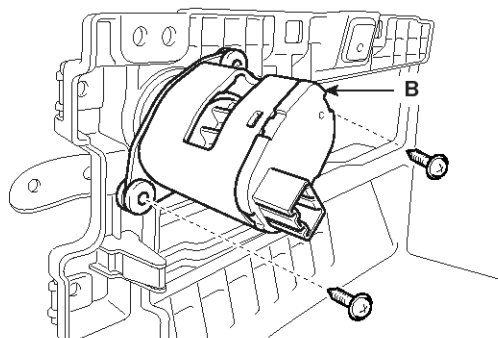
SHMHA7019D

5. Disconnect the heater controller connector(A) and then remove heater controller.



SHMHA7020D

6. Disconnect the connector of in-car sensor. Loosen the mounting 2 screws and then remove the in-car sensor (B).



SHMHA7021D

7. Installation is the reverse order of removal.

HA-30

Heating, Ventilation, Air Conditioning

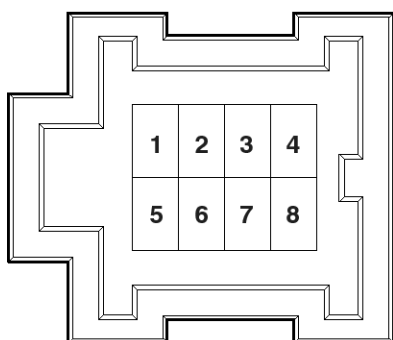
Photo sensor

Description

1. The photo sensor is located at the right of defrost nozzle.
2. The photo sensor contains a photovoltaic (sensitive to sunlight) diode. The solar radiation received by its light receiving portion, generates an electromotive force in proportion to the amount of radiation received which is transferred to the automatic temperature control module so that the solar radiation compensation will be performed.

Inspection

1. Ignition "ON"
2. Using the scan tool.
3. Emit intensive light toward photo sensor using a lamp, and check the output voltage change.
4. The voltage will rise with higher intensive light and reduce with lower intensive light.

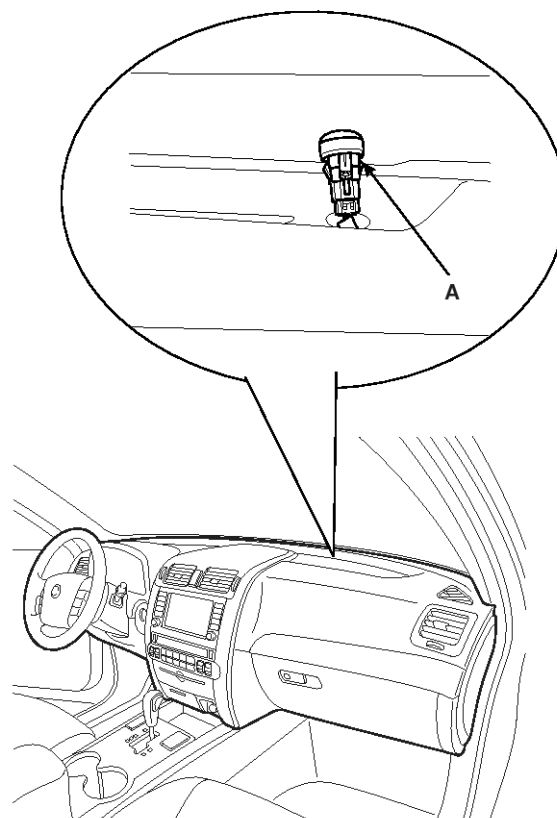


- | | |
|-----------------------|---------------------|
| 1. Sensor GND | 4. - |
| 2. Sensor Power (+5V) | 5. Photo Sensor (+) |
| 3. Signal | 6. Photo Sensor (-) |

SHMHA7100L

Replacement

1. Disconnect the negative (-) battery terminal.
2. With the (-) driver, remove the photo sensor (A) from the center of defrost nozzle.



SHMHA7022D

3. Install in the reverse order of removal.

Air conditioning System

HA-31

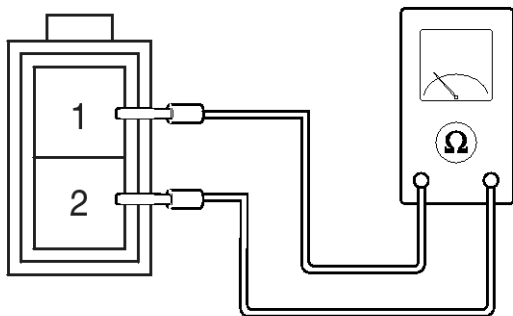
Water temperature sensor

Description

1. Water temperature sensor is located at the heater unit.
2. It detects coolant temperature. Its signal is used for cold engine lockout control. When the driver operates the heater before the engine is warmed up, the signal from sensor causes the heater control unit to reduce blower motor speed until coolant temperature reaches the threshold value.

Inspection

1. Ignition "ON"
2. Using the multi-tester, Measure resistance between terminal "1" and "2" of water temperature sensor.



1. Water temperature sensor (+)
2. Sensor GND (-)

SHMHA8637L

Specification

Coolant temperature [$^{\circ}\text{C}$ ($^{\circ}\text{F}$)]	Resistance ($\text{k}\Omega$)
-10(14)	55.85
0(32)	32.91
10(50)	19.99
20(68)	12.51
30(86)	8.047
40(104)	5.311
50(122)	3.588
60(140)	2.476
70(158)	1.742
80(176)	1.246

3. If the measured resistance is not specification, substitute with a known-good water temperature sensor and check for proper operation.
4. If the problem is corrected, replace the water temperature sensor.

NOTICE

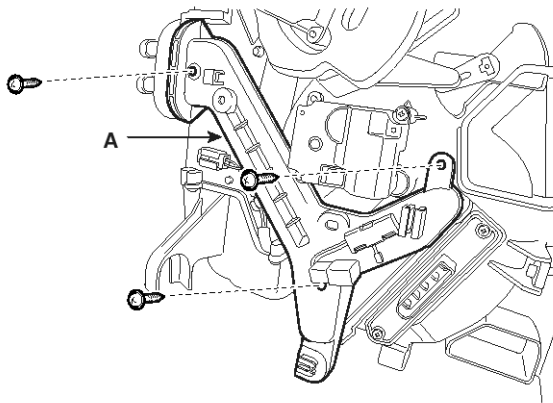
Negative type thermistor that resistance will rise with lower temperature, and reduce with higher temperature.

HA-32

Heating, Ventilation, Air Conditioning

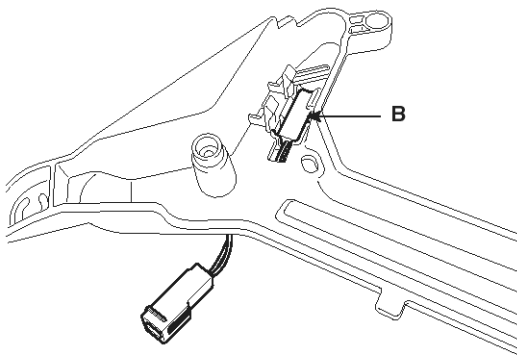
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad(refer to BD group-crash pad)
3. Remove the heater unit(refer to HA group-heater unit)
4. Loosen the heater core cover mount screw and then heater core cover(A).



SHMHA7023D

5. Disconnect the water temperature sensor(B) from heater core cover.



SHMHA7024L

6. Installation is the reverse order of removal.

NOTICE

Take care that wire of water temperature sensor is not to be damaged.

Air conditioning System

HA-33

Ambient sensor

Description

1. The ambient temperature sensor is located at the front of the condenser and detects ambient air temperature. It is a negative type thermistor; resistance will increase with lower temperature, and decrease with higher temperatures.
2. The sensor output will be used for discharge temperature control, temperature regulation door control, blower motor level control, mix mode control and in-car humidity control.

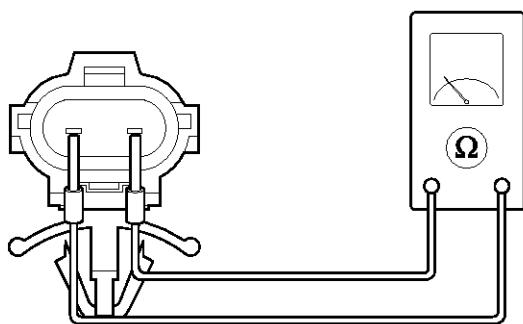
NOTICE

If the ambient temperature is below 2.0°C (35.6°F), the A/C compressor will be stopped.

The compressor will be operated by manual operating.

Inspection

1. Ignition "OFF".
2. Disconnect ambient temperature sensor.
3. Check the resistance of ambient temperature sensor between terminals 1 and 2 whether it is changed by changing of the ambient temperature.



AQQF204B

Specification

Ambient temperature [°C (°F)]	Resistance between terminals 1 and 2 (kΩ)
-30(-22)	479.22
-20(-4)	271.45
-10(14)	158.32
0 (32)	95.10
10 (50)	58.76
20 (68)	37.30
30(86)	24.27
40(104)	16.17
50(122)	11.00

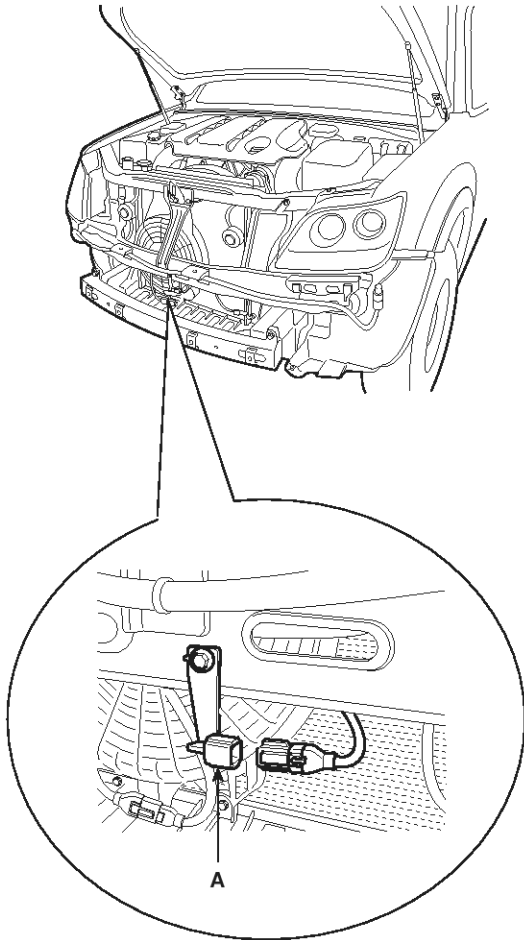
4. If the measured resistance is not specification, substitute with a known-good ambient temperature sensor and check for proper operation.
5. If the problem is corrected, replace the ambient temperature sensor.

HA-34

Heating, Ventilation, Air Conditioning

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper. (Refer to BD group-front bumper)
3. Remove the ambient temperature sensor (A).



SHMHA7026D

4. Installation is the reverse order of removal.

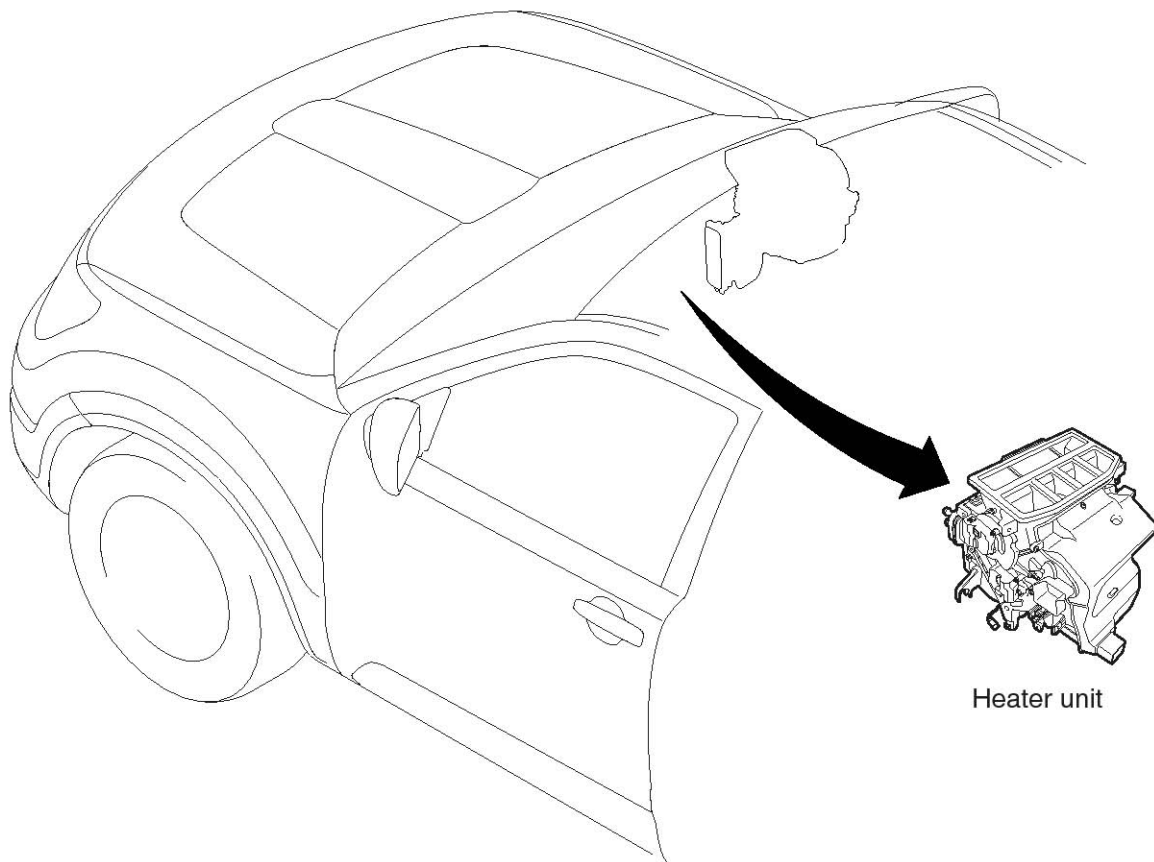
Heater

HA-35

Heater

Heater Unit

Component location



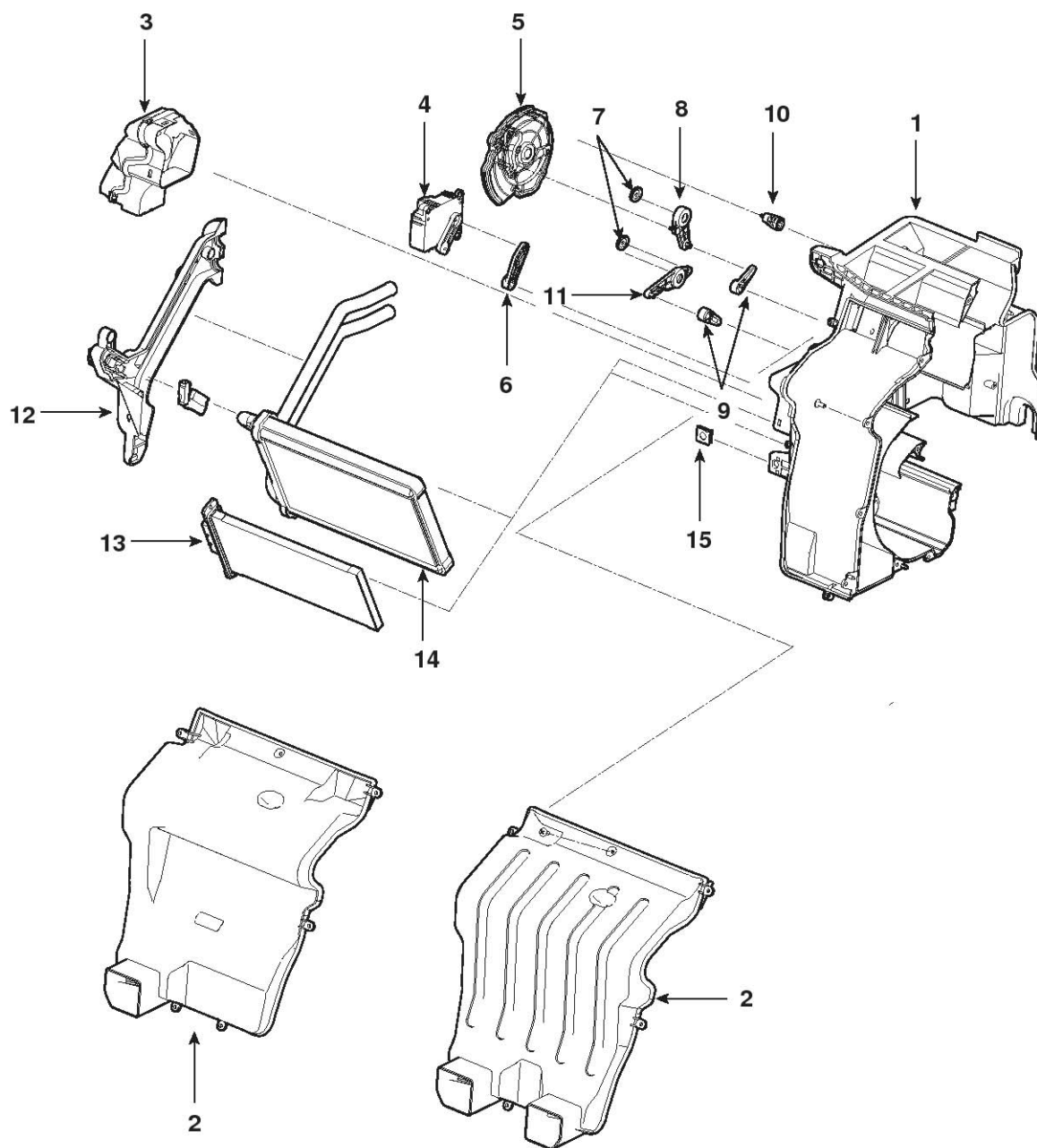
Heater unit

SHMHA7027L

HA-36

Heating, Ventilation, Air Conditioning

Components

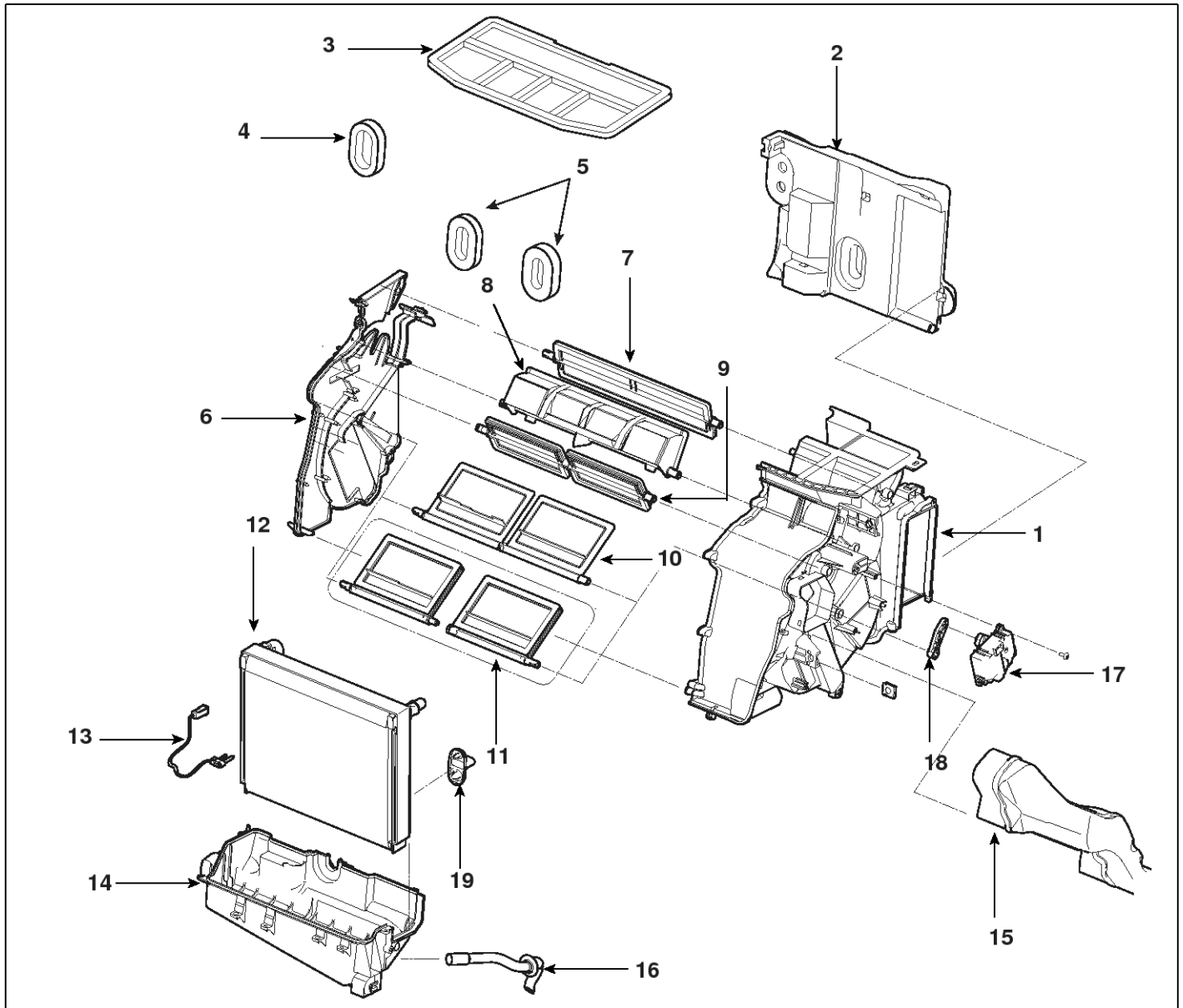


SHMHA7028D

- | | | |
|--------------------------|---------------------|-----------------------|
| 1. Heater case(LH) | 6. Temp control arm | 11. Floor door lever |
| 2. Rear vent case | 7. washer | 12. Heater core cover |
| 3. Shower duct(LH) | 8. Vent door arm | 13. PTC heater core |
| 4. Temp control actuator | 9. Foot door arm | 14. Heater core |
| 5. Mode control actuator | 10. Def door arm | 15. U nut |

Heater

HA-37



SHMHA7029D

- | | | |
|---------------------|----------------------------|---------------------------|
| 1. Heater case(RH) | 8. Vent door | 15. Shower duct(RH) |
| 2. From | 9. Foot door | 16. Drain hose |
| 3. Heater seal | 10. Temp door | 17. Temp control actuator |
| 4. Heater pipe seal | 11. Temp door(RH) | 18. U nut |
| 5. Flange seal | 12. evaporator core | 19. Cap |
| 6. Separator | 13. evaporator temp sensor | |
| 7. Def door | 14. Heater case(low) | |

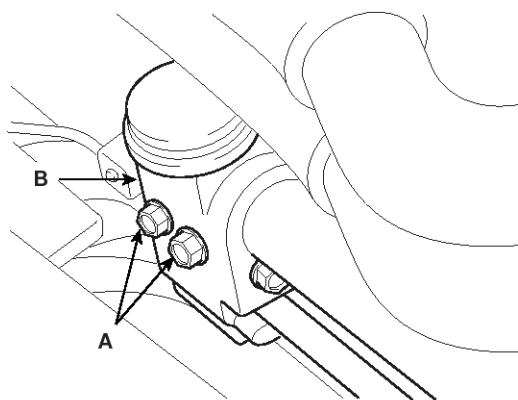
HA-38

Heating, Ventilation, Air Conditioning

Replacement

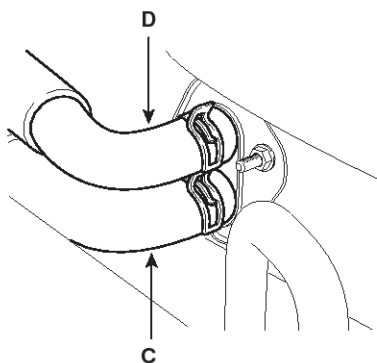
1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/ recycling/ charging station.
3. When the engine is cool, drain the engine coolant from the radiator.
4. Remove the bolts (A) and the expansion valve (B) from the evaporator core.
Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.

Torques : 7.84 ~ 11.7 N.m (0.8 ~ 12.2 kgf.m, 5.7 ~ 8.6 lb-ft)



SHMHA7030D

5. Disconnect the inlet (C) and outlet (D) heater hoses from the heater unit.

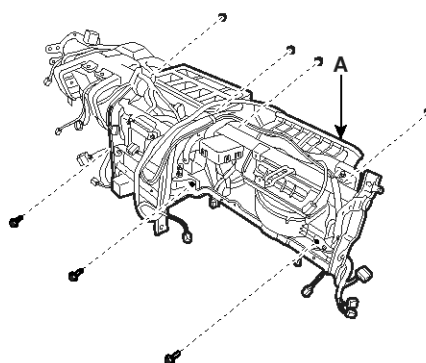


SHMHA7031D

CAUTION

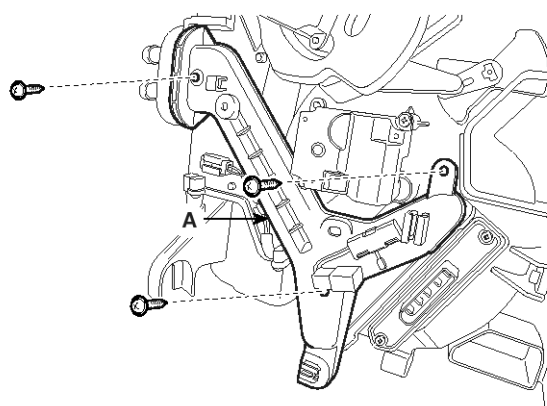
Engine coolant will run out when the hoses are disconnected; drain it into a clean drip pan. Be sure not to let coolant spill on electrical parts or painted surfaces. If any coolant spills, rinse it off immediately.

6. Remove the crash pad (Refer to BD group-crash pad).
7. Remove the cowl cross bar assembly. (Refer to BD group-cowl cross bar)
8. Disconnect the connectors from the temperature control actuator, the mode control actuator and the evaporator temperature sensor.
9. Remove the heater & blower unit after loosening 3 mounting nuts.



SHMHA7032D

10. Remove the heater core cover (A).

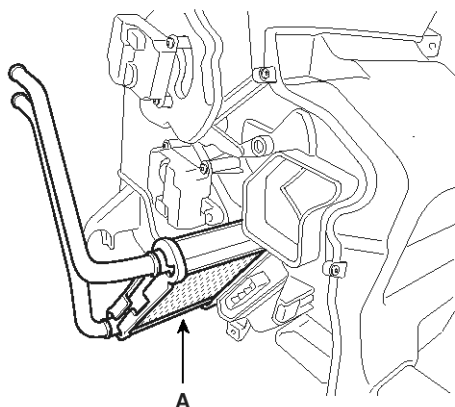


SHMHA7033D

Heater

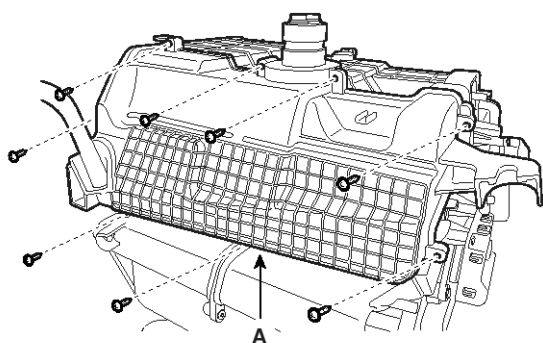
HA-39

11. Remove the heater core(A) from heater unit.



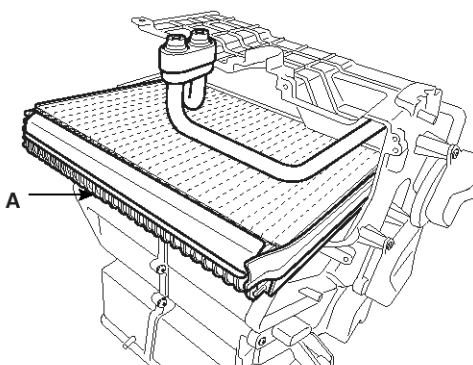
SHMHA7034D

12. Loosen the heater unit lower case mount screw and then remove the heater unit lower case(A).



SHMHA7035D

13. Remove the evaporator core(A).



SHMHA7036D

14. Be careful that the inlet and outlet pipe are not bent during heater core removal, and pull out the heater core.

15. Install the heater core in the reverse order of removal.

16. Installation is the reverse order of removal, and note these items :

- If you're installing a new evaporator, add refrigerant oil (ND-OIL8).
- Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
- Immediately after using the oil, replace the cap on the container, and seal it to avoid moisture absorption.
- Do not spill the refrigerant oil on the vehicle ; it may damage the paint ; if the refrigerant oil contacts the paint, wash it off immediately.
- Apply sealant to the grommets.
- Make sure that there is no air leakage.
- Charge the system and test its performance.
- Do not interchange the inlet and outlet heater hoses and install the hose clamps securely.
- Refill the cooling system with engine coolant.

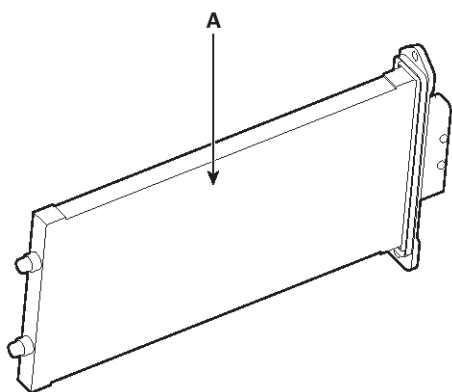
HA-40

Heating, Ventilation, Air Conditioning

Positive Temperature coefficient)heater

Description

PTC (Positive Temperature Coefficient) heater (A) is an electric heater using a PTC element as an auxiliary heating device that supplements deficiency of interior heat source in highly effective diesel engine (U engine).

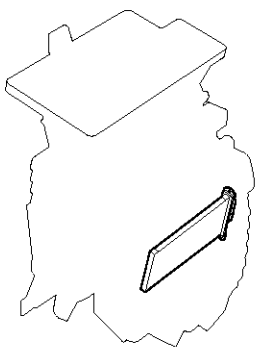


SHMHA8638L

An electric heater heats up the interior by directly heating the air that passes through the heater.

PTC = positive Temperature Coefficient

The name itself implies that the element has a proportional resistance change sensitive to temperature. PTC heater is installed at the exit or the backside of heater core

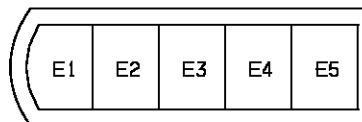


AQJF301A

Operation principle

ECM outputs a PTC on signal. Operate PTC from 1st setting to 3rd setting with an interval of 15 seconds.

Heat up the air, which passes through a heater core.



(Connector Spec)

PIN	WIRE	COLOR	FUNCTION
E1	4.0	-	PTC RLY 2
E2	5.0	-	GND
E3	4.0	-	PTC RLY 1
E4	5.0	-	GND
E5	4.0	-	PTC RLY 3

STQHA7143D

Operation condition

Judge the condition by ambient temperature is below 5°C, coolant temperature is below 70°C, and battery voltage is above 11V and engine RPM is above 700RPM.

Heater

HA-41

Inspection

Inspect the PTC operation by confirmation logic as below.

1. Entering method

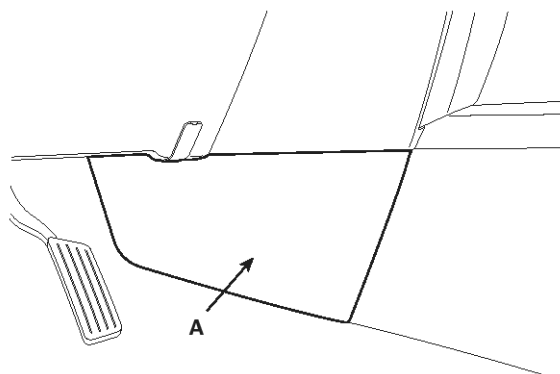
- 1) Set the floor mode, maximum heating
- 2) Turn off the blower switch
- 3) Press the intake button more than 5 times
- 4) Indicator of entire button is flashed with an interval of 0.5 seconds continuously (Manual).
Graphics of the entire LCD display switch on and off with an interval of 0.5 seconds continuously (Automatic)
- 5) Confirm the PTC operation by operating the blower switch
Manual : 1~8 step, Automatic: 1~8step.
- 6) Each PTC relay is operated with an interval of 3 seconds.
- 7) Execute the PTC operation by confirmation logic for 30 seconds.

2. Cancellation method.

- 1) Select the A/C button or intake button.
 - 2) IG "OFF".
 - 3) Cancel the logic after 30 seconds automatically.
3. If the PTC operation is not operated, substitute with a known-good PTC and check for proper operation.
If the problem is corrected, replace the PTC.

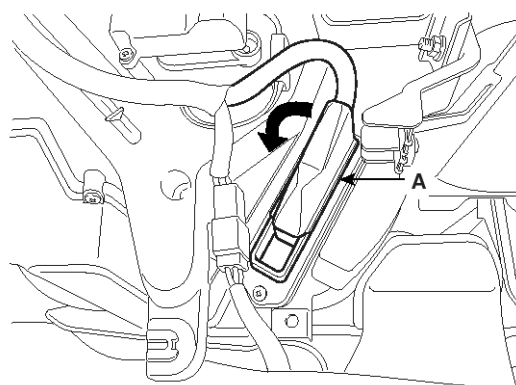
Replacement

1. Remove the crash pad lower panel(A).



SHMHA7037D

2. Disconnect the PTC heater connector (A).

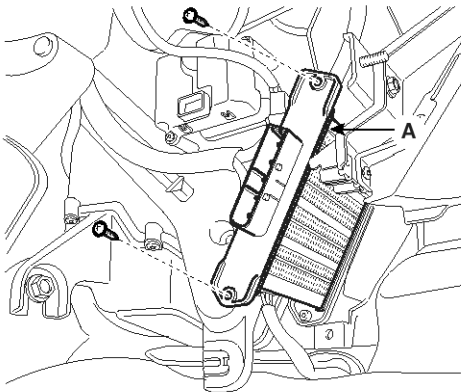


SHMHA7038D

HA-42

Heating, Ventilation, Air Conditioning

3. After loosening the mounting bolts, then remove the PTC heater (A).



SHMHA7039D

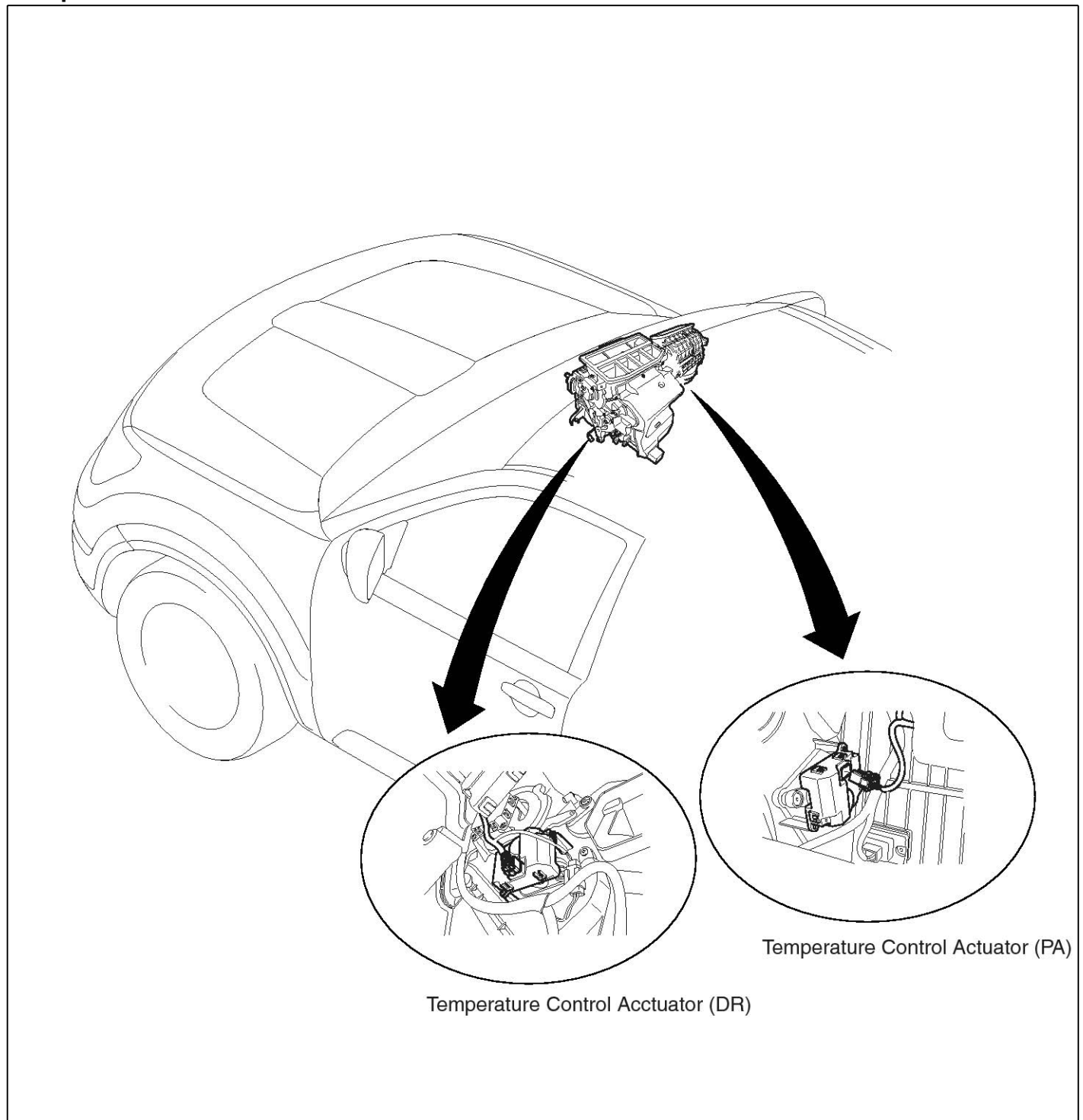
4. Installation is the reverse order of removal.

Heater

HA-43

Temperature Control Actuator

Component location



SHMHA7040L

HA-44

Heating, Ventilation, Air Conditioning

Description

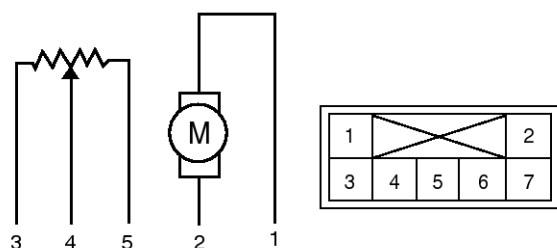
1. Heater unit includes mode control actuator and temperature control actuator.
2. Temperature control actuator is located at the heater unit. It regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temperature door by operating temperature switch and then temperature will be regulated by the hot/cold air ratio decided by position of temperature door.

Inspection

1. Ignition "OFF"
2. Disconnect the connector of temperature control actuator.
3. Verify that the temperature control actuator operates to the hot position when connecting 12V to the terminal 1 and grounding terminal 2.

Verify that the temperature control actuator operates to the cool position when connecting in the reverse.

[Drive]



1. Hot position
2. Cool position
3. 5V (Vcc)

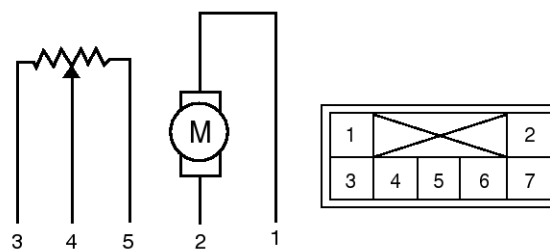
4. Feedback signal
5. Sensor ground

SHMHA7104L

Specification

Door position	Voltage(4-5)	Error detecting
Max. cooling	$0.3 \pm 0.15V$	Low voltage :0.1 V or less
Max. heating	$4.7 \pm 0.15V$	High voltage :4.9 V or more

[Passenger]



1. Hot position
2. Cool position
3. Sensor ground

4. Feedback signal
5. 5V (Vcc)

SHMHA7105L

4. Check the voltage between terminals 7 and 7(Drive).
5. Check the voltage between terminals 5 and 6(Passenger).

Specification

Door position	Voltage(3-4)	Error detecting
Max. cooling	$0.3 \pm 0.15V$	Low voltage :0.1 V or less
Max. heating	$4.7 \pm 0.15V$	High voltage :4.9 V or more

It will feedback current position of actuator to controls.

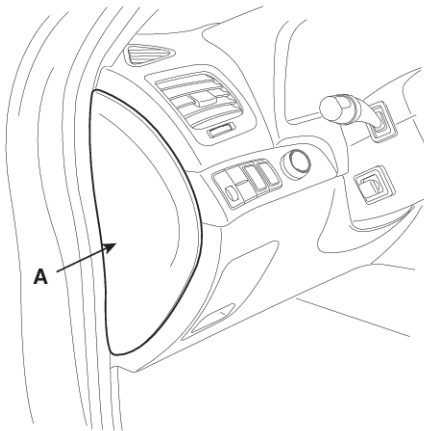
6. If the measured voltage is not specification, substitute with a known-good temperature control actuator and check for proper operation.
7. If the problem is corrected, replace the temperature control actuator.

Heater

HA-45

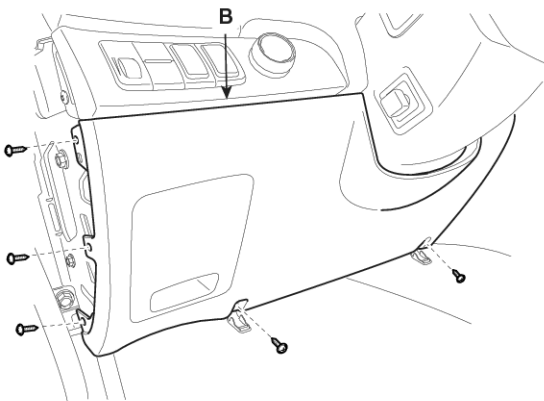
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).



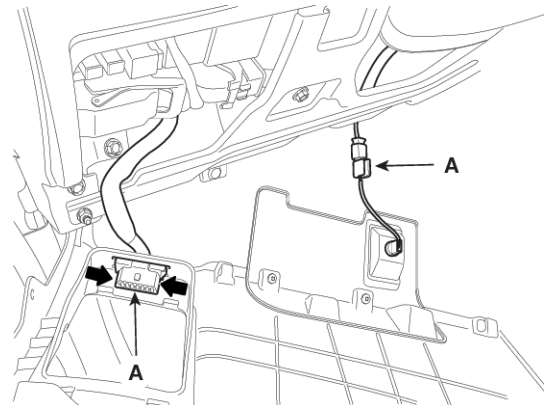
SHMHA7041D

3. Remove the crash pad lower cover(B).



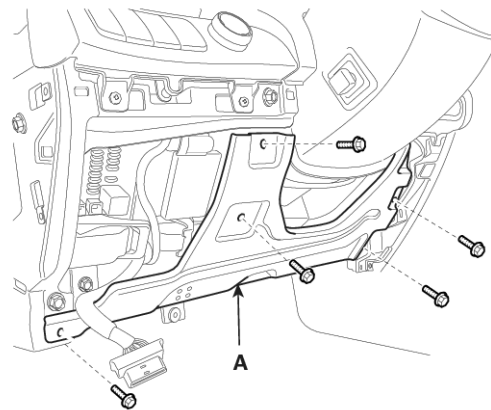
SHMBD8084D

4. Loosen the mount screw and then remove the connector(A).



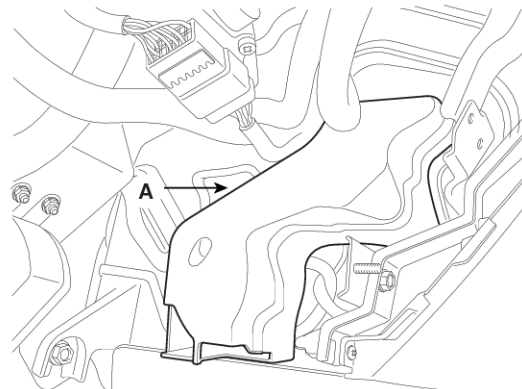
SHMBD8085D

5. After loosening the mounting bolts, then remove the reinforcing panel (A).



SHMHA7043D

6. Loosen the mounting screw and then remove the duct assembly (A).

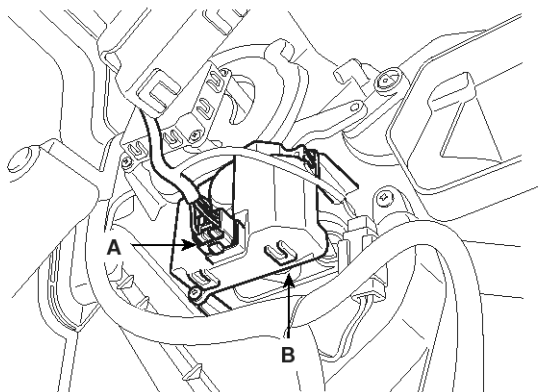


SHMHA7044D

HA-46

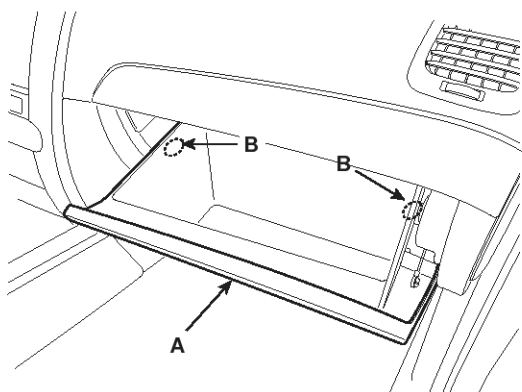
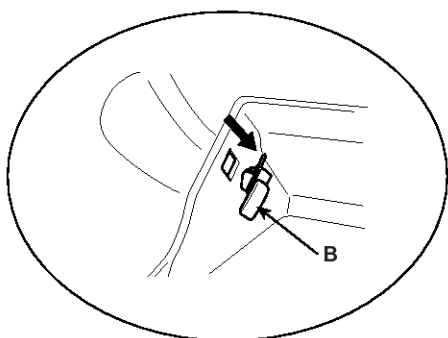
Heating, Ventilation, Air Conditioning

7. Remove the BCM(refer to BE group-BCM).
8. Disconnect the temperature control actuator connector (A).
9. Loosen the mounting screw and then remove the temperature control actuator (B).



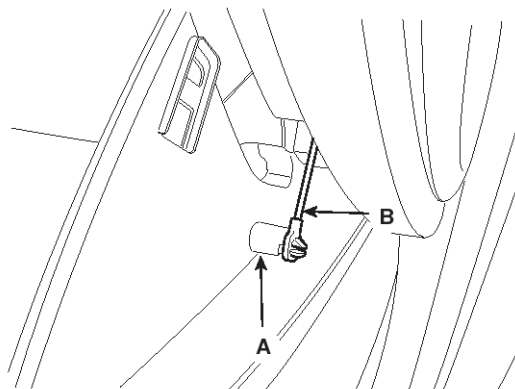
SHMHA7045D

10. Disconnect the guide (B) from the glove box (A).



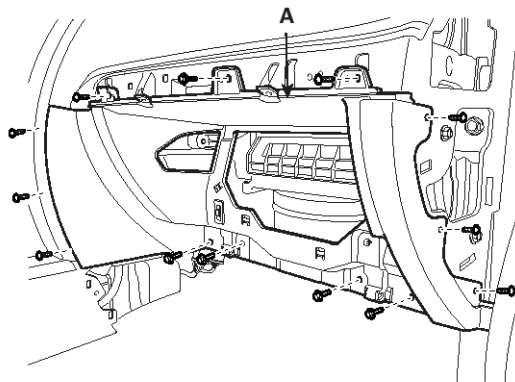
SHMBD8110D

11. Remove the side damper (A) from the glove box (B).



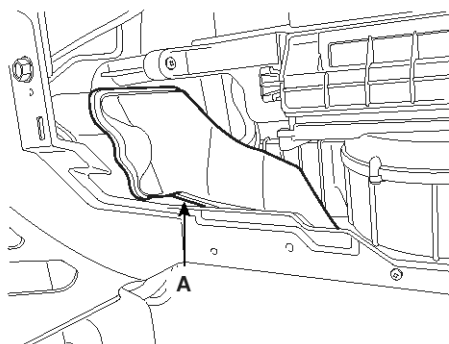
SHMBD8111D

12. After loosening the mounting screws and bolts, then remove the glove box housing (A).



SHMHA7046D

13. Remove the shower duct(A).

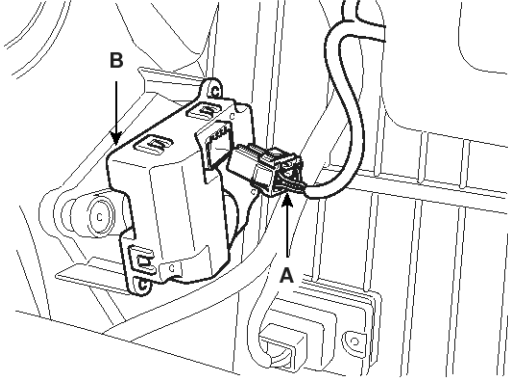


SHMHA7047D

Heater

HA-47

14. Disconnect the temperature control actuator connector (A)
15. Loosen the mounting screw and then remove the temperature control actuator (B).



SHMHA7048D

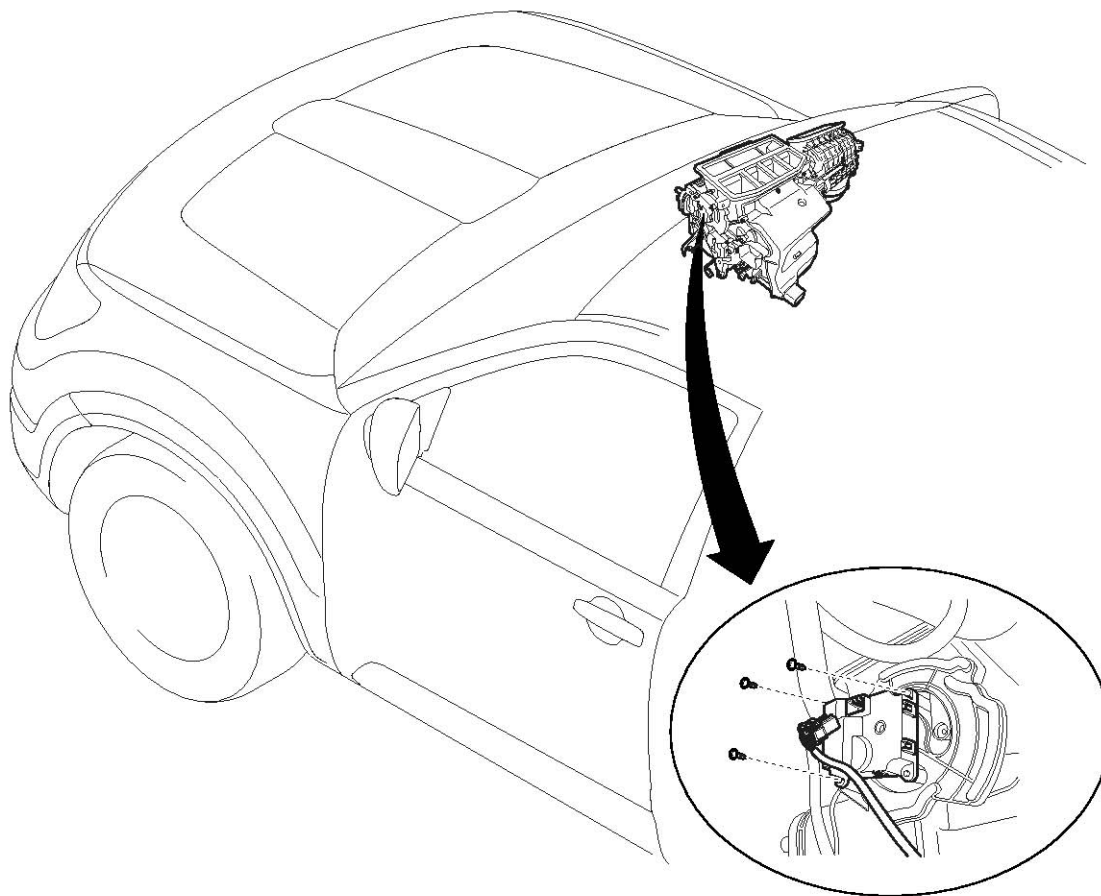
16. Installation is the reverse order of removal.

HA-48

Heating, Ventilation, Air Conditioning

Mode Control Actuator

Component Location



Mode Control Actuator

SHMHA7049L

Heater

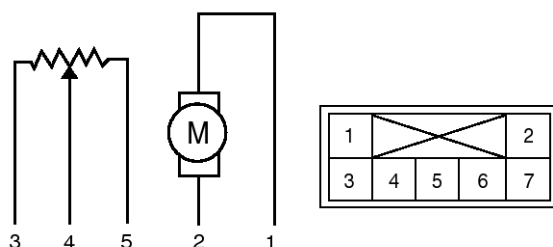
HA-49

Description

The mode control actuator is located at the heater unit. It adjusts position of mode door by operating mode control actuator based on signal of A/C control unit. Pressing mode select switch makes the mode control actuator shift in order of vent → B/L → floor → mix.

Inspection

1. Ignition "OFF"
2. Disconnect the connector of mode control actuator.
3. Verify that the mode control actuator operates to the defrost mode when connecting 12V to the terminal 1 and grounding terminal 2.
4. Verify that the mode control actuator operates to the vent mode when connecting in the reverse.



1. Vent mode
2. Defrost mode
3. 5V(Vcc)

4. Feedback signal
5. Sensor ground

SHMHA7106L

5. Check the voltage between terminals 4 and 5.

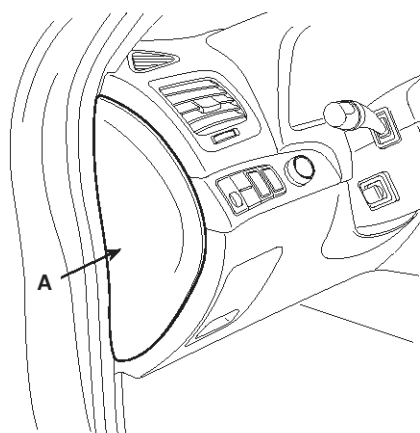
Door position	Voltage (4-5)	Error detecting
Vent	$0.3 \pm 0.15V$	Low voltage :0.1 V or less
Defrost	$4.7 \pm 0.15V$	High voltage :4.9 V or more

It will feedback current position of actuator to controls.

6. If the measured voltage is not specification, substitute with a known-good mode control actuator and check for proper operation.
7. If the problem is corrected, replace the mode control actuator.

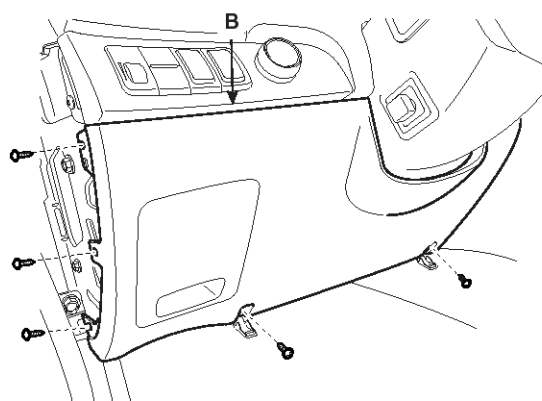
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover(A).

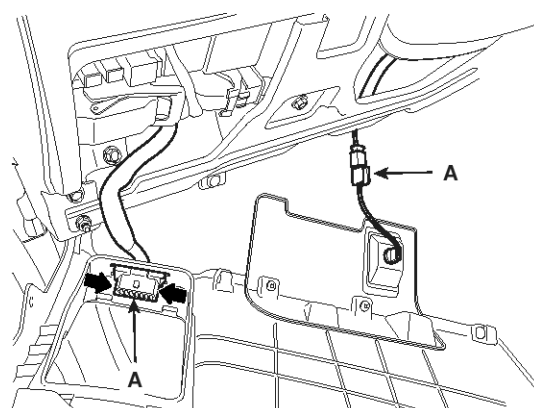


SHMHA7041D

3. Remove the crush pad lower cover(A).



SHMBD8084D

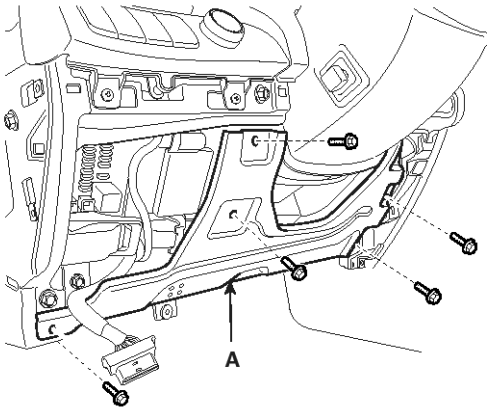


SHMBD8085D

HA-50

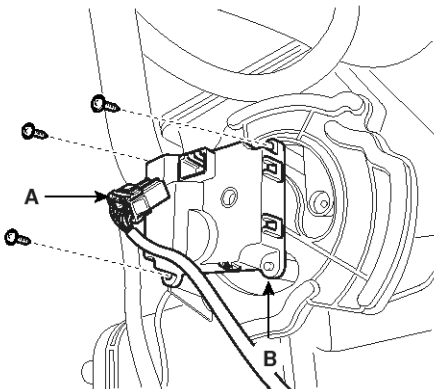
Heating, Ventilation, Air Conditioning

4. After loosening the mounting bolts, then remove the reinforcing panel (A).



SHMHA7043D

5. Remove the BCM(refer to BE group-BCM)
6. Disconnect the mode control actuator connector (A) after removing the air duct.
7. Loosen the mounting screws and then remove the mode control actuator (B).



SHMHA7050D

8. Installation is the reverse order of removal.

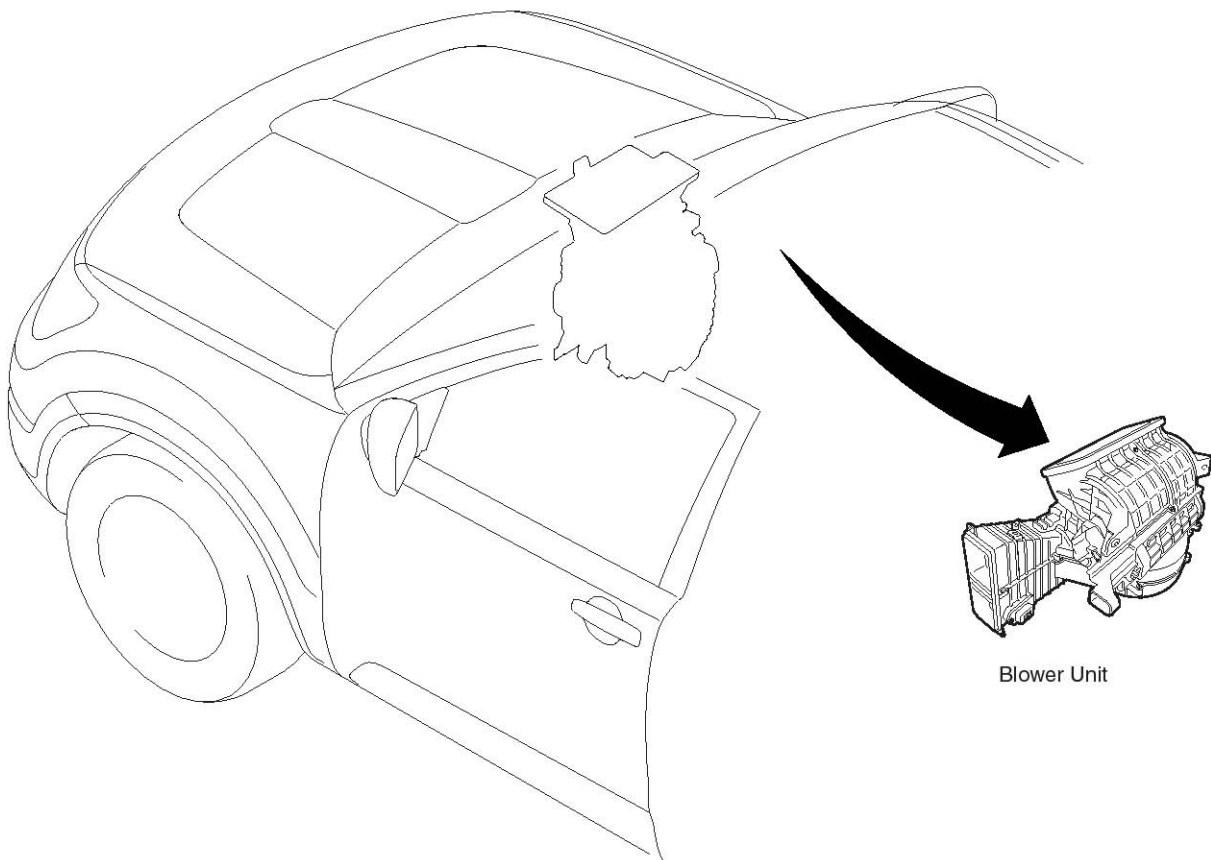
Blower

HA-51

Blower

Blower Unit

Component Location

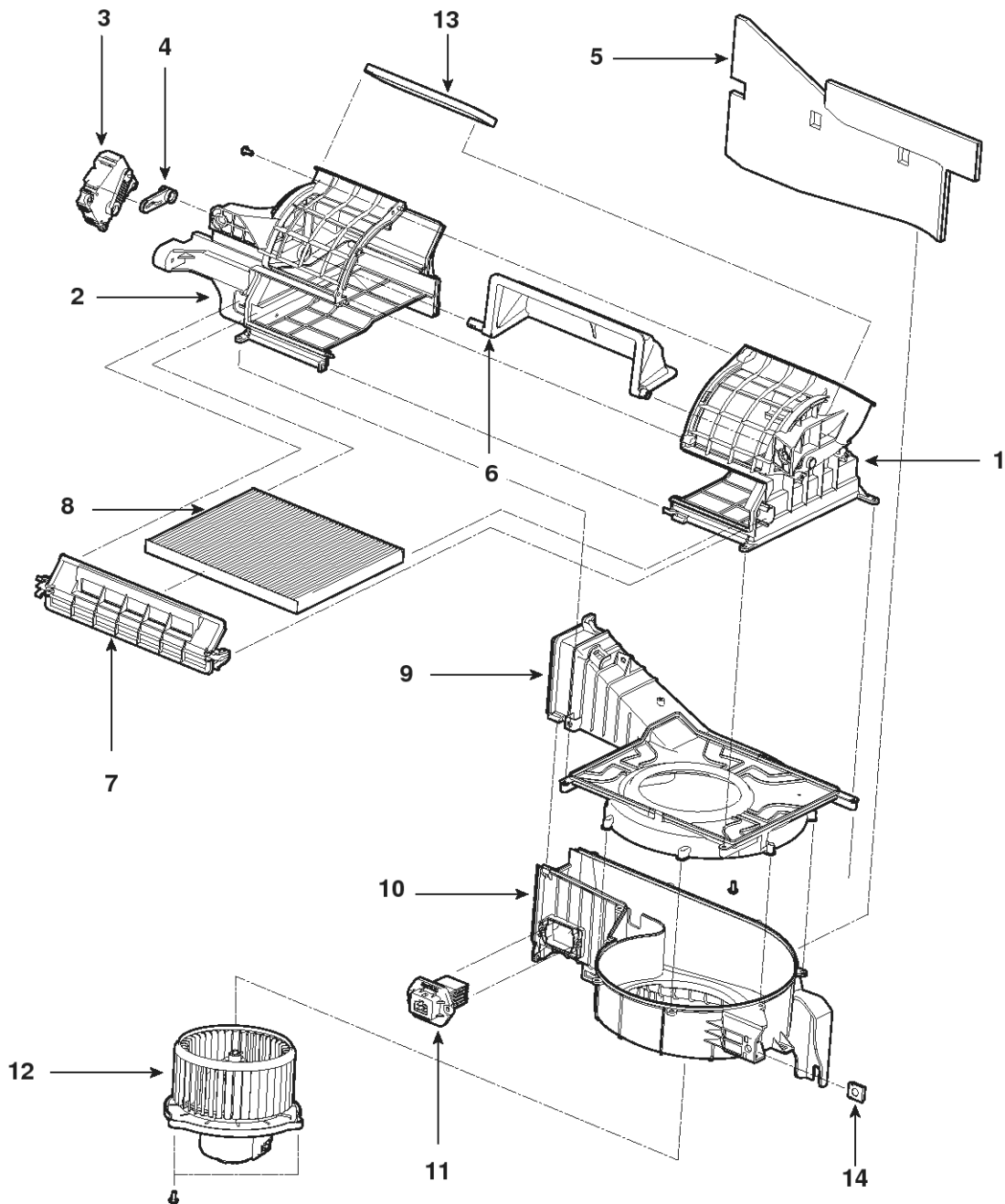


SHMHA7051L

HA-52

Heating, Ventilation, Air Conditioning

Components



SHMHA7052D

- 1. Inlet duct case(RH)
- 2. Inlet duct case(LH)
- 3. Intake actuator
- 4. Intake door lever
- 5. Blower cover pad

- 6. Inlet door
- 7. Climate control air filter cover
- 8. Climate control air filter
- 9. Blower case(upper)
- 10. Blower case(lower)

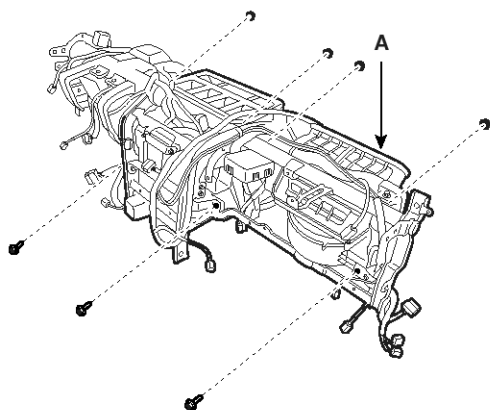
- 11. Power mosfet
- 12. Blower motor
- 13. Seal
- 14. U nut

Blower

HA-53

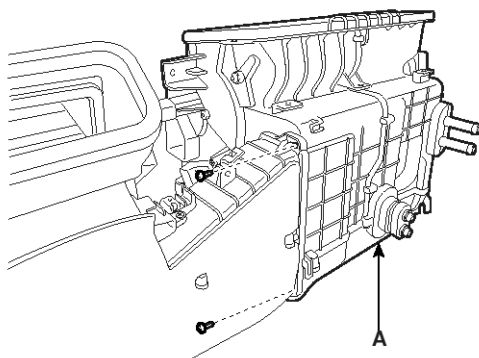
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crush pad.(Refer to BD group-crashpad)
3. Remove the cowl cross bar assembly.(Refer to BD group-crashpad)
4. Remove the heater and blower unit(A) from cowl cross bar assembly.

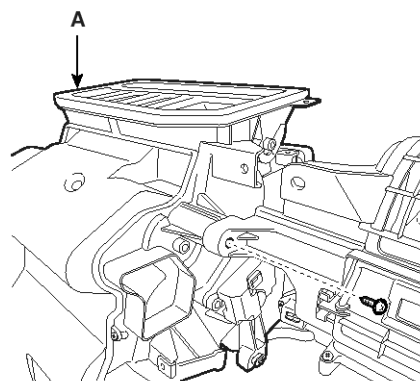


SHMHA7053D

5. Remove the blower unit (A) from the heater unit after loosening a mounting bolt and 3 screws.



SHMHA7054D



SHMHA7055D

NOTICE

Make sure that there is no air leaking out of the blower and duct joints.

6. Installation is the reverse order of removal.

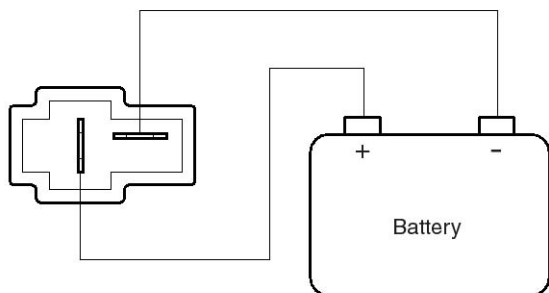
HA-54

Heating, Ventilation, Air Conditioning

Blower Motor

Inspection

1. Connect the battery voltage and check the blower motor rotation.

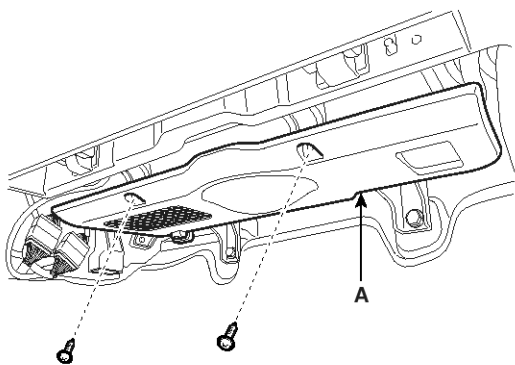


AQIE352C

2. If the blower motor voltage is not operated well, substitute with a known-good blower motor and check for proper operation.
3. If the problem is corrected, replace the blower motor.

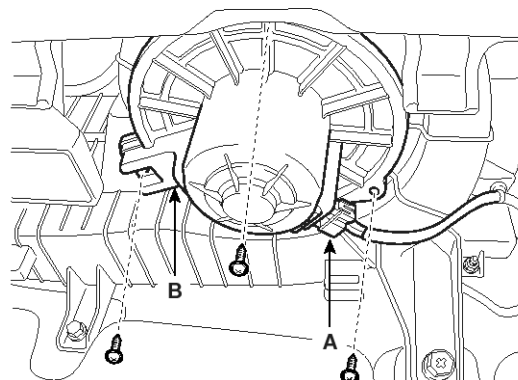
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel(A).



SHMHA7056D

3. Disconnect the connector (A) of the blower motor.
4. Remove the blower motor (B) after loosening the mounting screws.



SHMHA7057D

5. Installation is the reverse order of removal.

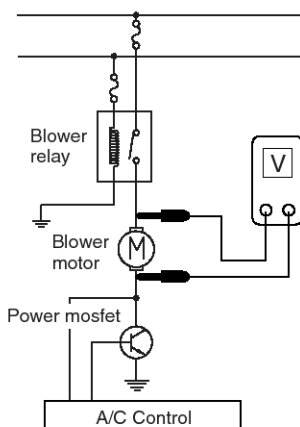
Blower

HA-55

Power Mosfet

Inspection

1. Ignition "ON"
2. Manually operate the control switch and measure the voltage of blower motor between pin 1 and 2.
3. Select the control switch to raise voltage until high speed.



EQRF355C

Specification

Fan	Motor Voltage
	Manual
First speed	$3.8 \pm 0.5V$
Second speed	$4.9 \pm 0.5V$
Third speed	$6.0 \pm 0.5V$
Fourth speed	$7.1 \pm 0.5V$
Fifth speed	$8.3 \pm 0.5V$
Sixth speed	$9.4 \pm 0.5V$
Seventh speed	$10.5 \pm 0.5V$
eighth speed	Battery

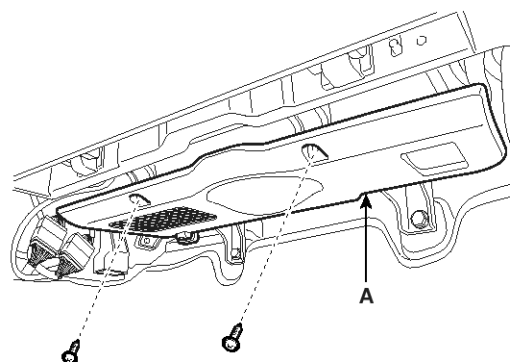
*AUTO COOLING: Auto speed (4.5V~B+)

*AUTO HEATING: Auto speed (4.5V~10.5V)

4. If the measured voltage is not specification, substitute with a known-good power mosfet and check for proper operation.
5. If the problem is corrected, replace the power mosfet.

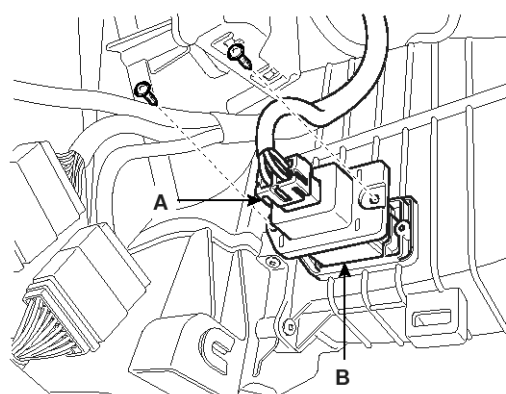
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel(A).



SHMHA7056D

3. Disconnect the power mosfet connector (A) and then remove the power mosfet (B) after loosening the mounting screws.



SHMHA7058D

4. Installation is the reverse order of removal.

HA-56

Heating, Ventilation, Air Conditioning

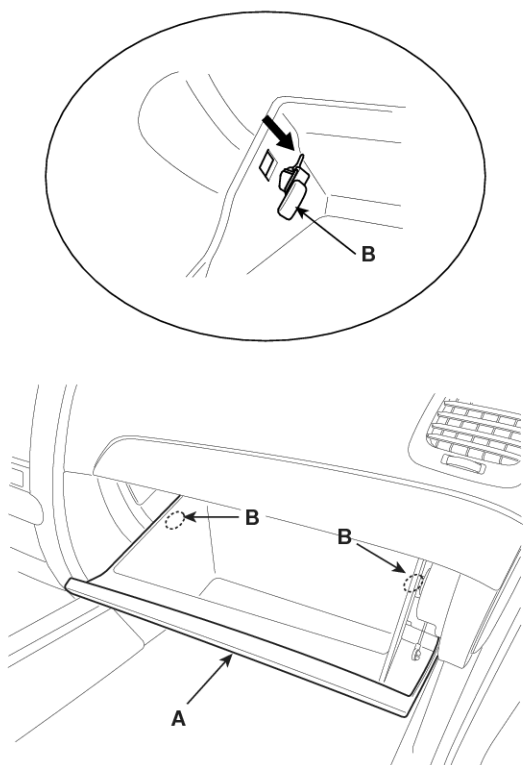
Climate control air filter

Description

This has particle filter which eliminates foreign materials and odor. The particle filter includes odor filter as well as conventional dust filter to ensure comfortable interior environment.

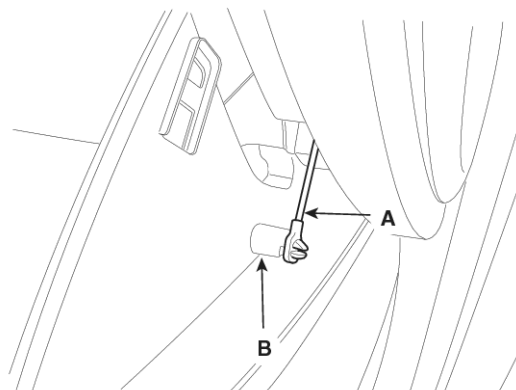
Replacement

1. Open the glove box (A). Lower the glove box down completely by removing the glove box stopper (B) to the glove box.



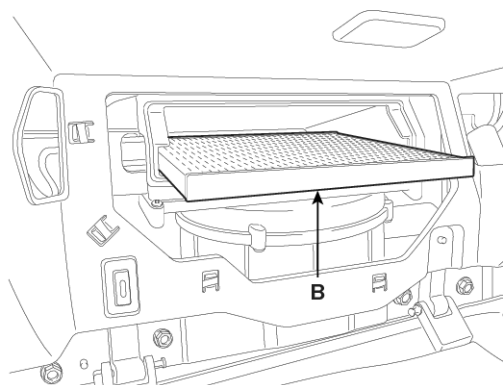
SHMBD8110D

2. Remove the side damper (A) from the glove box (B).



SHMHA7060L

3. Remove the filter cover with pushing the knob.
4. Replace the air filter (B), install it after making sure of the direction of air filter.



SHMHA7061D

NOTICE

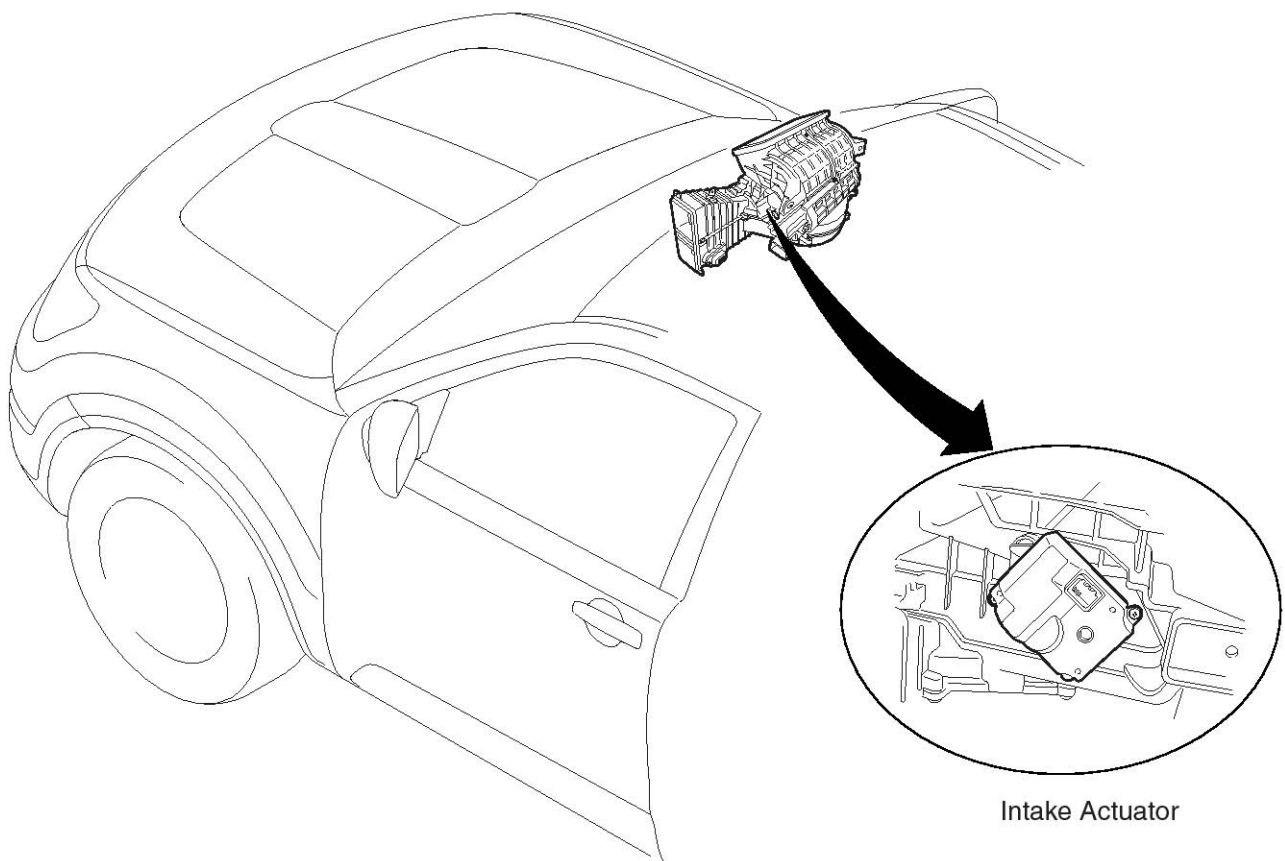
In case of driving in an air-polluted area or rugged terrain, check and replace the air filter as frequently as possible.

Blower

HA-57

Intake Actuator

Component location



Intake Actuator

SHMHA7062L

HA-58

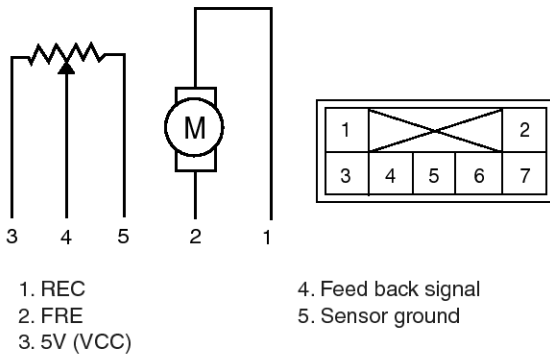
Heating, Ventilation, Air Conditioning

Description

1. The intake actuator is located at the blower unit.
2. It regulates the intake door by signal from control unit.
3. Pressing the intake selection switch will shift between recirculation and fresh air modes.

Inspection

1. Ignition "OFF"
2. Disconnect the intake actuator connector.
3. Verify that the actuator operates to the recirculation position when connecting 12V to the terminal 1 and grounding terminal 2.
4. Verify that the intake actuator operates to the fresh position when connecting in the reverse.

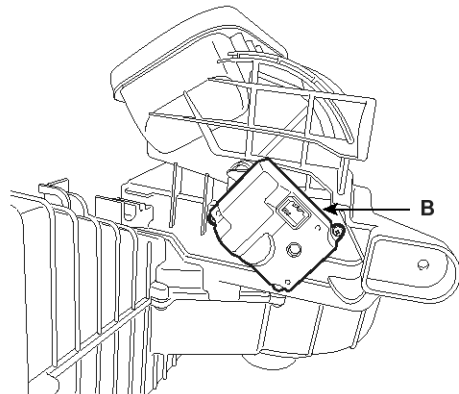


SHMHA7107L

5. If the intake actuator is not operated well, substitute with a known-good intake actuator and check for proper operation.
6. If the problem is corrected, replace the intake actuator.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box (Refer to BD group-crash pad).
3. Disconnect the intake actuator connector.
4. Loosen the mounting screw and then remove the intake actuator (B) from the blower unit.



SHMHA7063D

5. Installation is the reverse order of removal.

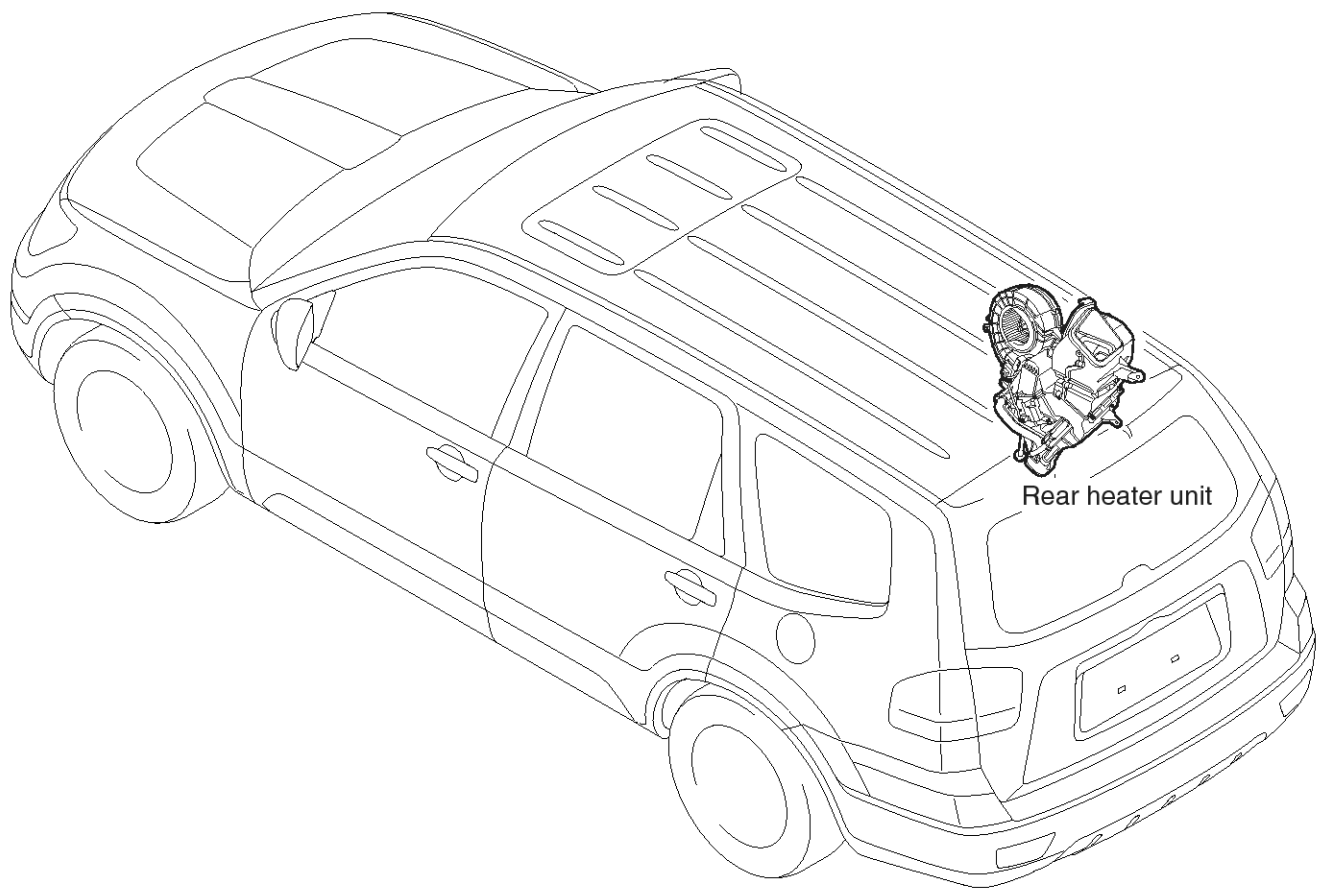
Rear Heater

HA-59

Rear Heater

Rear Heater Unit

Component Location

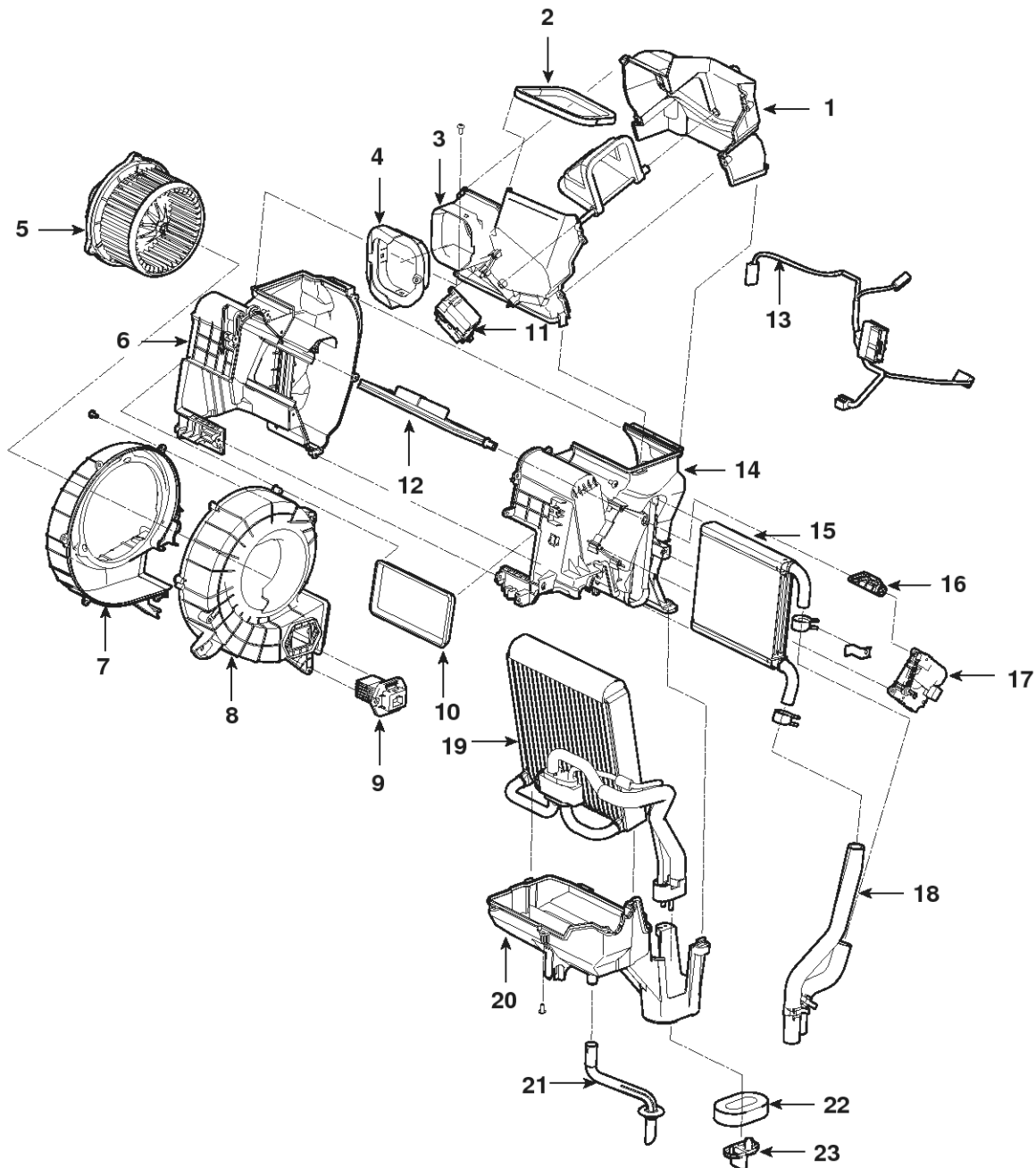


SHMHA7064L

HA-60

Heating, Ventilation, Air Conditioning

Components



SHMHA7065D

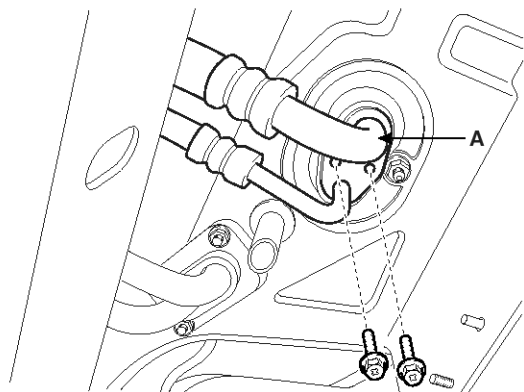
- | | | |
|--------------------|---------------------------|---------------------------|
| 1. Upper case | 9. Power mosfet | 17. Mode control actuator |
| 2. Seal | 10. Blower lining | 18. Water dose |
| 3. Upper case | 11. Temp control actuator | 19. Evaporator core |
| 4. Duct | 12. Temp door | 20. Lower case |
| 5. Blower motor | 13. Hanes | 21. Drain seal |
| 6. case(RH) | 14. Case(LH) | 22. Seal |
| 7. Blower case(RH) | 15. Heater core | 23. Cap |
| 8. Blower case(LH) | 16. Temp door arm | |

Rear Heater

HA-61

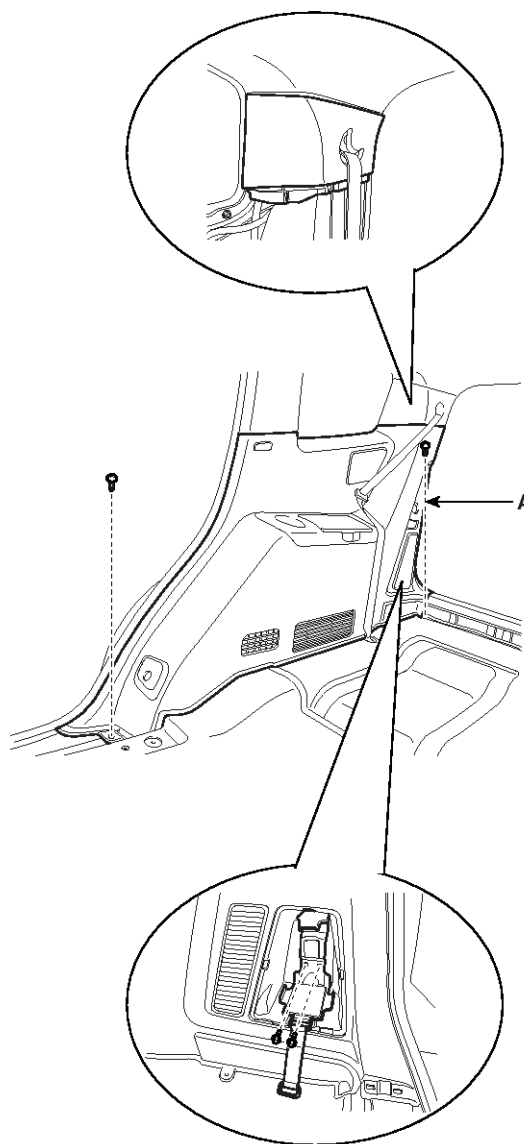
Replacement

1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recover/ recycling/ charging station.
3. When the engine is cool, drain the engine coolant from the radiator.
4. Loosen the refrigerant line mounting bolts, and then remove the rear refrigerant line (A).



SHMHA7066D

5. Remove the rear side pillar trim and jack mount bracket and then remove luggage side trim(A).

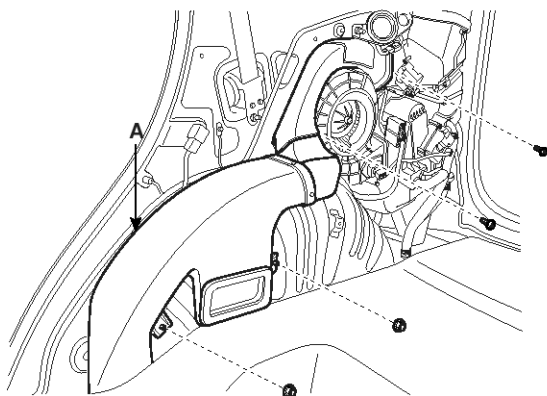


SHMHA7067D

6. Loosen the air duct mounting screw, and then remove the air duct (A).

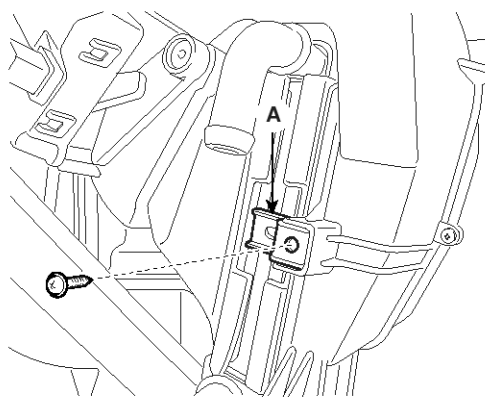
HA-62

Heating, Ventilation, Air Conditioning



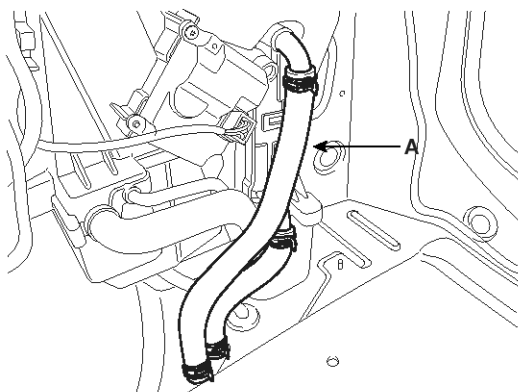
SHMHA7070D

7. Disconnect the rear heater hose(A).



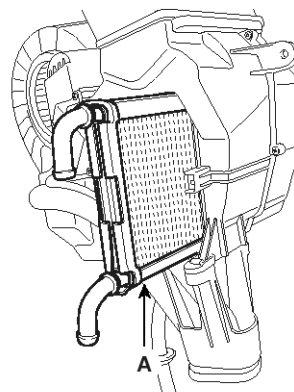
SHMHA7073D

10. Remove the heater core(B).



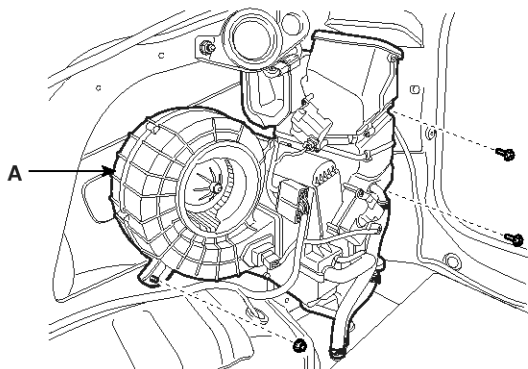
SHMHA7071D

8. Loosen the rear heater unit mounting bolts, and then remove the rear heater unit(A).



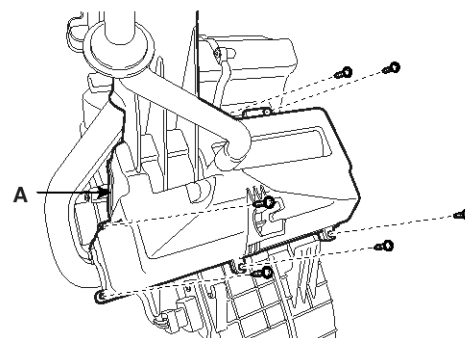
SHMHA7074D

11. Remove the evaporator core cover(A).



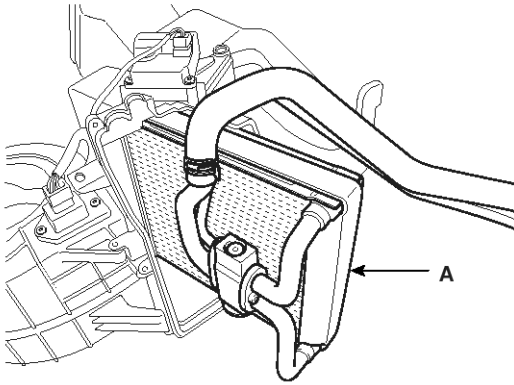
SHMHA7072D

9. Remove the heater core cover(A).



SHMHA7075D

12. Remove the evaporator core(A).



SHMHA7076D

13. Installation is the reverse order of removal.

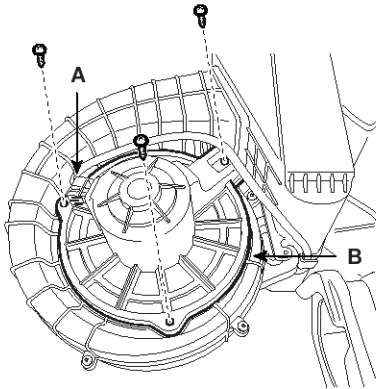
HA-64

Heating, Ventilation, Air Conditioning

Rear Blower Unit

Replacement

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector (A) of the blower motor.
3. Remove the blower motor (B) after loosening the mounting screws.



SHMHA7077D

4. Installation is the reverse order of removal.

Rear Heater

HA-65

Rear Temperature Control Actuator

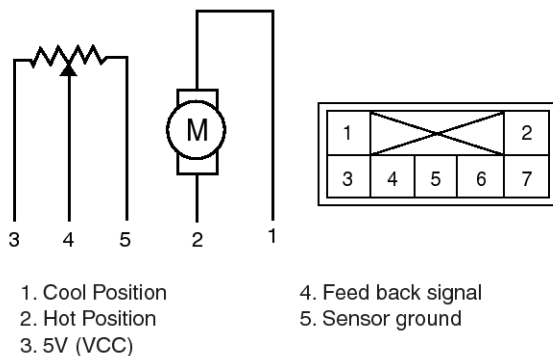
Description

1. Heater unit includes mode control actuator and temperature control actuator.
2. Temperature control actuator is located at the heater unit. It regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temperature door by operating temperature switch and then temperature will be regulated by the hot/cold air ratio decided by position of temperature door.

Inspection

1. Ignition "OFF".
2. Disconnect the connector of temperature control actuator.
3. Verify that the temperature control actuator operates to the hot position when connecting 12V to the terminal 1 and grounding terminal 2.

Verify that the temperature control actuator operates to the cool position when connecting in the reverse.



SHMHA7108L

4. Check the voltage between terminals 4 and 5.

Specification

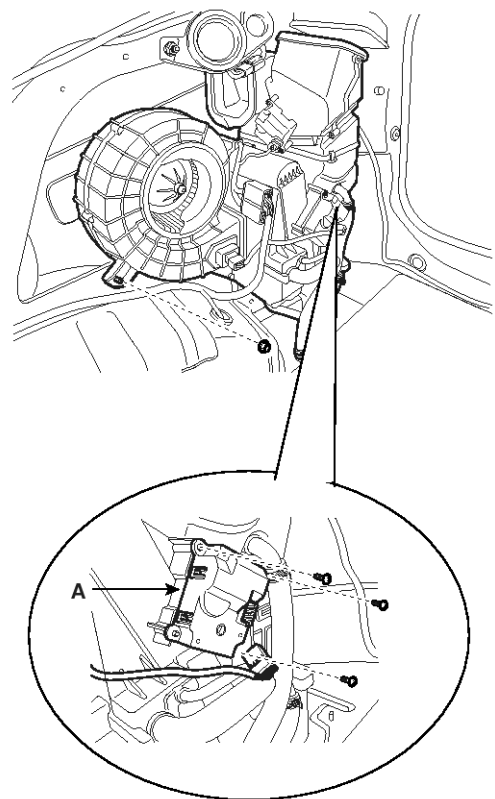
Door position	Voltage (4-5)	Error detecting
Max. cooling	$0.3 \pm 0.15V$	Low voltage : 0.1V or less
Max. heating	$4.7 \pm 0.15V$	High voltage : 4.9V or more

* It will feedback current position of actuator to controls.

5. If the measured voltage is not specification, substitute with a known-good temperature control actuator and check for proper operation.
6. If the problem is corrected, replace the temperature control actuator.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove luggage side trim (Refer to BD group-interior trim)
3. Loosen the mounting screw and then remove the temperature control actuator (A).



SHMHA7078D

4. Installation is the reverse order of removal.

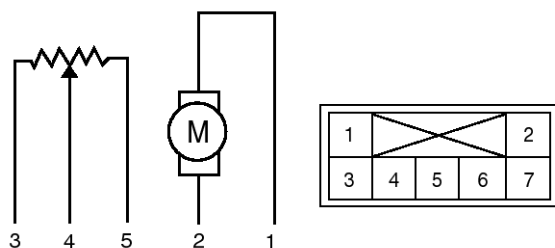
HA-66

Heating, Ventilation, Air Conditioning

Rear Mode Control Actuator

Inspection

1. Ignition "OFF".
2. Disconnect the connector of mode control actuator.
3. Verify that the mode control actuator operates to the defrost mode when connecting 12V to the terminal 1 and grounding terminal 2.
4. Verify that the mode control actuator operates to the vent mode when connecting in the reverse.



1. Vent
2. Defrost
3. Sensor ground

4. Feed back signal
5. 5V (VCC)

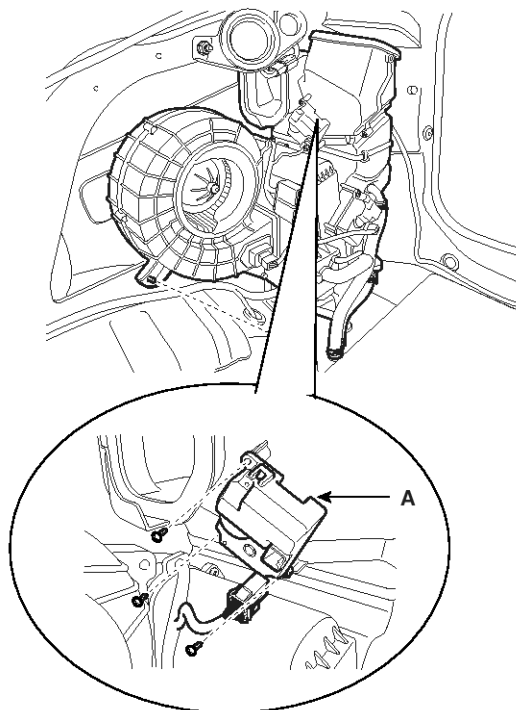
SHMHA7109L

5. Check the voltage between terminals 3 and 4.

Door position	Voltage (4-4)	Error detecting
Vent	$0.3 \pm 0.15V$	Low voltage :0.1 V or less
Defrost	$4.7 \pm 0.15V$	High voltage :4.9 V or more

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove luggage side trim.
3. Disconnect the mode control actuator connector.
4. Loosen the mounting screws and then remove the mode control actuator (A).



SHMHA7079D

5. Installation is the reverse order of removal.

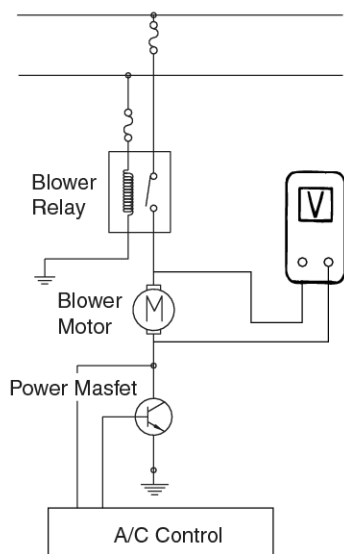
Rear Heater

HA-67

Rear Power Mosfet

Inspection

1. Ignition "ON".
2. Manually operate the control switch and measure the voltage of blower motor between pin 1 and 2.
3. Operate the blower motor control and measure the voltage output.



SHMHA9609L

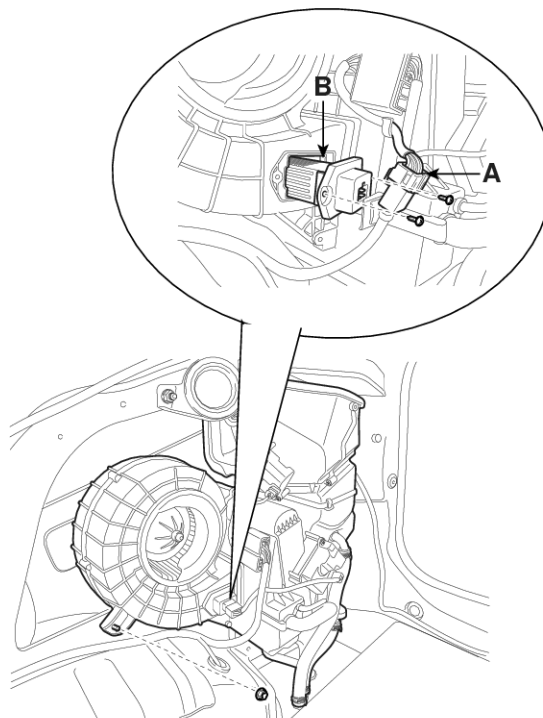
Fan	Voltage
	Manual
First speed	$4.0 \pm 0.5V$
Second speed	$5.1 \pm 0.5V$
Third speed	$6.2 \pm 0.5V$
Fourth speed	$7.3 \pm 0.5V$
Fifth speed	$8.4 \pm 0.5V$
Sixth speed	$9.5 \pm 0.5V$
Seventh speed	$10.5 \pm 0.5V$
eighth speed	Battery(+)

*AUTO COOLING : Auto speed (4.5V~B+)

*AUTO HEATING : Auto speed (4.5V~10.5V)

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove luggage side trim.
3. Disconnect the power mosfet connector (A).
4. Remove the power mosfet (B) after loosening the mounting screws.



SHMHA7080D

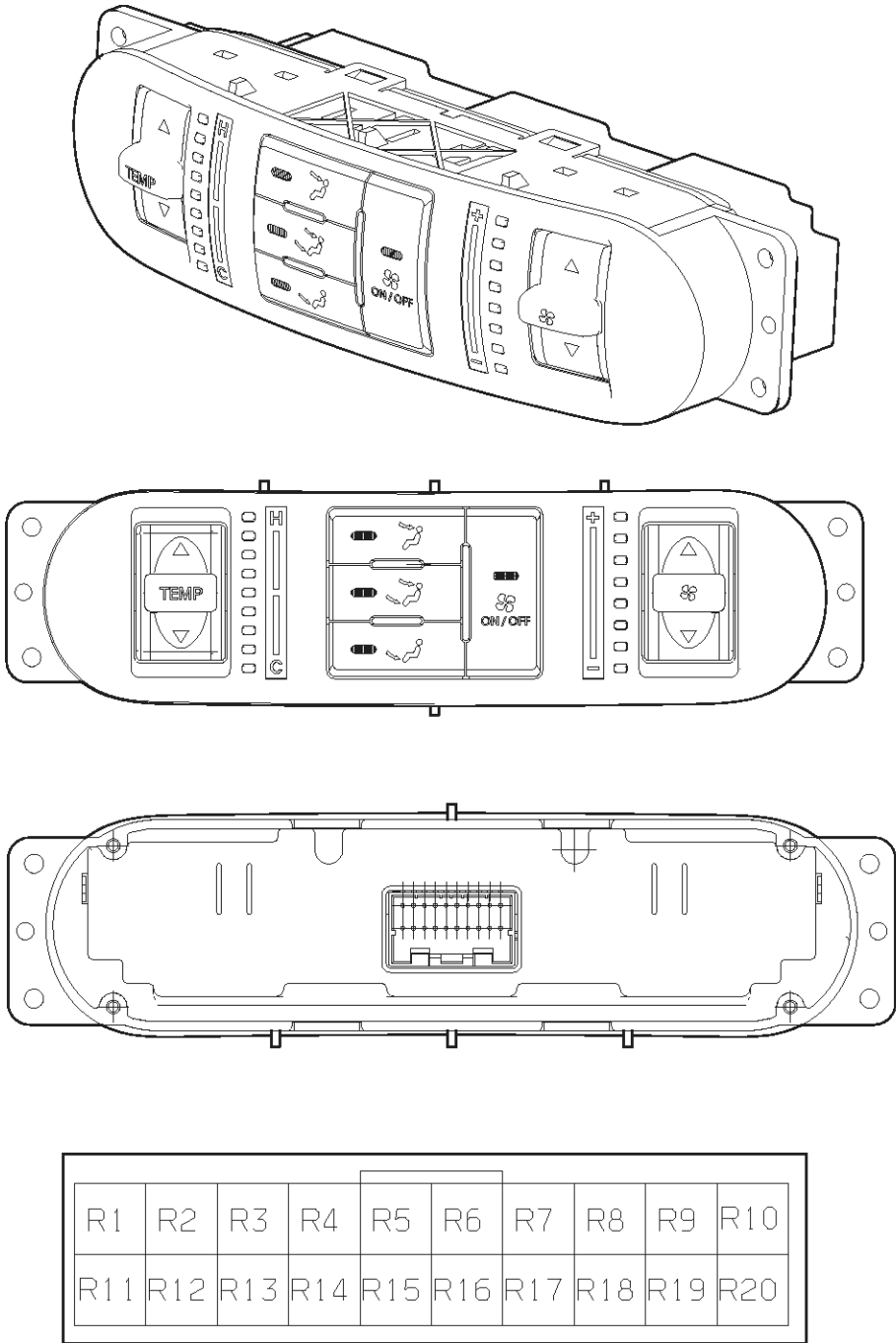
5. Installation is the reverse order of removal.

HA-68

Heating, Ventilation, Air Conditioning

Rear Control Panel

Component



SHMHA7081D

Rear Heater

HA-69

[Connector Pin Function]

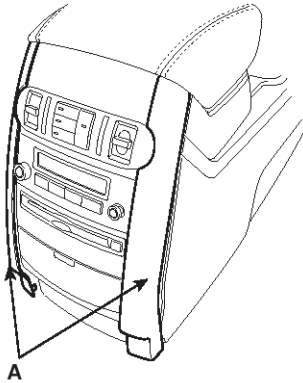
Connector	Pin	Function
Connector (A)	1	Battery
	2	Tail lamp
	3	IG2
	4	Power mosfet (G)
	5	Blower motor standard
	6	Vref (5V)
	7	-
	8	Temp actuator(cool)
	9	Rheostat
	10	GND
	11	Front comm(K-line)
	12	Mode actuator (vent)
	13	Power mosfet (D)
	14	Temp actuator f/back
	15	Mode actuator f/back
	16	-
	17	Mode actuator(def)
	18	Temp actuator(warm)
	19	-
	20	Sensor GND

HA-70

Heating, Ventilation, Air Conditioning

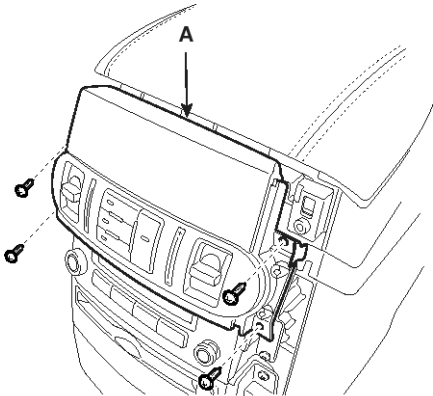
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the rear console panel(A).



SHMBD8067D

3. Loosen the mount screw and then remove the rear heater control unit(A).



SHMBD8068D

4. Installation is the reverse order of removal.

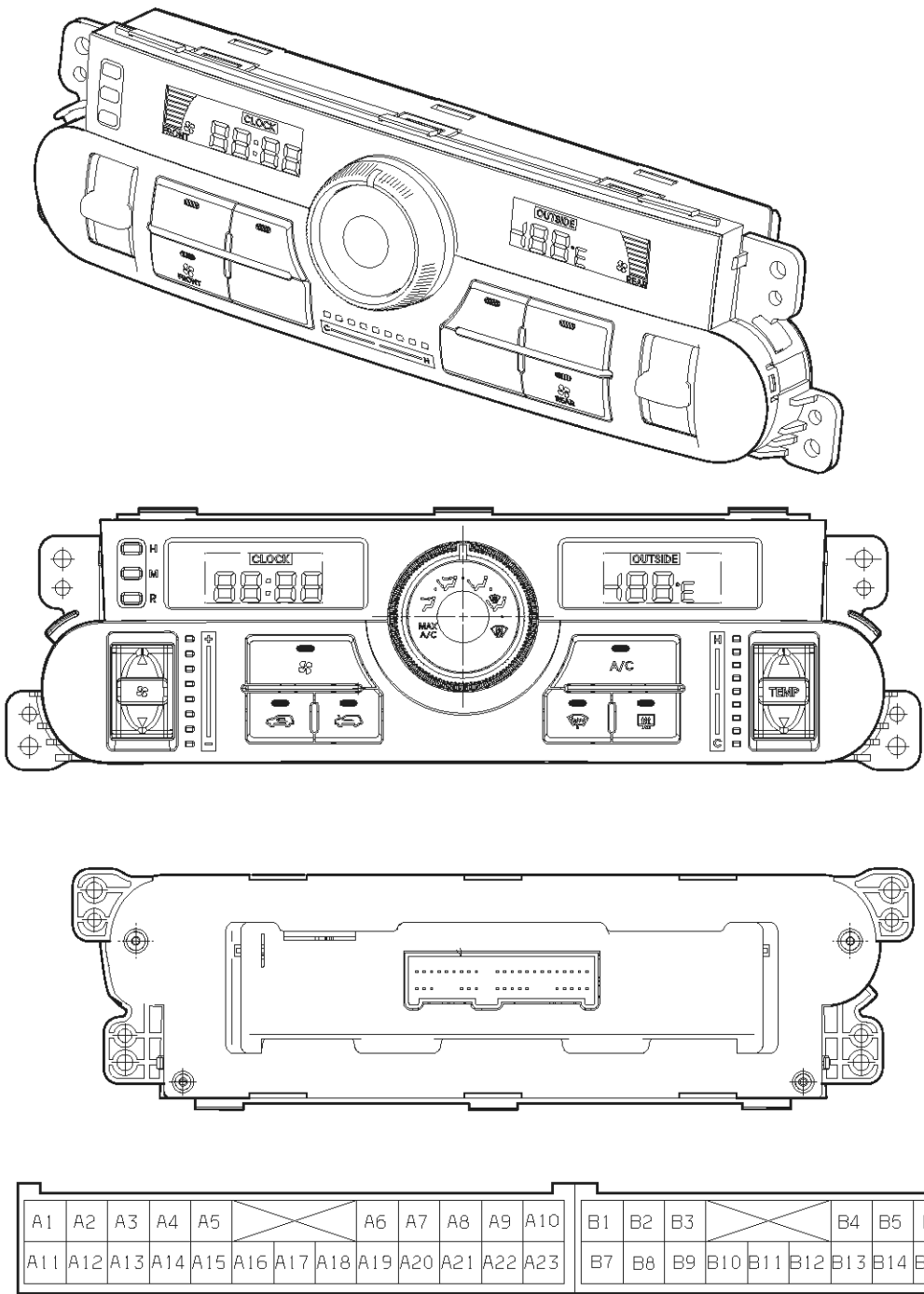
Controller

HA-71

Controller

Heater & A/C Control Unit(Manual)

Component



SHMHA7085D

HA-72

Heating, Ventilation, Air Conditioning

Connector pin function

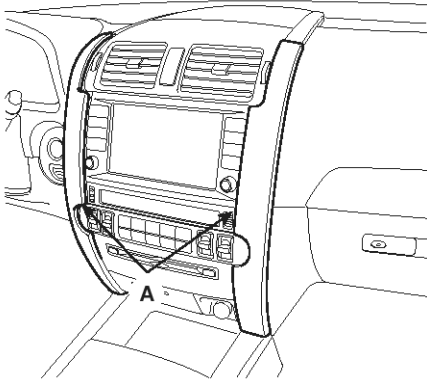
Connector	Pin	Function	Connector	Pin	Function
Connector (A)	1	Battery	Connector (B)	1	V ref(5V)
	2	Tail lamp		2	A/C select(high)
	3	IG2		3	Ambient sensor(+)
	4	Power mosfet(G)		4	Temp actuator f/back
	5	Blower motor standard		5	Mode actuator f/back
	6	Temp actuator(cool)		6	GND
	7	-		7	IG2
	8	Intake actuator(rec)		8	Evaporator sensor
	9	Rheostat		9	A/C thermo (high)
	10	GND		10	Speed sensor
	11	Rear comm..tx(K-line)		11	FRT wiper deicer S/W
	12	Mode actuator(def)		12	RR Def S/W
	13	Power mosfet (D)		13	Intake actuator f/back
	14	PTCONsignal(low)		14	-
	15	PTC relay #2		15	Sensor GND
	16	PTC relay #3			
	17	FRT wiper deicer			
	18	RR def indicator			
	19	Mode actuator(vent)			
	20	Temp actuator(warm)			
	21	Intake actuator(fre)			
	22	ACC(+)			
	23	Blower select(low)			

Controller

HA-73

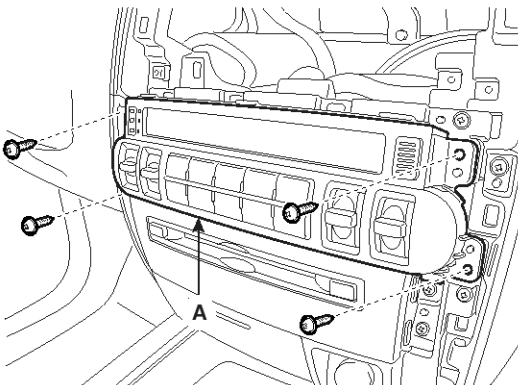
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel (A).



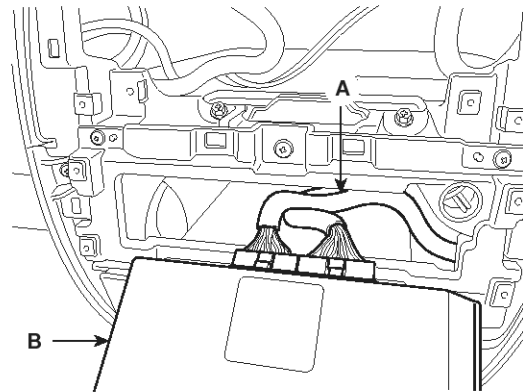
SHMBD8096D

3. Remove the audio assembly(refer to BD group-crash pad)
4. Loosen the heater & A/C controller (A) mount screws.



SHMHA7019D

5. Disconnect the heater & A/C controller and then remove the heater & A/C controller(B).



SHMHA7086D

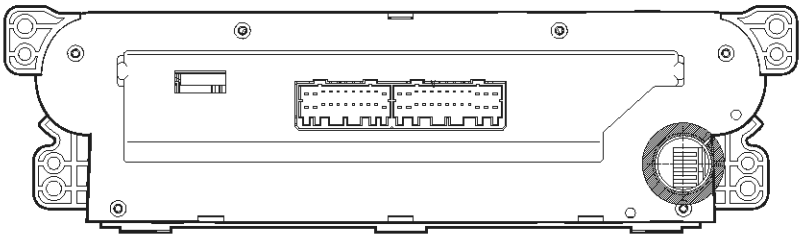
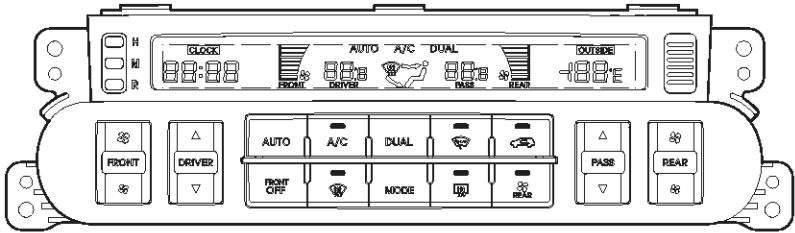
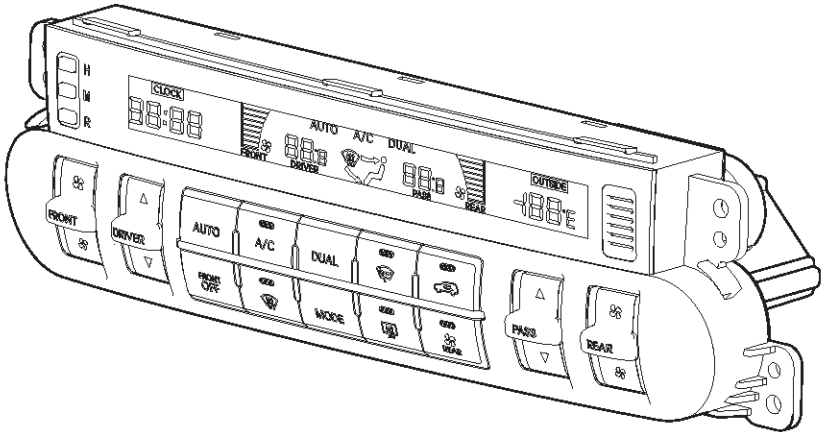
6. Installation is the reverse order of removal.

HA-74

Heating, Ventilation, Air Conditioning

Heater & A/C Control Unit(Full Automatic)

Component



A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22

SHMHA7103D

Controller

HA-75

Connector pin function

Connector	Pin	Function	Connector	Pin	Function
Connector (A)	1	Battery	Connector (B)	1	V ref(5V)
	2	Tail lamp(ILL+)		2	IG2
	3	IG2		3	Sun sensor(+)
	4	Power mosfet (G)		4	Evaporator sensor(+)
	5	A/C select (high)		5	Speed sensor
	6	PTCONsignal (low)		6	Hi-scan (K-line)
	7	Mode actuator(def)		7	-
	8	PS Temp actuator (cool)		8	In-car sensor(+)
	9	DR Temp actuator(cool)		9	-
	10	Intake actuator(rec)		10	DR Temp actuator f/back
	11	Rear comm.(K-line)		11	Mode actuator f/back
	12	Rheostat(ILL-)		12	Ambient sensor(+)
	13	GND		13	DR sun sensor(-)
	14	Blower motor standard		14	Water temp sensor
	15	IACC(+)		15	Intake actuator f/back
	16	Power mosfet (D)		16	PS Temp actuator f/back
	17	HTD(RR def indicate)		17	PS Sun sensor (-)
	18	A/C Thermo(high)		18	PS Temp actuator (warm)
	19	PTC relay #2		19	RF Def S/W
	20	PTC relay #3		20	RR Def S/W
	21	Mode actuator(vent)		21	GND
	22	DR Temp actuator(warm)		22	Sensor GND
	23	Intake actuator(fre)			
	24	Blower select(low)			
	25	In-car motor(-)			
	26	RE def indicate			

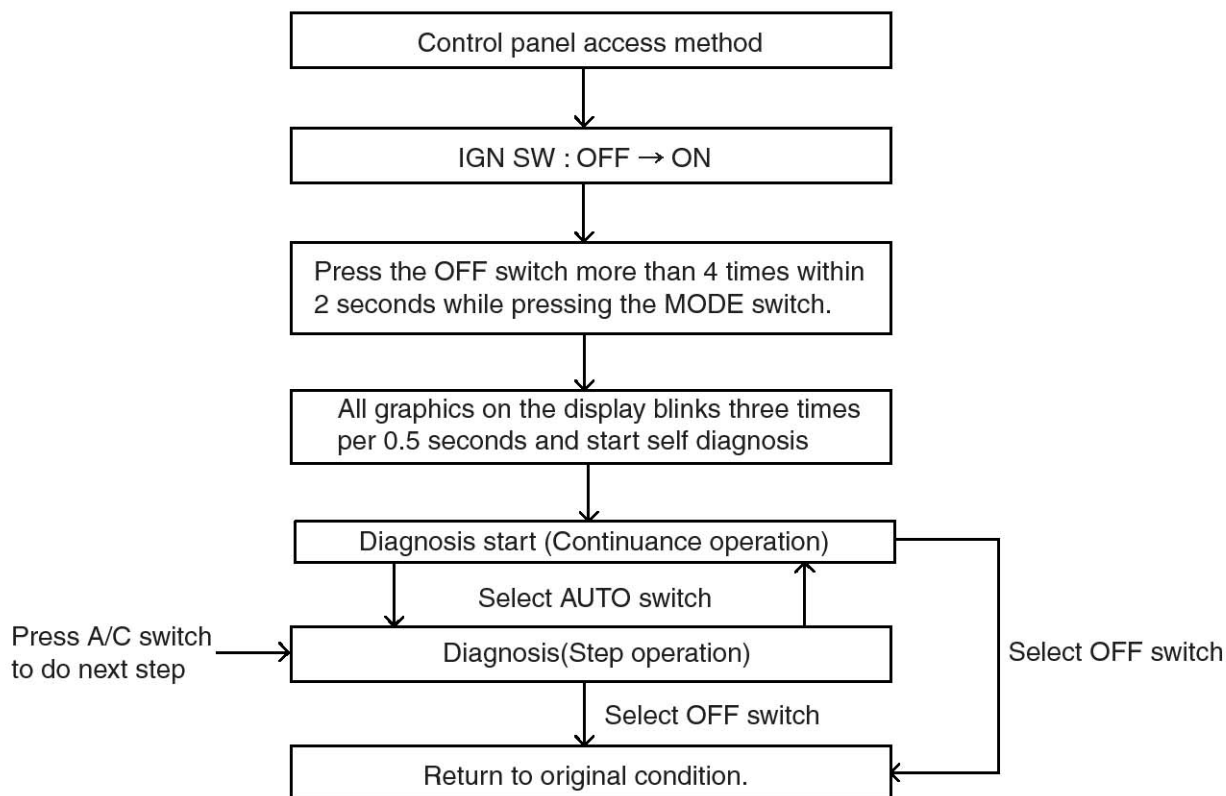
HA-76

Heating, Ventilation, Air Conditioning

SELF-DIAGNOSIS

1. Self-diagnosis process

The F.A.T.C. module self test feature will detect electrical malfunction and provide error codes for system components with suspected failures.



LQJF500E

NOTICE

DTC data can be retrieved from the control panel directly or from the DLC using the Hi-Scan Pro.

Controller

HA-77

2. How to read self-diagnostic code

After the display panel flickers three times every 0.5 second, the corresponding fault code flickers on the setup temperature display panel every 0.5 second and will show two figures. Codes are displayed in numerical format.

Display	Fail description
00	Normal
11	In-car sensor open
12	In-car sensor short
13	Ambient sensor open
14	Ambient sensor short
15	Water temp sensor open
16	Water temp sensor short
17	Evaporator sensor open
18	Evaporator sensor short
19	Temp door potentiometer open/short- Drive
20	Temp door potentiometer fault- Drive
21	Mode door potentiometer open/short – Passenger
22	Mode door potentiometer fault – Passenger
25	Intake door potentiometer open
26	Intake door potentiometer short
32	Temp door potentiometer open/short - Passenger
33	Temp door potentiometer fault - Passenger

HA-78

Heating, Ventilation, Air Conditioning

3. Fault code display

1) Continuance operation : DTC code is one



BQKF500C

2) Continuance operation : DTC code is more two

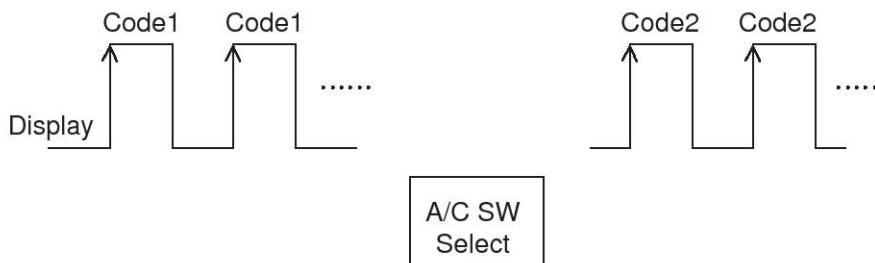


BQKF500D

3) Step operation

A. Nomal or one fault code is same a continuance

B. DTC code is more two



BQKF500E

4. If fault codes are displayed during the check, Inspect malfunction causes by referring to fault codes.

5. Fail safe

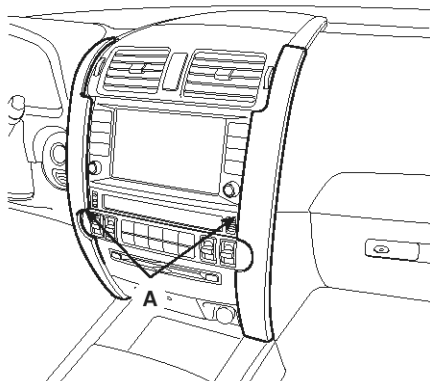
- 1) In-car temperature sensor: Control with the value of 25°C (77°F)
- 2) Ambient temperature sensor: Control with the value of 20°C (67°F)
- 3) Evaporator temperature sensor: Control with the value of -2°C (28.4°F)
- 4) Temperature control actuator (Air mix potentiometer):
If temperature setting 17°C-24.5°C, fix at maximum cooling position.
If temperature setting 25°C-32°C, fix at maximum heating position
- 5) Mode control actuator (Direction potentiometer):
Fix vent position, while selecting vent mode.
Fix defrost position, while selecting all except vent mode.
- 6) Intake control actuator :
Fix fresh position, while selecting fresh mode.
Fix recirculation position, while selecting recirculation mode.

HA-80

Heating, Ventilation, Air Conditioning

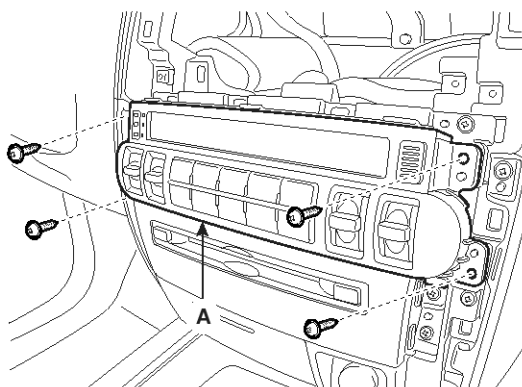
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia panel (A).



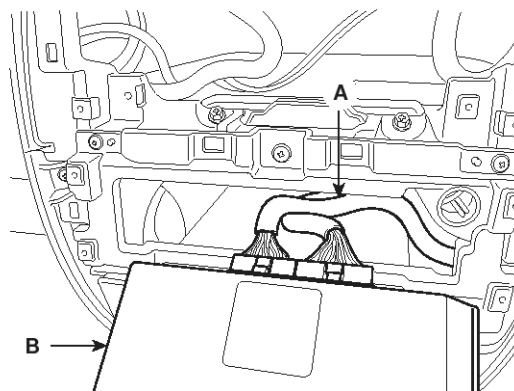
SHMBD8096D

3. Remove the audio assembly (refer to BD group-crash pad)
4. Loosen the heater & A/C controller (A) mount screws.



SHMHA7019D

5. Disconnect the heater & A/C controller connector (A) and then remove the heater & A/C controller (B).



SHMHA7086D

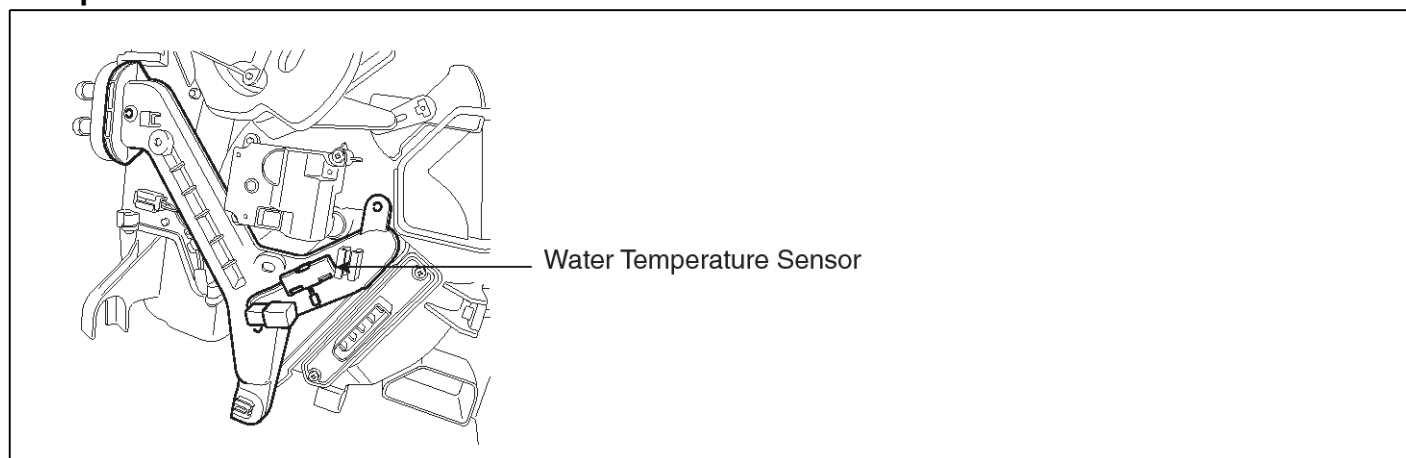
6. Installation is the reverse order of removal.

Controller

HA-81

B1202 Heater Water Temperature Sensor Open(High)

Component Location



SHMHA8608L

General Description

A water temp sensor located at heater unit detects coolant temperature. It contains negative type thermistor whose resistance value is in inverse proportion to temperature. Resistance of watersensor that varies with temperature makes signal voltage of A/C ECU change. In this way A/C ECU detects temperature. Signal of water sensor is used for cold engine lockout control - When the driver operates the heater before the engine is warmed up enough, to prevent driver from unpleasantness of cold air. the heater control unit reduces blower motor speed until coolant temperature reaches the threshold value.

DTC Description

Air conditioner Control Module sets DTC B1202 if water temperature sensor has been detected over 4.9V for 4 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor connection in wireharness - Open in signal circuit - Short to battery in signal circuit - Faulty Water temperature sensor - Faulty Air conditioner Control Module
Enable Conditions	IG KEY ON	
Threshold value	Water temperature sensor has been detected over 4.9V for 4 seconds.	
Failsafe	Control with the value of 85°C(185°F).	

Specification

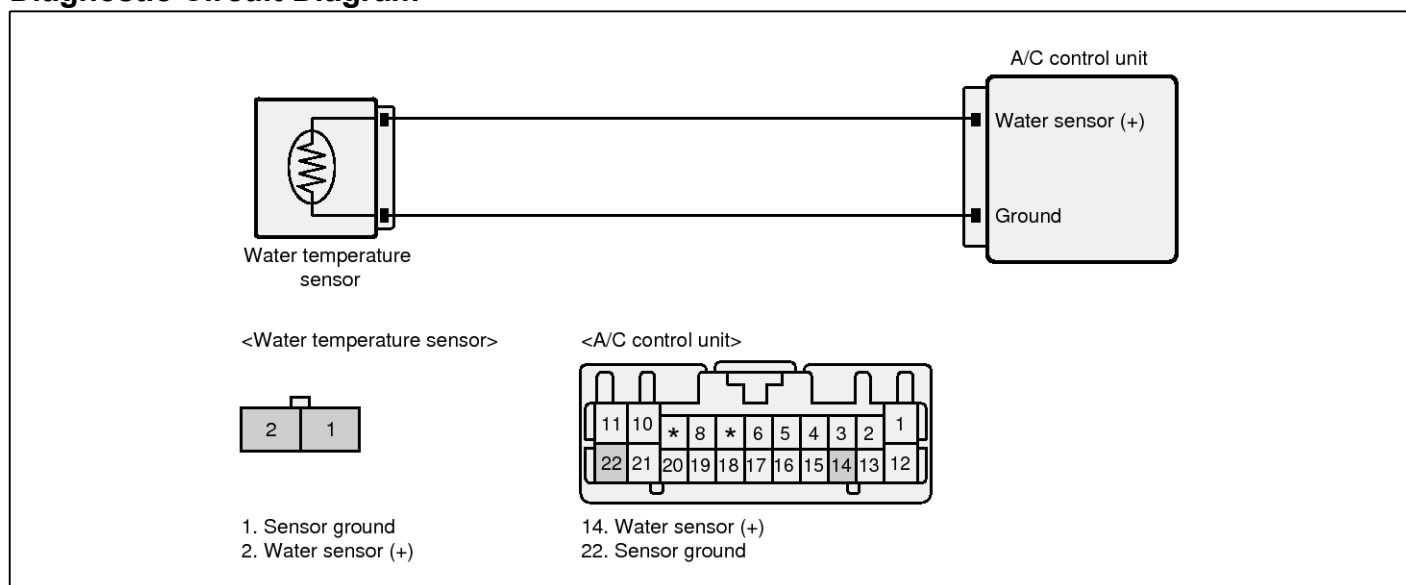
※ Resistance value of Water temperature sensor as a function of temperature.

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-10/14	55.8	40/104	5.3
0/32	32.9	60/140	2.4
20/68	12.5	80/176	1.2

HA-82

Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9501L

Scantool Diagnostics

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Water temperature sensor" parameter.

☒ Current Data

Standard Display ▾ Full List ▾ Graph ▾ Items List ▾ Reset Min.Max. Record Stop ▾ VSS

Sensor Name	Value	Unit
☒ Heater Water Temperature Sensor	85	°C

Fig.1

SHMHA9601L

FIG.1) Parameter of "Water TEMP.SENSOR" will be fixed at 85°C(185°F), if there is any fault in INCAR SENSOR.

4. Is the Incar temperature sensor normal ?

YES ► Go to "Inspection and Repair" procedure.

NO ► This is a intermittent problem caused by poor contact of component or Control Unit.
 ► Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ► Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ► Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ► Go to "W/Harness Inspection" procedure.

Controller

HA-83

Signal Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect Water temp.sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Power terminal of Water temp.sensor harness connector and chassis ground.

Specification : 0V

5. Is the measured voltage within specification?

YES ▶ Go to "Check for open in harness" as follows.

NO ▶ Check for short to battery in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Water temp.sensor and A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Water temp.sensor harness connector and Signal(+) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Ground circuit Inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Water temp.sensor and A/C control unit main harness connector.
3. Measure resistance between ground terminal of Water temp.sensor harness connector and ground terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Water temp.sensor

1. Ignition "OFF"
2. Disconnect Water temp.sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Water temp.sensor harness connector and Sensor ground harness connector .(Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-10/14	55.8	40/104	5.3
0/32	32.9	60/140	2.4
20/68	12.5	80/176	1.2

FIG.1) ※ Specifications : Resistance value of water sensor as a function of temperature.

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good Water temp.s-sensor and check for proper operation. If the problem is corrected, replace Water temp.sensor and then go to "Verification of Vehicle Repair" procedure.

HA-84

Heating, Ventilation, Air Conditioning

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Water temp.sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Water temp.sensor harness connector and chassis ground .(Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

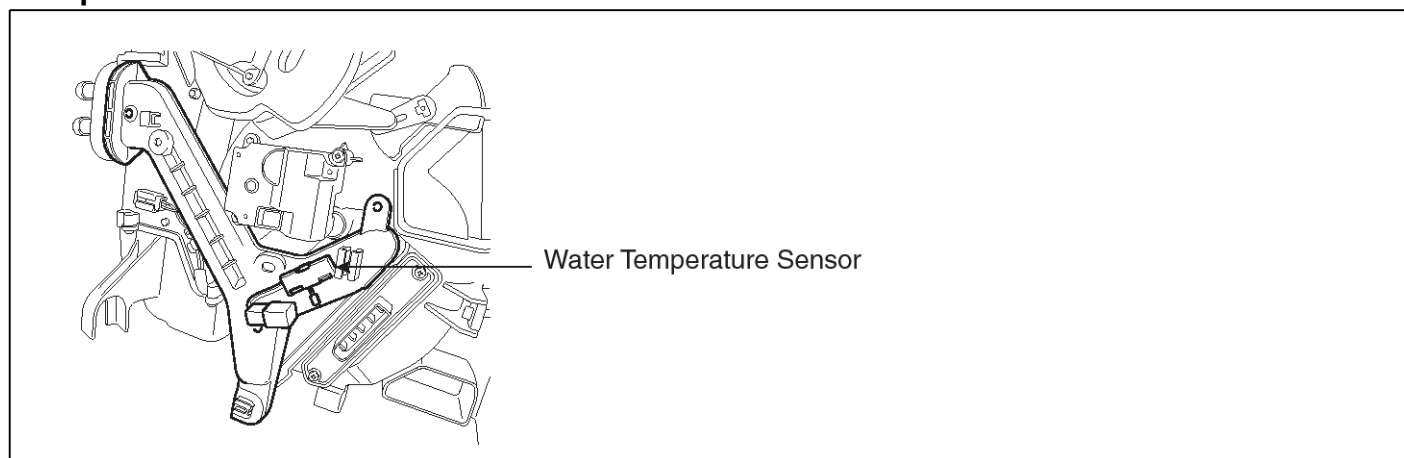
NO ► System is performing to specification at this time.

Controller

HA-85

B1203 Heater Water Temperature Sensor Short(Low)

Component Location



SHMHA8608L

General Description

A water temp sensor located at heater unit detects coolant temperature. It contains negative type thermistor whose resistance value is in inverse proportion to temperature. Resistance of watersensor that varies with temperature makes signal voltage of A/C ECU change. In this way A/C ECU detects temperature. Signal of water sensor is used for cold engine lockout control - When the driver operates the heater before the engine is warmed up enough, to prevent driver from unpleasantness of cold air. the heater control unit reduces blower motor speed until coolant temperature reaches the threshold value.

DTC Description

Air conditioner Control Module sets DTC B1203 if Water sensor has been detected below 0.1V for 4 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	• Voltage check	• Short in signal circuit • Faulty Water Sensor • Faulty A/C control Module
Enable Conditions	• IG KEY ON	
Threshold value	• Water temperature sensor has been detected 0.1V for 4 seconds.	
Failsafe	• Control with the value of 85°C(185°F).	

Specification

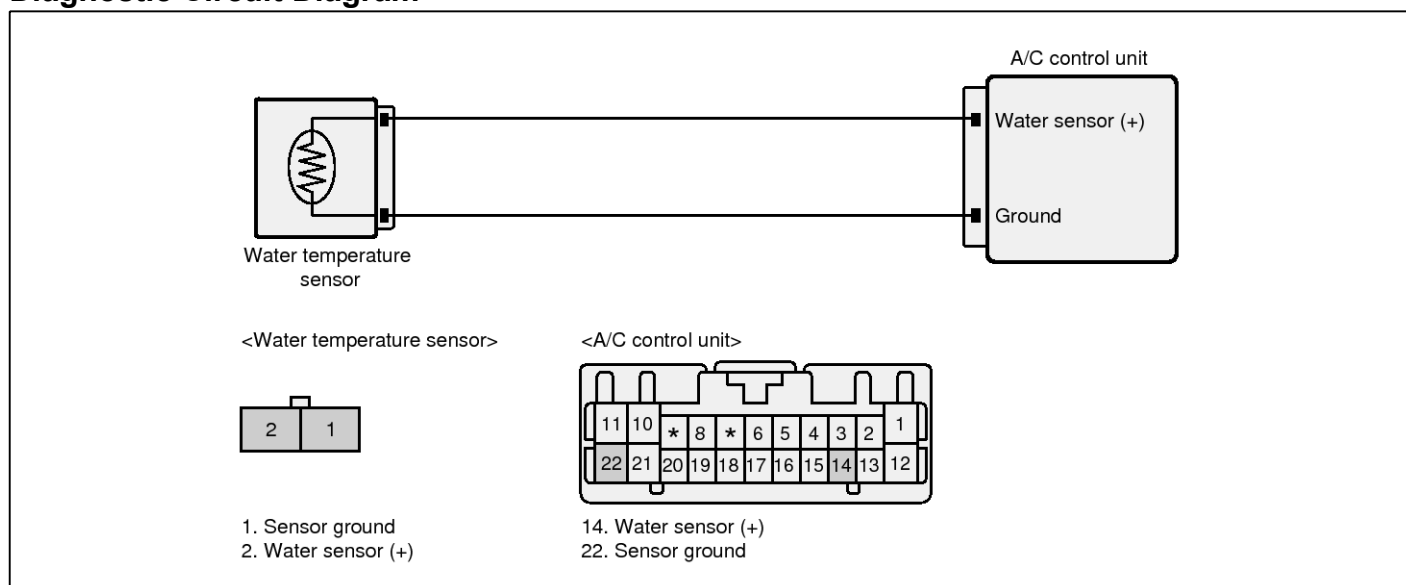
※ Resistance value of Water temperature sensor as a function of temperature.

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-10/14	55.8	40/104	5.3
0/32	32.9	60/140	2.4
20/68	12.5	80/176	1.2

HA-86

Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9501L

Scantool Diagnostics

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Water temperature sensor" parameter.

☒ Current Data

Standard Display ▾ Full List ▾ Graph ▾ Items List ▾ Reset Min.Max. Record Stop ▾ VSS

Sensor Name	Value	Unit
☒ Heater Water Temperature Sensor	85	°C

Fig.1

SHMHA9601L

FIG.1) Parameter of "Water TEMP.SENSOR" will be fixed at 85°C(185°F), if there is any fault in INCAR SENSOR.

4. Is the Incar temperature sensor normal ?

YES ► Go to "Inspection and Repair" procedure.

NO ► This is a intermittent problem caused by poor contact of component or Control Unit.
 ► Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ► Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ► Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ► Go to "W/Harness Inspection" procedure.

Controller

HA-87

Signal Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect Water temp.sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Power terminal of Water temp.sensor harness connector and chassis ground.

Specification : Infinity

5. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure .

NO ▶ Check for short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Water temp.sensor

1. Ignition "OFF"
2. Disconnect Water temp.sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Water temp.sensor harness connector and Sensor ground harness connector.(Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-10/14	55.8	40/104	5.3
0/32	32.9	60/140	2.4
20/68	12.5	80/176	1.2

FIG.1) ※ Specifications : Resistance value of water sensor as a function of temperature.

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good Water temp.s-sensor and check for proper operation. If the problem is corrected, replace Water temp.sensor and then go to "Verification of Vehicle Repair" procedure.

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Water temp.sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Water temp.sensor harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ▶ Go to the applicable troubleshooting procedure.

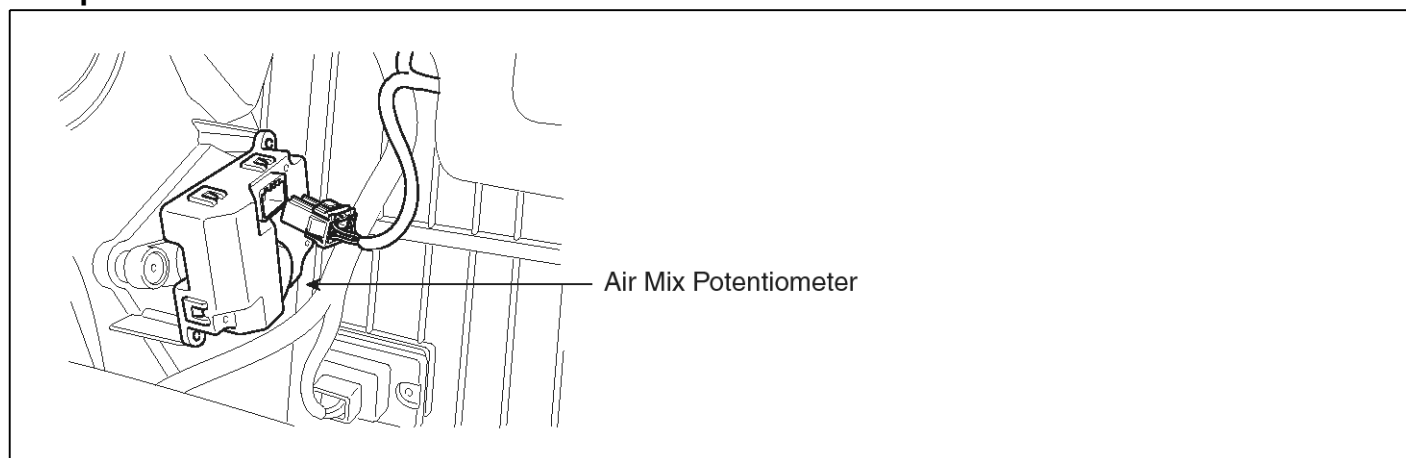
NO ▶ System is performing to specification at this time.

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Heating, Ventilation, Air Conditioning

B1204 Air Mix Potentiometer Open (Low)–Passenger

Component Location



SHMHA8613L

General Description

Temperature control actuator located at heater unit. It contains temp motor that changes temp door position and potentiometer that monitors position of temp door. Temperature control actuator regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temp door by operating temp motor and then temperature will be regulated by the hot/cold air ratio decided by position of temp door. In operation, potentiometer delivers temp door position transformed into voltage value to A/C ECU.

DTC Description

Airconditioner Control Module sets DTC B1204 if the Feed Back signal of Passenger Temperature Actuator has been detected open or below 0.1V for 100ms.

DTC Detecting Condition

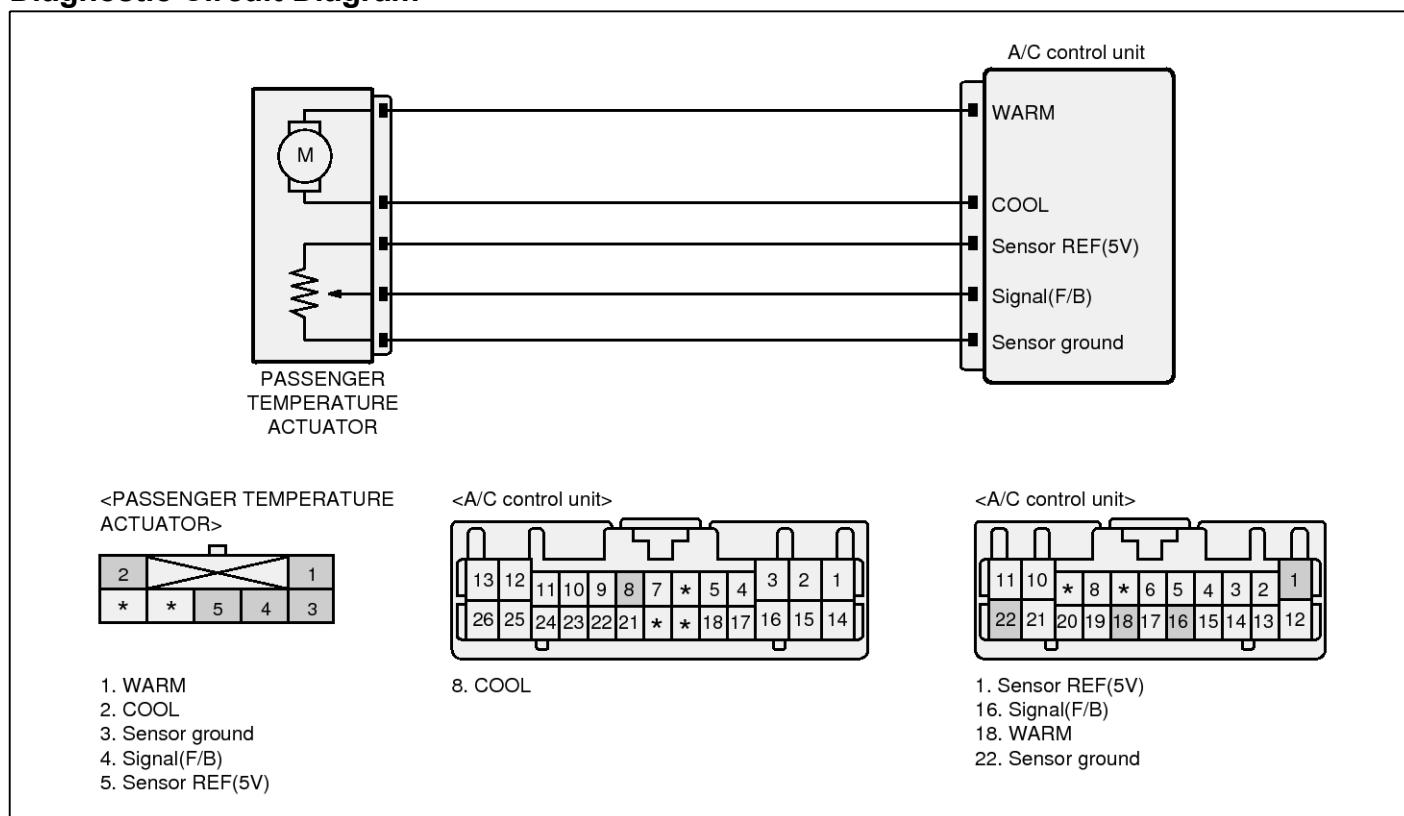
Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor connection of connected part - Open in signal circuit (Feedback circuit), Power circuit or Ground Circuit - Faulty passenger air mix actuator - Faulty A/C control unit
Enable Conditions	IG KEY ON	
Threshold value	Feedback signal has been detected open or below 0.1V for 100ms	
Failsafe	- setting temperature : 24.5°C(76.1°F) fix at max. cooling position - setting temperature : 25°C(77°F) fix at max. heating position	

Specification

※ Voltage value of Air Mix potentiometer as a function of temp door position.

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

Diagnostic Circuit Diagram



SHMHA9502L

Monitor Scantool data

■ Check Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal temperature after engine start
3. Select "Air Mix Door Potentiometer-Passenger" parameter on the current data with scantool
4. Perform Actuation Test for Passenger Air Mix Door - 0% / 50% / 100%.
5. With performing Actuation test, check that the value of Air Mix Door Potentiometer is changed and close to the value of Actuation Test.

Specification : Check that the value of Air Mix Door Potentiometer at current data should be close to the value of the acutation test .

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Heating, Ventilation, Air Conditioning

☒ Current Data

Standard Display ▾

Full List ▾

Graph ▾

Items List ▾

Reset Min.Max.

Record

Stop ▾

VSS

Sensor Name	Value	Unit
☒ Air Mix Door Potentiometer-Passenger	6.3	%

☒ Actuation Test

Test Items

Passenger Air Mix Door-0%
Passenger Air Mix Door-50%
Passenger Air Mix Door-100%
Driver Mode Door-Face
Driver Mode Door-Foot
Driver Mode Door-Defrost
Air Inlet Mode Selection-Fresh
Air Inlet Mode Selection-Recirculation
External Control Valve - 0%

• Duration

Until Stop Button

• Conditions

ENG. RUNNING, A/C ON

• Result

Success

Start

Stop

SHMHA9602L

6. Does the value of current data follow in accordance with the each actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect passenger air mix actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of passenger air mix actuator harness connector and Signal(F/B) terminal of A/C-ECU harness connector.

Specification : 1Ω below

- Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check short to ground in harness

- Ignition "OFF"
- Disconnect passenger air mix actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of passenger air mix actuator harness connector and chassis ground .

Specification : Infinity

Controller

HA-91

4. Is the measured resistance within specification?

YES ▶ Go to "Power circuit Inspection " procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Power Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Sensor REF(5V) terminal of passenger air mix actuator harness connector and chassis ground .

Specification : approx. 5V

5. Is the measured voltage within specification?

YES ▶ Go to "Ground circuit Inspection " procedure .

NO ▶ Check for open and short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and A/C control unit main harness connector.
3. Measure resistance between Sensor ground(-) terminal of passenger air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check passenger air mix actuator

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to WARM(+) of passenger air mix actuator and (-) terminal to COOL(-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting. (WARM(+) and COOL(-)). (Component side)

Specification : Refer the specifications in Fig.1)

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Heating, Ventilation, Air Conditioning

Fig.1)

Actuator harness	WARM(+)	COOL(-)	Door position
Battery terminal	12 V	ground	Max. warm
	ground	12 V	Max. cool

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good passenger air mix actuator and check for proper operation. If the problem is corrected, replace passenger air mix actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect passenger air mix actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of passenger air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

FIG.2) ※ Voltage value of Air Mix potentiometer as a function of temp door position.

5. Is "voltage" display near the specified value?

YES ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good passenger air mix actuator and check for proper operation. If the problem is corrected, replace passenger air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ▶ Go to the applicable troubleshooting procedure.

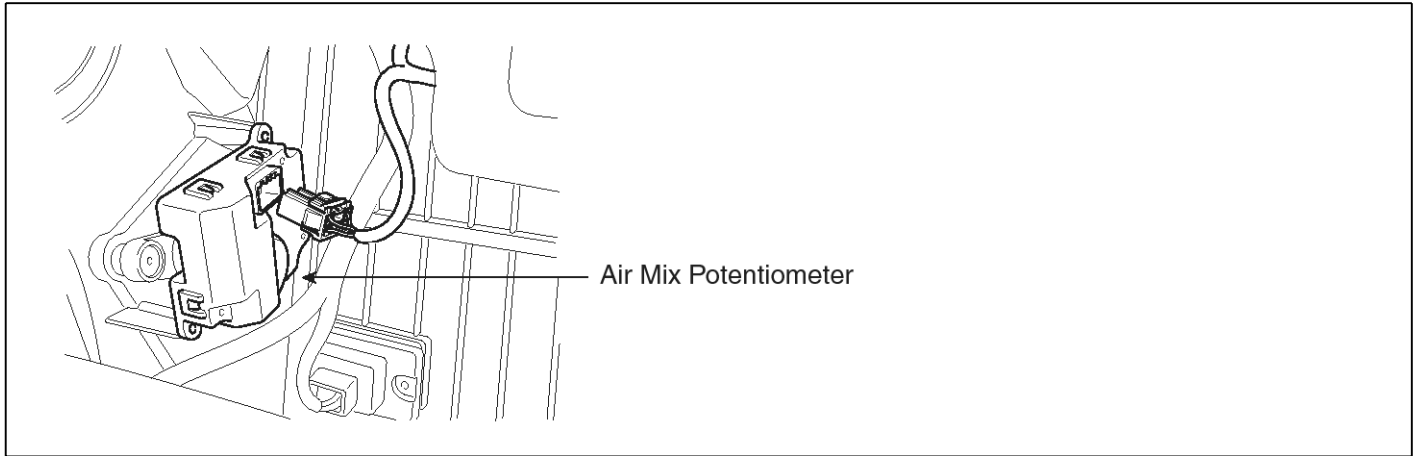
NO ▶ System is performing to specification at this time.

Controller

HA-93

B1205 Air Mix Potentiometer Short (High)–Passenger

Component Location



SHMHA8613L

General Description

Temperature control actuator located at heater unit. It contains temp motor that changes temp door position and potentiometer that monitors position of temp door. Temperature control actuator regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temp door by operating temp motor and then temperature will be regulated by the hot/cold air ratio decided by position of temp door. In operation, potentiometer delivers temp door position transformed into voltage value to A/C ECU.

DTC Description

Airconditioner Control Module sets DTC B1205 if the Feed Back signal of Passenger Temperature Actuator has been detected over 4.9V for 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Short to battery in signal(Feed-back) circuit - Faulty passenger air mix actuator - Faulty A/C control unit
Enable Conditions	IG KEY ON	
Threshold value	Feedback circuit has been detected over 4.9V for 100ms	
Failsafe	- setting temperature : 24.5°C(76.1°F) fix at max. cooling position - setting temperature : 25°C(77°F) fix at max. heating position	

HA-94

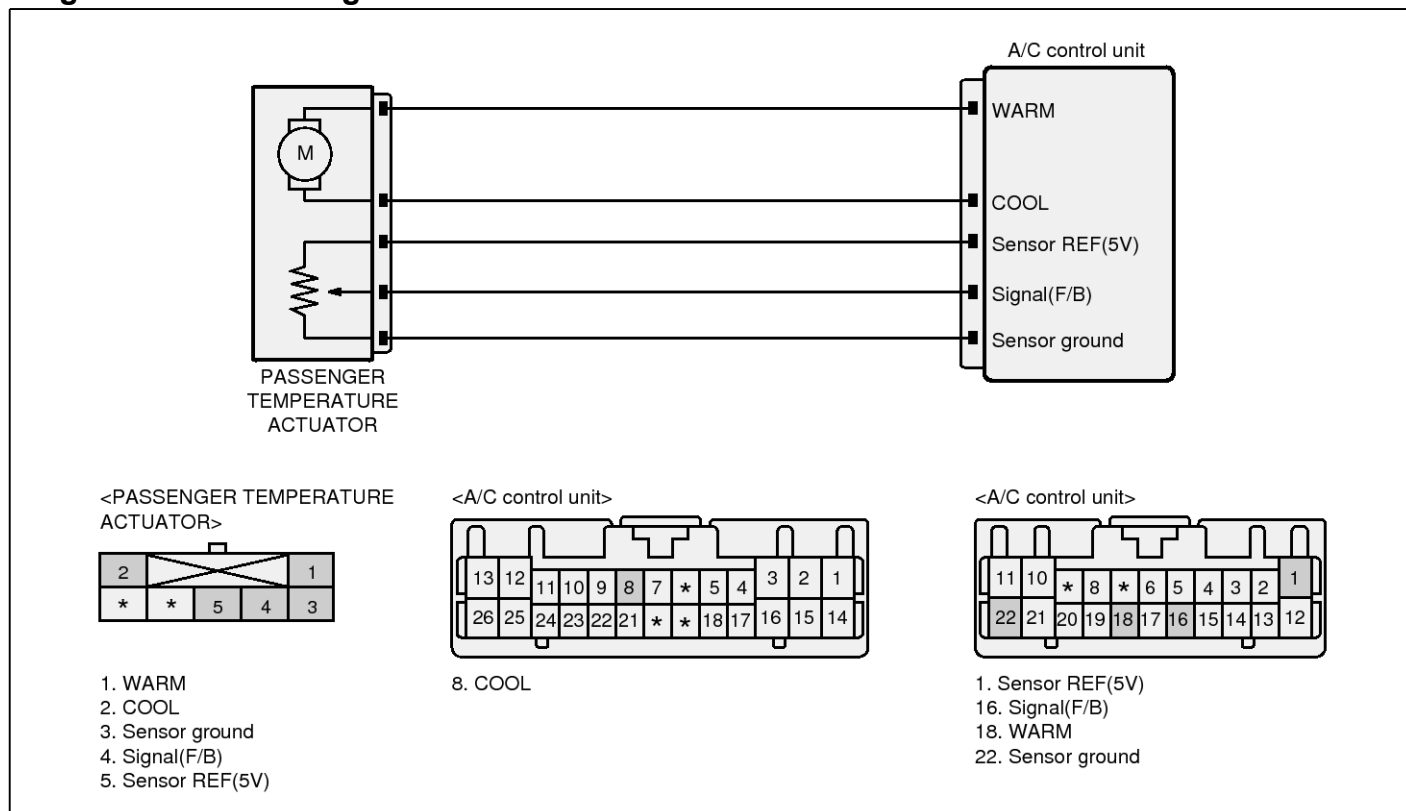
Heating, Ventilation, Air Conditioning

Specification

※ Voltage value of Air Mix potentiometer as a function of temp door position.

Door position	Voltage
Max. cool	$0.3 \pm 0.15V$
Max. warm	$4.7 \pm 0.15V$

Diagnostic Circuit Diagram



SHMHA9502L

Monitor Scantool data

■ Check Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal temperature after engine start
3. Select "Air Mix Door Potentiometer-Passenger" parameter on the current data with scantool
4. Perform Actuation Test for Passenger Air Mix Door - 0% / 50% / 100%.
5. With performing Actuation test, check that the value of Air Mix Door Potentiometer is changed and close to the value of Actuation Test.

Specification : Check that the value of Air Mix Door Potentiometer at current data should be close to the value of the acutation test .

Controller

HA-95

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Air Mix Door Potentiometer-Passenger	6.3	%

Actuation Test

Test Items

Passenger Air Mix Door-0%
Passenger Air Mix Door-50%
Passenger Air Mix Door-100%
Driver Mode Door-Face
Driver Mode Door-Foot
Driver Mode Door-Defrost
Air Inlet Mode Selection-Fresh
Air Inlet Mode Selection-Recirculation
External Control Valve - 0%

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9602L

6. Does the value of current data follow in accordance with the each actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check short to battery in harness

- Ignition "OFF"
- Disconnect passenger air mix actuator and A/C control unit main harness connector.
- Ignition "ON"
- Measure voltage between Signal(F/B) terminal of passenger air mix actuator harness connector and chassis ground .

Specification : 0V

- Is the measured voltage within specification?

YES ▶ Go to "Ground circuit Inspection " procedure

NO ▶ Check for short to battery in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

HA-96

Heating, Ventilation, Air Conditioning

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and A/C control unit main harness connector.
3. Measure resistance between Sensor ground(-) terminal of passenger air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check passenger air mix actuator

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to WARM(+) of passenger air mix actuator and (-) terminal to COOL(-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting. (WARM(+) and COOL(-)). (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	WARM(+)	COOL(-)	Door position
Battery terminal	12 V	ground	Max. warm
	ground	12 V	Max. cool

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good passenger air mix actuator and check for proper operation. If the problem is corrected, replace passenger air mix actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect passenger air mix actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of passenger air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
Max. cool	0.3±0.15V
Max. warm	4.7±0.15V

FIG.2) ※ Voltage value of Air Mix potentiometer as a function of temp door position.

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good passenger air mix actuator and check for proper operation. If the problem is corrected, replace passenger air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

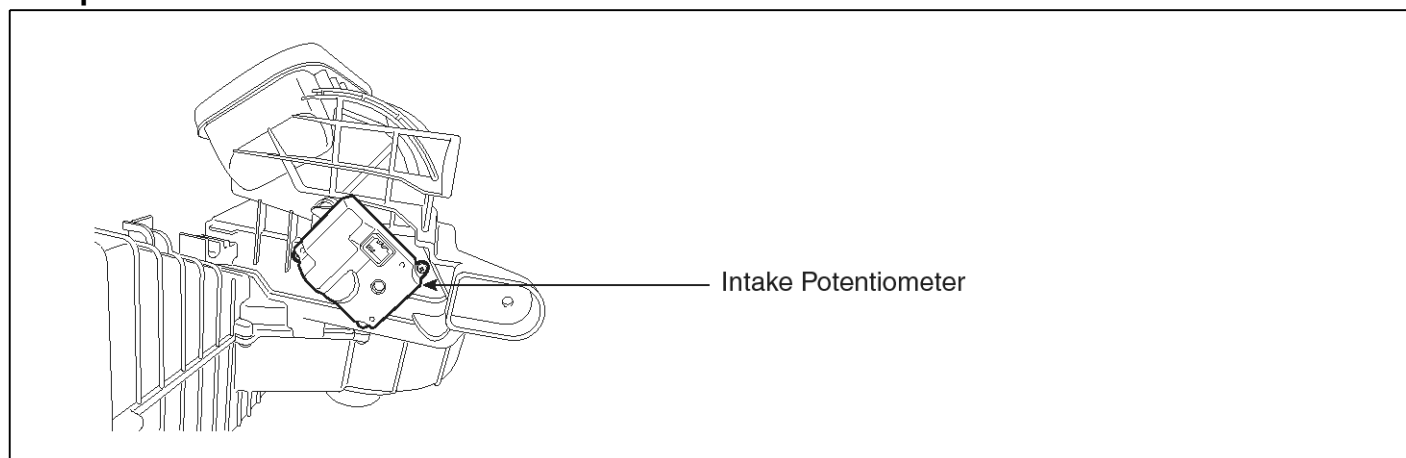
NO ► System is performing to specification at this time.

HA-98

Heating, Ventilation, Air Conditioning

B1208 Intake Potentiometer Open (Low)

Componet Location



SHMHA8609L

General Description

Intake door located at heater unit controls the inlet of car. It contains intake motor that changes intake door position and potentiometer that monitors position of intake door. When driver operates the intake switch, ECU receives mode signal from intake switch and operates intake door motot to turn intake door to intended position. (with FRE mode signal, intake door is closed and with REC mode signal, intake door is opened)In operation, potentiometer delivers intake door position transformed into voltage value to A/C ECU.

DTC Description

Airconditioner Control Module sets DTC B1208 if the Feed Back signal of Intake Actuator has been detected open or below 0.1V for 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor connection of connected part - Open circuit in signal/power harness - Short circuit in signal/power harness - Faulty Intake potentiometer
Enable Conditions	IG KEY ON	
Threshold value	Feedback circuit has been detected open or below 0.1V for 100ms	
Failsafe	- Setting mode : REC Fix at REC position - Setting mode : Except REC Fix at FRE position	

Specification

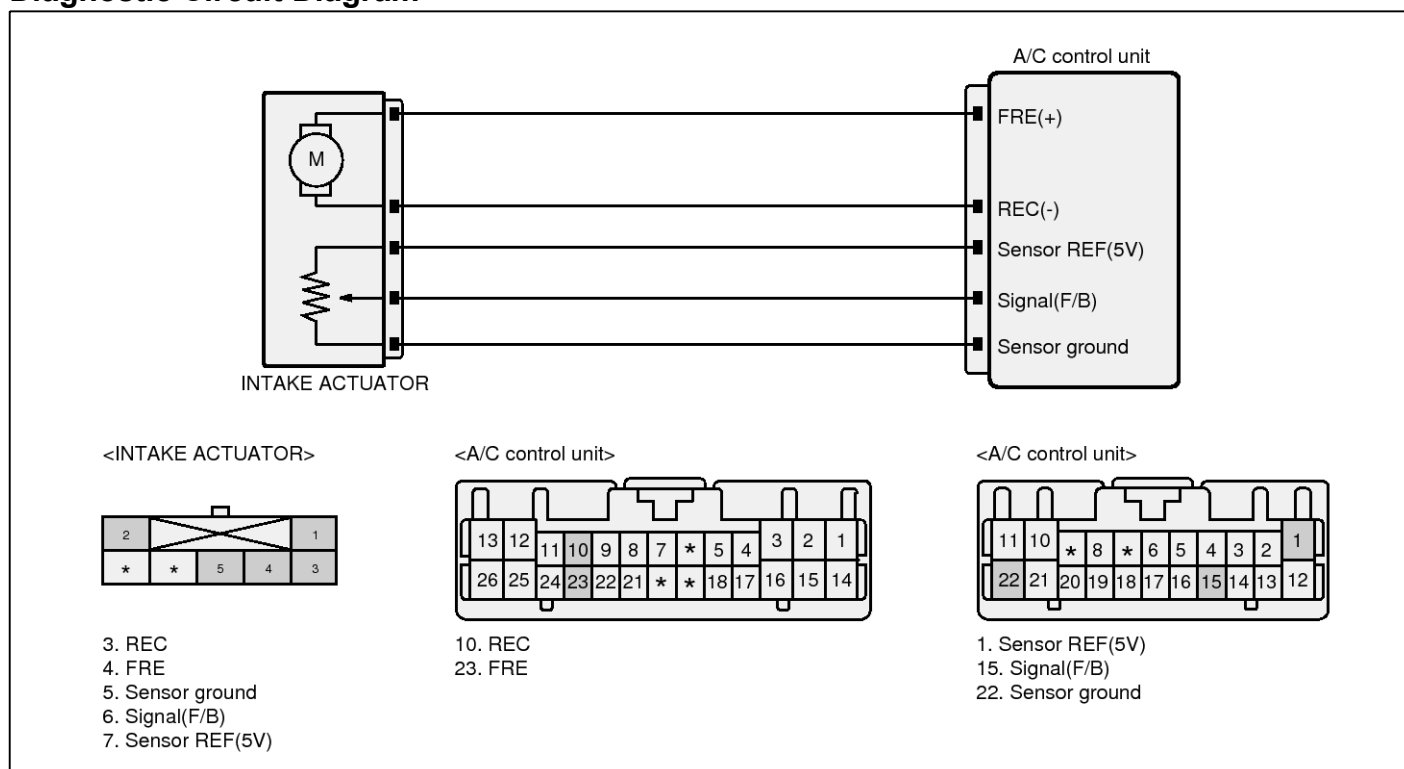
※ Voltage value of Intake potentiometer as a function of position of Intake door

Door position	Voltage
FRE	$0.3 \pm 0.15V$
REC	$4.7 \pm 0.15V$

Controller

HA-99

Diagnostic Circuit Diagram



SHMHA9503L

Monitor Scantool data

■ Check Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal temperature after engine start
3. Select " Intake Potentiometer " parameter on the current data with scantool
4. Perform Actuation Test for Air Inlet Mode Selection - Reculation /Fresh in order.
5. With performing Actuation test, check that the value of each position sensors are changing.

Specification : Recirculation : About 90%, Fresh : About 10%.

HA-100

Heating, Ventilation, Air Conditioning

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Intake Potentiometer	6.3	%

Actuation Test

Test Items

Driver Mode Door-Foot

Driver Mode Door-Defrost

Air Inlet Mode Selection-Fresh

Air Inlet Mode Selection-Recirculation

External Control Valve - 0%

External Control Valve - 85%

Auto Defog Mode Door - 0% [close]

Auto Defog Mode Door - 50%

Auto Defog Mode Door - 100% [open]

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9603L

6. Are the value of each position sensors changed when performing actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Intake actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of Intake actuator harness connector and Signal(F/B) terminal of A/C-ECU harness connector.

Specification : 1Ω below

- Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check short to ground in harness

- Ignition "OFF"
- Disconnect Intake actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of Intake actuator harness connector and chassis ground.

Specification : Infinity

- Is the measured resistance within specification?

Controller

HA-101

YES ▶ Go to "Power circuit Inspection " procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Power Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect Intake actuator and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Sensor REF(5V) terminal of Intake actuator harness connector and chassis ground.

Specification : approx. 5V

5. Is the measured voltage within specification?

YES ▶ Go to " Component inspection " procedure.

NO ▶ Check for open and short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Intake actuator

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to FRE(+) of intake actuator and (-) terminal to REC(-). (Component side)
4. Verify that the actuator operates to the REC position
5. Verify that the temperature actuator operates to the FRE position with reverse connecting. (REC(-) and FRE(+)) (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	FRE(+)	REC(-)	Door position
Battery terminal	12 V	ground	FRE
	ground	12 V	REC

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Intake actuator and check for proper operation. If the problem is corrected, replace Intake actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(F/B) terminal of Intake actuator harness connector and chassis ground. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
FRE	0.3±0.15V
REC	4.7±0.15V

FIG.2) ※ Voltage value of intake potentiometer as a function of intake door position.

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Heating, Ventilation, Air Conditioning

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Intake actuator and check for proper operation. If the problem is corrected, replace Intake actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

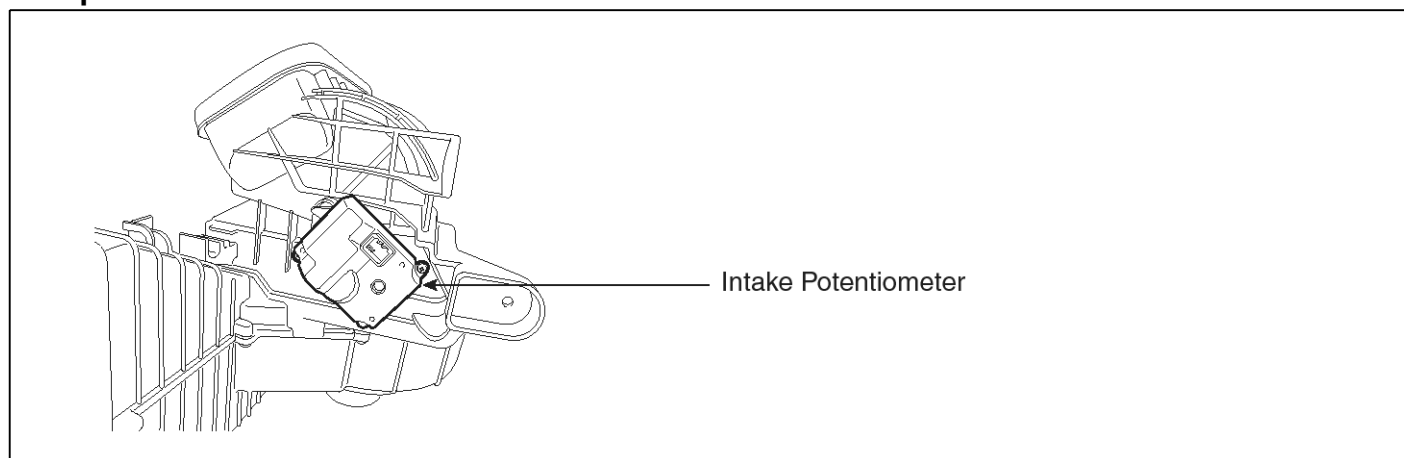
NO ► System is performing to specification at this time.

Controller

HA-103

B1209 Intake Potentiometer Short (High)

Componet Location



SHMHA8609L

General Description

Intake door located at heater unit controls the inlet of car. It contains intake motor that changes intake door position and potentiometer that monitors position of intake door. When driver operates the intake switch, ECU receives mode signal from intake switch and operates intake door motot to turn intake door to intended position. (with FRE mode signal, intake door is closed and with REC mode signal, intake door is opened)

In operation, potentiometer delivers intake door position transformed into voltage value to A/C ECU .

DTC Description

Airconditioner Control Module sets DTC B1209 if the Feed Back signal of Intake Actuator has been detected over 4.9V for 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Short to battery in signal(Feed-back) circuit - Open in ground circuit - Faulty Intake Actuator - Faulty Air Conditioner Module
Enable Conditions	IG KEY ON	
Threshold value	Feedback circuit has been detected over 4.9V for 100 ms	
Failsafe	Intake Actuator is moved and fixed at FRE position if F-RE is selected or REC position if REC is selected.	

Specification

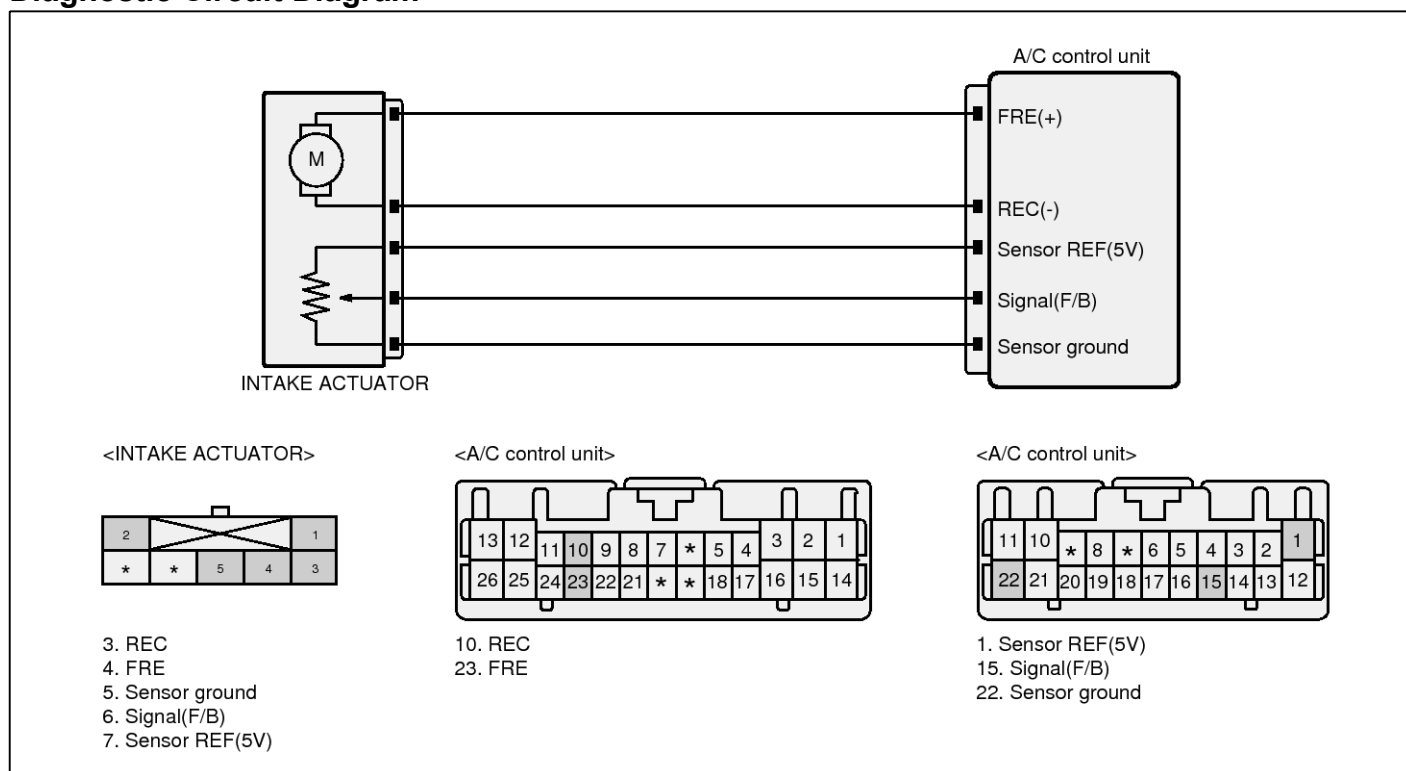
※ Voltage value of Intake potentiometer as a function of position of Intake door

Door position	Voltage
FRE	$0.3 \pm 0.15V$
REC	$4.7 \pm 0.15V$

HA-104

Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9503L

Monitor Scantool data

■ Check Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal temperature after engine start
3. Select " Intake Potentiometer " parameter on the current data with scantool
4. Perform Actuation Test for Air Inlet Mode Selection - Reculation /Fresh in order.
5. With performing Actuation test, check that the value of each position sensors are changing.

Specification : Recirculation : About 90%, Fresh : About 10%.

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Intake Potentiometer	6.3	%

Actuation Test

Test Items

Driver Mode Door-Foot

Driver Mode Door-Defrost

Air Inlet Mode Selection-Fresh

Air Inlet Mode Selection-Recirculation

External Control Valve - 0%

External Control Valve - 85%

Auto Defog Mode Door - 0% [close]

Auto Defog Mode Door - 50%

Auto Defog Mode Door - 100% [open]

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9603L

6. Are the value of each position sensors changed when performing actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check short to battery in harness

- Ignition "OFF"
- Disconnect Intake actuator and A/C control unit main harness connector.
- Ignition "ON"
- Measure voltage between Signal(F/B) terminal of Intake actuator harness connector and chassis ground.

Specification : 0V

- Is the measured voltage within specification?

YES ▶ Go to "Ground circuit Inspection" procedure.

NO ▶ Check for short to battery in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Intake actuator and A/C control unit main harness connector.
- Measure resistance between Sensor ground(-) terminal of Intake actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

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Heating, Ventilation, Air Conditioning

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Intake actuator

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to FRE(+) of intake actuator and (-) terminal to REC(-). (Component side)
4. Verify that the actuator operates to the REC position
5. Verify that the temperature actuator operates to the FRE position with reverse connecting. (REC(-) and FRE(+)) (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	FRE(+)	REC(-)	Door position
Battery terminal	12 V	ground	FRE
	ground	12 V	REC

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Intake actuator and check for proper operation. If the problem is corrected, replace Intake actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(F/B) terminal of Intake actuator harness connector and chassis ground. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
FRE	$0.3 \pm 0.15V$
REC	$4.7 \pm 0.15V$

FIG.2) ※ Voltage value of intake potentiometer as a function of intake door position.

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Intake actuator and check for proper operation. If the problem is corrected, replace Intake actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

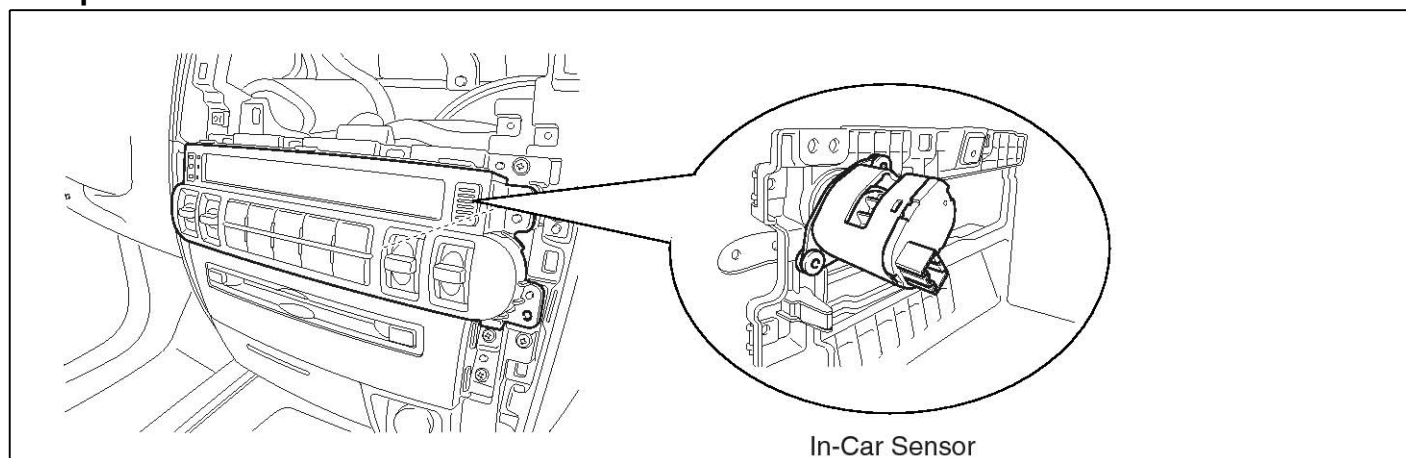
NO ► System is performing to specification at this time.

HA-108

Heating, Ventilation, Air Conditioning

B1233 In-Car Temperature Sensor Short (Low)

Componet Location



SHMHA8619L

General Description

Incar sensor is located at left side of DATC control panel. It contains a thermistor which measures the temperature of the inside. The signal, decided by the resistance value which changes in accordance with perceived inside temperature, is delivered to heater control unit. According to this signal, the control unit regulates incar temperature to intended value.

DTC Description

Air conditioner Control Module sets DTC B1233 if Incar temperature sensor has been detected below 0.1V for 4 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Short circuit in harness - Faulty incar temp.sensor - Faulty A/C Control Unit
Enable Conditions	IG KEY ON	
Threshold value	Incar temperature sensor has been detected 0.1V for 4 seconds	
Failsafe	Control with the value of 23°C (73.4°F)	

Specification

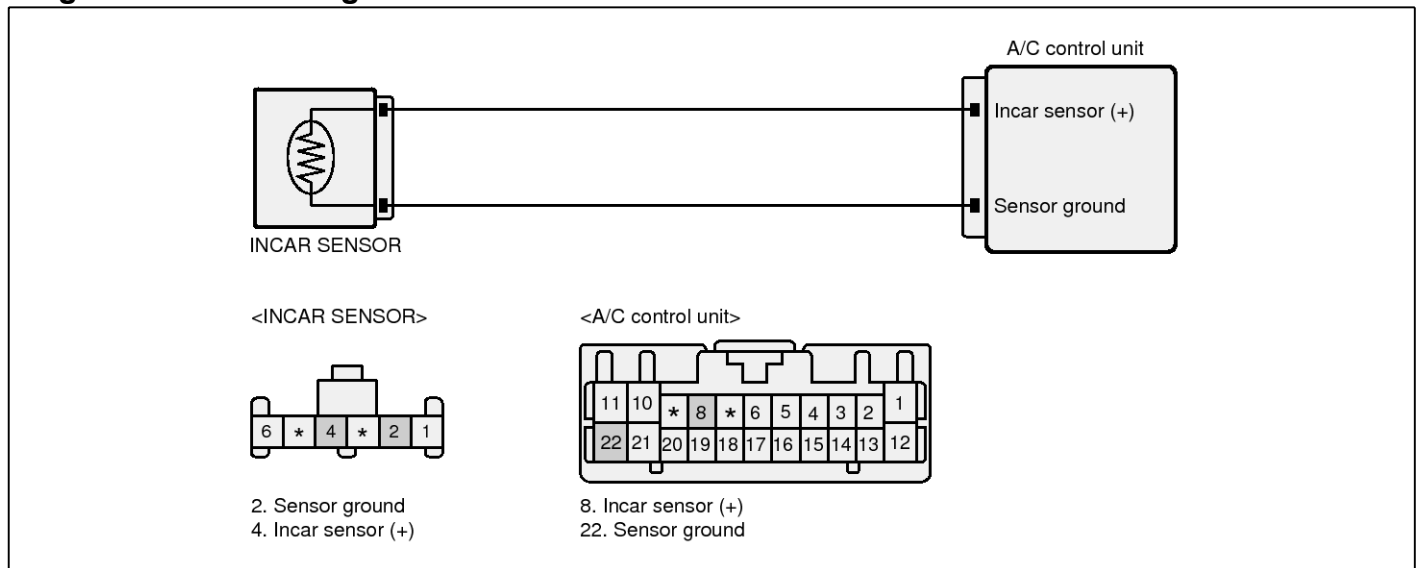
※ Resistance value of incar temp sensor as a function of temperature.

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	285.6	20/68	37.4
-10/-14	164.6	30/86	24.1
0/32	97.7	40/104	15.9
10/50	59.67	50/122	10.8

Controller

HA-109

Diagnostic Circuit Diagram



SHMHA9504L

Monitor Scantool data

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "In-car temperature sensor" parameter.

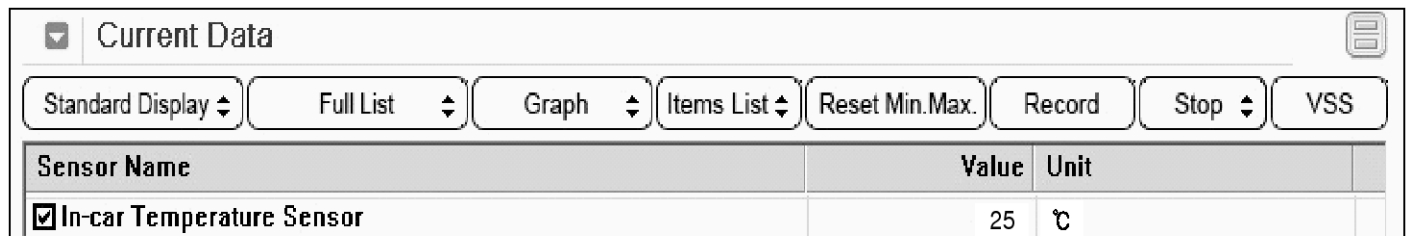


Fig.1

SHMHA9604L

FIG.1) Parameter of "INCAR TEMP.SENSOR" will be fixed at 25°C(77°F), if there is any fault in INCAR SENSOR.

4. Is the Incar temperature sensor normal ?

YES ▶ Go to "Inspection and Repair" procedure.

NO ▶ This is a intermittent problem caused by poor contact of component or Control Unit

▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.

▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

HA-110

Heating, Ventilation, Air Conditioning

Signal Circuit Inspection

■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of incar temp.sensor harness connector and chassis ground

Specification : Infinity

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Incar temp.sensor

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Incar temp.sensor harness connector and Sensor ground harness connector. (Component side)

Specification : Refer the specifications in Fig.1)

FIG.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	285.6	20/68	37.4
-10/-14	164.6	30/86	24.1
0/32	97.7	40/104	15.9
10/50	59.67	50/122	10.8

FIG.1) ※ Specifications : Resistance value of incar sensor as a function of temperature .

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good Incar temp.sensor and check for proper operation. If the problem is corrected, replace Incar temp.sensor and then go to "Verification of Vehicle Repair" procedure.

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Incar temp.sensor harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

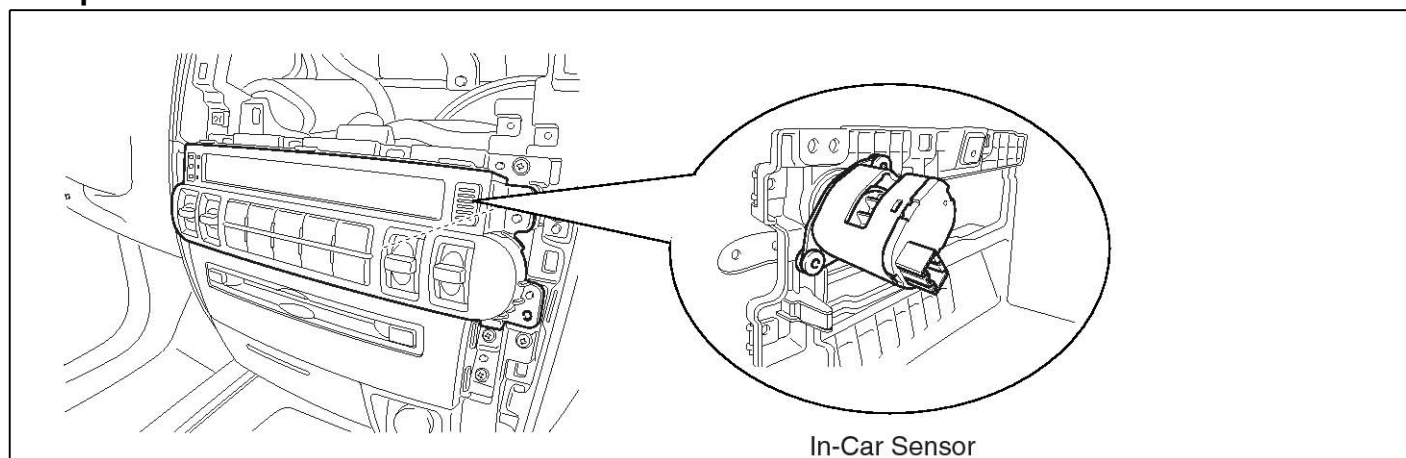
NO ► System is performing to specification at this time.

HA-112

Heating, Ventilation, Air Conditioning

B1234 In-Car Temperature Sensor Open (High)

Component Location



SHMHA8619L

General Description

Incar sensor is located at left side of DATC control panel. It contains a thermistor which measures the temperature of the inside. The signal, decided by the resistance value which changes in accordance with perceived inside temperature, is delivered to heater control unit. According to this signal, the control unit regulates incar temperature to intended value.

DTC Description

Air conditioner Control Module sets DTC B1234 if Incar temperature sensor has been detected over 4.9V for 0.3 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor connection in wireharness - Open in signal circuit - Short to battery in signal circuit - Faulty Incar temperature sensor - Faulty Air conditioner Control Module
Enable Conditions	IG KEY ON	
Threshold value	Incar temperature sensor has been detected over 4.9V for 0.3 seconds.	
Failsafe	Control with the value of 23°C (73.4°F)	

Specification

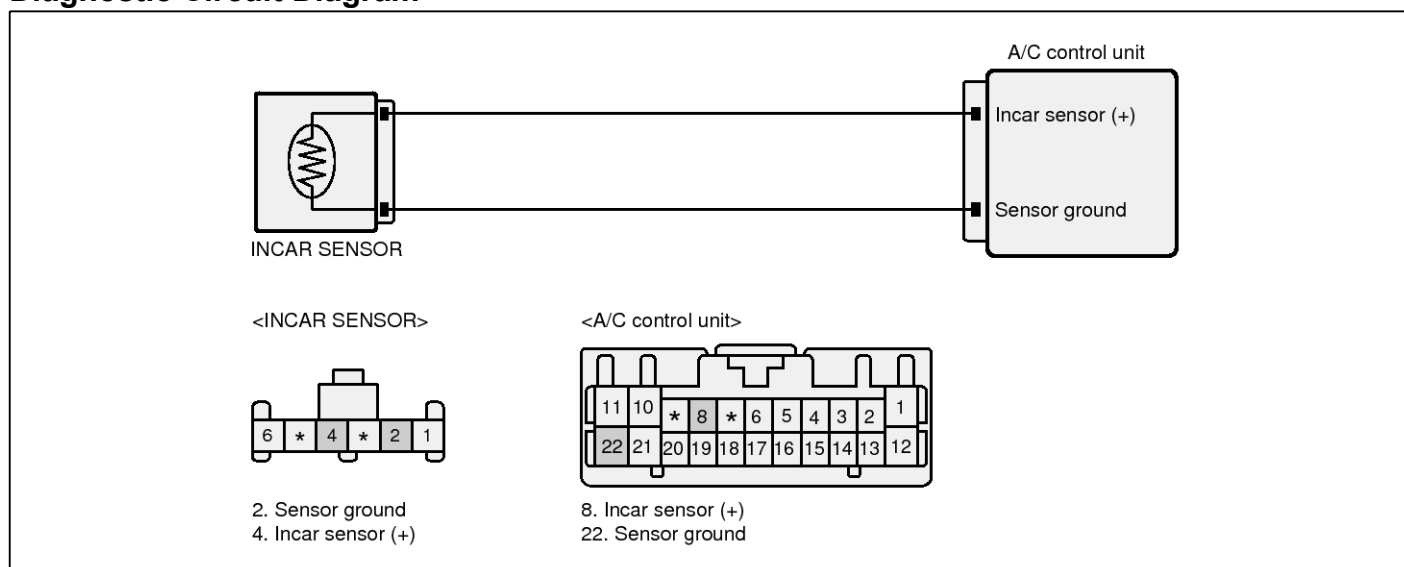
※ Resistance value of incar temp sensor as a function of temperature.

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	285.6	20/68	37.4
-10/-14	164.6	30/86	24.1
0/32	97.7	40/104	15.9
10/50	59.67	50/122	10.8

Controller

HA-113

Diagnostic Circuit Diagram



SHMHA9504L

Monitor Scantool data

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "In-car temperature sensor" parameter.

☒ Current Data

Standard Display ▾ Full List ▾ Graph ▾ Items List ▾ Reset Min.Max. Record Stop ▾ VSS

Sensor Name	Value	Unit
☒ In-car Temperature Sensor	25	℃

Fig.1

SHMHA9604L

FIG.1) Parameter of "INCAR TEMP.SENSOR" will be fixed at 25℃(77°F), if there is any fault in INCAR SENSOR.

4. Is the Incar temperature sensor normal ?

YES ▶ Go to "Inspection and Repair" procedure.

NO ▶ This is a intermittent problem caused by poor contact of component or Control Unit

▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.

▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

HA-114

Heating, Ventilation, Air Conditioning

Signal Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect Incar temp. sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Power terminal of Incar temp. sensor harness connector and chassis ground .

Specification : 0V

5. Is the measured voltage within specification?

YES ▶ Go to "Check for open in harness" as follows.

NO ▶ Check for short to battery in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Incar temp.sensor harness connector and Signal(+) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Ground circuit Inspection " procedure

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and A/C control unit main harness connector.
3. Measure resistance between ground terminal of Incar temp.sensor harness connector and ground terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Incar temp.sensor

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Incar temp.sensor harness connector and Sensor ground harness connector. (Component side)

Specification : Refer the specifications in Fig.1)

FIG.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	285.6	20/68	37.4
-10/-14	164.6	30/86	24.1
0/32	97.7	40/104	15.9
10/50	59.67	50/122	10.8

FIG.1) ※ Specifications : Resistance value of incar sensor as a function of temperature .

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good Incar temp.sensor and check for proper operation. If the problem is corrected, replace Incar temp.sensor and then go to "Verification of Vehicle Repair" procedure.

Controller

HA-115

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Incar temp.sensor and Connect A/C control unit main harness connector.
3. Ignition "ON" (ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Incar temp.sensor harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

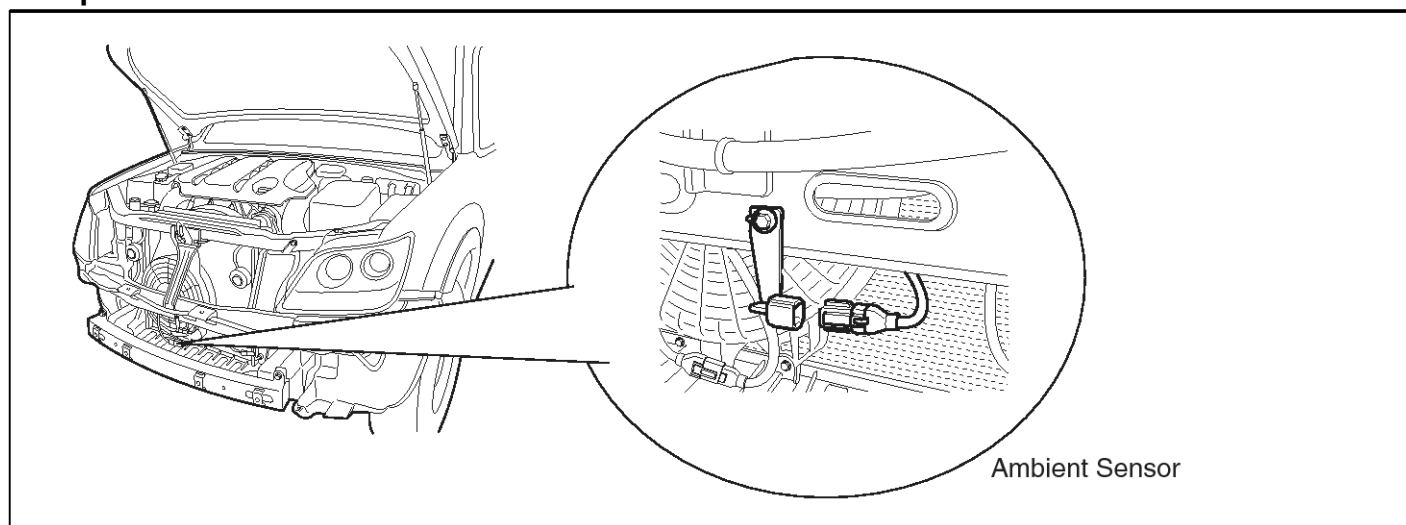
NO ► System is performing to specification at this time.

HA-116

Heating, Ventilation, Air Conditioning

B1237 Ambient Temperature Sensor Short (Low)

Componet Location



SHMHA8610L

General Description

The ambient temperature sensor located at the center stay of the condensor detects ambient air temperature. It is a negative type thermistor whose resistance is inversely proportional to temperature. Its output is used for sensor fail-safe, temperature regulation door lock, blower motor level control, mix mode control and in-car humidity control.

DTC Description

Air conditioner Control Module sets DTC B1237 if Ambient sensor has been detected below 0.1V for 4 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	• Voltage check	• Short in signal circuit • Faulty Ambient Sensor • Faulty A/C control Module
Enable Conditions	• IG KEY ON	
Threshold value	• Ambient sensor has been dtected 0.1V for 4 seconds.	
Failsafe	• Displayed '--' and A/C control Module regards and controls it as 20°C(68°F)	

Specification

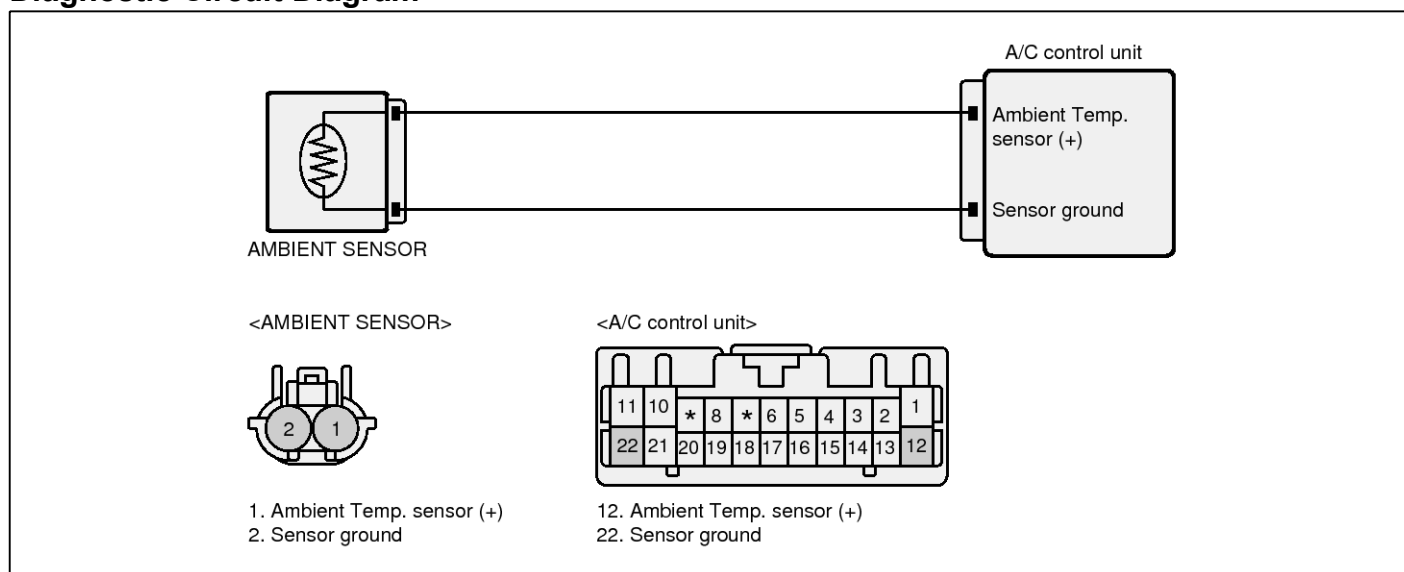
※ Resistance value of ambient temp.sensor as a function of temperature.

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	271.4	50/122	11
0/32	95.1	70/158	7.58
25/77	30		

Controller

HA-117

Diagnostic Circuit Diagram



SHMHA9505L

Monitor Scantool data

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Ambient Air Temperature sensor" parameter.

☒ Current Data

Standard Display
 Full List
 Graph
 Items List
 Reset Min.Max.
 Record
 Stop
 VSS

Sensor Name	Value	Unit
☒ Ambient Air Temperature Sensor	20	℃

Fig.1

SHMHA9605L

FIG.1) Parameter of "Ambinent Sensor" will be fixed at 20℃(68°F), if there is any fault in Ambient Sensor.

4. Is the ambient sensor normal?

YES ► Go to "Inspection and Repair" procedure.

NO ► This is a intermittent problem caused by poor contact of component or Control Unit

► Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.

► Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ► Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ► Go to "W/Harness Inspection" procedure.

HA-118

Heating, Ventilation, Air Conditioning

Signal Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect ambient sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Power terminal of Ambient sensor harness connector and chassis ground .

Specification : Infinity

5. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check ambient sensor

1. Ignition "OFF"
2. Disconnect ambient sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of ambient sensor harness connector and Sensor ground harness connector. (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	271.4	50/122	11
0/32	95.1	70/158	7.58
25/77	30		

FIG.1) ※ Specifications : Resistance value of ambient sensor as a function of temperature .

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good ambient sensor and check for proper operation. If the problem is corrected, replace ambient sensor and then go to "Verification of Vehicle Repair" procedure.

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Ambient Temp. sensor (+) and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Ambient Temp. sensor (+) harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ▶ Go to the applicable troubleshooting procedure.

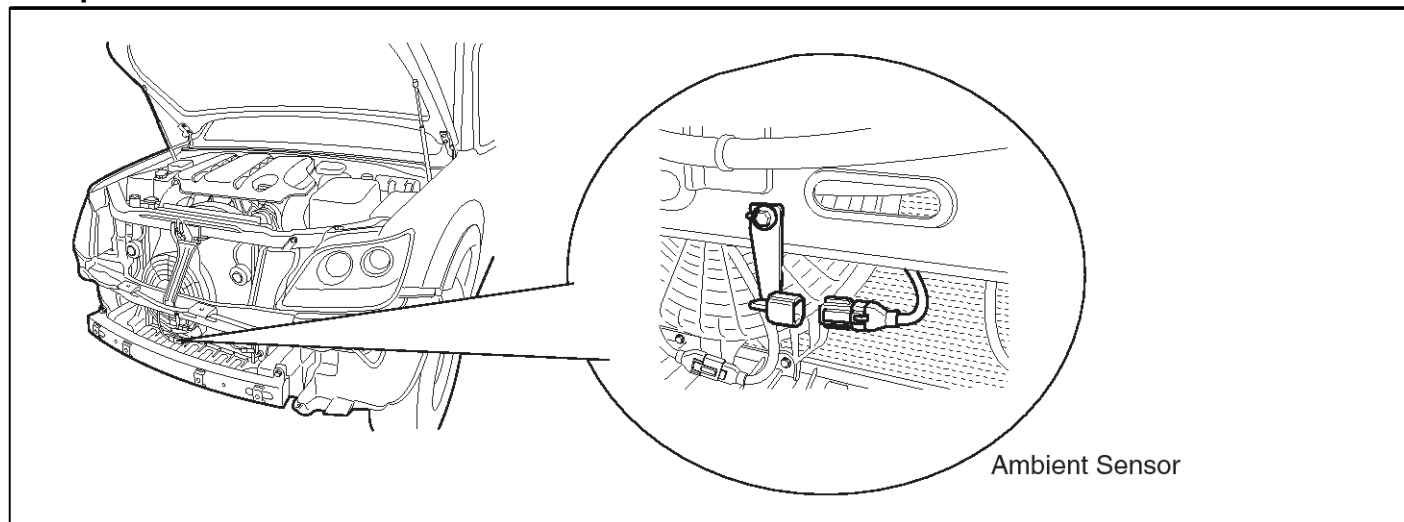
NO ▶ System is performing to specification at this time.

Controller

HA-119

B1238 Ambient Temperature Sensor Open (High)

Componet Location



SHMHA8610L

General Description

The ambient temperature sensor located at the center stay of the condensor detects ambient air temperature. It is a negative type thermistor whose resistance is inversely proportional to temperature. Its output is used for sensor fail-safe, temperature regulation door lock, blower motor level control, mix mode control and in-car humidity control.

DTC Description

Air conditioner Control Module sets DTC B1238 if Ambient sensor has been detected over 4.9V for 4 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor Connection in harness - Open in signal circuit - Shrot to battery in signal circuit - Faulty Ambient Temperature s-ensor - Faulty air condtioner control M-odule
Enable Conditions	IG KEY ON	
Threshold value	Ambient Temperature sensor has been detected over 4 .9V for 4 seconds	
Failsafe	Displayed '--' and A/C control Module regards and controls it as 20°C (68°F)	

Specification

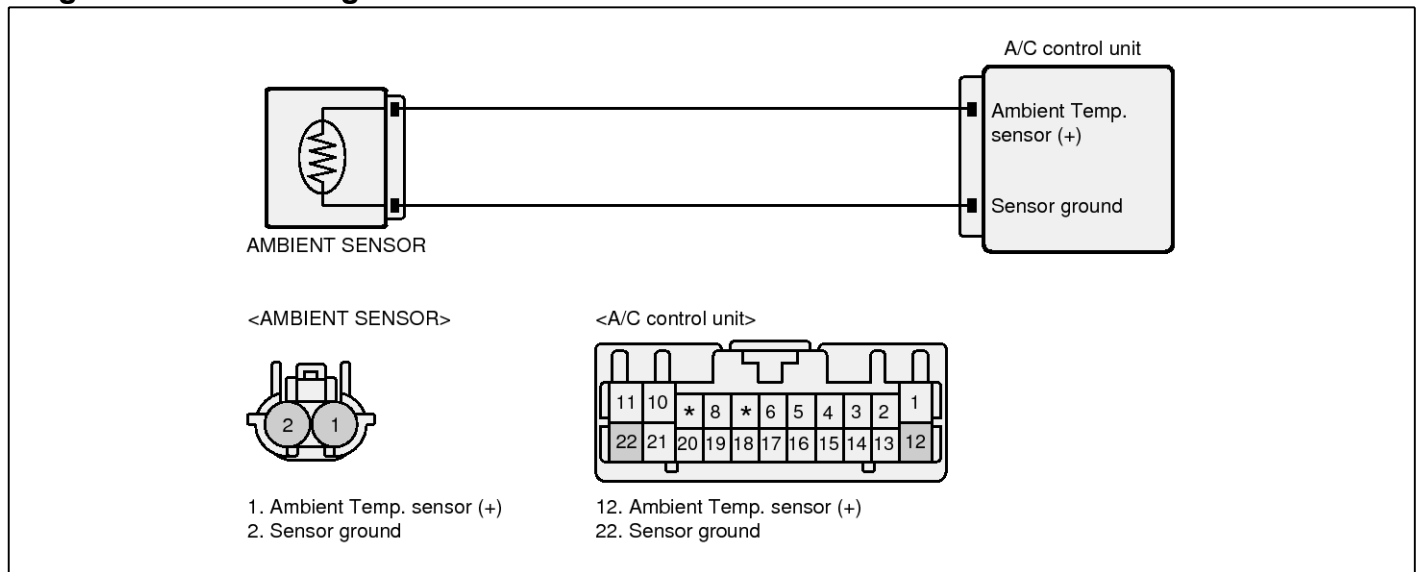
※ Resistance value of ambient temp.sensor as a function of temperature.

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	271.4	50/122	11
0/32	95.1	70/158	7.58
25/77	30		

HA-120

Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9505L

Monitor Scantool data

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Ambient Air Temperature sensor" parameter.

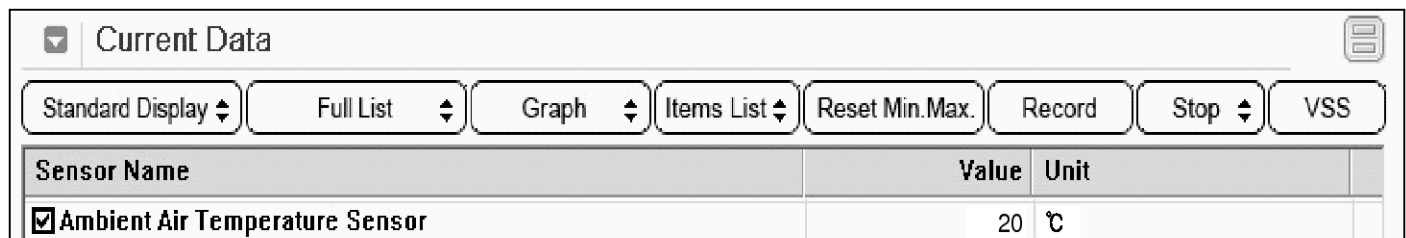


Fig.1

SHMHA9605L

FIG.1) Parameter of "Ambient Sensor" will be fixed at 20°C (68°F), if there is any fault in Ambient Sensor.

4. Is the ambient sensor normal?

YES ► Go to "Inspection and Repair" procedure.

NO ► This is an intermittent problem caused by poor contact of component or Control Unit
► Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
► Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?
YES ► Repair as necessary and go to "Verification of Vehicle Repair" procedure
NO ► Go to "W/Harness Inspection" procedure.

Controller

HA-121

Signal Circuit Inspection

■ Check short to battery in harness

1. Ignition "OFF"
2. Disconnect ambient sensor and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of ambient sensor harness connector and chassis ground .

Specification : 0V

5. Is the measured voltage within specification?

YES ▶ Go to "Check for open in harness" as follows.

NO ▶ Check for short to battery in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect ambient sensor and A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of ambient sensor harness connector and Signal(+) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Ground circuit Inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect ambient sensor and A/C control unit main harness connector.
3. Measure resistance between ground terminal of ambient sensor harness connector and ground terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check ambient sensor

1. Ignition "OFF"
2. Disconnect ambient sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of ambient sensor harness connector and Sensor ground harness connector. (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-20/-4	271.4	50/122	11
0/32	95.1	70/158	7.58
25/77	30		

FIG.1) ※ Specifications : Resistance value of ambient sensor as a function of temperature .

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good ambient sensor and check for proper operation. If the problem is corrected, replace ambient sensor and then go to "Verification of Vehicle Repair" procedure.

HA-122

Heating, Ventilation, Air Conditioning

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Ambient Temp. sensor (+) and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Ambient Temp. sensor (+) harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

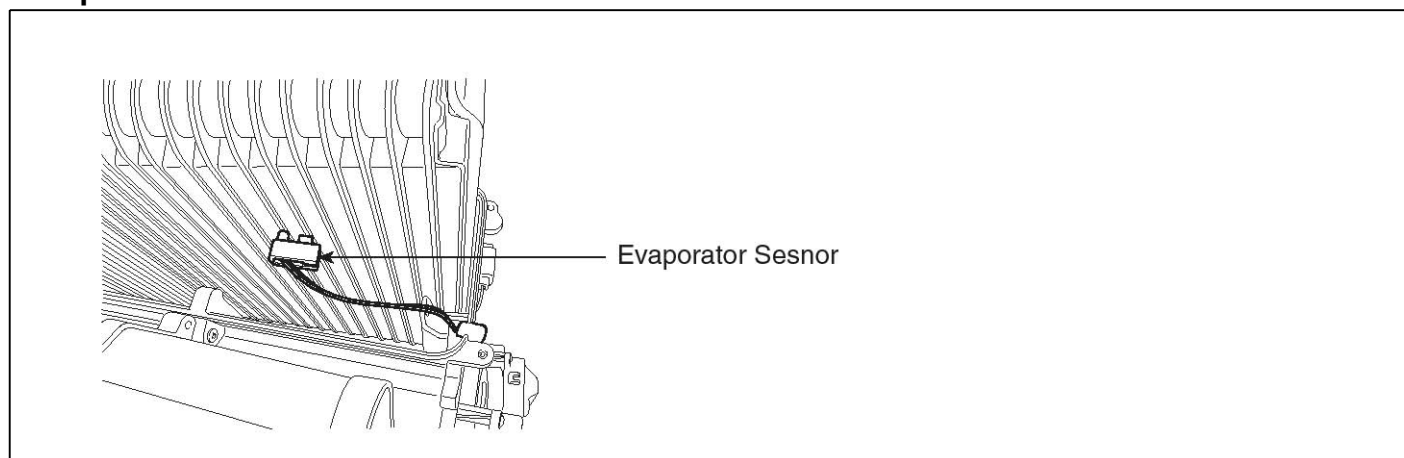
NO ► System is performing to specification at this time.

Controller

HA-123

B1241 Evaporator Sensor Short (Low)

Componet Location



SHMHA8611L

General Description

The Evaporator sensor located on heater unit detects the core temperature. It is a negative type thermistor whose resistance is inversely proportional to temperature. Evaporator sensor transforms measured temperature into voltage value and delivers it to A/C ECU. when core temperature is blow threshold value, A/C ECU interrupts compressor relay power, in order to prevent evaporator freezing by excessive cooling.

DTC Description

Air conditioner Control Module sets DTC B1241 if Evaporator sensor has been detected below 0.1V for 4 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	• Voltage check	• Short circuit in harness • Faulty Evaporator sensor • Faulty A/C Control Unit
Enable Conditions	• IG KEY ON	
Threshold value	• Evaporator sensor has been detected below 01.V for 4 seconds.	
Failsafe	• Control with the value of -2℃(28.4°F)	

Specification

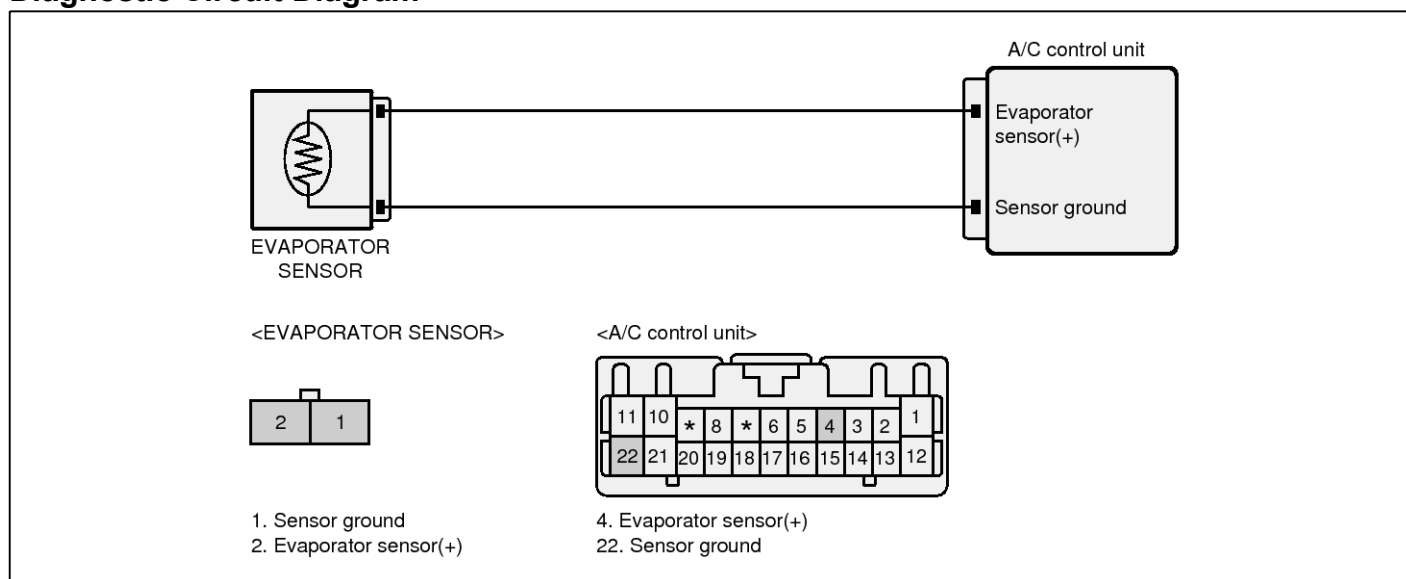
※ Resistance value of evaporator sensor as a function of temperature.

Temperature(℃/°F)	Resistance(kΩ)	Temperature(℃/°F)	Resistance(kΩ)
-10/-14	18	20/68	4.8
0/32	11	30/86	3.3
10/50	7.3	40/104	2.3

HA-124

Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9506L

Monitor Scantool data

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Evaporator sensor" parameter on scantool.



Fig.1

SHMHA9606L

FIG.1) Parameter of "Evaporator Sensor" will be fixed at -2°C(28.4°F), if there is any fault in Evaporator Sensor.

4. Is the Evaporator Sensor normal ?

YES ► Go to "Inspection and Repair" procedure.

NO ► This is a intermittent problem caused by poor contact of component or Control Unit
 ► Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ► Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ► Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ► Go to "W/Harness Inspection" procedure.

Controller

HA-125

Signal Circuit Inspection

■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect Evaporator sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Evaporator sensor harness connector and chassis ground

Specification : Infinity

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for short to battery in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Evaporator sensor

1. Ignition "OFF"
2. Disconnect Evaporator sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Evaporator sensor harness connector and Sensor ground harness connector. (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-10/-14	18	20/68	4.8
0/32	11	30/86	3.3
10/50	7.3	40/104	2.3

FIG.1) ※ Specifications : Resistance value of Evaporator sensor as a function of temperature.

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good Evaporator sensor and check for proper operation. If the problem is corrected, replace Evaporator sensor and then go to "Verification of Vehicle Repair" procedure.

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Evaporator sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Evaporator sensor harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ▶ Go to the applicable troubleshooting procedure.

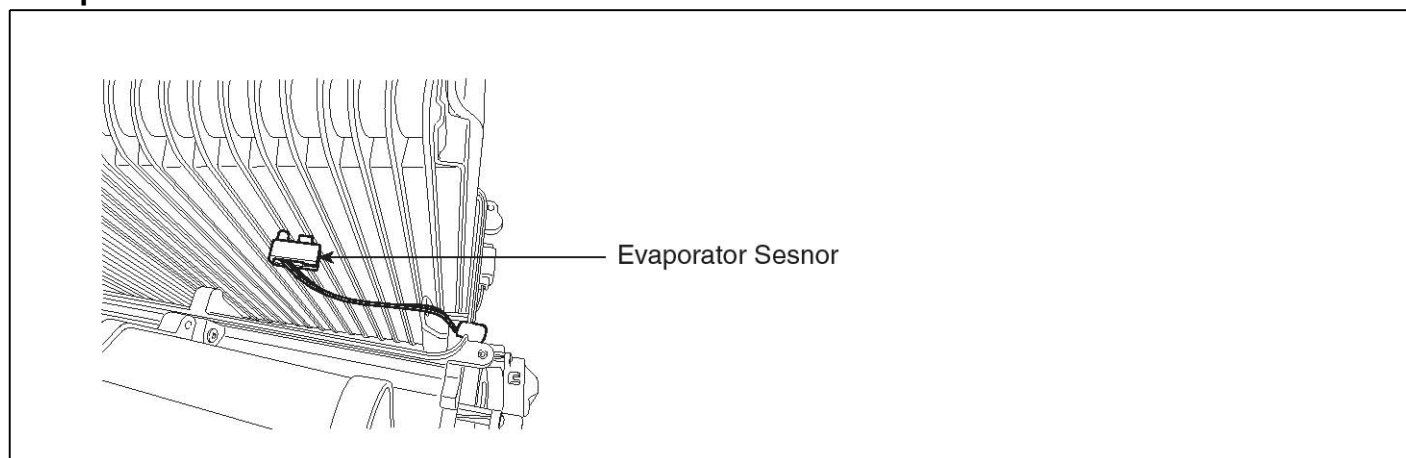
NO ▶ System is performing to specification at this time.

HA-126

Heating, Ventilation, Air Conditioning

B1242 Evaporator Sensor Open (High)

Component Location



SHMHA8611L

General Description

The Evaporator sensor located on heater unit detects the core temperature. It is a negative type thermistor whose resistance is inversely proportional to temperature. Evaporator sensor transforms measured temperature into voltage value and delivers it to A/C ECU. when core temperature is below threshold value, A/C ECU interrupts compressor relay power, in order to prevent evaporator freezing by excessive cooling.

DTC Description

Air conditioner Control Module sets DTC B1242 if Evaporator sensor has been detected over 4.9V for 4 seconds

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	• Voltage check	• Open in signal circuit • Short to battery in signal circuit • Faulty Evaporator sensor • Faulty Air conditioner control Unit
Enable Conditions	• IG KEY ON	
Threshold value	• Evaporator sensor has been detected over 4.9V for 0.3 seconds	
Failsafe	• Control with the value of -2°C (28.4°F)	

Specification

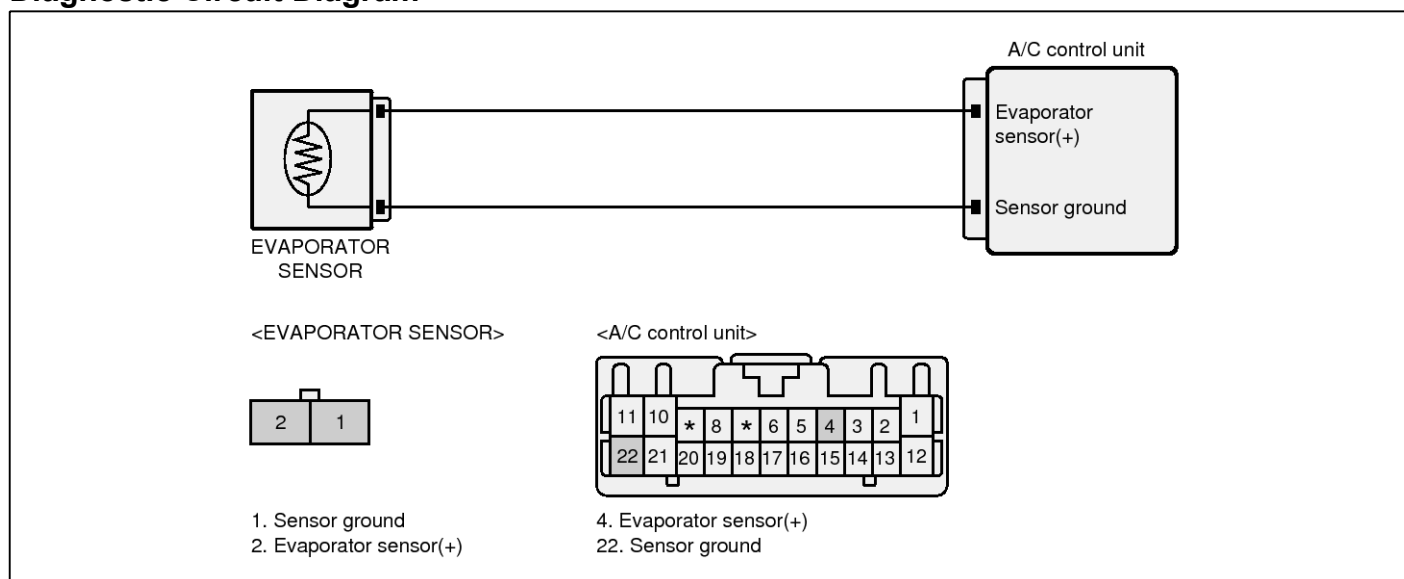
※ Resistance value of evaporator sensor as a function of temperature.

Temperature($^{\circ}\text{C}/^{\circ}\text{F}$)	Resistance($\text{k}\Omega$)	Temperature($^{\circ}\text{C}/^{\circ}\text{F}$)	Resistance($\text{k}\Omega$)
-10/-14	18	20/68	4.8
0/32	11	30/86	3.3
10/50	7.3	40/104	2.3

Controller

HA-127

Diagnostic Circuit Diagram



SHMHA9506L

Monitor Scantool data

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Evaporator sensor" parameter on scantool.



Fig.1

SHMHA9606L

FIG.1) Parameter of "Evaporator Sensor" will be fixed at -2°C(28.4°F), if there is any fault in Evaporator Sensor.

4. Is the Evaporator Sensor normal ?

YES ► Go to "Inspection and Repair" procedure.

NO ► This is a intermittent problem caused by poor contact of component or Control Unit
 ► Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ► Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES ► Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ► Go to "W/Harness Inspection" procedure.

HA-128

Heating, Ventilation, Air Conditioning

Signal Circuit Inspection

■ Check short to battery in harness

1. Ignition "OFF"
2. Disconnect Evaporator sensor and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Evaporator sensor harness connector and chassis ground.

Specification : 0V

5. Is the measured voltage within specification?

YES ▶ Go to "Check for open in harness" as follows.

NO ▶ Check for short to battery in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Evaporator sensor and A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Evaporator sensor harness connector and Signal(+) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Ground circuit Inspection" procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Evaporator sensor and A/C control unit main harness connector.
3. Measure resistance between ground terminal of Evaporator sensor harness connector and ground terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Evaporator sensor

1. Ignition "OFF"
2. Disconnect Evaporator sensor and Connect A/C control unit main harness connector.
3. Measure resistance between Signal(+) terminal of Evaporator sensor harness connector and Sensor ground harness connector. (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Temperature(°C/°F)	Resistance(kΩ)	Temperature(°C/°F)	Resistance(kΩ)
-10/-14	18	20/68	4.8
0/32	11	30/86	3.3
10/50	7.3	40/104	2.3

FIG.1) ※ Specifications : Resistance value of Evaporator sensor as a function of temperature.

※ The actual value may differ from it according to various engine condition.

4. Is "resistance" display near the specified value?

YES ▶ Go to "Check A/C-ECU" procedure.

NO ▶ Substitute with a known-good Evaporator sensor and check for proper operation. If the problem is corrected, replace Evaporator sensor and then go to "Verification of Vehicle Repair" procedure.

Controller

HA-129

■ Check A/C-ECU

1. Ignition "OFF"
2. Disconnect Evaporator sensor and Connect A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(+) terminal of Evaporator sensor harness connector and chassis ground. (Component side)

Specification : approx. 5V

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good A/C-ECU and check for proper operation. If the problem is corrected, replace A/C-ECU and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

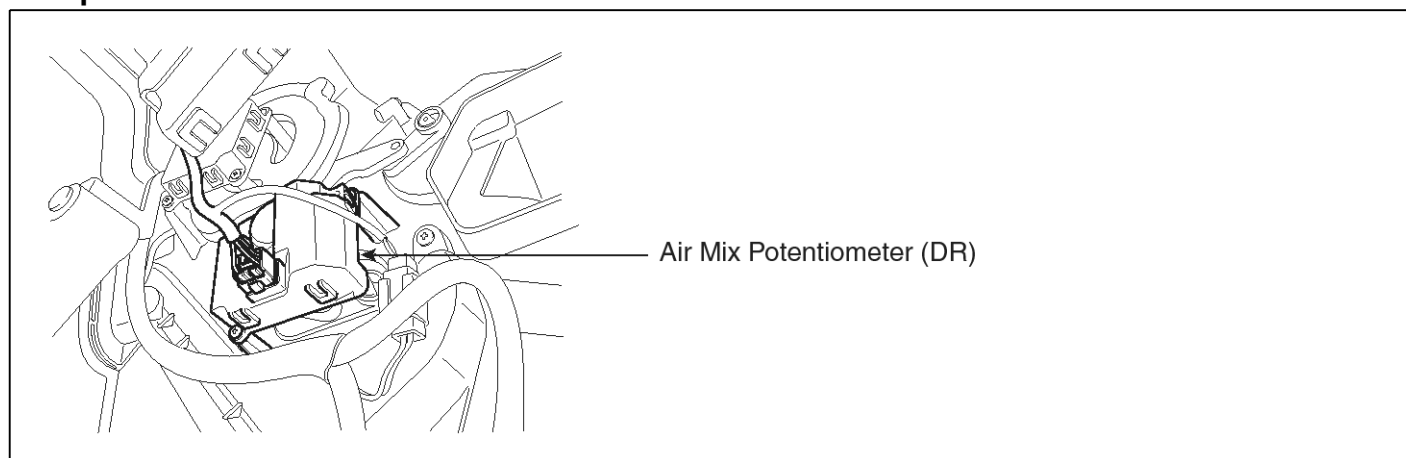
NO ► System is performing to specification at this time.

HA-130

Heating, Ventilation, Air Conditioning

B1245 Air Mix Potentiometer Open (Low)-Driver

Component Location



SHMHA8614L

General Description

Temperature control actuator located at heater unit. It contains temp motor that changes temp door position and potentiometer that monitors position of temp door. Temperature control actuator regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temp door by operating temp motor and then temperature will be regulated by the hot/cold air ratio decided by position of temp door. In operation, potentiometer delivers temp door position transformed into voltage value to A/C ECU.

DTC Description

Air conditioner Control Module sets DTC B1245 if Feedback signal of Driver Temperature Actuator has been detected open or below 0.1V for 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor Connection in harness - Open in signal(Feedback signal), power and ground circuit - Faulty Driver Temperature Actuator - Faulty Air condition Control Module
Enable Conditions	IG KEY ON	
Threshold value	Feedback signal of Driver Temperature Actuator has been detected open or below 0.1V for 100ms	
Failsafe	- Setting temperature : 17°C(63°F)-24°C(76.1°F), fix at max. cooling position - Setting temperature : 25°C(77°F)-32°C(89.6°F), fix at max. heating position	

Specification

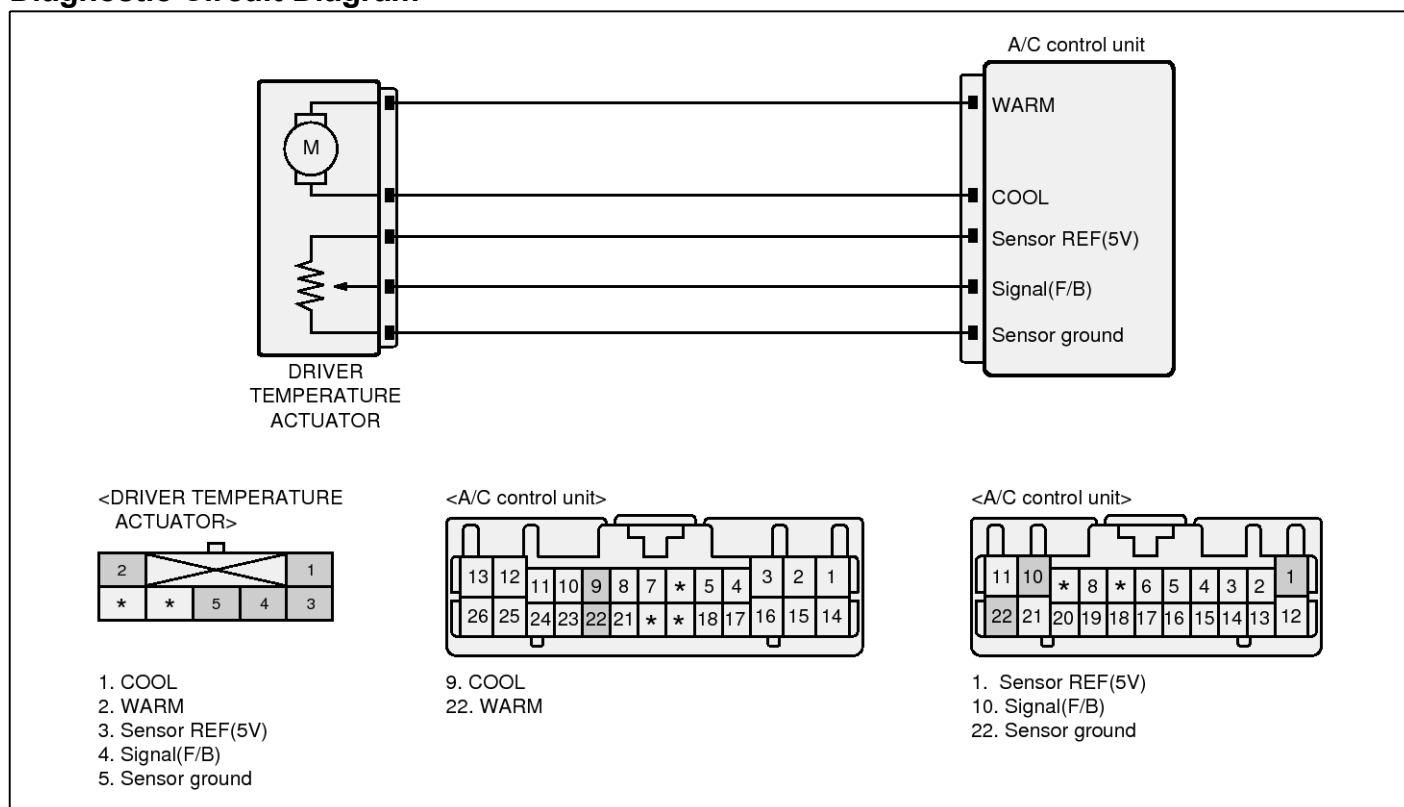
※ Voltage value of Air Mix potentiometer as a function of temp door position.

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

Controller

HA-131

Diagnostic Circuit Diagram



SHMHA9507L

Monitor Scantool data

■Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Air Mix Door Potentioner-Driver" parameter on scantool.
4. Select and perform Actuation test Air Mix Door Potentioner-Driver - 0% / 50% / 100% in order.
5. With performing Actuation test, check that the value of Air Mix Door Potentiometer follows is changed and close to the value of Actuation Test.

Specification : Check that the value of Air Mix Door Potentiometer at current data should be close to the value of the acutation test.

HA-132

Heating, Ventilation, Air Conditioning

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Air Mix Door Potentiometer-Driver	6.3	%

Actuation Test

Test Items

Driver Air Mix Door-0%

Driver Air Mix Door-50%

Driver Air Mix Door-100%

Passenger Air Mix Door-0%

Passenger Air Mix Door-50%

Passenger Air Mix Door-100%

Driver Mode Door-Face

Driver Mode Door-Foot

Driver Mode Door-Defrost

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9607L

6. Does the value of current data follow in accordance with the each actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Driver air mix actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of Driver air mix actuator harness connector and Signal(F/B) terminal of A/C-ECU harness connector.

Specification : 1Ω below

- Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Controller

HA-133

■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Measure resistance between Signal(F/B) terminal of Driver air mix actuator harness connector and chassis ground .

Specification : Infinity

4. Is the measured resistance within specification?

YES ▶ Go to "Power circuit Inspection " procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Power Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Sensor REF(5V) terminal of Driver air mix actuator harness connector and chassis ground.

Specification : approx. 5V

5. Is the measured voltage within specification?

YES ▶ Go to "Ground circuit Inspection" procedure.

NO ▶ Check for open and short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Measure resistance between Sensor ground(-) terminal of Driver air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Driver air mix actuator

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to WARM(+) of Driver air mix actuator and (-) terminal to COOL(-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting.(WARM(+) and COOL(-)) . (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	WARM(+)	COOL(-)	Door position
Battery terminal	12 V	ground	Max.warm
	ground	12 V	Max.cool

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

HA-134

Heating, Ventilation, Air Conditioning

■ Check potentiometer

1. Ignition "OFF"
2. Connect Driver air mix actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Driver air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector .(Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
Max. cool	$0.3 \pm 0.15V$
Max. warm	$4.7 \pm 0.15V$

FIG.2) ※ Voltage value of Air Mix potentiometer as a function of temp door position.

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

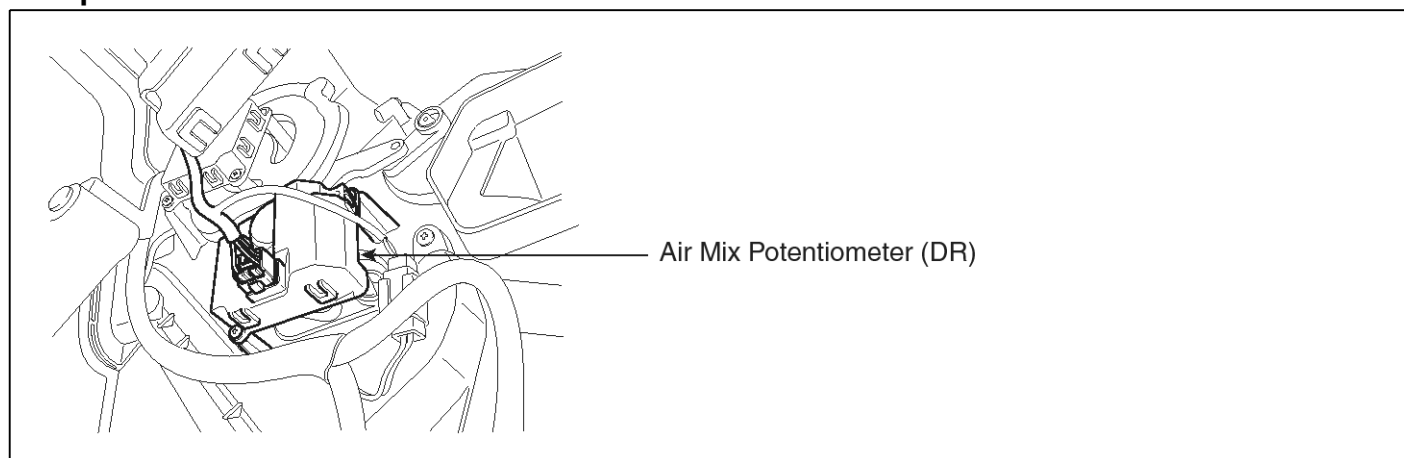
NO ► System is performing to specification at this time.

Controller

HA-135

B1246 Air Mix Potentiometer Short (High)-Driver

Componet Location



SHMHA8614L

General Description

Temperature control actuator located at heater unit. It contains temp motor that changes temp door position and potentiometer that monitors position of temp door. Temperature control actuator regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temp door by operating temp motor and then temperature will be regulated by the hot/cold air ratio decided by position of temp door. In operation, potentiometer delivers temp door position transformed into voltage value to A/C ECU .

DTC Description

Air conditioner Control Module sets DTC B1246 if Feedback signal of Driver Temperature Actuator has been detected over 4.9V for 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Short to battery in signal circuit (Feedback signal) - Faulty Driver temperature Actuator - Air conditioner Control Module
Enable Conditions	IG KEY ON	
Threshold value	Feedback signal of Driver Temperature Actuator has been detected over 4.9V for 100ms.	
Failsafe	- Setting temperature : 17°C(63°F)-24°C(76.1°F), fix at max. cooling position - Setting temperature : 25°C(77°F)-32°C(89.6°F), fix at max. heating position	

Specification

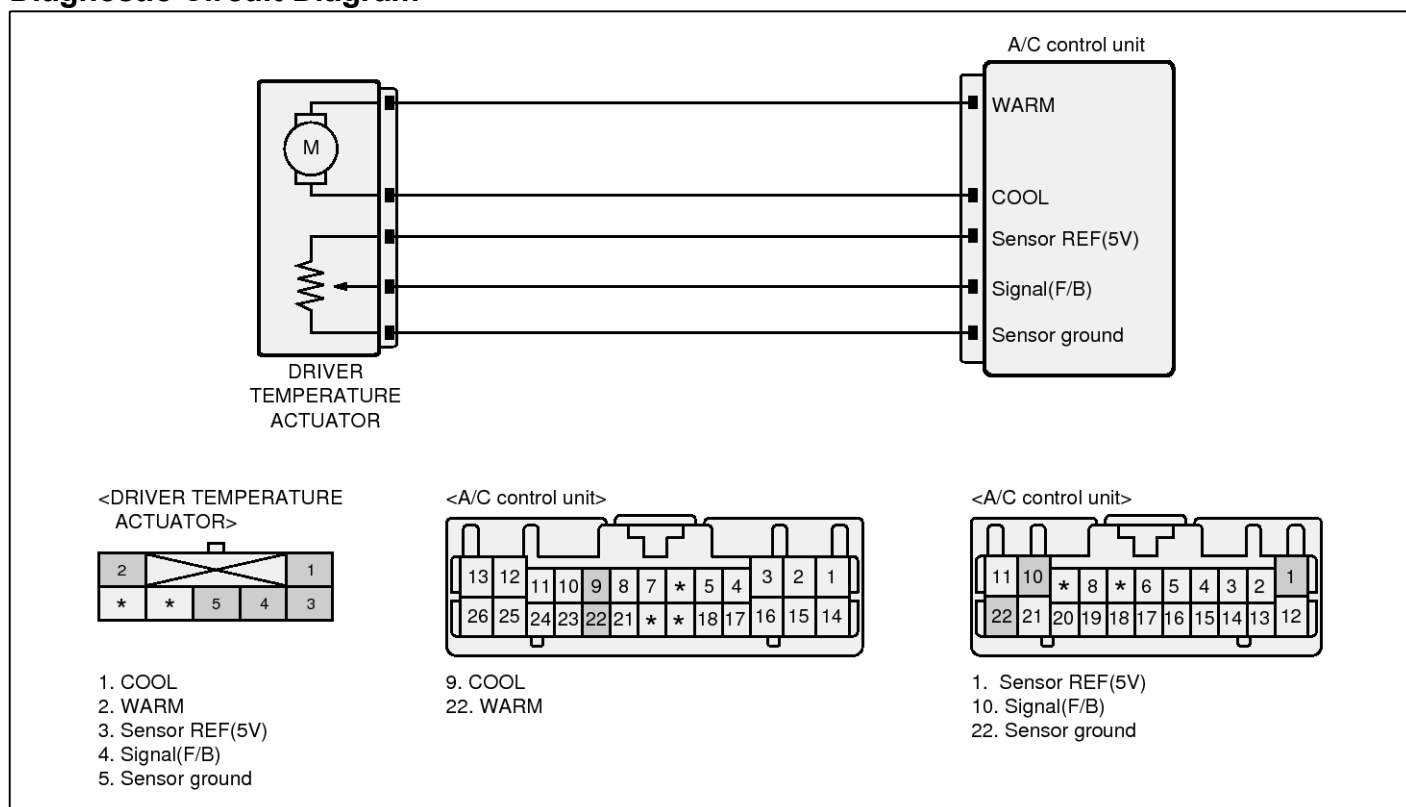
※ Voltage value of Air Mix potentiometer as a function of temp door position.

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

HA-136

Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9507L

Monitor Scantool data

■Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Air Mix Door Potentioner-Driver" parameter on scantool.
4. Select and perform Actuation test Air Mix Door Potentioner-Driver - 0% / 50% / 100% in order.
5. With performing Actuation test, check that the value of Air Mix Door Potentiometer follows is changed and close to the value of Actuation Test.

Specification : Check that the value of Air Mix Door Potentiometer at current data should be close to the value of the acutation test.

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Air Mix Door Potentiometer-Driver	6.3	%

Actuation Test

Test Items

Driver Air Mix Door-0%

Driver Air Mix Door-50%

Driver Air Mix Door-100%

Passenger Air Mix Door-0%

Passenger Air Mix Door-50%

Passenger Air Mix Door-100%

Driver Mode Door-Face

Driver Mode Door-Foot

Driver Mode Door-Defrost

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9607L

6. Does the value of current data follow in accordance with the each actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check short to battery in harness

- Ignition "OFF"
- Disconnect Driver air mix actuator and A/C control unit main harness connector.
- Ignition "ON"
- Measure voltage between Signal(F/B) terminal of Driver air mix actuator harness connector and chassis ground .

Specification : 0V

- Is the measured resistance within specification?

YES ▶ Go to "Ground circuit Inspection " procedure

NO ▶ Check for short to battery in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

HA-138

Heating, Ventilation, Air Conditioning

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Measure resistance between Sensor ground(-) terminal of Driver air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Driver air mix actuator

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to WARM(+) of Driver air mix actuator and (-) terminal to COOL(-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting.(WARM(+) and COOL(-)) . (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	WARM(+)	COOL(-)	Door position
Battery terminal	12 V	ground	Max.warm
	ground	12 V	Max.cool

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect Driver air mix actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Driver air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector .(Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

FIG.2) ※ Voltage value of Air Mix potentiometer as a function of temp door position.

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

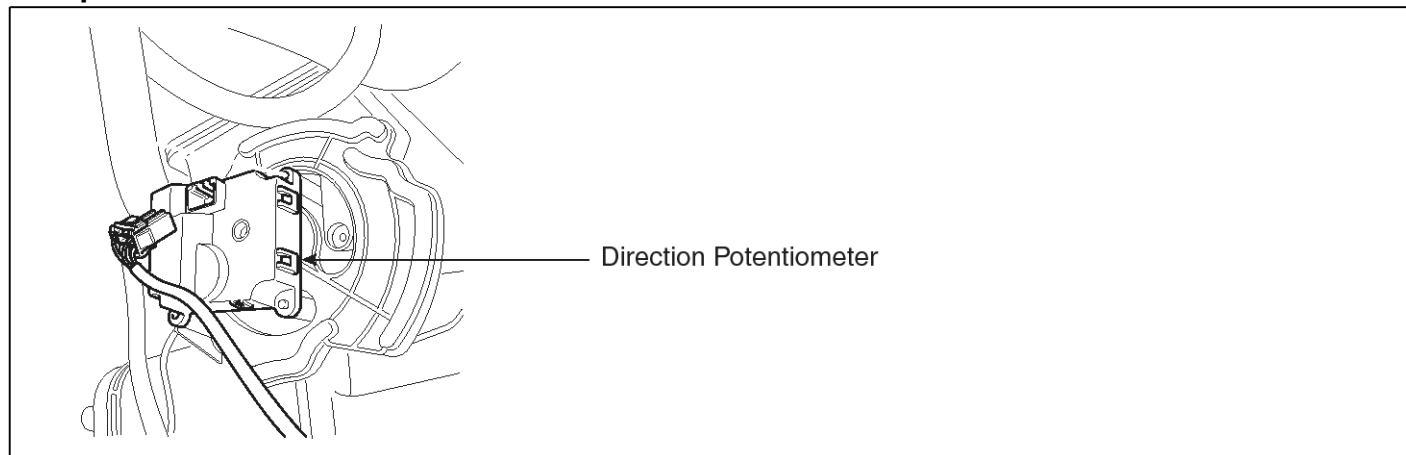
NO ► System is performing to specification at this time.

HA-140

Heating, Ventilation, Air Conditioning

B1249 Direction Potentiometer Open (Low)-Driver

Component Locations



SHMHA8615L

General Description

The mode control actuator mounted on heater unit adjusts position of mode door by operating Direction Motor based on signal of A/C control unit. Pressing mode select switch makes the mode control actuator shift in order of vent → B/L → floor → mix.

DTC Description

Air conditioner Control Module sets DTC B1249 if Feedback signal of Mode Actuator has been detected below 0.1V for 0.3 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor Connection in harness - Open in signal (Feedback signal), Power or Ground circuit - Faulty Mode Actuator - Faulty Air conditioner Control Unit
Enable Conditions	IG KEY ON	
Threshold value	Feedback signal of Mode Actuator has been detected below 0.1V for 100ms.	
Failsafe	- If the Mode actuator is placed at Vent mode right before fail detection, Actuator is operated and fixed to Vent Mode Position. - The others mode are selected, Actuator is moved to DEF mode position	

Specification

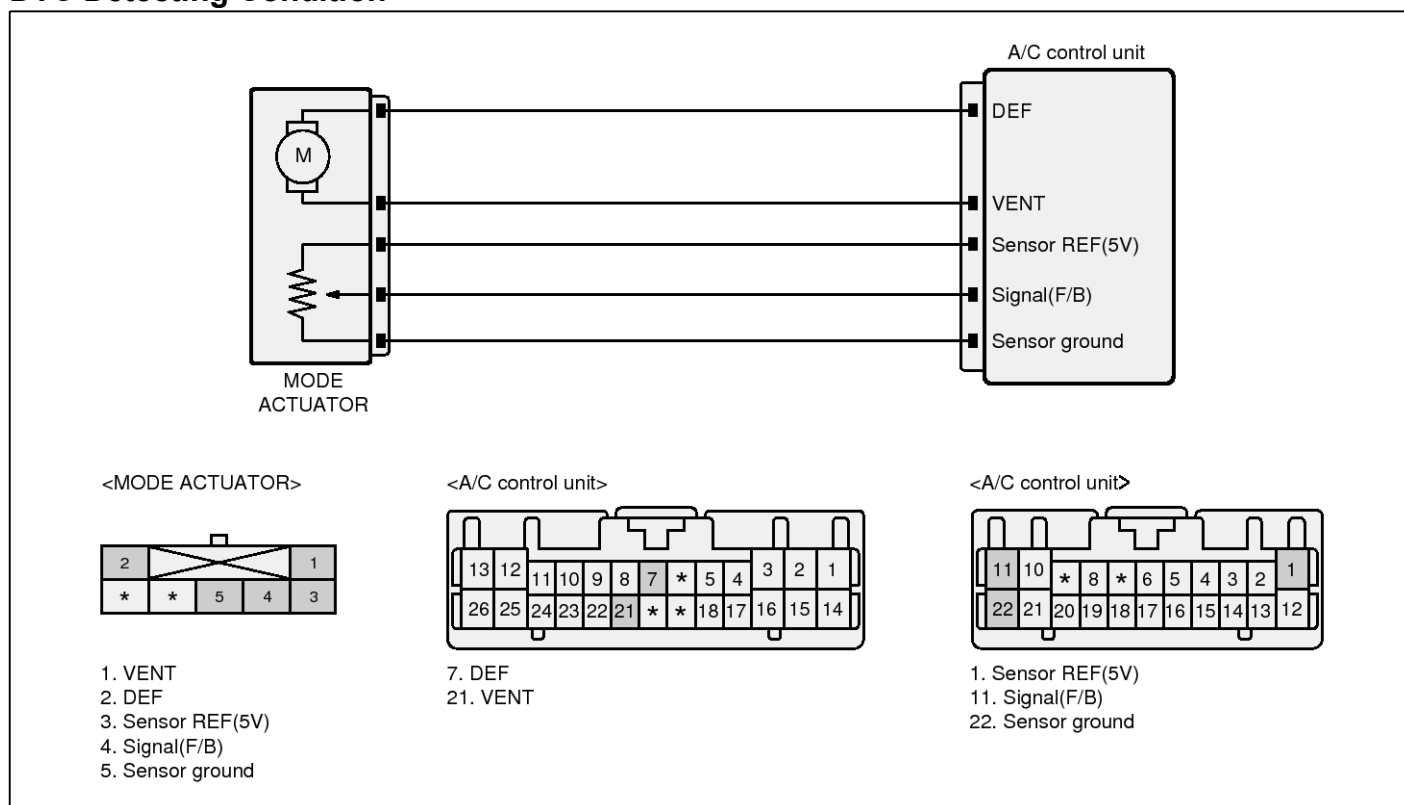
※ Voltage value of potentiometer as a function of mode door position.

Mode Door Position	Voltage
VENT	$0.4 \pm 0.3V$
BI-LEVEL	$1.45 \pm 0.3V$
FLOOR	$2.5 \pm 0.3V$
MIX	$3.55 \pm 0.3V$
DEF	$4.6 \pm 0.3V$

Controller

HA-141

DTC Detecting Condition



SHMHA9508L

Monitor Scantool data

■Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Direction Potention" parameter on scantool.
4. Select and perform Actuation test Driver Mode Door - Face / Foot / Defrost in order.
5. Check that the value of all the parameters are changed when performing the actuation test.

Specification : Face - About below 10%, Foot : About 50%, Defrost : About 90%.

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Direction Potention	93.7	%

Actuation Test

Test Items

Driver Mode Door-Face
Driver Mode Door-Foot
Driver Mode Door-Defrost
Air Inlet Mode Selection-Fresh
Air Inlet Mode Selection-Recirculation
External Control Valve - 0%
External Control Valve - 85%
Auto Defog Mode Door - 0% (close)
Auto Defog Mode Door - 50%

Duration

Until Stop Button

Conditions

ENG. RUNNING, BLOWER ON

Result

Success

Start

Stop

SHMHA9608L

6. Are all the parameters changed when performing Actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Driver Direction actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of Driver Direction actuator harness connector and Signal(F/B) terminal of A/C-ECU harness connector.

Specification : 1Ω below

- Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

■ Check short to ground in harness

- Ignition "OFF"
- Disconnect Driver Direction actuator and A/C control unit main harness connector.
- Measure resistance between Signal(F/B) terminal of Driver Direction actuator harness connector and chassis ground .

Specification : Infinity

Controller

HA-143

4. Is the measured resistance within specification?

YES ▶ Go to "Power circuit Inspection " procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Power Circuit Inspection

■ Check power in harness

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and Connect A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Sensor REF(5V) terminal of Driver Direction actuator harness connector and chassis ground.

Specification : approx. 5V

5. Is the measured voltage within specification?

YES ▶ Go to "Ground circuit Inspection" procedure.

NO ▶ Check for open and short to ground in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and A/C control unit main harness connector.
3. Measure resistance between Sensor ground(-) terminal of Driver Direction actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Driver Direction actuator

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and A/C control unit main harness connector.
3. Connect(+) terminal of battery to DEF (+) of Driver Direction actuator and (-) terminal to VENT (-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting. (DEF (+) and VENT (-)). (Component side)

Specification : Refer the specifications in Fig.1)

HA-144

Heating, Ventilation, Air Conditioning

Fig.1)

Actuator harness	DEF (+)	VENT (-)	Door position
Battery terminal	12 V	ground	VENT.Mode
	ground	12 V	DEF.Mode

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Driver Direction actuator and check for proper operation. If the problem is corrected, replace Driver Direction actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect Driver Direction actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Driver Direction actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Mode Door Position	Voltage
VENT	$0.4 \pm 0.3V$
BI-LEVEL	$1.45 \pm 0.3V$
FLOOR	$2.5 \pm 0.3V$
MIX	$3.55 \pm 0.3V$
DEF	$4.6 \pm 0.3V$

Fig.2) ※ Voltage value of Direction potentiometer as a function of position of mode switch

5. Is "voltage" display near the specified value?

YES ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ▶ Substitute with a known-good Driver Direction actuator and check for proper operation. If the problem is corrected, replace Driver Direction actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ▶ Go to the applicable troubleshooting procedure.

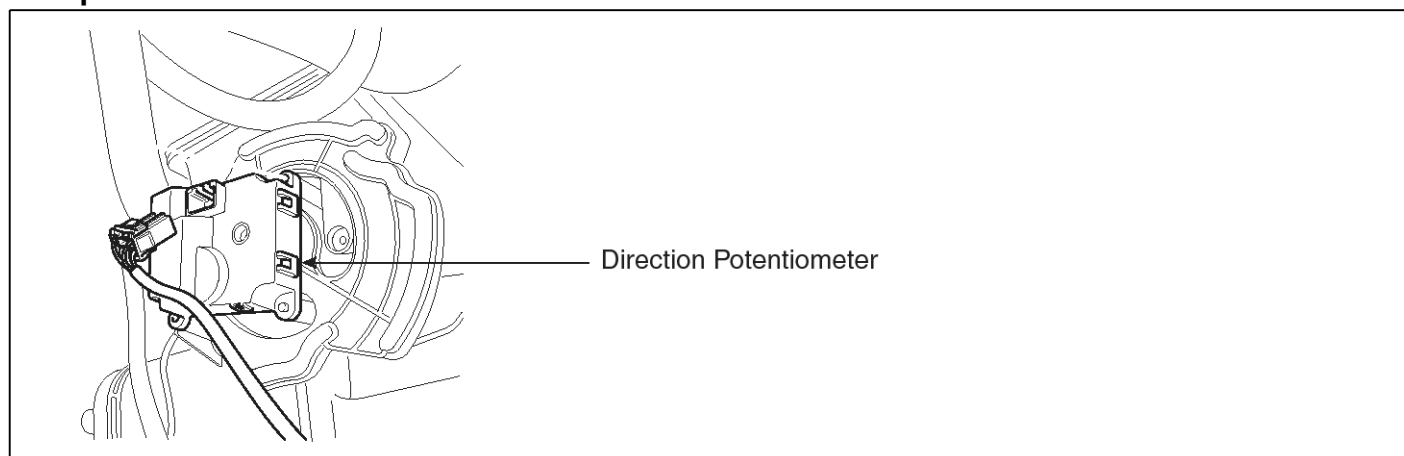
NO ▶ System is performing to specification at this time.

Controller

HA-145

B1250 Direction Potentiometer Short (High)-Driver

Componet Location



SHMHA8615L

General Description

The mode control actuator mounted on heater unit adjusts position of mode door by operating Direction Motor based on signal of A/C control unit. Pressing mode select switch makes the mode control actuator shift in order of vent → B/L → floor → mix.

DTC Description

Air conditioner Control Module sets DTC B1250 if Feedback signal of Mode Actuator has been detected over 4.9V for 100ms.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Short in signal circuit(Feedback signal) - Faulty Mode Actuator - Faulty Air conditioner Control Module
Enable Conditions	IG KEY ON	
Threshold value	Feedback signal of Mode Actuator has been detected over 4.9V for 0.3 seconds	
Failsafe	- If the Mode actuator is placed at Vent mode right before fail detection, Actuator is operated and fixed to Vent Mode Postion. - In case of the others, Actuator is moved to DEF mode position	

Specification

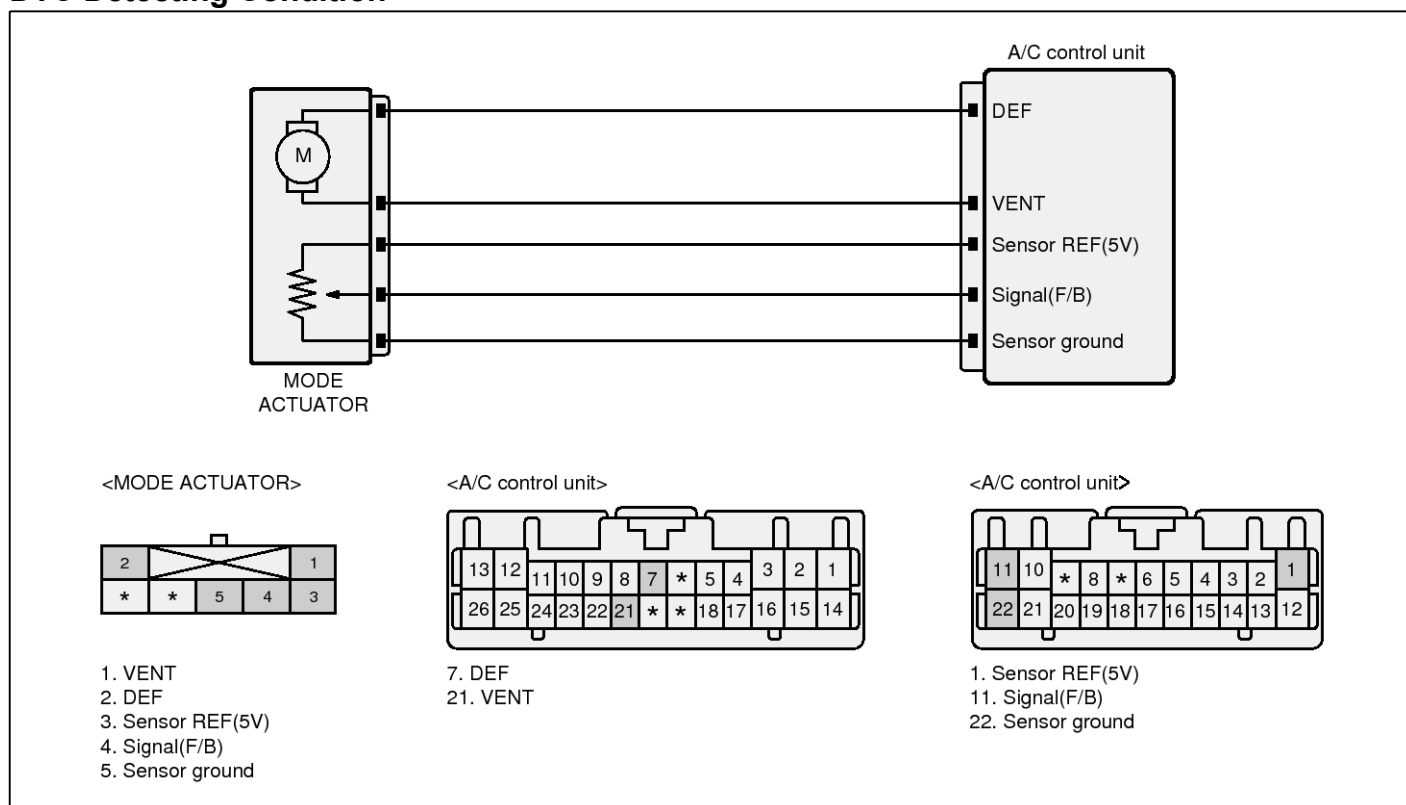
※ Voltage value of potentiometer as a function of mode door position.

Mode Door Position	Voltage
VENT	$0.4 \pm 0.3V$
BI-LEVEL	$1.45 \pm 0.3V$
FLOOR	$2.5 \pm 0.3V$
MIX	$3.55 \pm 0.3V$
DEF	$4.6 \pm 0.3V$

HA-146

Heating, Ventilation, Air Conditioning

DTC Detecting Condition



SHMHA9508L

Monitor Scantool data

■Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Direction Potention" parameter on scantool.
4. Select and perform Actuation test Driver Mode Door - Face / Foot / Defrost in order.
5. Check that the value of all the parameters are changed when performing the actuation test.

Specification : Face - About below 10%, Foot : About 50%, Defrost : About 90%.

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Direction Potention	93.7	%

Actuation Test

Test Items

Driver Mode Door-Face
Driver Mode Door-Foot
Driver Mode Door-Defrost
Air Inlet Mode Selection-Fresh
Air Inlet Mode Selection-Recirculation
External Control Valve - 0%
External Control Valve - 85%
Auto Defog Mode Door - 0% (close)
Auto Defog Mode Door - 50%

Duration

Until Stop Button

Conditions

ENG. RUNNING, BLOWER ON

Result

Success

Start

Stop

SHMHA9608L

6. Are all the parameters changed when performing Actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Signal Circuit Inspection

■ Check short to battery in harness

- Ignition "OFF"
- Disconnect Driver Direction actuator and A/C control unit main harness connector.
- Ignition "ON"
- Measure voltage between Signal(F/B) terminal of Driver Direction actuator harness connector and chassis ground .

Specification : 0V

5. Is the measured voltage within specification?

YES ▶ Go to "Ground circuit Inspection " procedure

NO ▶ Check for short to battery in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

HA-148

Heating, Ventilation, Air Conditioning

Ground Circuit Inspection

■ Check for open in harness

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and A/C control unit main harness connector.
3. Measure resistance between Sensor ground(-) terminal of Driver Direction actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

4. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for open in harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Driver Direction actuator

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and A/C control unit main harness connector.
3. Connect(+) terminal of battery to DEF (+) of Driver Direction actuator and (-) terminal to VENT (-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting. (DEF (+) and VENT (-)). (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	DEF (+)	VENT (-)	Door position
Battery terminal	12 V	ground	VENT.Mode
	ground	12 V	DEF.Mode

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Driver Direction actuator and check for proper operation. If the problem is corrected, replace Driver Direction actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect Driver Direction actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Driver Direction actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Mode Door Position	Voltage
VENT	0.4±0.3V
BI-LEVEL	1.45±0.3V
FLOOR	2.5±0.3V
MIX	3.55±0.3V
DEF	4.6±0.3V

Fig.2) ※ Voltage value of Direction potentiometer as a function of position of mode switch

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Driver Direction actuator and check for proper operation. If the problem is corrected, replace Driver Direction actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

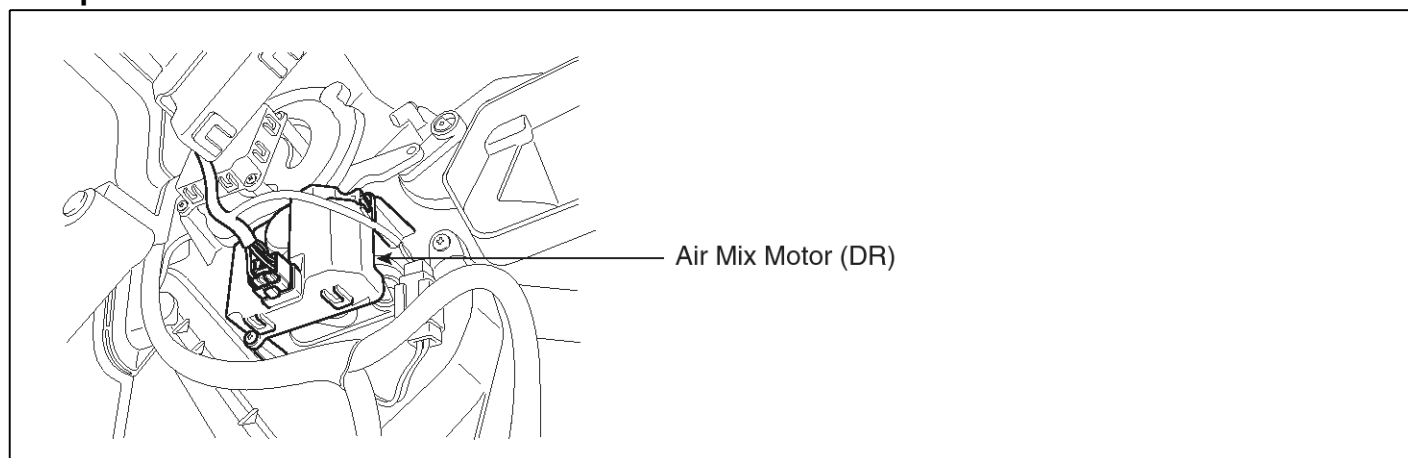
NO ► System is performing to specification at this time.

HA-150

Heating, Ventilation, Air Conditioning

B2406 Air Mix Motor-Driver

Componet Location



SHMHA8616L

General Description

Temperature control actuator located at heater unit. It contains temp motor that changes temp door position and potentiometer that monitors position of temp door. Temperature control actuator regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temp door by operating temp motor and then temperature will be regulated by the hot/cold air ratio decided by position of temp door. In operation, potentiometer delivers temp door position transformed into voltage value to A/C ECU .

DTC Description

Air conditioner Control Module sets DTC B2406 if Driver air mix actuator has not been moved to the mode, where air condition control module controls, within 40 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor contact in harness - Open or short in motor power circuit - Faulty Driver air mix actuator - Faulty air conditioner control module
Enable Conditions	IG KEY ON	
Threshold value	No movement to controlled mode position for 40 seconds	
Failsafe	Fixed as current position	

Specification

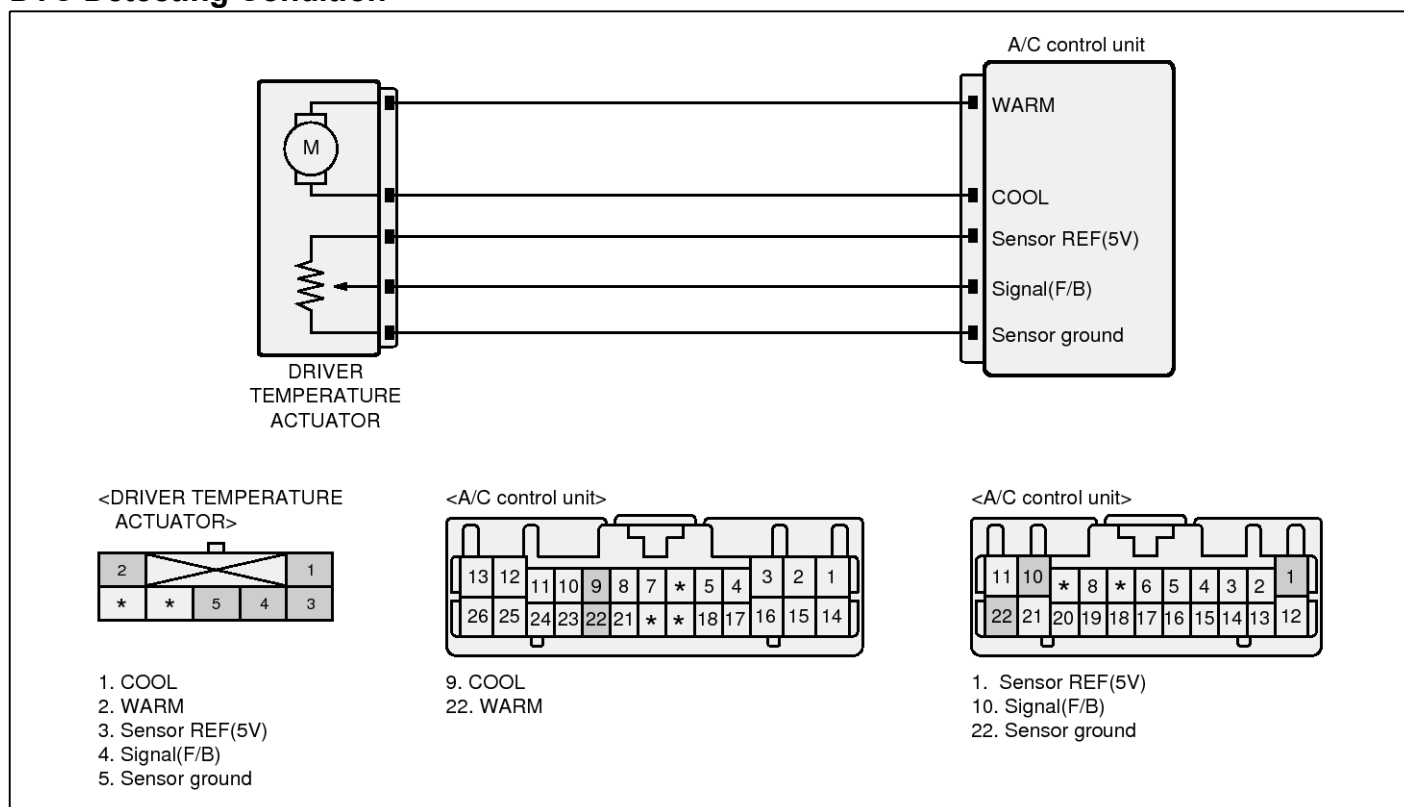
※ Voltage value of Air Mix potentiometer as a function of temp door position.

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

Controller

HA-151

DTC Detecting Condition



SHMHA9507L

Monitor Scantool data

■Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Air Mix Door Potentioner-Driver" parameter on scantool.
4. Select and perform Actuation test Air Mix Door Potentioner-Driver - 0% / 50% / 100% in order.
5. Check that the value of all the parameters are changed when performing the actuation test.

Specification : Check that the value of Air Mix Door Potentiometer at current data should be close to the value of the acutation test .

HA-152

Heating, Ventilation, Air Conditioning

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Air Mix Door Potentiometer-Driver	6.3	%

Actuation Test

Test Items

Driver Air Mix Door-0%

Driver Air Mix Door-50%

Driver Air Mix Door-100%

Passenger Air Mix Door-0%

Passenger Air Mix Door-50%

Passenger Air Mix Door-100%

Driver Mode Door-Face

Driver Mode Door-Foot

Driver Mode Door-Defrost

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9607L

6. Does the value of current data follow in accordance with the each actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Control Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Driver air mix actuator and A/C control unit main harness connector.
- Measure resistance between WARM terminal of Driver air mix actuator harness connector and WARM terminal of A/C-ECU harness connector.
- Measure resistance between COOL terminal of Driver air mix actuator harness connector and COOL terminal of A/C-ECU harness connector.

Specification : 1Ω below

5. Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Controller

HA-153

■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Measure resistance between WARM terminal of Driver air mix actuator harness connector and chassis ground .
4. Measure resistance between COOL terminal of Driver air mix actuator harness connector and chassis ground .

Specification : Infinity

5. Is the measured resistance within specification?

YES ▶ Go to " Component inspection " procedure .

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Driver air mix actuator

1. Ignition "OFF"
2. Disconnect Driver air mix actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to WARM(+) of Driver air mix actuator and (-) terminal to COOL(-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting.(WARM(+) and COOL(-)) . (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	WARM(+)	COOL(-)	Door position
Battery terminal	12 V	ground	Max.warm
	ground	12 V	Max.cool

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect Driver air mix actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Driver air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector .(Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

FIG.2) ※ Voltage value of Air Mix potentiometer as a function of temp door position.

HA-154

Heating, Ventilation, Air Conditioning

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

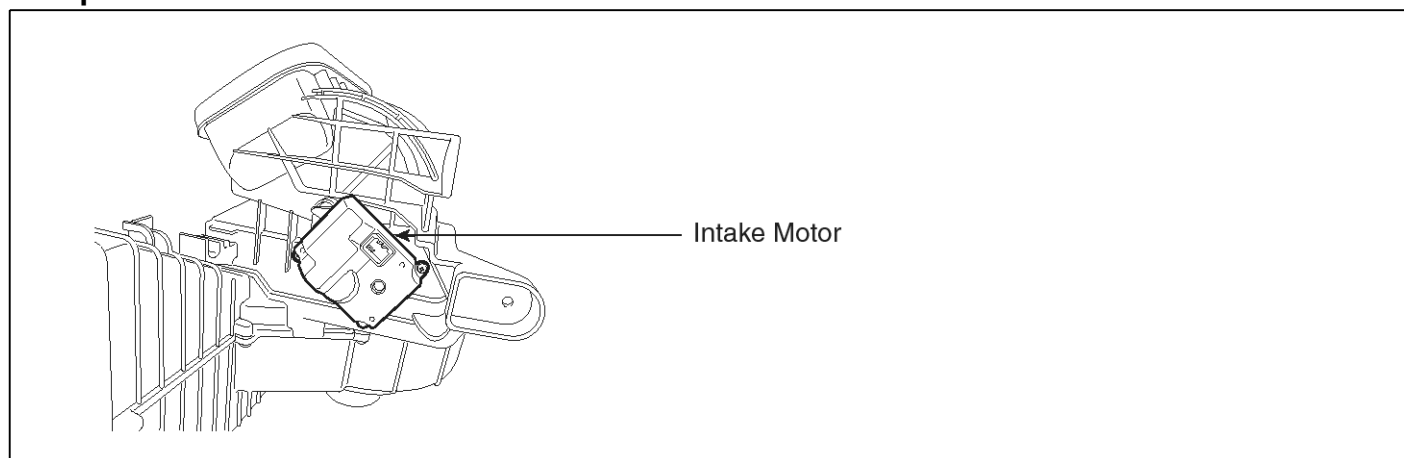
NO ► System is performing to specification at this time.

Controller

HA-155

B2408 Intake Motor

Componet Location



SHMHA8621L

General Description

Intake door located at heater unit controls the inlet of car. It contains intake motor that changes intake door position and potentiometer that monitors position of intake door. When driver operates the intake switch, ECU receives mode signal from intake switch and operates intake door motot to turn intake door to intended position. (with FRE mode signal, intake door is closed and with REC mode signal, intake door is opened)In operation, potentiometer delivers intake door position transformed into voltage value to A/C ECU .

DTC Description

Air conditioner Control Module sets DTC B2408 if Intake actuator has not been moved to the mode,where air condition control module controls, within 40 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor contact in harness - Open or short in motor power circuit - Faulty Intake actuator - Faulty air conditioner control module
Enable Conditions	IG KEY ON	
Threshold value	No movement to controlled mode position for 40 seconds	
Failsafe	Fixed as current position	

Specification

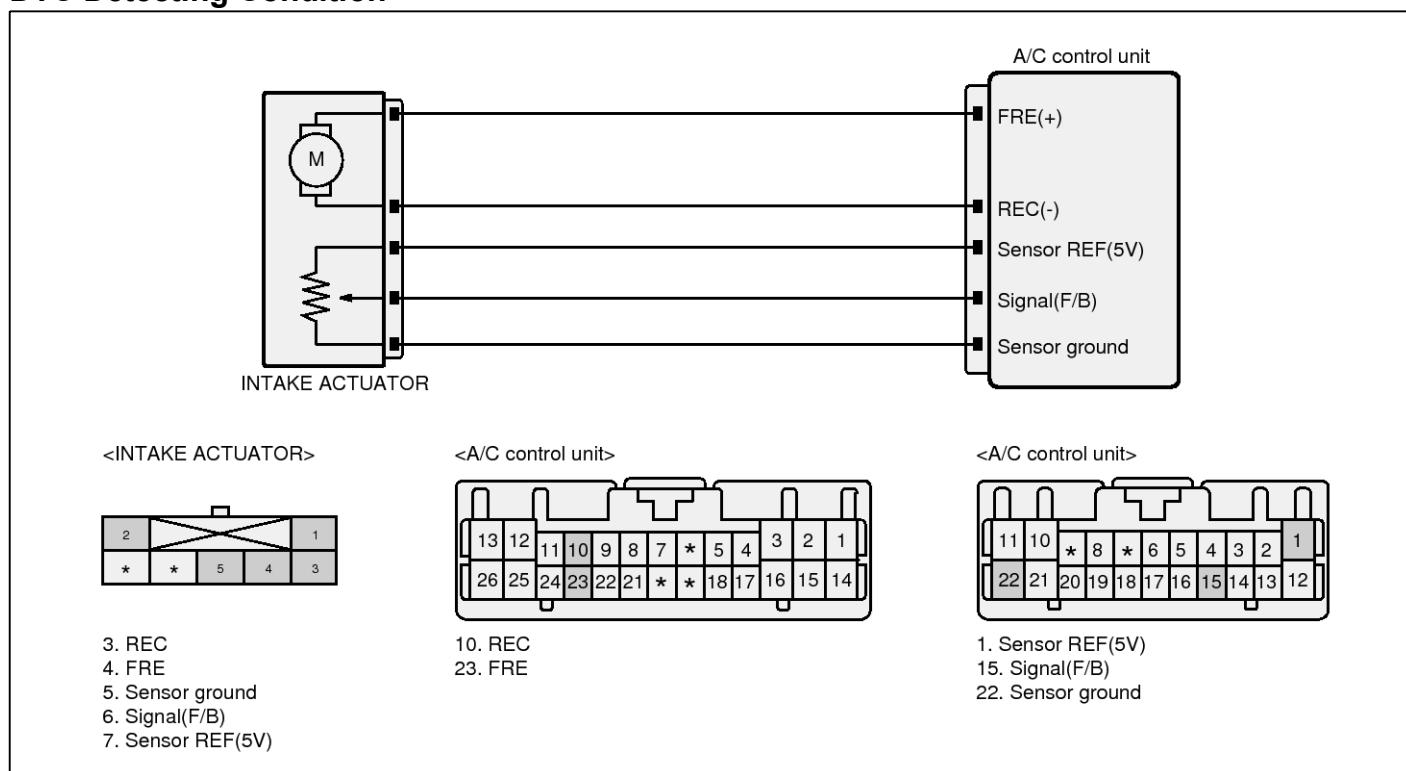
※ Voltage value of Intake potentiometer as a function of position of Intake door

Door position	Voltage
FRE	$0.3 \pm 0.15V$
REC	$4.7 \pm 0.15V$

HA-156

Heating, Ventilation, Air Conditioning

DTC Detecting Condition



SHMHA9503L

Monitor Scantool data

■ Check Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal temperature after engine start
3. Select " Intake Potentiometer " parameter on the current data with scantool
4. Perform Actuation Test for Air Inlet Mode Selection - Reculation /Fresh in order.
5. With performing Actuation test, check that the value of each position sensors are changing.

Specification : Recirculation : About 90%, Fresh : About 10%.

Current Data

Standard Display

Full List

Graph

Items List

Reset Min.Max.

Record

Stop

VSS

Sensor Name	Value	Unit
☒ Intake Potentiometer	6.3	%

Actuation Test

Test Items

Driver Mode Door-Foot

Driver Mode Door-Defrost

Air Inlet Mode Selection-Fresh

Air Inlet Mode Selection-Recirculation

External Control Valve - 0%

External Control Valve - 85%

Auto Defog Mode Door - 0% [close]

Auto Defog Mode Door - 50%

Auto Defog Mode Door - 100% [open]

Duration

Until Stop Button

Conditions

ENG. RUNNING, A/C ON

Result

Success

Start

Stop

SHMHA9603L

6. Are the value of each position sensors changed when performing actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Control Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Intake actuator and A/C control unit main harness connector.
- Measure resistance between FRE(+) terminal of Intake actuator harness connector and FRE(+) terminal of A/C-ECU harness connector.
- Measure resistance between REC(-) terminal of Intake actuator harness connector and REC(-) terminal of A/C-ECU harness connector.

Specification : 1Ω below

- Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

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Heating, Ventilation, Air Conditioning

■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Measure resistance between FRE(+) terminal of Intake actuator harness connector and chassis ground.
4. Measure resistance between REC(-) terminal of Intake actuator harness connector and chassis ground.

Specification : Infinity

5. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Intake actuator

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to FRE(+) of intake actuator and (-) terminal to REC(-). (Component side)
4. Verify that the actuator operates to the REC position
5. Verify that the temperature actuator operates to the FRE position with reverse connecting. (REC(-) and FRE(+)) (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	FRE(+)	REC(-)	Door position
Battery terminal	12 V	ground	FRE
	ground	12 V	REC

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Intake actuator and check for proper operation. If the problem is corrected, replace Intake actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Disconnect Intake actuator and A/C control unit main harness connector.
3. Ignition "ON"(ENGINE "OFF").
4. Measure voltage between Signal(F/B) terminal of Intake actuator harness connector and chassis ground. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
FRE	$0.3 \pm 0.15V$
REC	$4.7 \pm 0.15V$

FIG.2) ※ Voltage value of intake potentiometer as a function of intake door position.

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Intake actuator and check for proper operation. If the problem is corrected, replace Intake actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

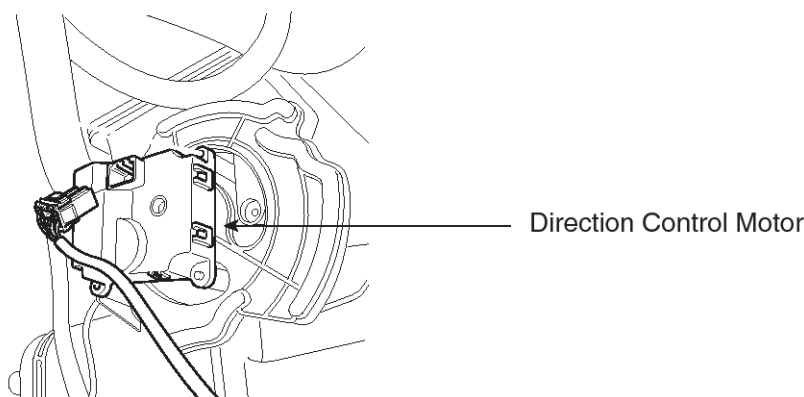
NO ► System is performing to specification at this time.

HA-160

Heating, Ventilation, Air Conditioning

B2409 Direction Control Motor-Driver

Componet Location



SHMHA8617L

General Description

The mode control actuator mounted on heater unit adjusts position of mode door by operating Direction Motor in accordance with signal of A/C control unit. Pressing mode select switch makes the mode control actuator shift in order of vent → B/L → floor → mix.

DTC Description

Air conditioner Control Module sets DTC B2409 if Driver Direction actuator has not been moved to the mode, where air condition control module controls, within 40 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor contact in harness - Open or short in motor power circuit - Faulty Driver Direction actuator - Faulty air conditioner control module
Enable Conditions	IG KEY ON	
Threshold value	No movement to controlled mode position for 40 seconds	
Failsafe	Fixed as current position	

Specification

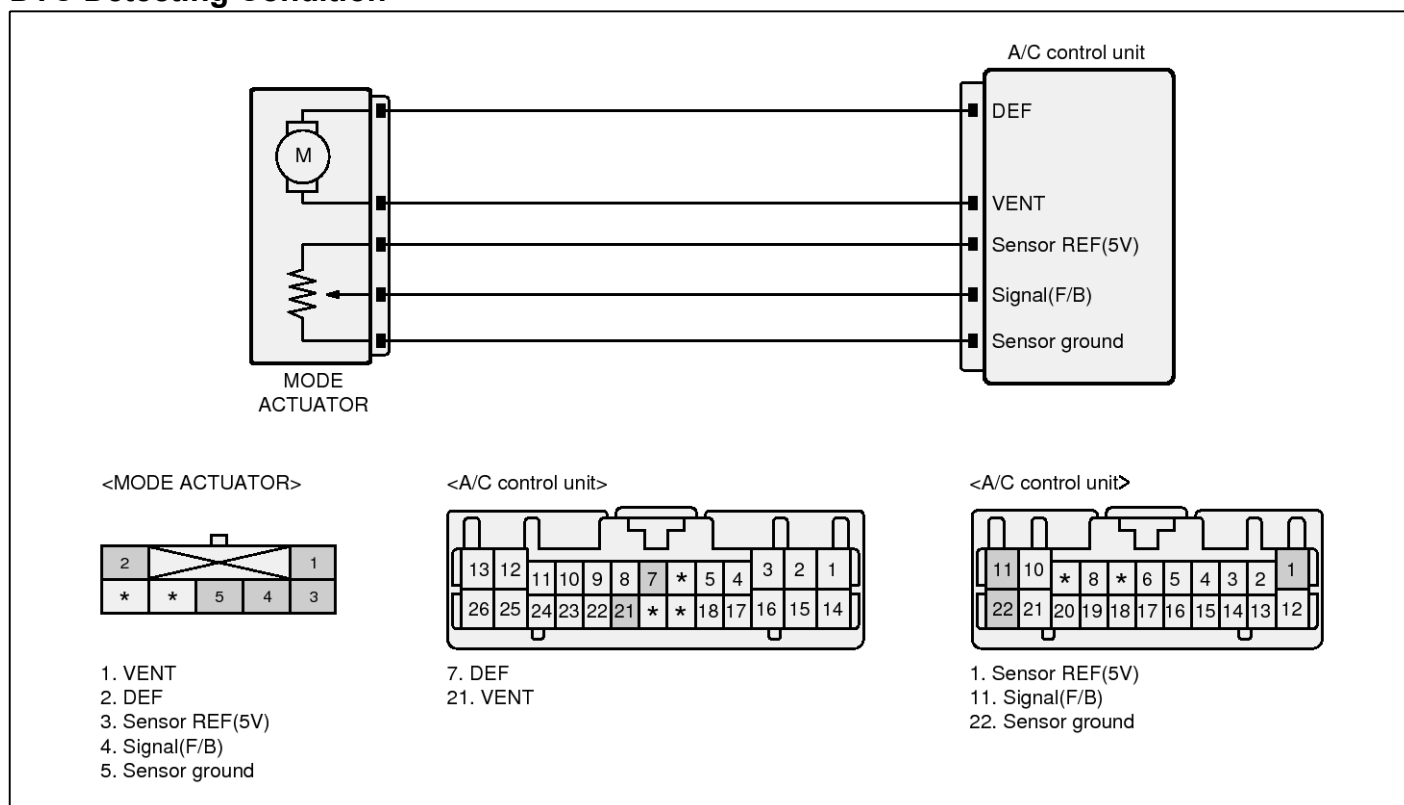
※ Voltage value of potentiometer as a function of mode door position.

Mode Door Position	Voltage
VENT	$0.4 \pm 0.3V$
BI-LEVEL	$1.45 \pm 0.3V$
FLOOR	$2.5 \pm 0.3V$
MIX	$3.55 \pm 0.3V$
DEF	$4.6 \pm 0.3V$

Controller

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DTC Detecting Condition



SHMHA9508L

Monitor Scantool data

■Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal engine temperature after engine starts.
3. Select and monitor "Direction Potention" parameter on scantool.
4. Select and perform Actuation test Driver Mode Door - Face / Foot / Defrost in order.
5. Check that the value of all the parameters are changed when performing the actuation test.

Specification : Face - About below 10%, Foot : About 50%, Defrost : About 90%.

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Heating, Ventilation, Air Conditioning

☒ Current Data

☐ Standard Display
 ☐ Full List
 ☐ Graph
 ☐ Items List

Sensor Name	Value	Unit
☒ Direction Potention	93.7	%

☒ Actuation Test

Test Items

Driver Mode Door-Face
Driver Mode Door-Foot
Driver Mode Door-Defrost
Air Inlet Mode Selection-Fresh
Air Inlet Mode Selection-Recirculation
External Control Valve - 0%
External Control Valve - 85%
Auto Defog Mode Door - 0% (close)
Auto Defog Mode Door - 50%

• Duration

• Conditions

• Result

SHMHA9608L

6. Are all the parameters changed when performing Actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Control Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect Driver Direction actuator and A/C control unit main harness connector.
- Measure resistance between DEF terminal of Driver Direction actuator harness connector and DEF terminal of A/C-ECU harness connector.
- Measure resistance between VENT terminal of Driver Direction actuator harness connector and VENT terminal of A/C-ECU harness connector.

Specification : 1Ω below

5. Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Controller

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■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and A/C control unit main harness connector.
3. Measure resistance between DEF terminal of Driver Direction actuator harness connector and chassis ground.
4. Measure resistance between VENT terminal of Driver Direction actuator harness connector and chassis ground.

Specification : Infinity

5. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check Driver Direction actuator

1. Ignition "OFF"
2. Disconnect Driver Direction actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to DEF (+) of Driver air mix actuator and (-) terminal to VENT (-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting. (DEF (+) and VENT (-)). (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	DEF (+)	VENT (-)	Door position
Battery terminal	12 V	ground	VENT.Mode
	ground	12 V	DEF.Mode

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect Driver Direction actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of Driver Direction actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Mode Door Position	Voltage
VENT	0.4±0.3V
BI-LEVEL	1.45±0.3V
FLOOR	2.5±0.3V
MIX	3.55±0.3V
DEF	4.6±0.3V

Fig.2) ※ Voltage value of Direction potentiometer as a function of position of mode switch

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Heating, Ventilation, Air Conditioning

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good Driver air mix actuator and check for proper operation. If the problem is corrected, replace Driver air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

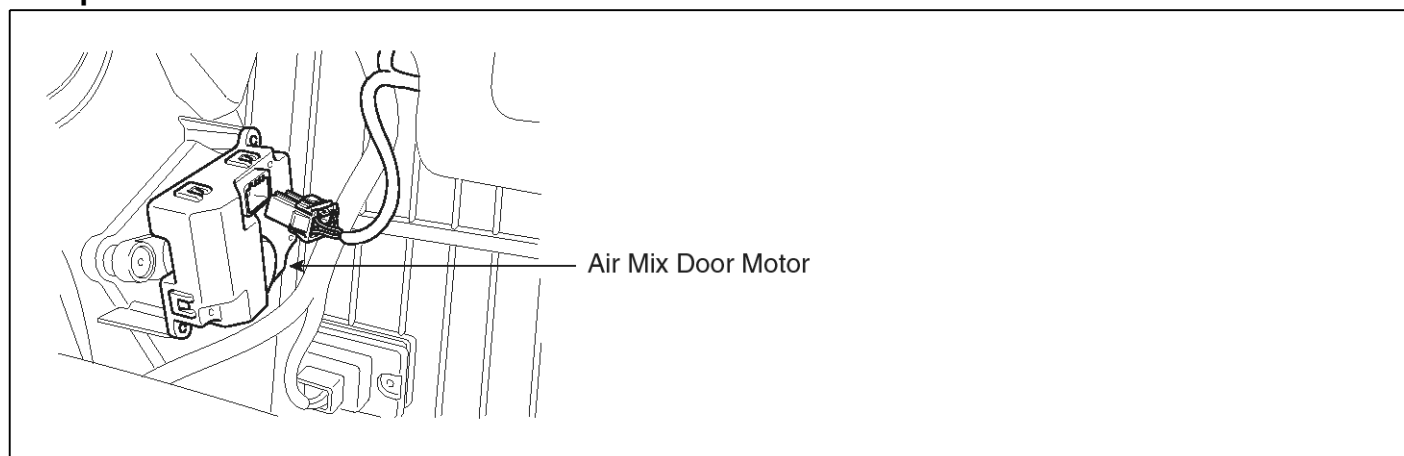
NO ► System is performing to specification at this time.

Controller

HA-165

B2415 Air Mix Door Motor-Passenger

Componet Location



SHMHA8618L

General Description

Temperature control actuator located at heater unit. It contains temp motor that changes temp door position and potentiometer that monitors position of temp door. Temperature control actuator regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temp door by operating temp motor and then temperature will be regulated by the hot/cold air ratio decided by position of temp door. In operation, potentiometer delivers temp door position transformed into voltage value to A/C ECU.

DTC Description

Air conditioner Control Module sets DTC B2415 if passenger air mix actuator has not been moved to the mode, where air condition control module controls, within 40 seconds.

DTC Detecting Condition

Item	Detecting Condition	Detecting Condition
DTC Strategy	Voltage check	- Poor contact in harness - Open or short in motor power circuit - Faulty passenger air mix actuator - Faulty air conditioner control module
Enable Conditions	IG KEY ON	
Threshold value	No movement to controlled mode position for 40 seconds	
Failsafe	Fixed as current position	

Specification

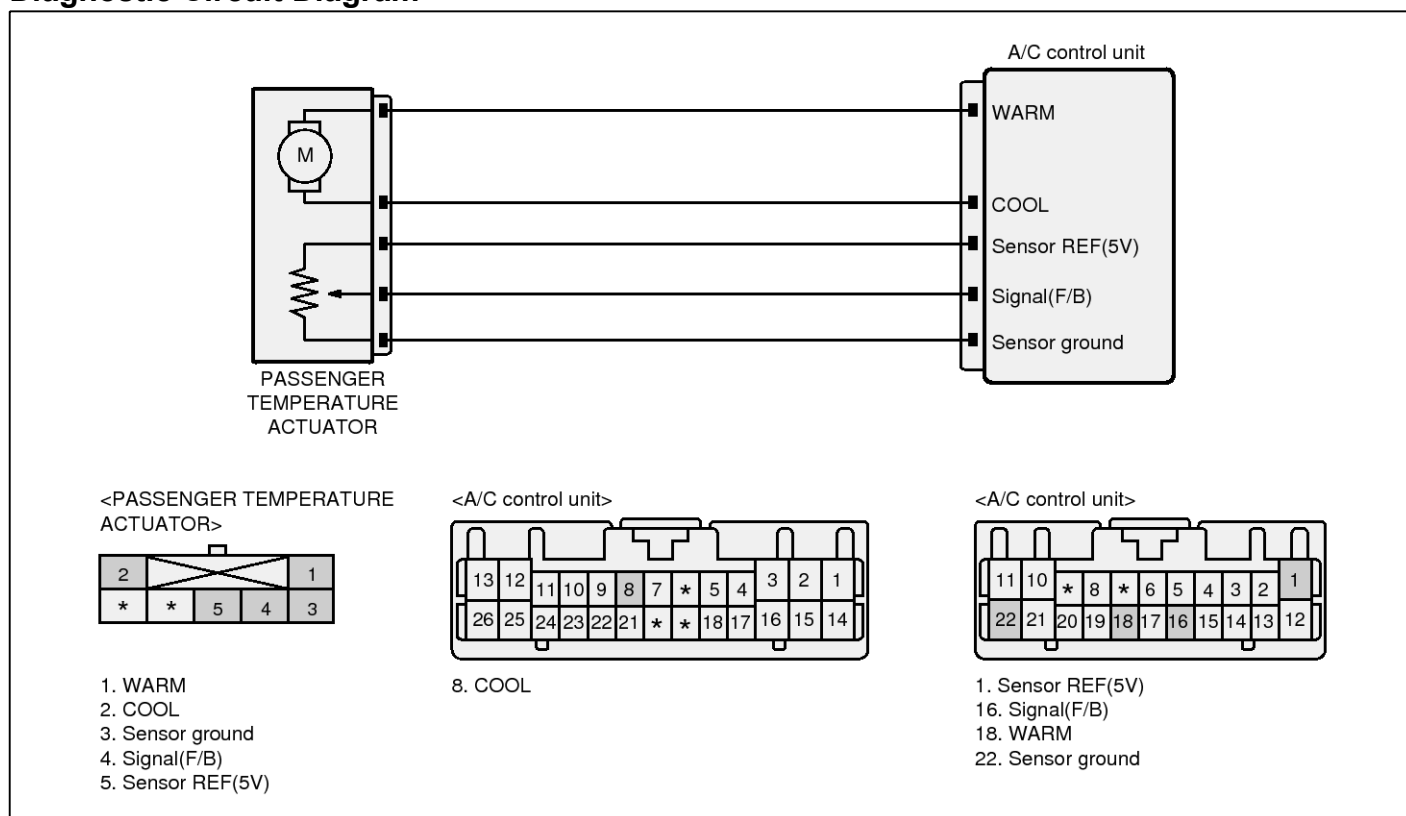
※ Voltage value of Air Mix potentiometer as a function of temp door position.

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

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Heating, Ventilation, Air Conditioning

Diagnostic Circuit Diagram



SHMHA9502L

Monitor Scantool data

■ Check Actuation Test

1. Connect scantool with diagnostic connector.
2. Warm up the engine to normal temperature after engine start
3. Select "Air Mix Door Potentiometer-Passenger" parameter on the current data with scantool
4. Perform Actuation Test for "Passenger Air Mix Door - 0% / 50% / 100%.
5. With performing Actuation test, check that the value of Air Mix Door Potentiometer is changed and close to the value of Actuation Test.

Specification : Check that the value of Air Mix Door Potentiometer at current data should be close to the value of the acutation test .

☒ Current Data

☐

Standard Display ▾

Full List ▾

Graph ▾

Items List ▾

Reset Min.Max.

Record

Stop ▾

VSS

Sensor Name	Value	Unit
☒ Air Mix Door Potentiometer-Passenger	6.3	%

☒ Actuation Test

☐

Test Items

Passenger Air Mix Door-0%

Passenger Air Mix Door-50%

Passenger Air Mix Door-100%

Driver Mode Door-Face

Driver Mode Door-Foot

Driver Mode Door-Defrost

Air Inlet Mode Selection-Fresh

Air Inlet Mode Selection-Recirculation

External Control Valve - 0%

• Duration

Until Stop Button

• Conditions

ENG. RUNNING, A/C ON

• Result

Success

Start

Stop

SHMHA9602L

6. Does the value of current data follow in accordance with the each actuation test ?

YES ▶ This is a intermittent problem caused by poor contact of component or Control Unit
 ▶ Thoroughly check the looseness, poor connection, bent, corrosion, contamination, deformation or damage of connector.
 ▶ Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

NO ▶ Go to " Inspection/Repair " procedure.

Terminal and Connector Inspection

- Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
- Has a problem been found?

YES ▶ Repair as necessary and go to "Verification of Vehicle Repair" procedure

NO ▶ Go to "W/Harness Inspection" procedure.

Control Circuit Inspection

■ Check for open in harness

- Ignition "OFF"
- Disconnect passenger air mix actuator and A/C control unit main harness connector.
- Measure resistance between WARM terminal of passenger air mix actuator harness connector and WARM terminal of A/C-ECU harness connector.
- Measure resistance between COOL terminal of passenger air mix actuator harness connector and COOL terminal of A/C-ECU harness connector.

Specification : 1Ω below

- Is the measured resistance within specification?

YES ▶ Go to "Check short to ground in harness" as follows.

NO ▶ Check for open in harness.
 ▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

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■ Check short to ground in harness

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and A/C control unit main harness connector.
3. Measure resistance between WARM terminal of passenger air mix actuator harness connector and chassis ground.
4. Measure resistance between COOL terminal of passenger air mix actuator harness connector and chassis ground.

Specification : Infinity

5. Is the measured resistance within specification?

YES ▶ Go to "Component inspection" procedure.

NO ▶ Check for short to ground in control harness.
▶ Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

■ Check passenger air mix actuator

1. Ignition "OFF"
2. Disconnect passenger air mix actuator and A/C control unit main harness connector.
3. Connect (+) terminal of battery to WARM(+) of passenger air mix actuator and (-) terminal to COOL(-). (Component side)
4. Verify that the temperature actuator operates to the cool position
5. Verify that the temperature actuator operates to the warm position with reverse connecting. (WARM(+) and COOL(-)). (Component side)

Specification : Refer the specifications in Fig.1)

Fig.1)

Actuator harness	WARM(+)	COOL(-)	Door position
Battery terminal	12 V	ground	Max.warm
	ground	12 V	Max.cool

FIG.1) ※ Function of the actuator motor according to terminal connection type. (observe safety regulations)

6. Is "Door position" display near the specified value?

YES ▶ Go to "Check potentiometer" procedure.

NO ▶ Substitute with a known-good passenger air mix actuator and check for proper operation. If the problem is corrected, replace passenger air mix actuator and then go to "Verification of Vehicle Repair" procedure.

■ Check potentiometer

1. Ignition "OFF"
2. Connect passenger air mix actuator and A/C control unit main harness connector.
3. Ignition "ON"
4. Measure voltage between Signal(F/B) terminal of passenger air mix actuator harness connector and Sensor ground(-) terminal of A/C-ECU harness connector. (Component side)

Specification : Refer the specifications in Fig.2)

Fig.2)

Door position	Voltage
Max. cool	0.4 V±0.3V
Max. warm	4.6 V±0.3V

FIG.2) ※ Voltage value of Air Mix potentiometer as a function of temp door position.

5. Is "voltage" display near the specified value?

YES ► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO ► Substitute with a known-good passenger air mix actuator and check for proper operation. If the problem is corrected, replace passenger air mix actuator and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES ► Go to the applicable troubleshooting procedure.

NO ► System is performing to specification at this time.