General Information

SPECIFICATION

AIR CONDITIONER

Item		Specification	
		Gasoline	Diesel
Compressor	Type	10PA15C (Swash plate)	10PA17C (Swash plate)
	Oil type & Capacity	ND-OIL8 (PAG), 120 ~ 135cc	ND-OIL8 (PAG), 200 ~ 215cc
	Pulley type	4PK-TYPE	5PK-TYPE (U1.5), 6PK-TYPE (U2.0)
	Displacement	155.3 cc/rev	177.7 cc/rev
Condensor	Heat rejection	12,000 ± 10% kcal/hr	
Triple switch	High [psi(kg/cm²)]	ON : 370 ± 2.8 (26.0 ± 0.2) OFF : 455 ± 2.8 (32.0 ± 0.2)	
	Low [psi(kg/cm²)]	ON : 28.6 ~ 36.3 (2.00 ~ 2.55) OFF : 28.4 ± 2.8 (2.0 ± 0.2)	
	Medium [psi(kg/cm²)]	ON : 220 ± 11.4 (15.5 ± 0.8) OFF : 164 ± 17.1 (11.5 ± 1.2)	
Expansion valve	Type	Block	
Refrigerant	Type	R-134a	
	Capacity [oz.(g)]	17.64 ± 0.88 (500 ± 25)	

Blower unit

Item		Specification
Fresh and recirculation	Operating method	Actuator
Blower	Type	Sirocco
	Speed step	4 speed (Manual), Auto + 7 speed (Auto)
	Speed control	Resistor (Manual), Power transistor and hi-relay (Auto)
Air filter	Type	Particle filter

Heater and evaporator unit

Item		Specification
Heater	Type	Pin & Tube type
	Heating capacity	5,000 ± 5% kcal/hr
	Mode operating method	Actuator
	Temperature operating method	Actuator

Item		Specification
Evaporator	Type	Laminated type
	Temperature control type	Thermistor
	A/C ON/OFF [℃ (˚F)]	OFF : 5.0 ± 0.5 (41.0 ± 32.9), ON : 7.0 ± 0.5 (44.6 ± 32.9)

SPECIFICATION

Air conditioner

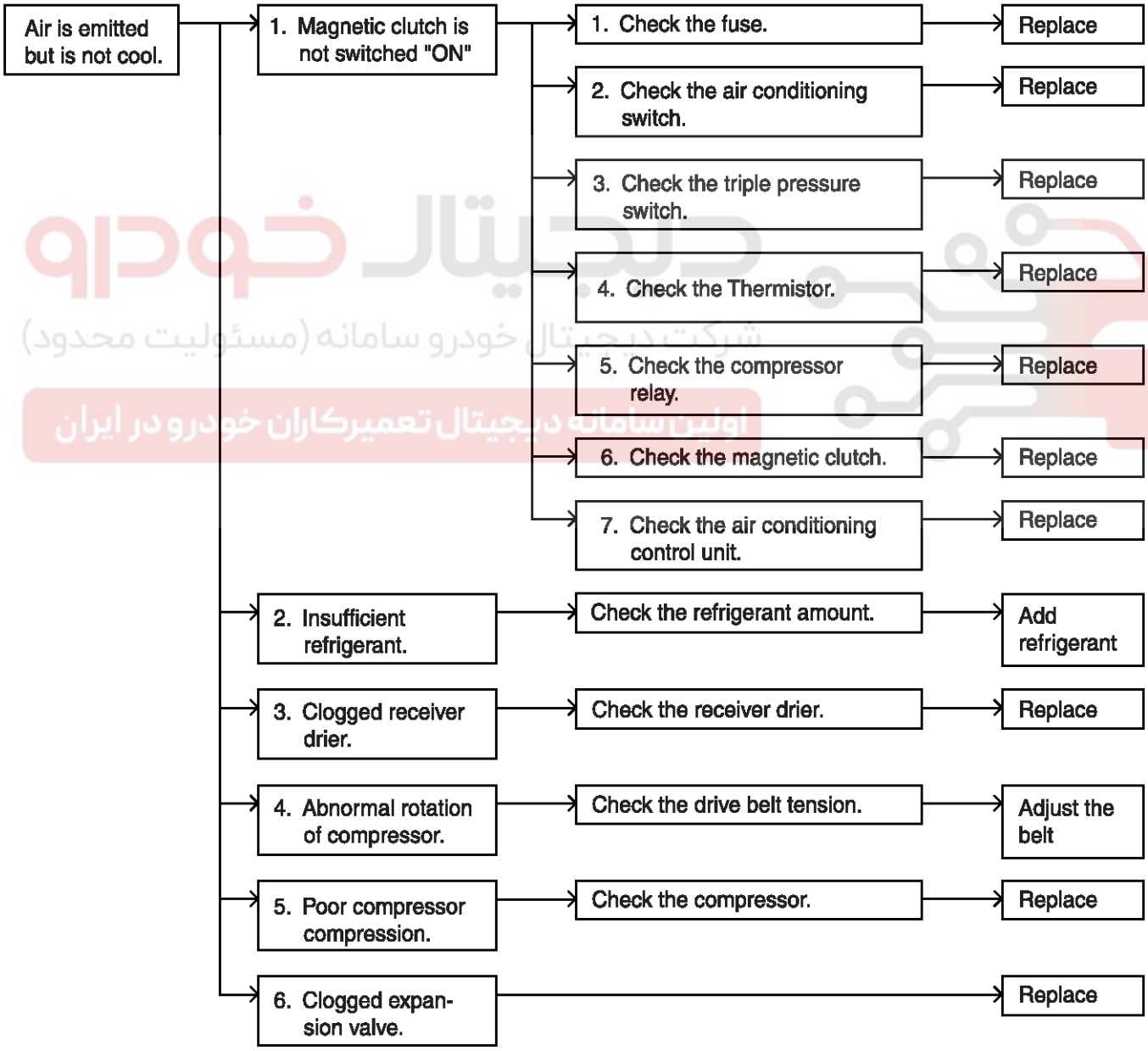
Item		Specification
Compressor	Type	6SBU16
	Oil type & Capacity	ND-OIL8 (PAG), 120 ± 10cc
	Pulley type	L5OS-TYPE
	Displacement	160cc/rev
APT (A/C pressure transducer)	The method to measure the pressure	Voltage = 0.00878835 * Pressure (psig) + 0.5

TROUBLESHOOTING

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

The following diagnostic charts have been developed as a quick reference for determining the cause of the malfunction. If these charts do not satisfactorily describe the problem, refer to the appropriate section for a more detailed explanation. After correcting the malfunction, check the complete system to ensure that performance is satisfactory.

MALFUNCTION CAUSES AND REMEDIES (NUMBERS INDICATE CHECKING/INSPECTION ORDER.)



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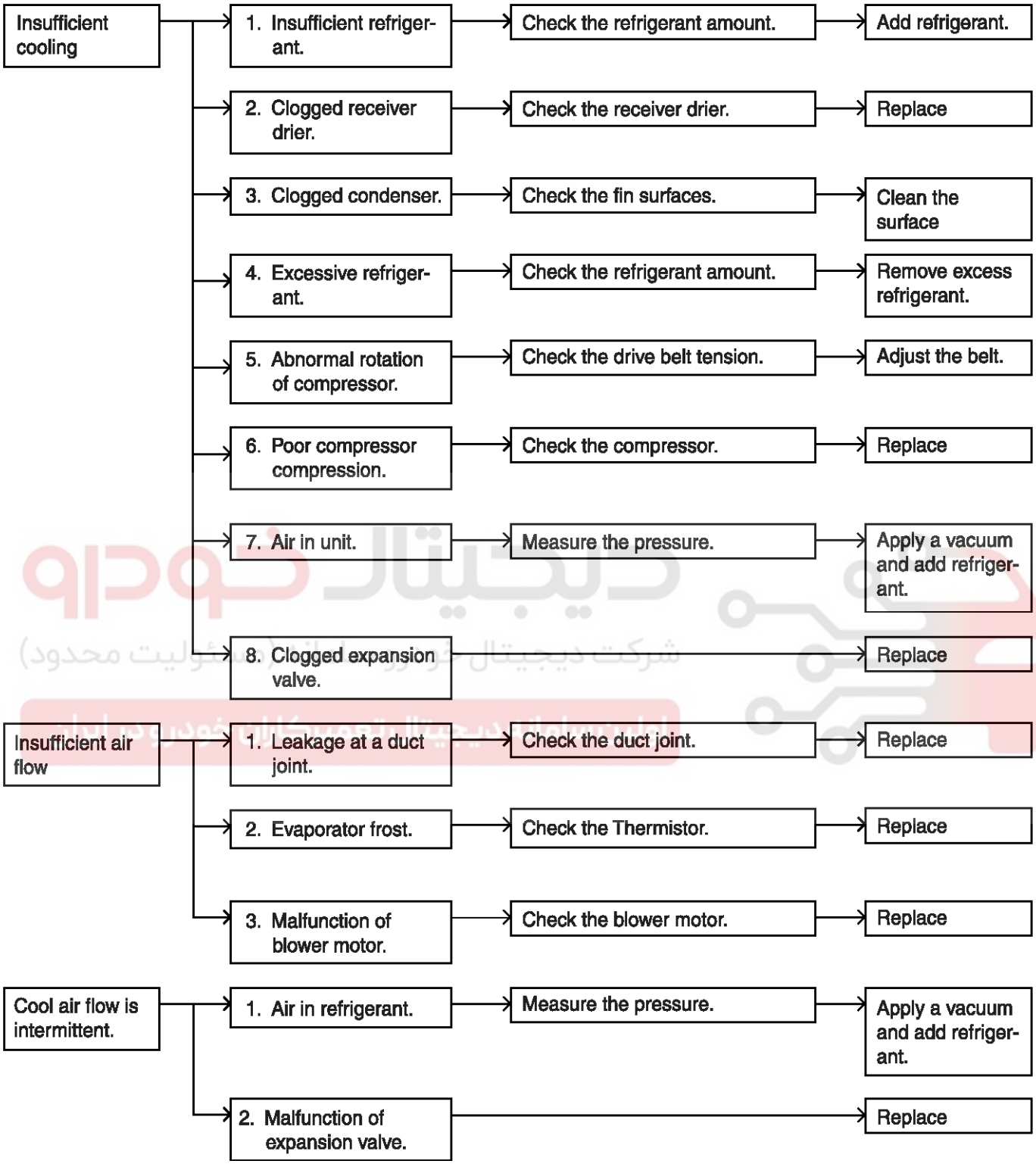

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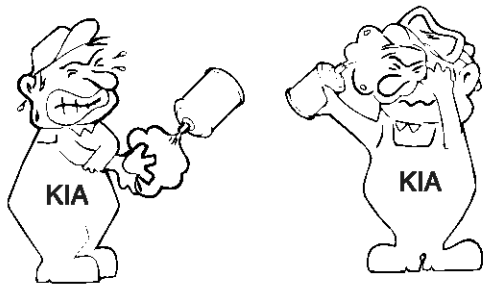
Air conditioning System

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℃ (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.



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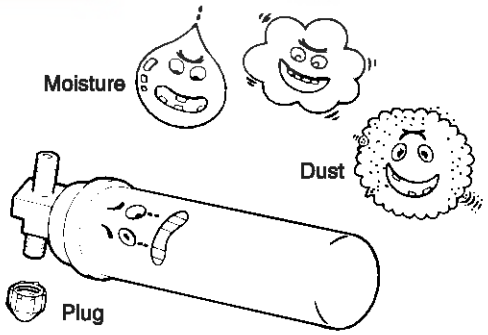
WHEN REPLACING PARTS ON A/C SYSTEM

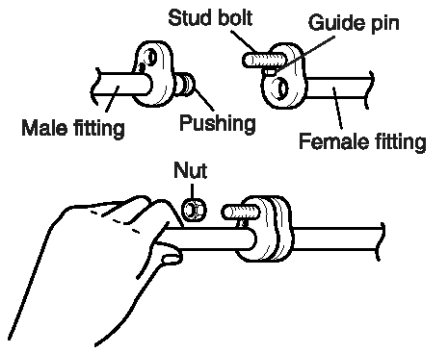
1. Never open or loosen a connection before discharging the system.
2. Seal the open fittings of components with a cap or plug immediately to prevent intrusion of moisture or dust.
3. Do not remove the sealing caps from a replacement component until it is ready to be installed.
4. Before connecting an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



LQAC003B

WHEN INSTALLING CONNECTING PATRS 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.



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Size	Tightening torque (N·m (kg·m, lb·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
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.

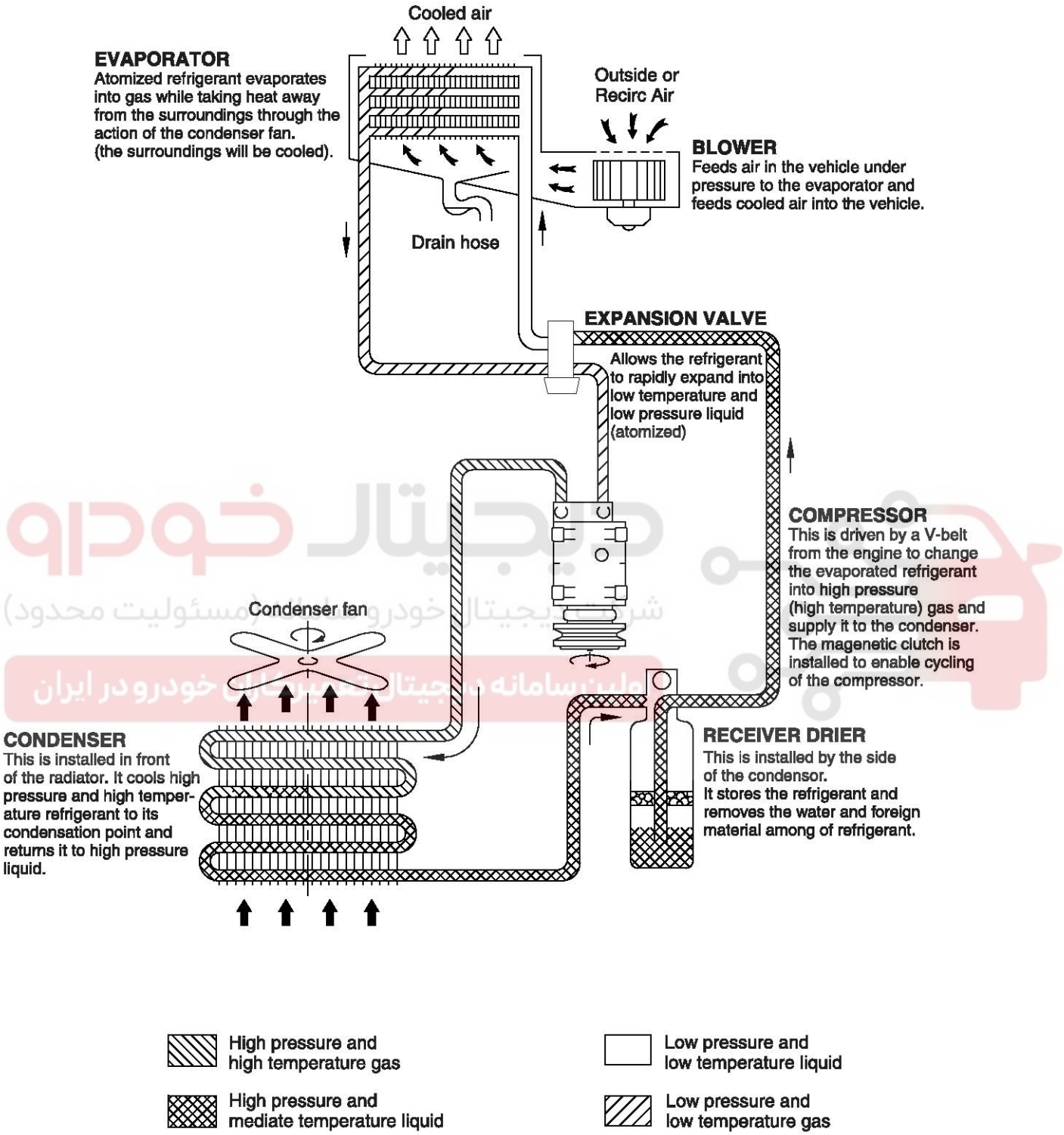
HANDLING TUBING AND FITTINGS

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



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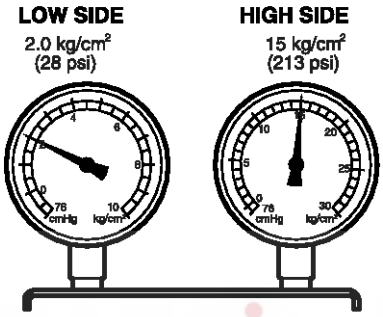
PERFORMANCE TEST DIAGNOSIS USING MANIFOLD GAUGE

STANDARD VALUE

If cooling cycle is operating normally, the manifold gauge reading will be approx. 21-28psi (1.5-2.0kg/cm²) for the low pressure side and approx. 206-213psi (14.5-15kg/cm²) for the high pressure side. Inlet temperature should be 30-35℃(80-95˚F), with the engine at 2,000 rpm, maximum cooling selected, and the blower on highest level.



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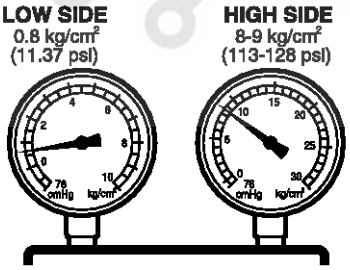
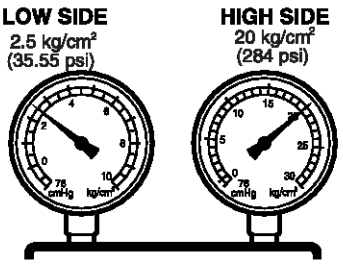
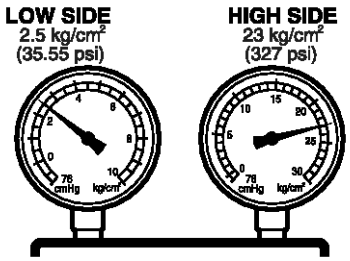
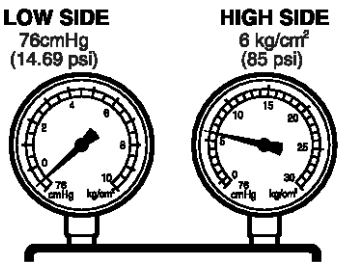
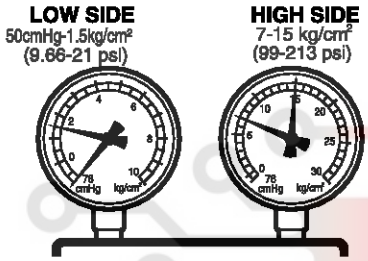
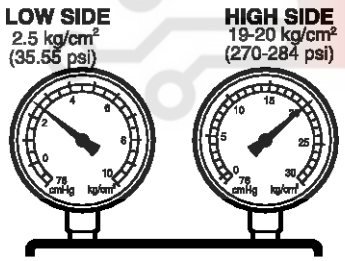
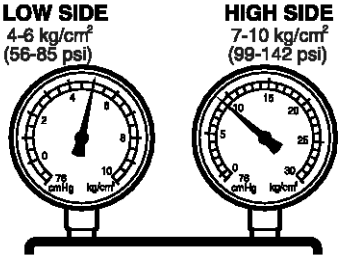
DIAGNOSIS

SYMPTOMS	PROBABLE CAUSES	REMEDY	MANIFOLD GAUGE READ INGS
1. Low pressure and high pressure are low. 2. Cooler outlet air is a little cooler.	• Gas leak.	• Check and repair. • Add refrigerant.	
1. Low pressure and high pressure air high	• Faulty cooling or condenser freezing. • Belt slip.	• Maintain the proper level of refrigerant. Clean the condenser. • Adjust the belt.	

SYMPTOMS	PROBABLE CAUSES	REMEDY	MANIFOLD GAUGE READ INGS
1. Low pressure and high pressure are high. 2. Low pressure pipe is not cold.	• Air in the system.	• Replace the receiver drier. • Check for oil contamination.	
1. Low pressure side indicates negative pressure and high pressure side indicates low pressure. 2. Frost or dew on pipes connected with receiver or expansion valve.	• Dust or moisture frozen at expansion valve. • Gas leak.	• Replace the expansion valve and receiver drier.	
1. Low pressure side pressure sometimes goes to negative pressure or normal.	• Intake moisture is frozen at expansion valve hole.	• Repair receiver drier and bleed.	
1. Low pressure and high pressure are high. 2. Much frost or dew on the low pressure side piping.	• Expansion valve failure. • Flow control faulty.	• Repair expansion valve. • Check oil contamination.	
1. Low pressure side pressure is high and high pressure side pressure is low .	• Leak inside compressor.	• Replace compressor.	

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

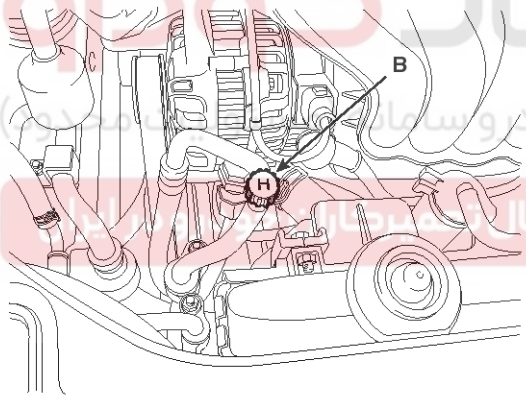
- **Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.**
- **Be careful when connecting service equipment.**
- **Do not breathe refrigerant or vapor.**

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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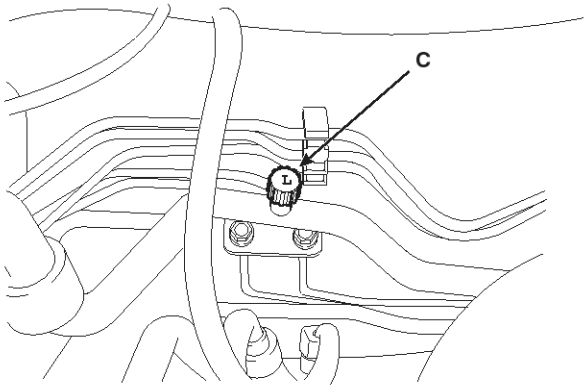

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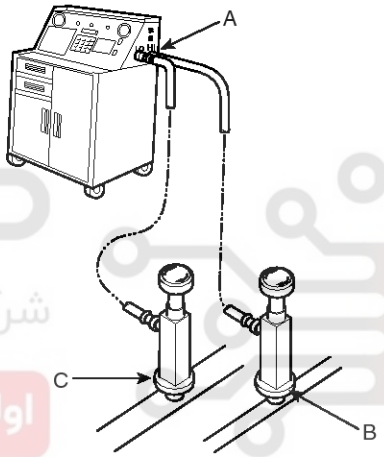

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2. Measure the amount of refrigerant oil removed from the A/C system after the recovery process is completed. Be sure to install the same amount of new refrigerant oil back into the A/C system before charging.

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.**

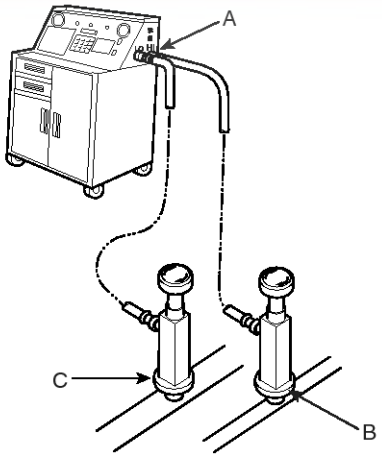
If accidental system discharge occurs, ventilate work area before resuming service.

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.



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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 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

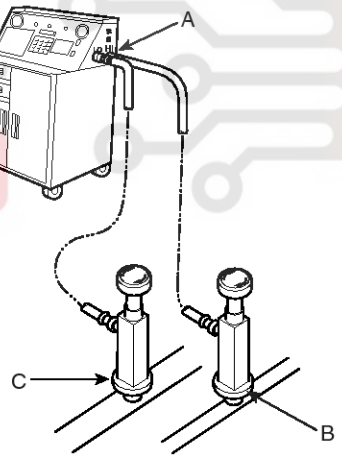
- **Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.**
- **Be careful when connecting service equipment.**
- **Do not breathe refrigerant or vapor.**

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 15.8 ± 0.88 oz. (450 ± 25g) of R-134a refrigerant. Do not overcharge the system the compressor will be damaged.

REFRIGERANT LEAK TEST

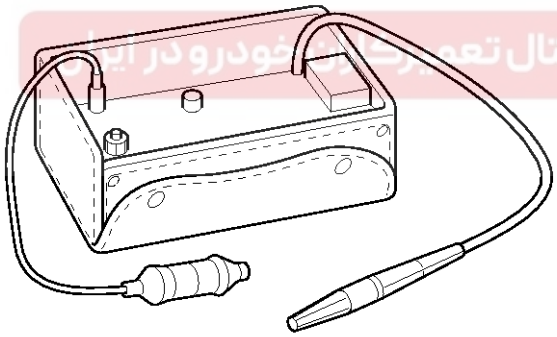
Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

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.
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.
4. Charge the system and recheck for gas leaks. If no leaks are found, evacuate and charge the system again.



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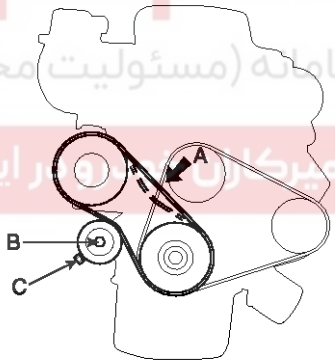
Drive belt

DRIVE BELT

INSPECTION (GASOLINE)

1. The compressor should be operated once or twice a month even in seasons air conditioning is not required, and compressor belt tension shall be adjusted from time to time.
2. Apply a force of 98N(10kgf, 22lbf), and measure the deflection at the mid point(A) between the air condition compressor and crankshaft pulley.

Item	Capacity(when 10kg (22 lb) load applied)	Tension
New belt	5 ~ 5.5 mm (0.197 ~ 0.217 in.)	75 ± 10 kg (165 ± 22 lb)
Used belt	6 ~ 7 mm (0.0236 ~ 0.276 in.)	36 ± 5 kg (79 ± 11 lb)
Check after operation	8 mm (0.315 in.)	25 ~ 50 kg (55 ~ 110 lb)



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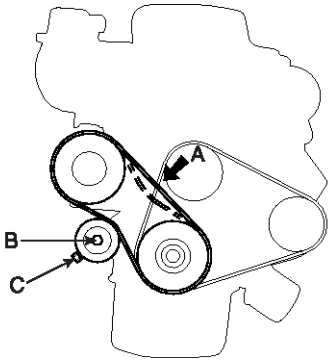
NOTICE

These items when adjusting belt tension :

- *If there are cracks or any damage evident on the belt, replace it with a new one.*
- *"Used belt" means a belt which has been used for five minutes or more.*
- *"New belt" means a belt which has been used for less than five minutes.*

ADJUSTMENT (GASOLINE)

1. Loosen the tension mounting bolt(B).
2. Turn the adjusting bolt(C) to obtain the proper belt tension, then retighten the mounting bolt(B).
3. Recheck the deflection of the A/C compressor belt.



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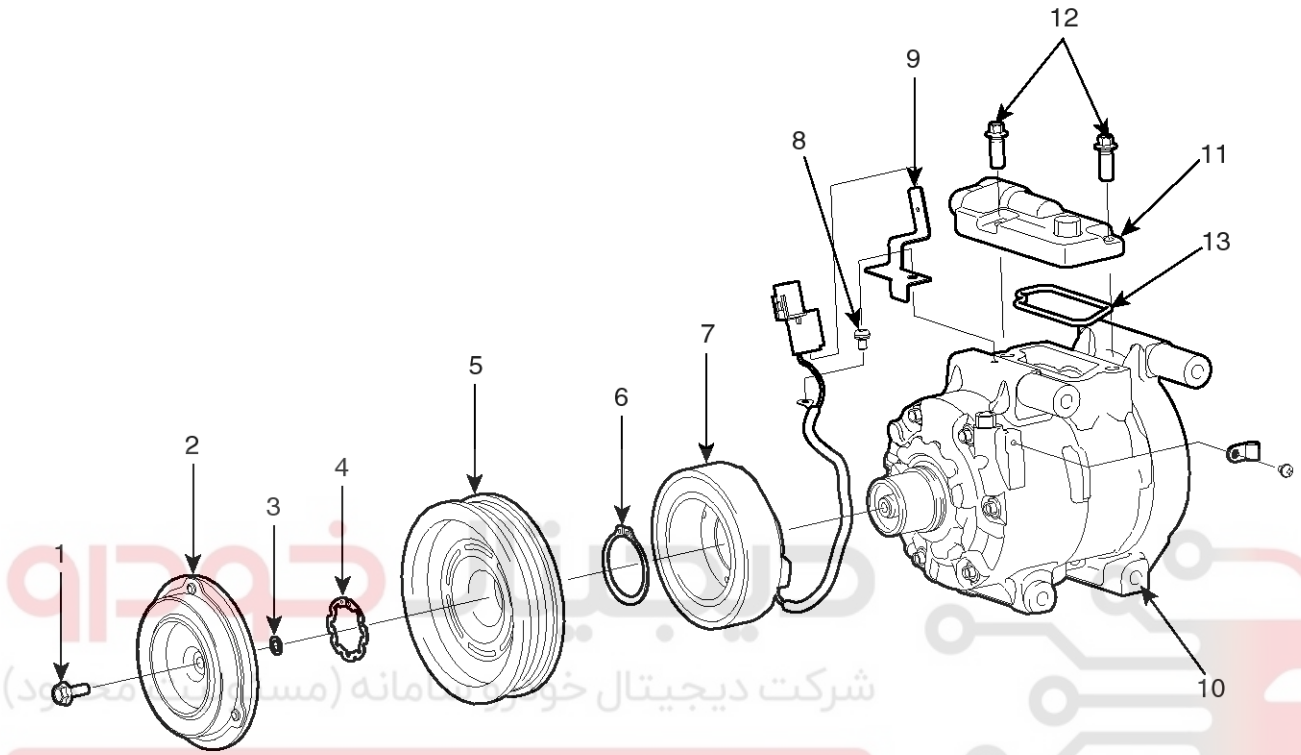
NOTICE

- *Do not adjust the drive belt of Diesel engine.*
- *Refer to the EM group for adjustment of Diesel engine.*

Compressor

COMPONENTS



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
11. Manifold
12. Bolt wrench
13. Gasket

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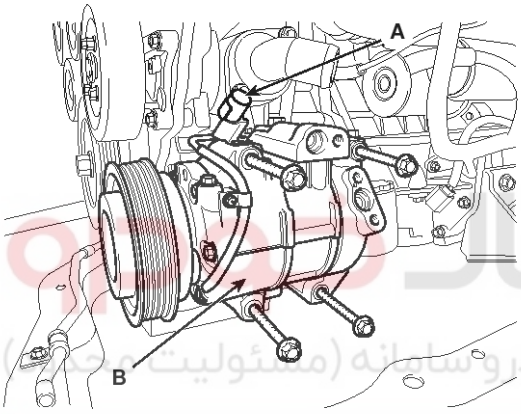
REMOVAL

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 (Refer to HA-8).
4. Loosen the drive belt (Refer to HA-14).
5. Remove the bolts, then disconnect the suction line and discharge line from the compressor. Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.
6. Disconnect the compressor clutch connector (A), and then remove 4 mounting bolts and the compressor.



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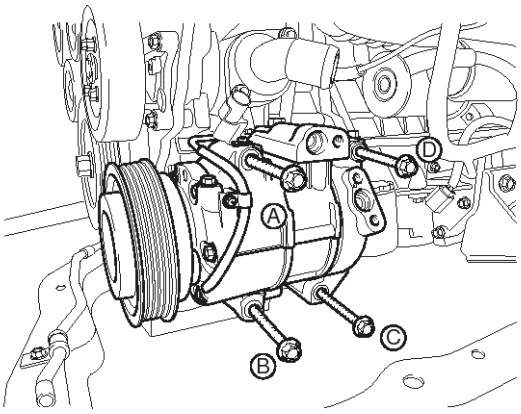
INSTALLATION

1. Make sure of the length of compressor mounting bolts, and then tighten it A→B→C→D order.



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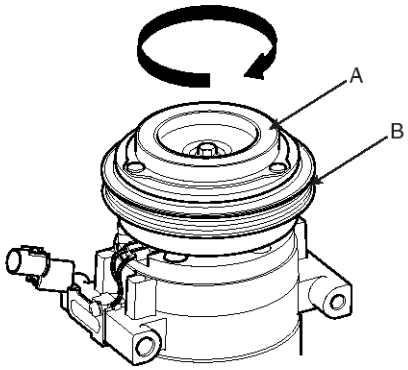
Tightening torque : 2.0 ~ 2.5 kgf.m (19.6 ~ 24.5 N.m, 14.5 ~ 18.1 lbf.ft)

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 (Refer to HA-14)
   - Charge the system and test its performance. (Refer to HA-9)

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.



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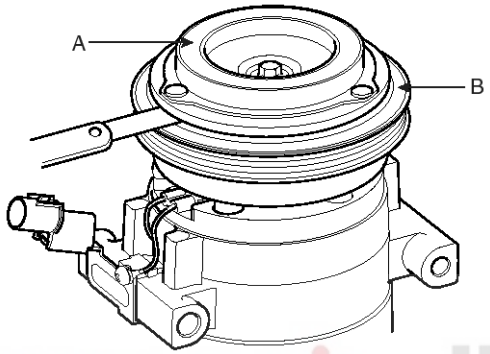
3. Measure the clearance between the pulley (B) and the disc & hub assembly (A) all the way around. If the

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 ± 0.1mm (0.018 ± 0.004 in.)

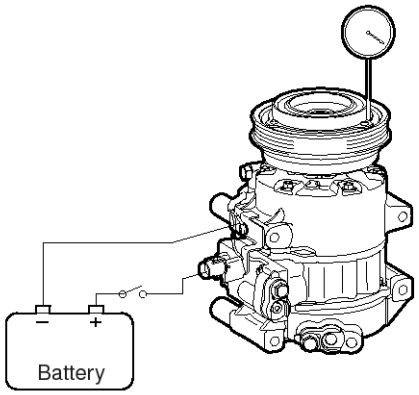
NOTICE

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

Compressor oil

INSPECTION

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:
120±10cc (4.05±0.34 fl.oz)

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 :

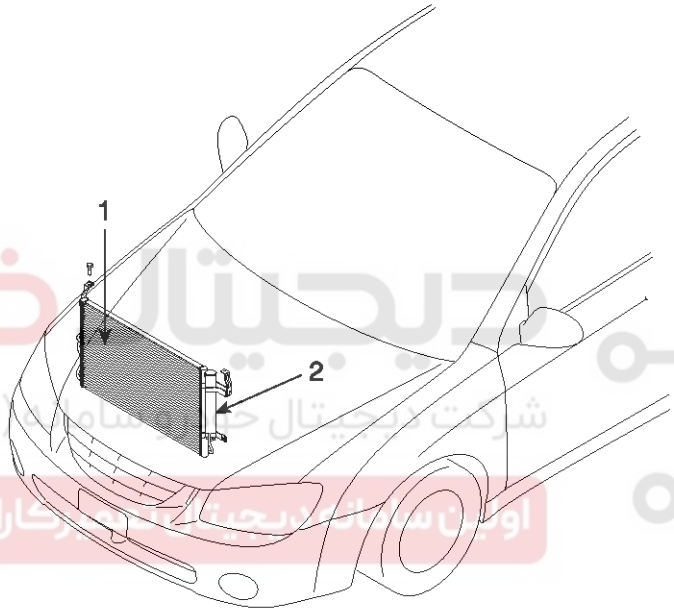
The specified volume - volume of removed compressor = volume to drain from the new compressor.

NOTICE

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

Condenser

COMPONENT



1. Condenser
2. Receiver/drier

LQGE108A

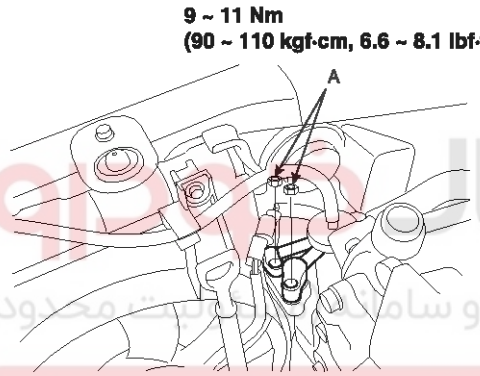
INSPECTION

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 screwdriver or pliers.
2. Check the condenser connections for leakage, and repair or replace it, if required.

REPLACEMENT

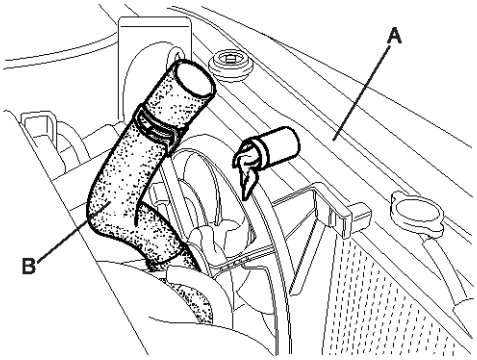
1. Recover the refrigerant with a recovery/recycling/charging station.
2. Drain the coolant. about 1ℓ from the radiator.
3. Remove the nuts(A), then disconnect the discharge line and condenser line from the condenser.

   Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.



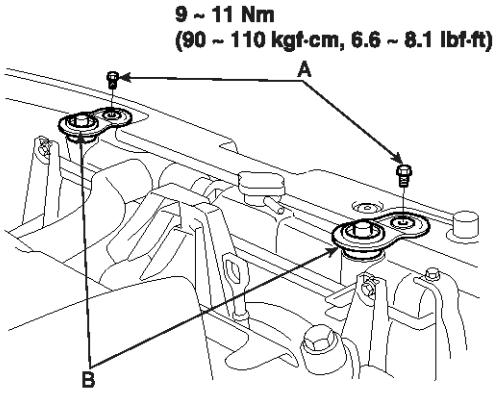
LQGE108B

4. Remove the condenser fan (Refer to the condenser fan).
5. Disconnect the upper hose(B) from the radiator(A).



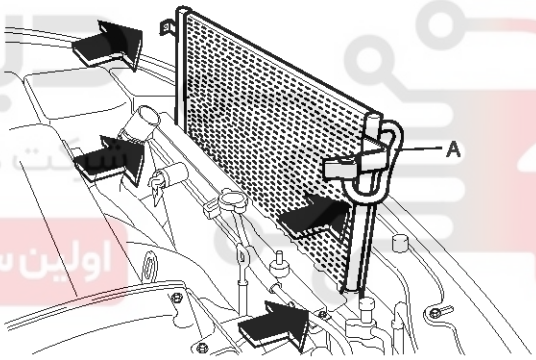
AQGE108C

6. Remove the radiator fan.
7. Remove the bolts(A), then remove the upper mount brackets(B) from the radiator.



EQKE121A

8. Remove the bolts(A), then remove the condenser (B) by lifting it up. Be careful not to damage the radiator and condenser fins when removing the condenser.

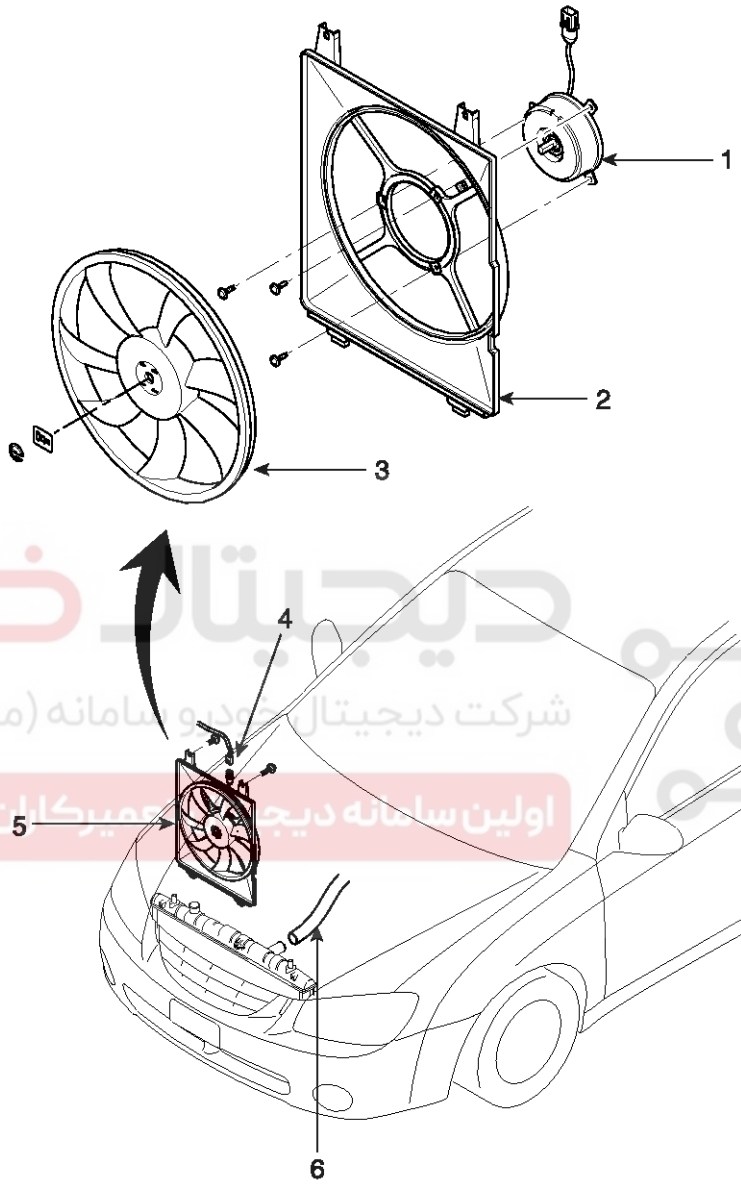


AQGE108E

9. 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.

Condenser fan & relay

COMPONENTS



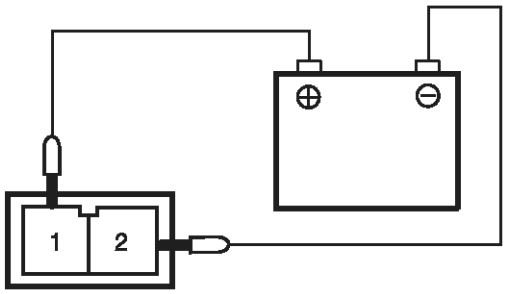
1. Fan motor
2. Condenser fan shroud
3. Condenser fan
4. Condenser fan connector
5. Condenser fan
6. Upper hose

LQGE109A

INSPECTION

CONDENSER FAN

1. Check the condenser fan for proper operation.
2. Check the harness connector.
3. Check the condenser fan motor using battery voltage as shown below.

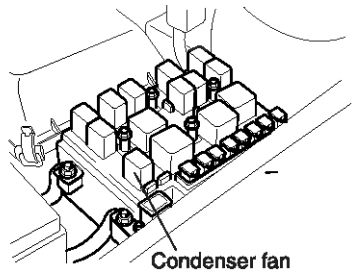


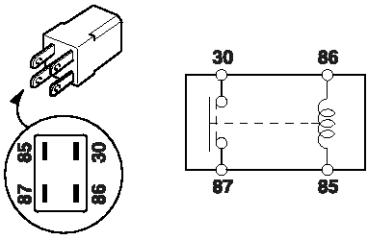
AQCD022A

CONDENSER FAN RELAY (Type A)

Check for continuity between the terminals.

1. There should be continuity between the No.87 and No.30 terminals when power and ground are connected to the No.86 and No.85 terminals.
2. There should be no continuity between the No.87 and No.30 terminals when power is disconnected.





LQGE109B

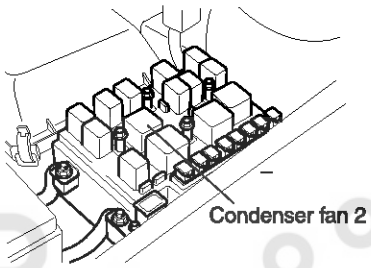
Terminal / Position	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

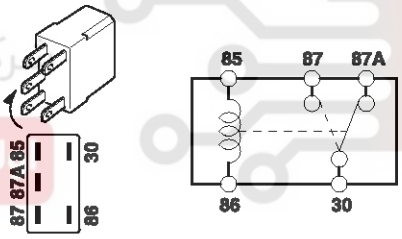
LTGE221B

CONDENSER FAN 2 RELAY (Type B)

Check for continuity between the terminals.

1. There should be continuity between the No.87 and No.30 terminals when power and ground are connected to the No.86 and No.85 terminals.
2. There should be continuity between the No.87A and No.30 terminals when power is disconnected.





LQGE109C

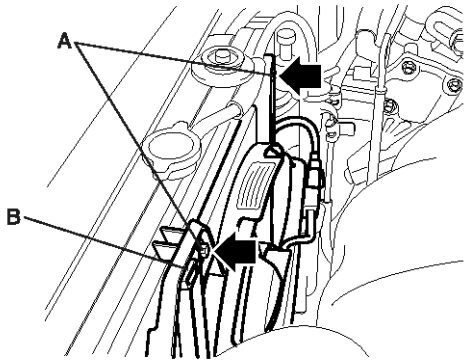
Terminal / Position	85	86	30	87	87A
Disconnected			○		○
Connected	⊖	⊕	○	○	

LTGE221D

REPLACEMENT

CONDENSER FAN

1. Disconnect the negative(-) battery terminal.
2. Disconnect the connector of condenser fan.
3. Remove the bolts(A), then remove the condenser fan(B) by lifting it up.



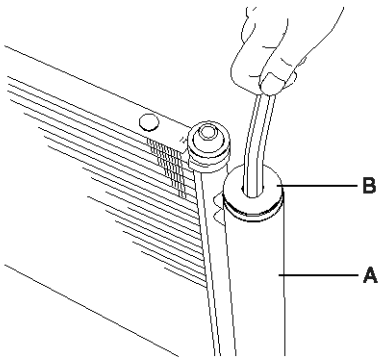
AQGE109E

4. Install in the reverse order of removal.

Receiver-Drier

REPLACEMENT

1. Remove the condenser, and then remove the drying agent after loosening the cap(B) at the lower of receiver/drier(A).



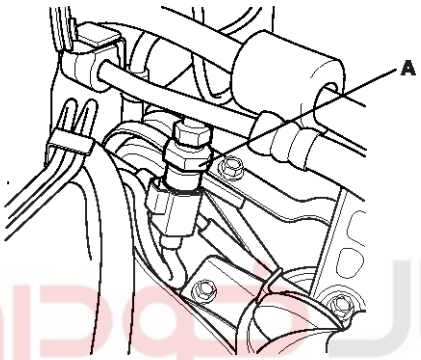
AQHE100A

2. Install in the reverse order of removal, and note these items :
   - If you're installing a new receiver/drier, 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.

Triple pressure switch

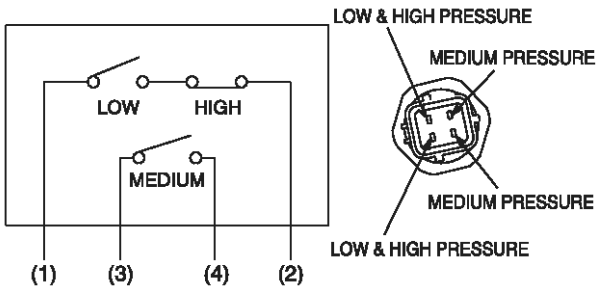
DESCRIPTION

The triple switch is a combination of a medium switch as well as conventional low pressure and high pressure switches. The low pressure switch will be turned off to stop compressor operation if refrigerant pressure is low. The high pressure switch will be turned off to stop compressor operation if refrigerant pressure is too high. The medium switch will be turned on at medium level pressure to cool the A/C system operating radiator fan and condenser fan at high speed.



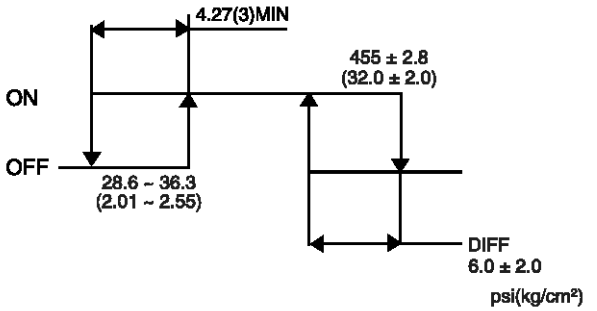
AQGE101A

Pressure	ON	OFF
High [psi (kg/cm²)]	370 ± 2.8 (26.0 ± 2.0)	455 ± 2.8 (32.0 ± 2.0)
Low [psi (kg/cm²)]	28.6 ~ 36.3 (2.01 ~ 2.55)	28.4 ± 2.8 (2.0 ± 0.2)
Medium [psi (kg/cm²)]	220 ± 11.4 (15.5 ± 0.8)	164 ± 17.1 (11.5 ± 1.2)



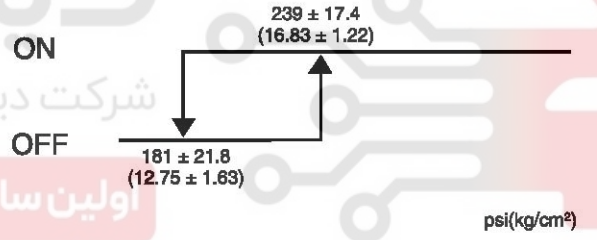
LQGE101E

LOW & HIGH PRESSURE



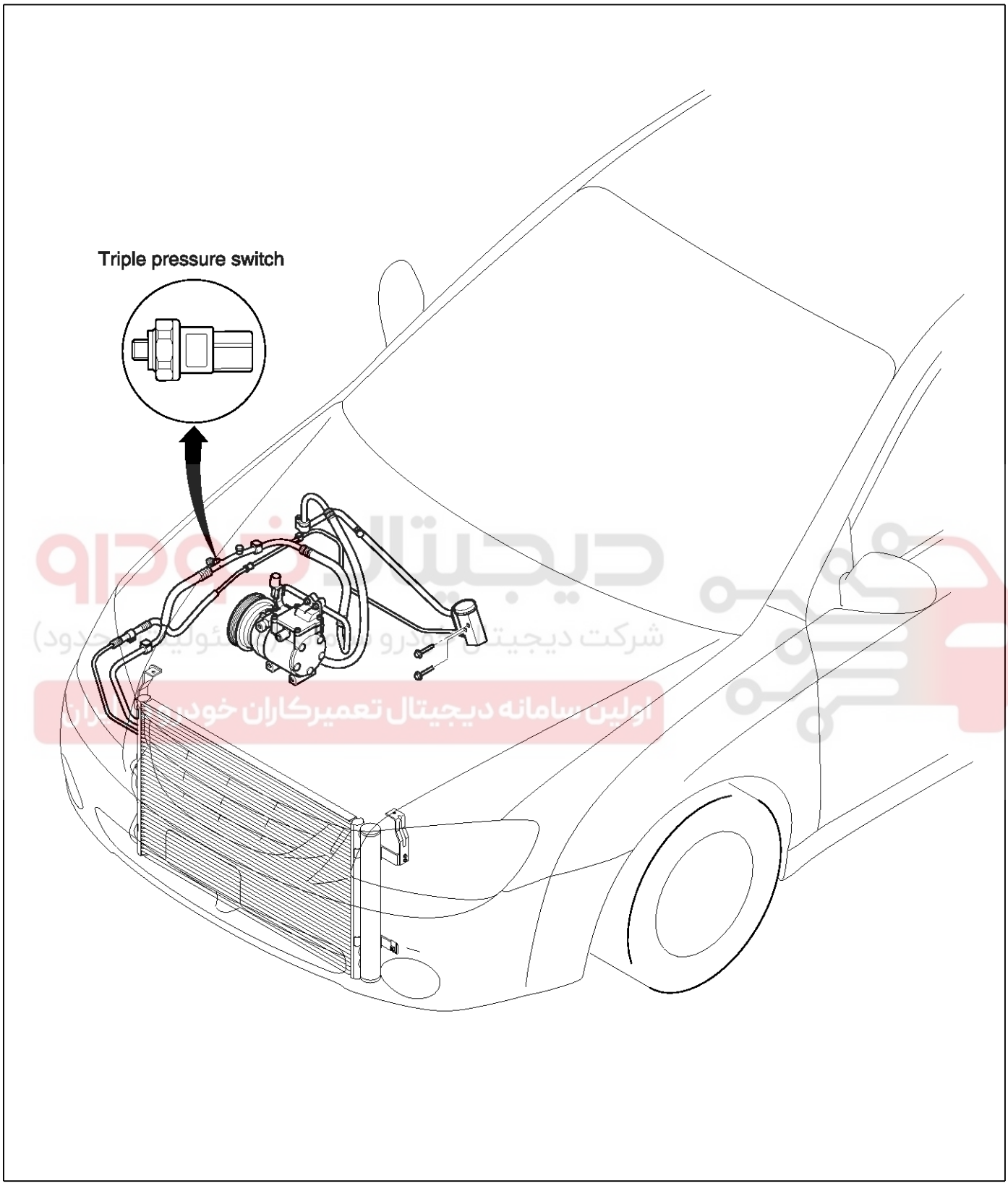
LQGE101C

MEDIUM PRESSURE



LQGE101D

COMPONENT



LQGE101B

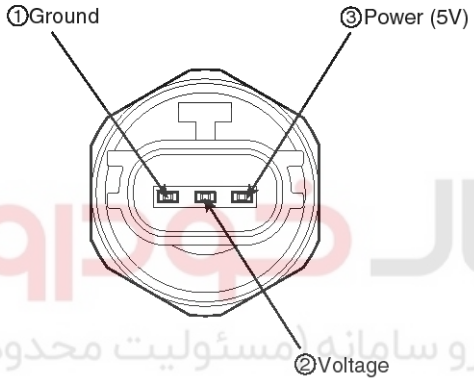
A/C pressure transducer

DESCRIPTION

A/C pressure transducer convert the pressure value of high pressure line into voltage value after measure it. By converting 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 measuring voltage output between NO.1 and NO.2 terminals.



EQRE116B

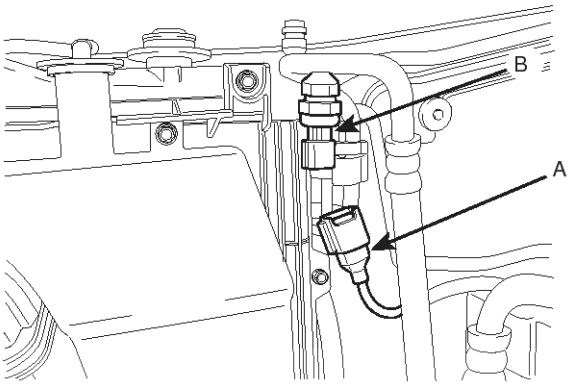
2. Inspect the voltage value whether it is sufficient to be regular value or not.

Voltage = 0.125 * Pressure + 0.5 [kgf/㎠]
Voltage = 0.00878835 * 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 A/C pressure transducer connector (A) and then remove the A/C pressure transducer (B).



SLDHA6005D

WARNING

Take care that liquid & suction pipe are not bent.

4. Installation is the reverse order of removal.

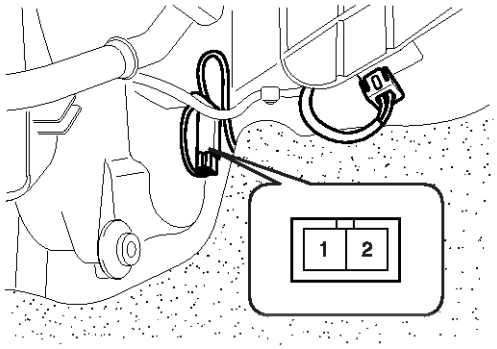
TORQUE: 10~12N.m (1.0~1.2kgf.m, 7.4~8.8lbf.ft)

Thermistor

DESCRIPTION

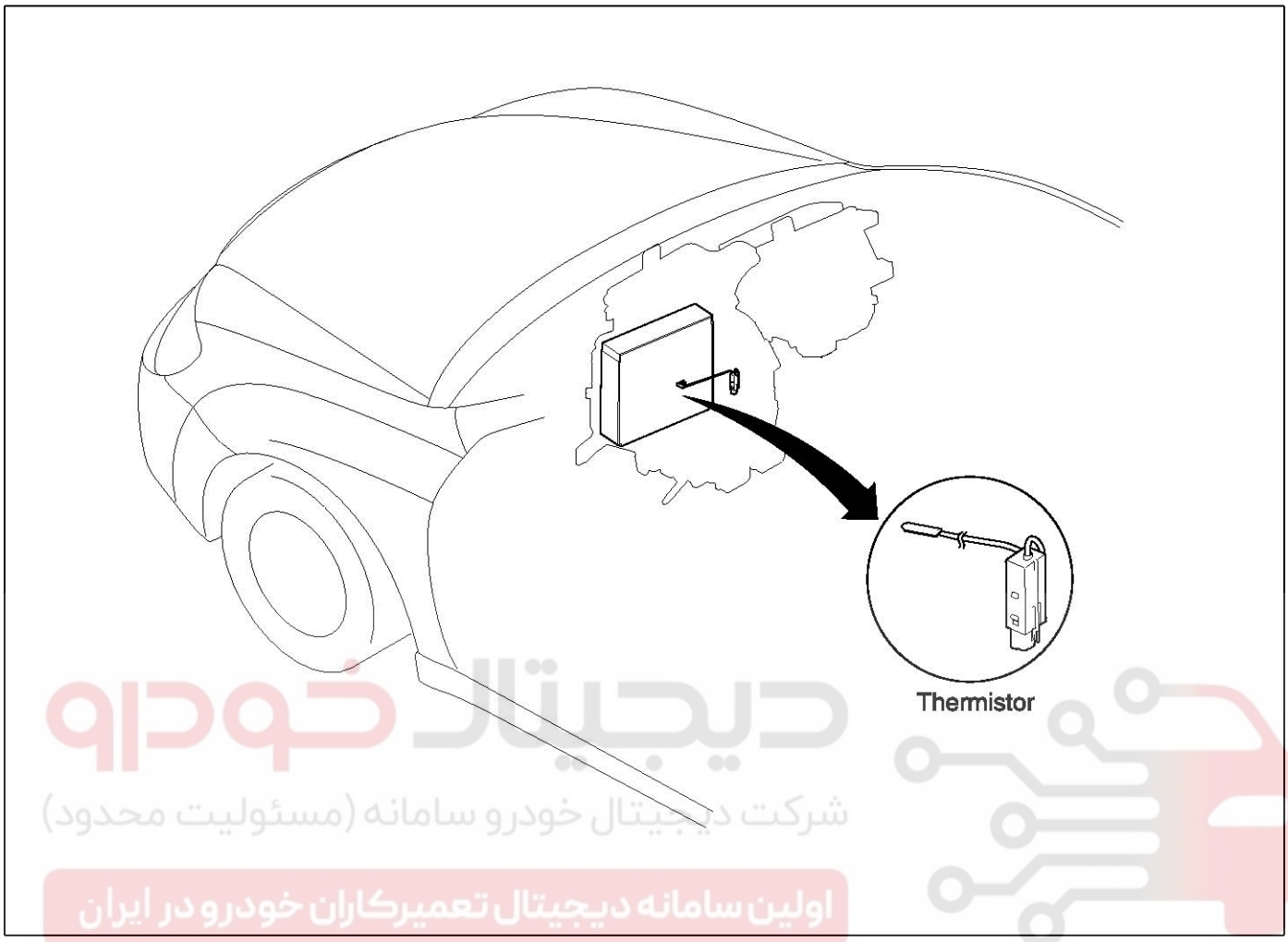
The thermistor will detect the evaporator core temperature and interrupt compressor relay power in order to prevent evaporator freezing by excessive cooling.

The thermistor is an NTC device.



AQGE116B

COMPONENT

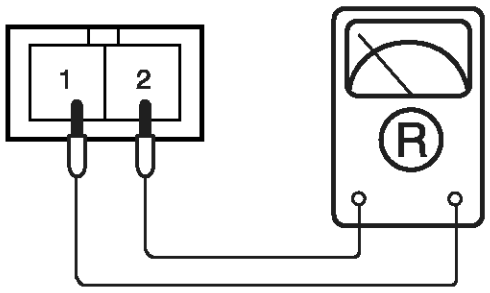


LQGE116A

INSPECTION

1. Start the engine.
2. Turn on the air conditioner.
3. Using the multi-tester, check the resistance between terminals 1 and 2 in the thermistor.

Thermistor signal	Evaporator core temperature	Resistance
ON	7.0 ± 0.5℃ (44.6 ± 32.9˚F)	8.36 kΩ
OFF	5.0 ± 0.5℃ (41 ± 32.9˚F)	9.12 kΩ



AQGE116C

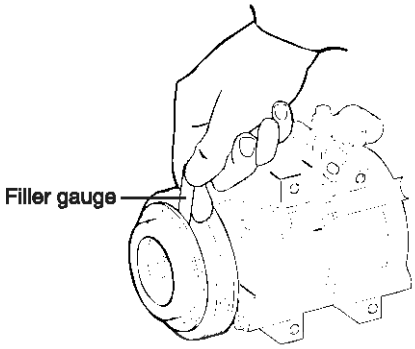
Magnetic Clutch

MAGNETIC CLUTCH

CHECKING THE CLUTCH AIR GAP

1. Check the air gap between the clutch hub and pulley contact surface using a filler gauge.

Clutch air gap : 0.35 - 0.65mm (0.0138 - 0.0256 in)

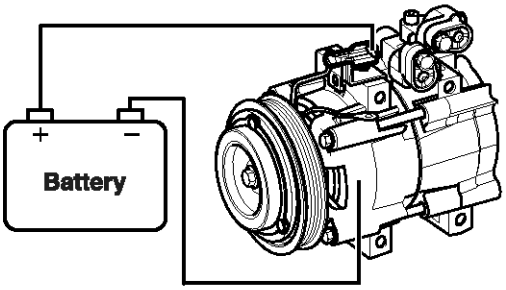


LQAC017A

2. Check the gap around the pulley at 3 points.
3. If the clutch air gap is outside the normal range, correct it using a shim of proper size.

MAGNETIC CLUTCH OPERATION

Connect the compressor terminal to battery(+) and the battery(-) terminal to the compressor body. Verify magnetic clutch operation by a clicking noise.

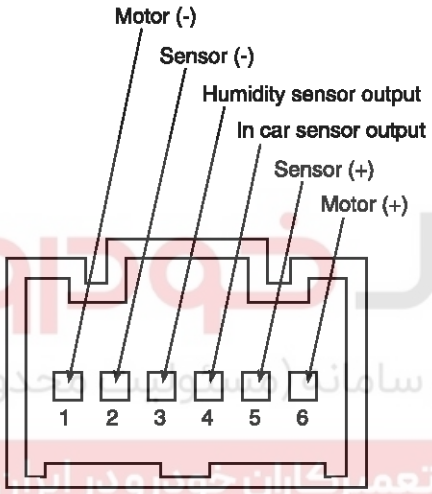


LQAC018A

In-car sensor

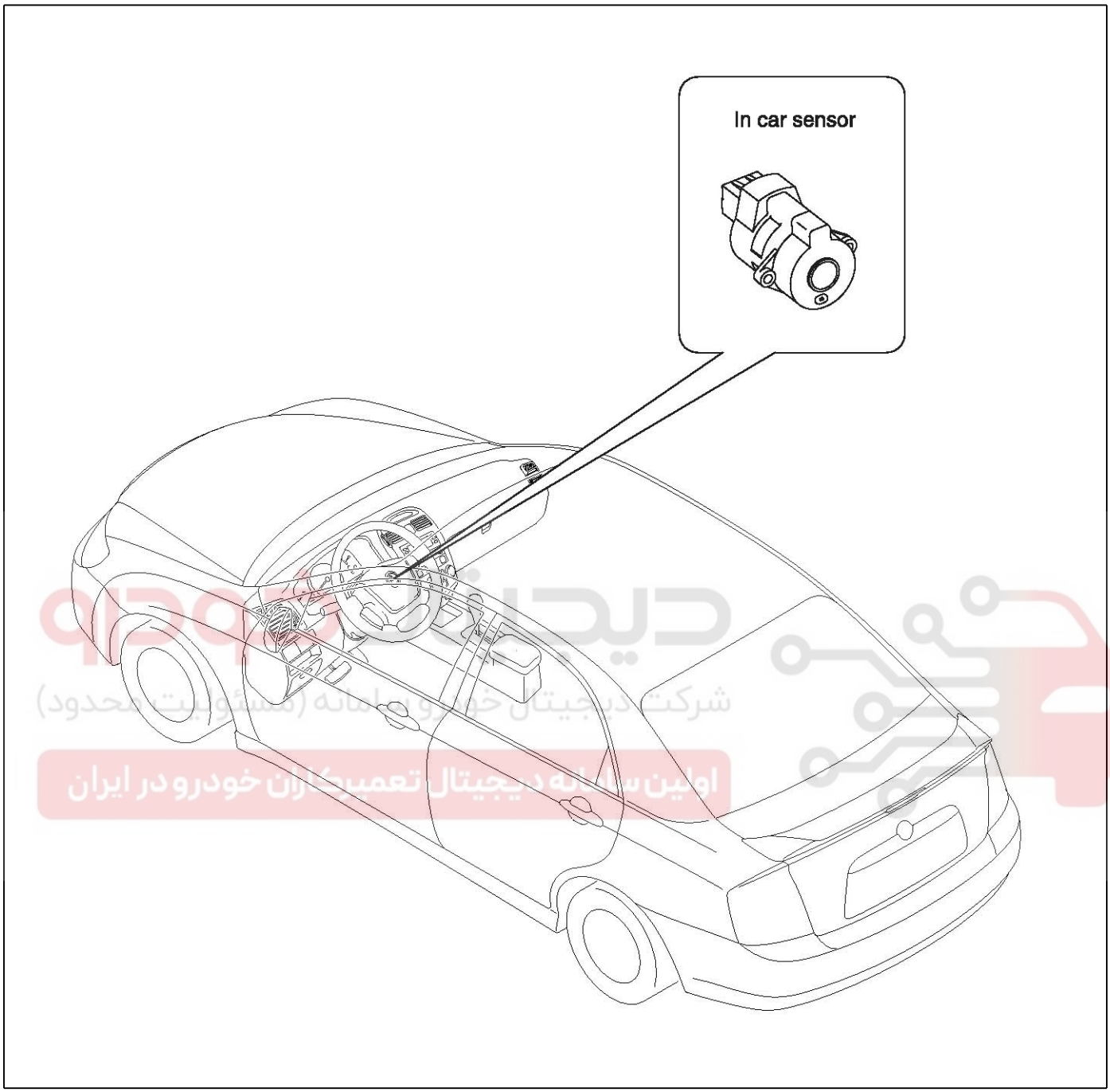
DESCRIPTION

1. In-car air temperature sensor is located at the lower crush pad.
2. The sensor contains a thermistor which measures the temperature of the inside. It perceives the inside temperature, changes the resistance value, and enters the corresponding voltage into the automatic temperature control module.
3. It will used for discharge temperature control, sensor failsafe, temperature door control, blower motor level control, and A/C auto control.



LQGE201C

COMPONENT



LQGE201A

INSPECTION

1. Check the resistance of in car sensor between terminals 2 and 4 whether it is changed by changing temperature of the in car sensor.

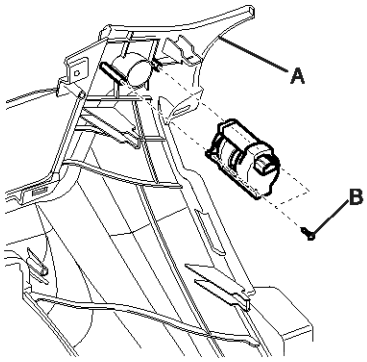
Temperature [˚C(˚F)]	Resistance between terminals 2 and 4 (kΩ)
0 (32)	97.83 ± 2.61%
15 (59)	47.12 ± 1.45%
25 (77)	30.00 ± 1.20%
35 (95)	19.60 ± 1.44%
50 (122)	10.82 ± 2.26%

NOTICE

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 lower crush panel(A) (Refer to the Body group).
3. Disconnect the connector of in-car sensor.
4. Loosen the mounting screws(B) and then remove the in-car sensor.



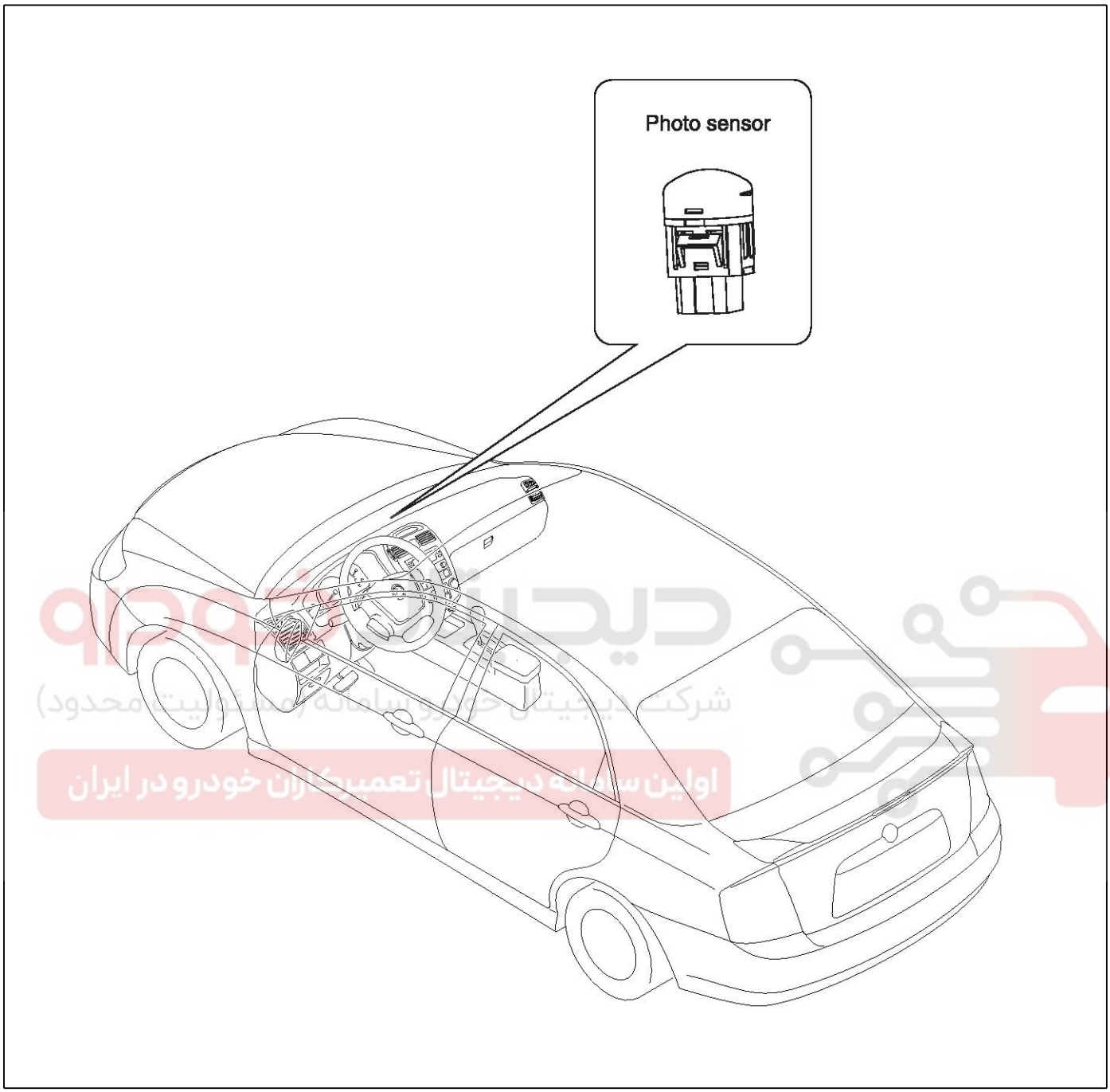
AQGE201D

Photo sensor

DESCRIPTION

1. The photo sensor is located at the center of main panel.
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.

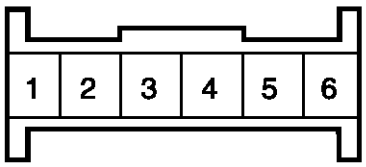
COMPONENT



LQGE202A

INSPECTION

1. Emit intensive light toward in-car sensor using a lamp, and check the output current change.

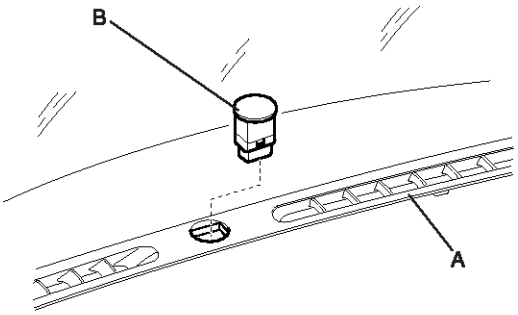


1. Sensor ground
2. Sensor power(5V)
3. Sensor signal
4. Blank
5. Photo sensor (+)
6. Photo sensor (-)

LQGE202C

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Remove the defroster center cover(A) from the crash panel.
3. Remove the photo sensor(B).
4. Install in the reverse order of removal.



AQGE202D

Ambient sensor

DESCRIPTION

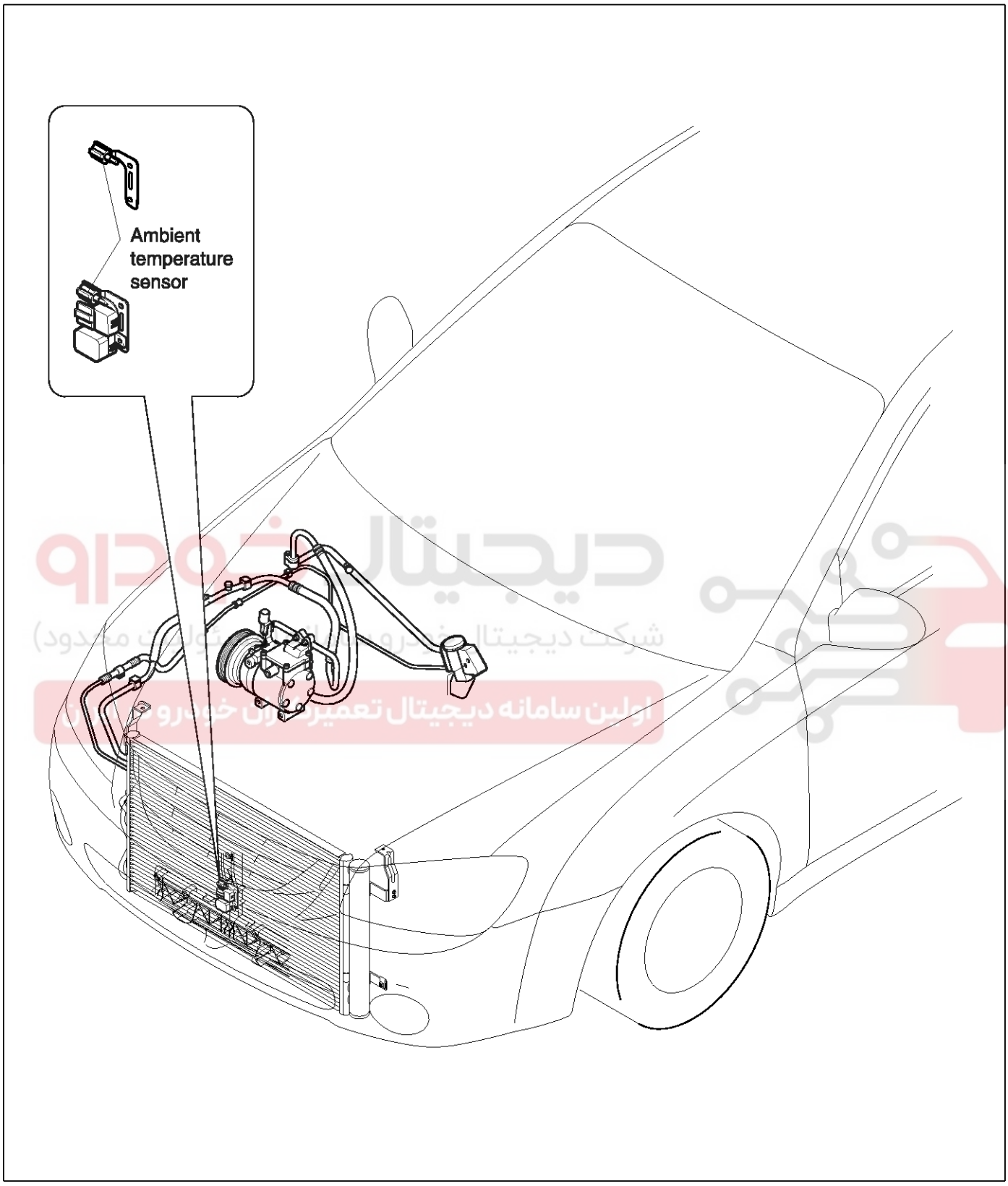
1. The ambient temperature sensor is located at the front of the condenser and detects ambient air temperature. It is a negative type thermistor; resistance will increase with lower temperature, and decrease with higher temperatures.
2. The sensor output will be used for discharge temperature control,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

NOTICE

If the ambient temperature is below 3.0℃(37.4°F), the A/C compressor will be stopped.

The compressor will be operated by manual operating.

COMPONENT

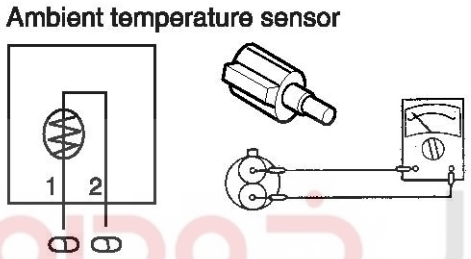


LQGE204A

INSPECTION

1. Check the resistance of ambient temperature sensor between terminals 1 and 2 whether it is changed by changing temperature of the ambient temperature sensor.

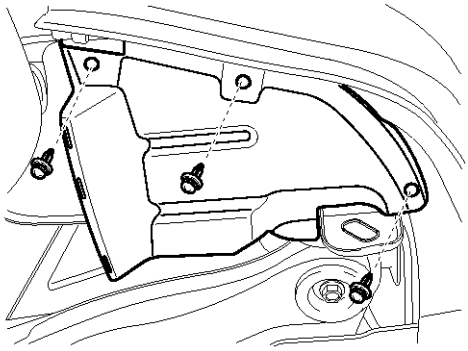
Temperature [˚C(˚F)]	1 - 2 (kΩ ± 3)
14 (-10)	163
30 (0)	97.5
50 (10)	59.6
68 (20)	37.5



LQCD035C

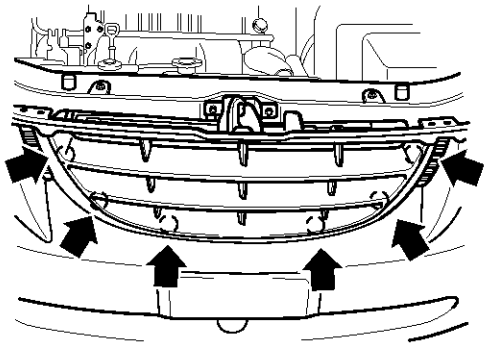
REPLACEMENT

1. Remove the upper tray after loosening the mounting screws.



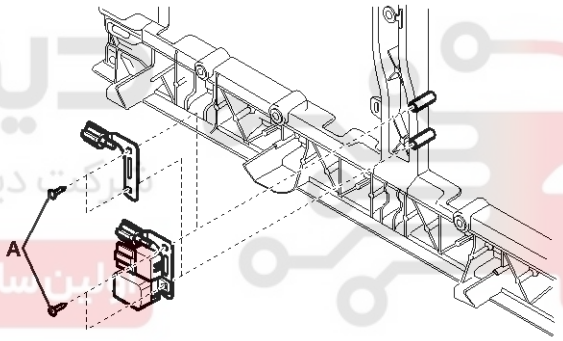
AQGE204C

2. Remove the radiator grill after loosening the mounting screws.



AQGE204D

3. Remove the ambient sensor(A) after loosening the mounting bolts.



AQGE204E

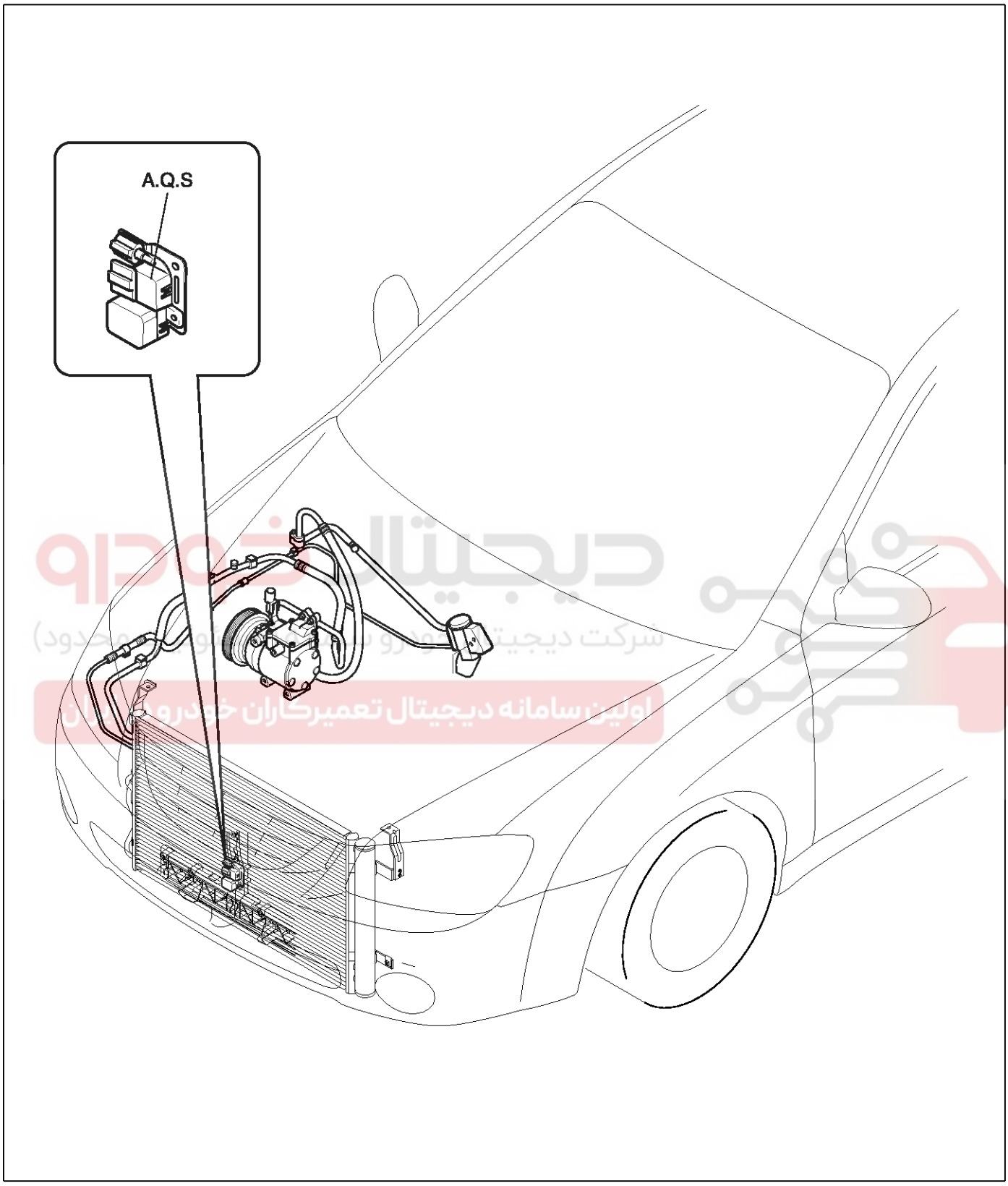
4. Install in the reverse order of removal.

Air Quality Sensor(AQS)

DESCRIPTION

1. A.Q.S sensor is located at center support in front of the engine radiator, and detects hazardous elements in ambient air providing output signal to control.
2. It will detect sulfurous acid gas, carbon dioxide, carbon monoxide, hydrocarbon and allergen.

COMPONENT



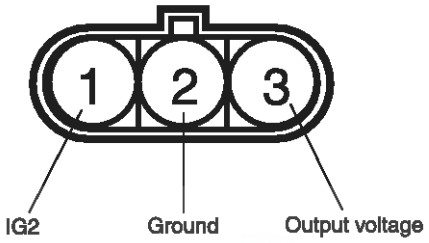
AQGE207A

INSPECTION

1. Check the output voltage of AQS between terminals 2 and 3.

SENSOR OUTPUT

Condition	Output signal	Fresh/recirculation
Normal condition	4 ~ 5V	Fresh
Hazardous gas detection	0 ~ 1V	Recirculation



LQCD036A

2. A.Q.S diagnosis and fail safe

   Detect the open of signal for 7 seconds without choosing the AQS switch when IG on.

   If 2.5V or more is detected for 3.5 seconds or more among 7 seconds, be judged the open of AQS signal.

   Operates as below fail safe function. When AQS is chosen.

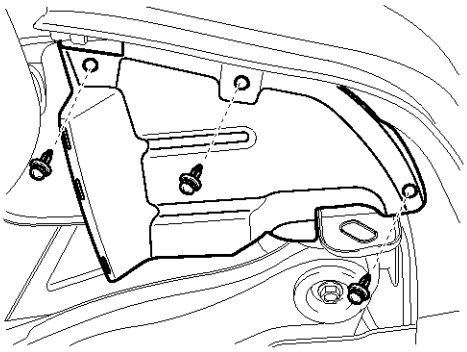
   Fail safe : Release the AQS (AQS cannot be selected), Fresh/recirculation maintains previous situation of AQS selection.

   NOTICE

   When IG is turned ON, AQS sensor heats for 34±5 seconds, it will output below 1.0 voltage during this time.

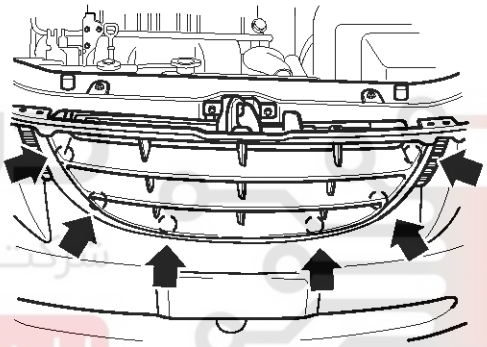
REPLACEMENT

1. Remove the upper tray after loosening the mounting screws.



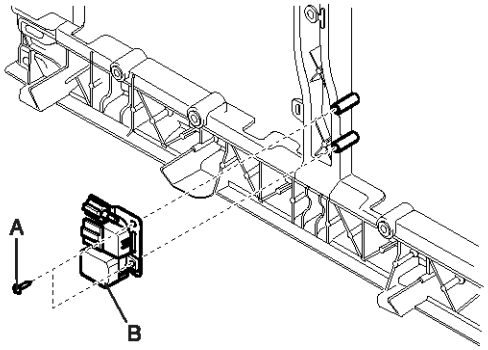
AQGE204C

2. Remove the radiator grill after loosening the mounting screws.



AQGE204D

3. Remove the AQS(B) after loosening the mounting bolts(A).



AQGE207B

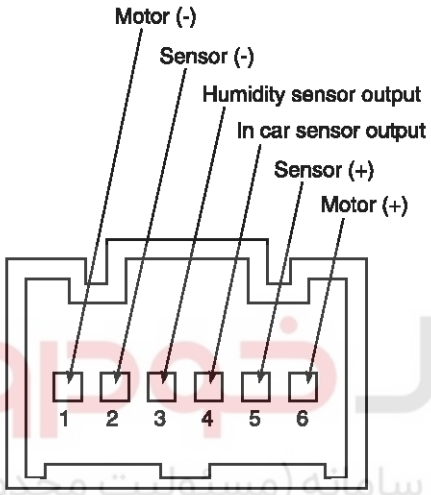
4. Install in the reverse order of removal.

Humidity Sensor

DESCRIPTION

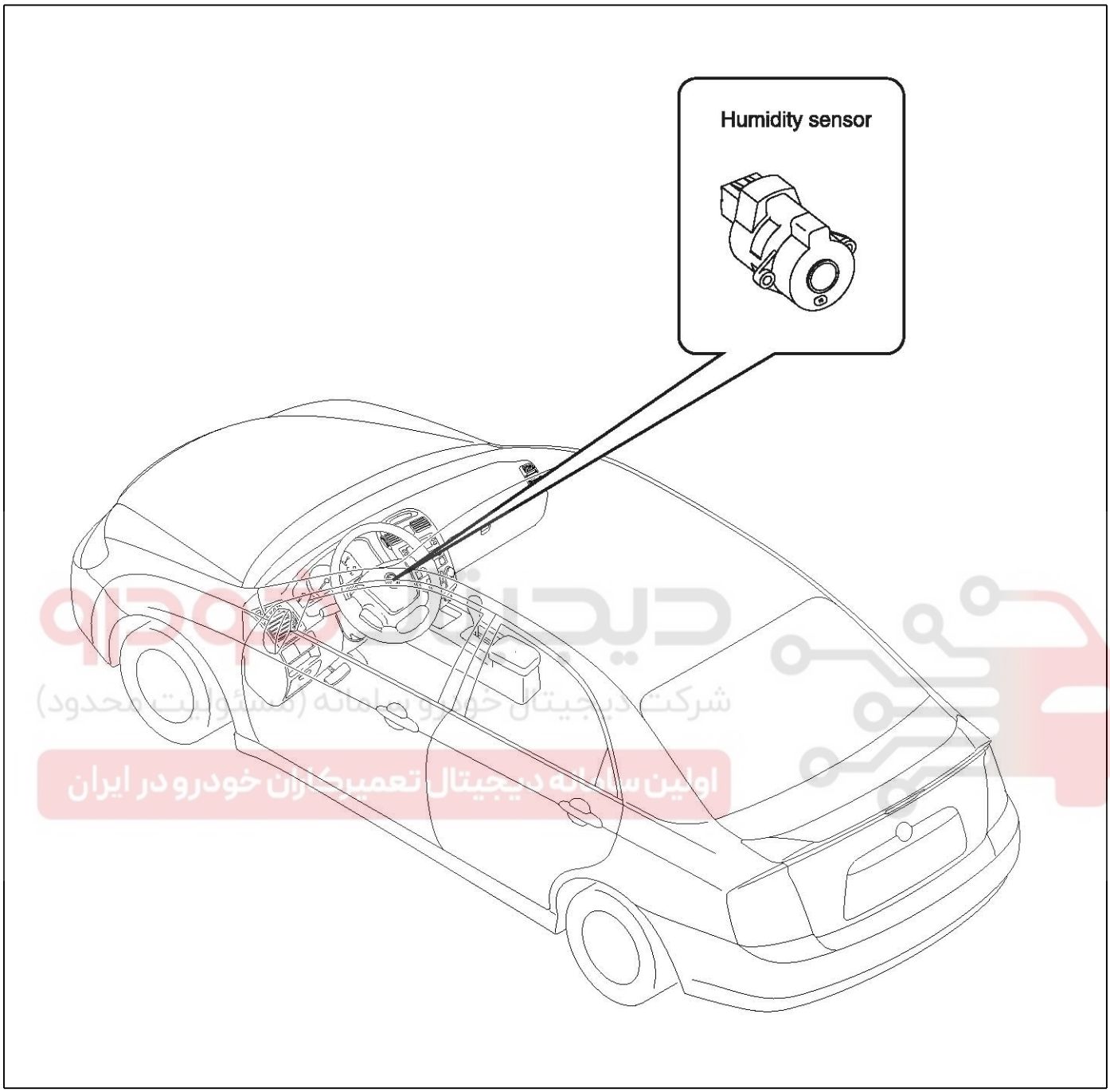
1. Humidity sensor is located at the lower crush pad and detected in-car humidity for in-car humidity control.
2. If ambient air temperature or in-car humidity is outside certain range, it will turn on A/C to control in-car humidity preventing in car fogging.

   Air conditioner operation depends on ambient temperature and humidity.



LQGE201C

COMPONENT



LQGE208A

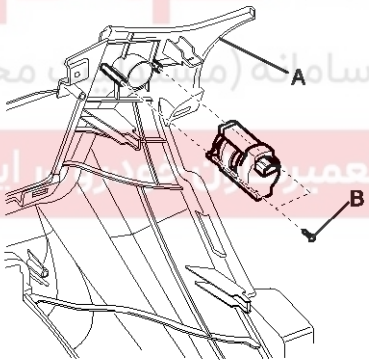
INSPECTION

Check the frequency of humidity sensor between terminals 2 and 3.

Humidity (%)	Frequency between terminals 2 and 3(Hz)
30	6982 ± 3%
45	6791 ± 3%
60	6601 ± 3%
75	6409 ± 3%
90	6218 ± 3%
100	6093 ± 3%

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Remove the lower crush panel(A) (Refer to the Body group).
3. Disconnect the connector of humidity sensor.
4. Loosen the mounting screws(B) and then remove the humidity sensor.



AQGE201D

5. Install in the reverse order of removal.

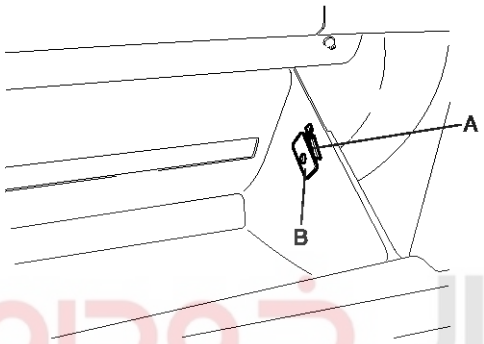
Evaporator Air Filter

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.

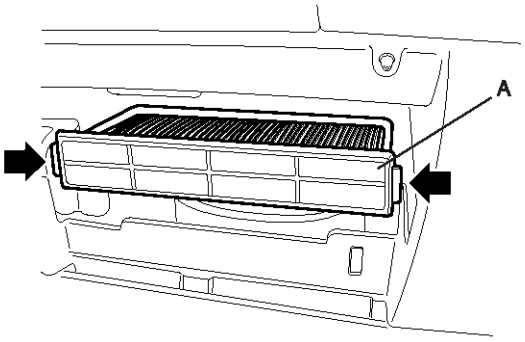
REPLACEMENT

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



AQGE052A

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



AQGE052B

⚠CAUTION

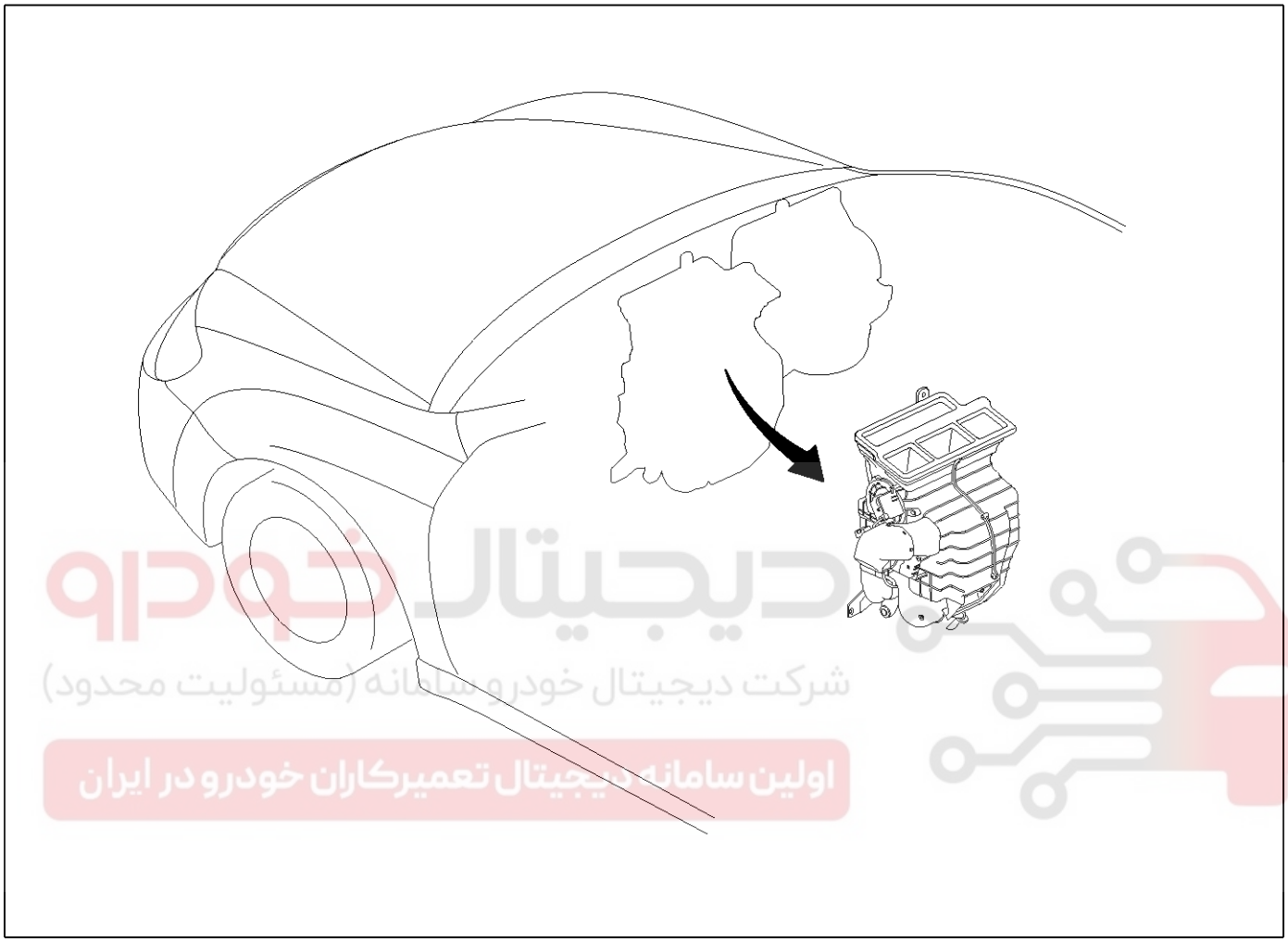
In case of driving in an air-polluted area or rugged terrain, check and replace the air filter as frequently as possible.

Replacement period : 15,000 km (9320 mile)

Heater

Heater Unit

COMPONENT



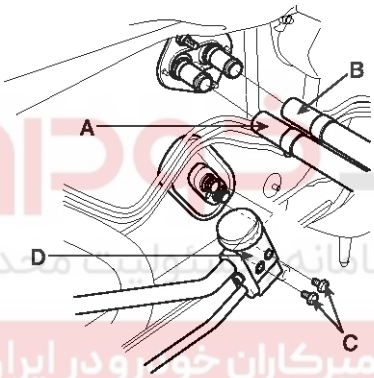
LQGE300A

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. Disconnect the inlet(A) and outlet(B) heater hoses from the heater unit.

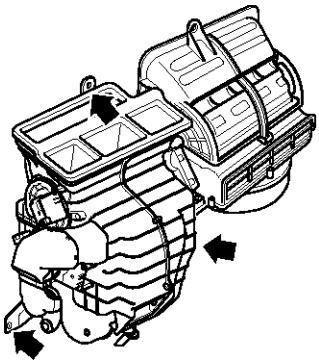
   Engine coolant will run out when the hoses are disconnected ; drain it into a clean drip pan. Be sure not to let coolantspill on electrical parts or painted surfaces. If any coolant spills, rinse it off immediately.
5. Remove the bolts(C) and the expansion valve(D) from the evaporator core.

   Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.



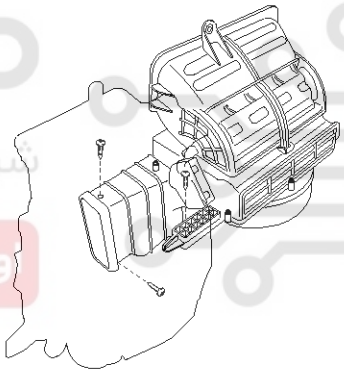
EQKE301A

6. Remove the crash pad (Refer to the Body group)
7. Disconnect the connectors from the temp. actuator, the mode actuator and the thermistor, then remove the mounting nuts.



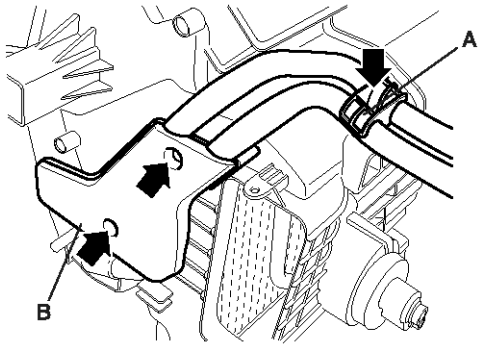
AQGE300B

8. Remove the heater & evaporator unit after loosening the mounting screws.



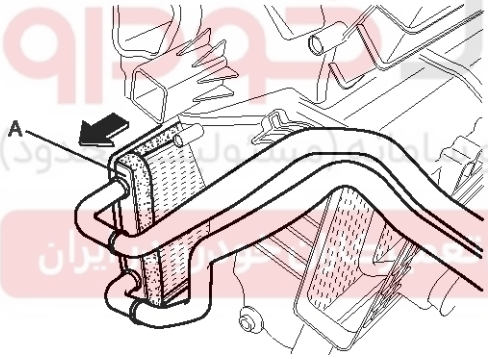
AQGE350C

9. Remove the self-tapping screws and the upper bracket(A), the side cover(B).



AQGE300C

10. Be careful not to bend the inlet and outlet pipes during heater core(A) removal, and pull out the heater core.



AQGE300D

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

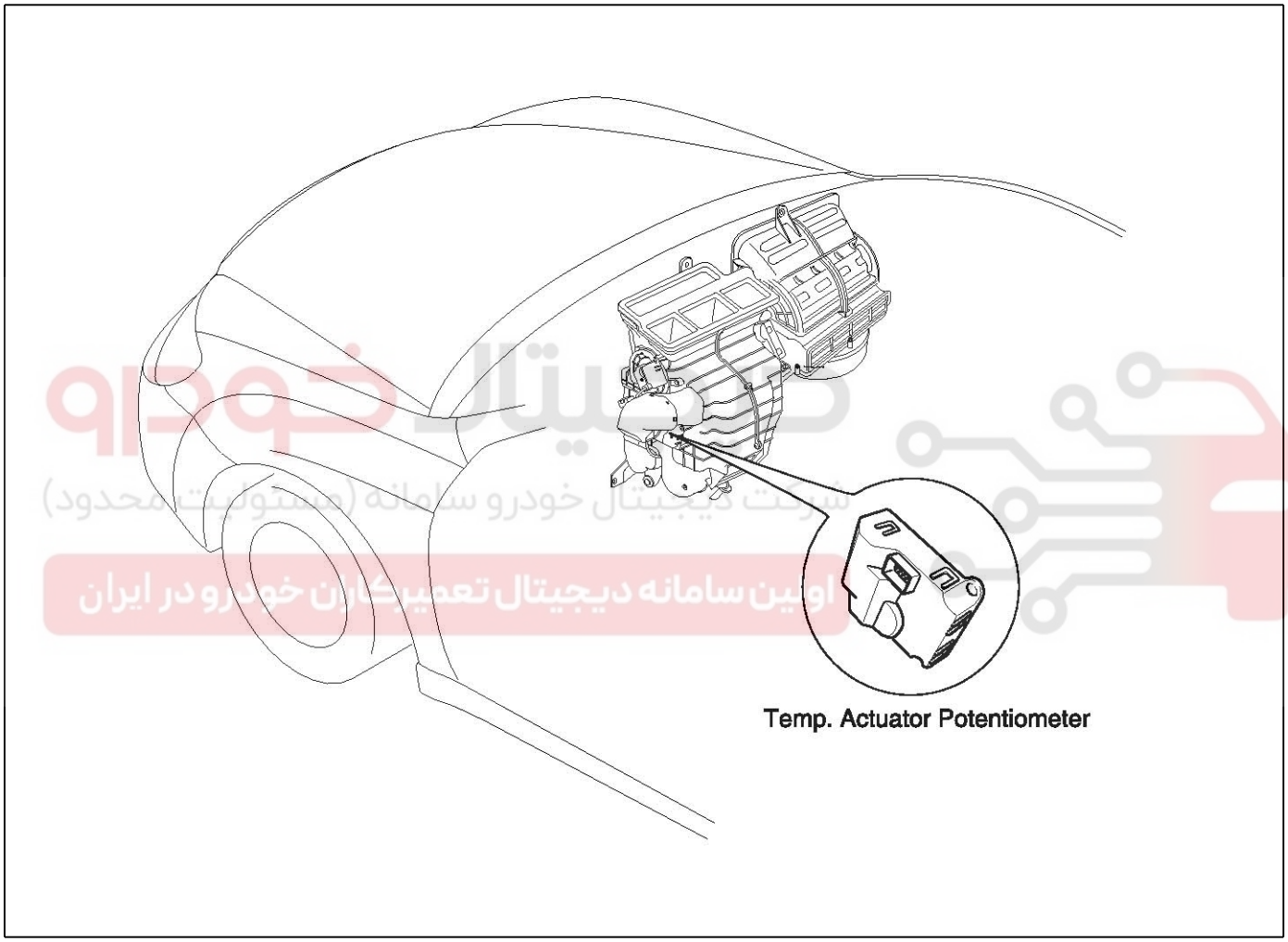
12. Install in the reverse order of removal, and note these items :
    - If you're installing a new evaporator, add refrigerant oil (ND-OIL8).
    - Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for 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.

Temperature Control Actuator

DESCRIPTION

1. Heater unit includes mode door actuator and temperature control door actuator.
2. Temperature control actuators are installed at driver side. Control switches will operate actuators, that will regulate temperature control position and discharge air temperature.

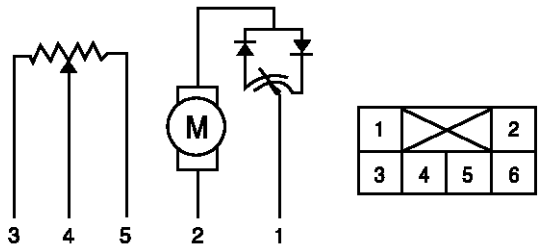
COMPONENT



LQGE205A

INSPECTION

1. Verify that the temperature actuator operates to the hot position when connecting 12V to the terminal 2 and grounding terminal 1.
2. Verify that the temperature actuator operates to the cool position when connecting in the reverse.



AQGE205B

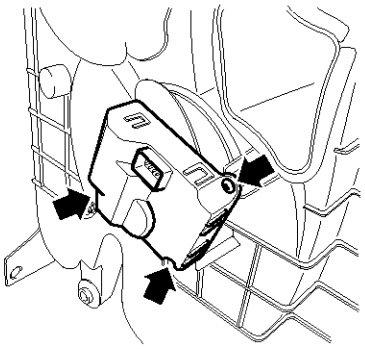
3. Check the voltage between terminals 3 and 4.

Door position	Voltage	Error detection
Max. cooling	0.4 ± 0.15V	Low voltage : 0.08V or less
Max. heating	4.5 ± 0.15V	High voltage : 4.9V or more

It will feed back current position of actuator to controls.

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Remove the lower crash panel and the side cover (Refer to the Body group).
3. Disconnect the connector of temperature actuator after removing the air duct.
4. Loosen the mounting screw and then remove the temperature actuator.



AQGE205C

5. Install in the reverse order of removal.

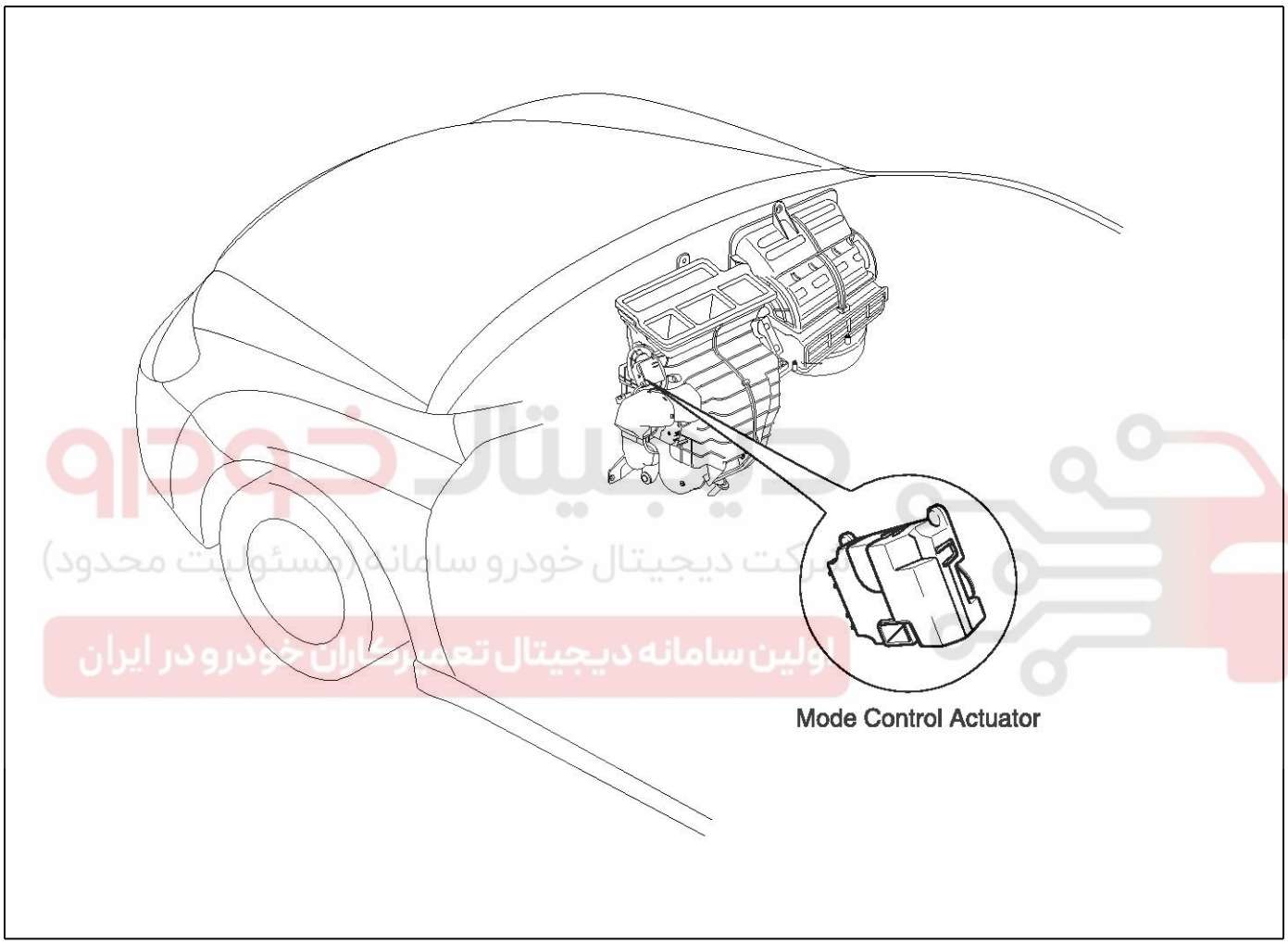
Mode Control Actuator

DESCRIPTION

Pressing mode select switch with the ignition on, driver side and passenger side mode door actuators will shift as follows

Vent ⇒ Bi/Level ⇒ Floor ⇒ Mix.

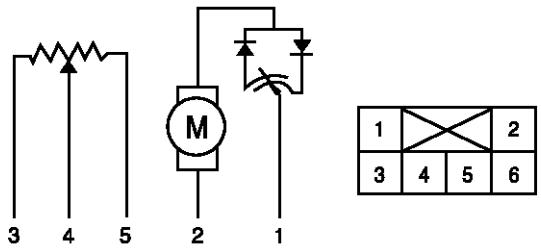
COMPONENT



LQGE209A

INSPECTION

1. Verify that the mode actuator operates to the vent position when connecting 12V to the terminal 1 and grounding terminal 2.
2. Verify that the mode actuator operates to the defrost position when connecting in the reverse.



AQGE205B

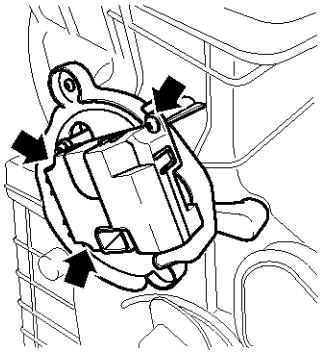
3. Check the voltage between terminals 3 and 4.

Door position	Voltage	Error detection
Vent	0.4 ± 0.15V	Low voltage : 0.08V or less
Defrost	4.5 ± 0.15V	High voltage : 4.9V or more

It will feed back current position of actuator to controls.

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Remove the lower crush panel and the side cover (Refer to the Body group).
3. Disconnect the connector of mode actuator after removing the air duct.
4. Loosen the mounting screw and then remove the mode actuator.



AQGE209B

5. Install in the reverse order of removal.

Positive Temperature coefficient)heater

DESCRIPTION

It 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(D4EA).

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

PTC = positive Temperature Coefficient

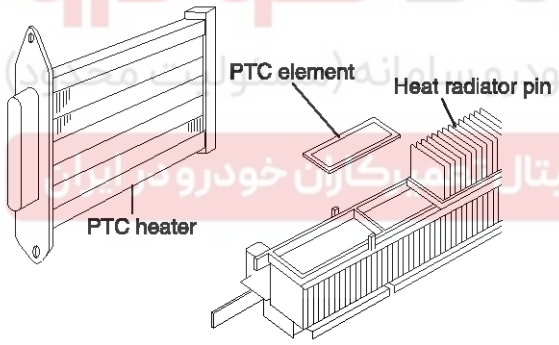
The name itself implies that the element has a proportional resistance change sensitive to temperature. it is installed at the exit or the backside of heater core.

PTC characteristics

Current is limited due to a rapid resistance increase above a certain temperature.

It restrains surface temperature increase.

It restrains current overflow.



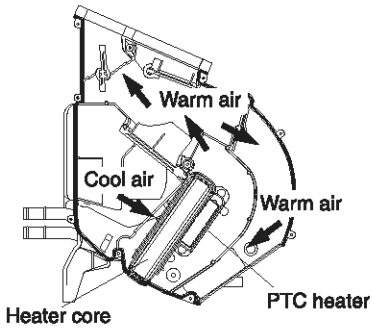
LQGE300F

OPERATION PRINCIPLE

ECU 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.



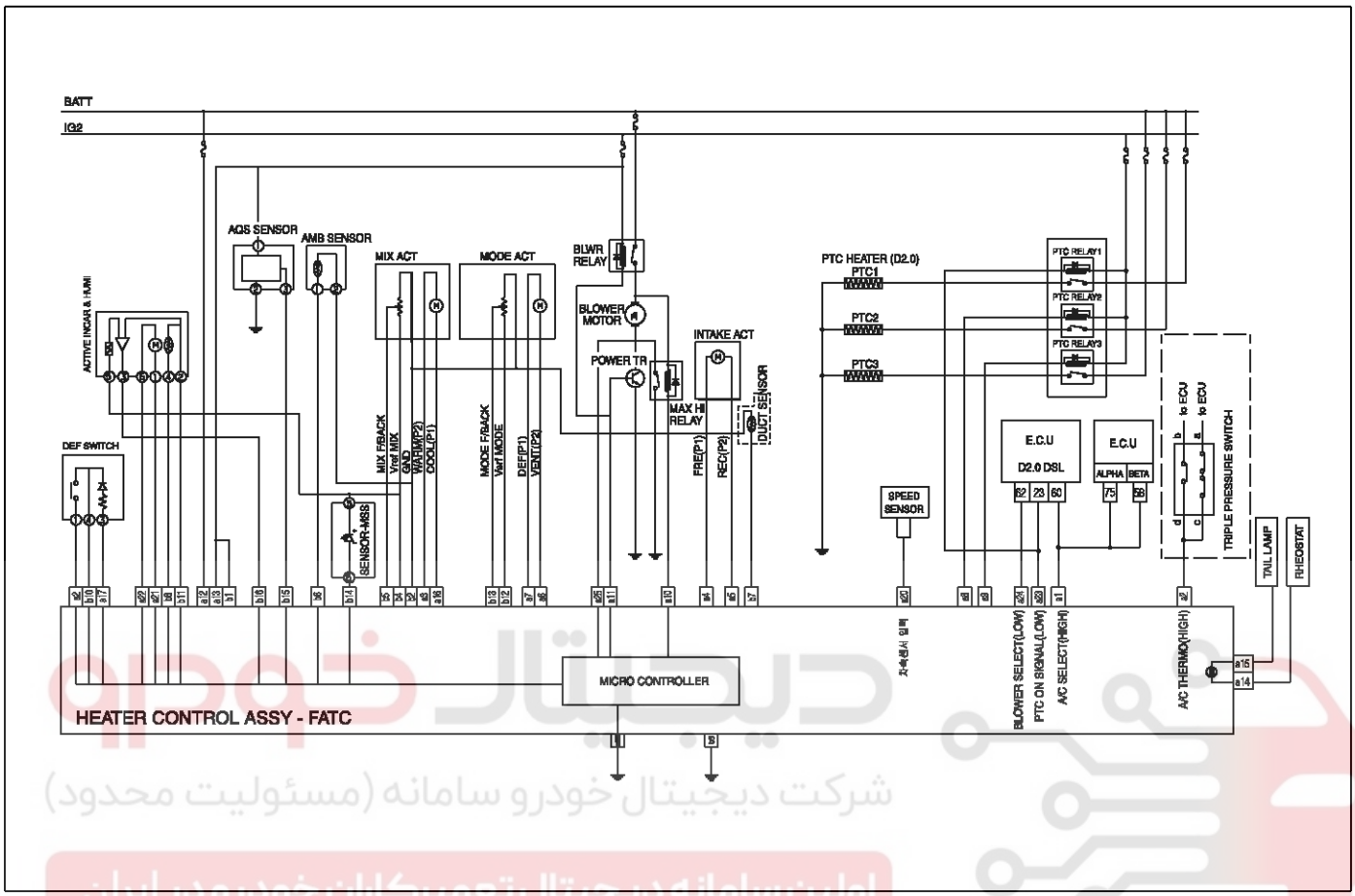
LQ8C111A

OPERATION CONDITION

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

Blower

CURCUIT DIAGRAM



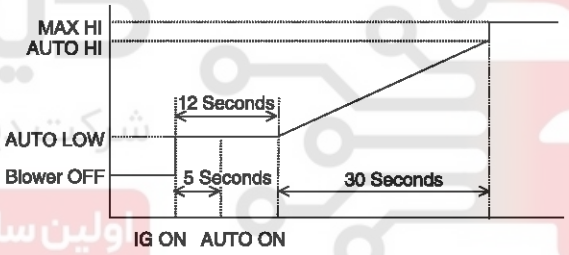
LQGE550H

OVERVIEW

Auto A/C uses all kinds of sensors (Ambient temperature sensor, in-car sensor, photo sensor, thermistor, humidity sensor, and AQS) to precisely sense ambient temperature, sunray load, evaporator discharge temperature, outer harmful gas, in-car humidity and temperature of which information is being input into micro computer for automatic control of discharge temperature, discharge wind capacity, compressor ON/OFF, Air discharge, and intake actuator switch, maintaining fresh in-car air and temperature.

CONTROL LOGIC

1. In-car temperature automatic control
   1) Automatically controls in-car temperature to set temperature regardless of changes vehicle speed, ambient temperature, sunray load, and passengers.
2. MAX COOL/HOT Function
   1) Execute MAX COOL when setting temperature to 17˚C.
   2) Fix to A/C ON, mix, MAX COOL, blower max hi (12V), recirculation, vent except manual mode when setting to 17˚C.
   3) Execute MAX HOT when setting temperature to 32˚C.
   4) Fix to A/C OFF, Mix MAX HOT, blower auto(10.5V), fresh, floor mode.
3. Wind capacity automatic control
   1) Automatically controls blower motor speed by associating with air mix door change during blower switch AUTO.
4. Mode control
   1) During AUTO mode, operate a value of each sensor, automatically controlling all actuators in vent, bi-level, and floor mode.
5. Compressor control
   1) During A/C AUTO, operate a value of each sensor and have compressor ON/OFF. activate compressor by force when setting to 17℃(MAX COOL), setting to defroster mode, or by humidity sensor though A/C being OFF by AUTO.
6. Intake control
   1) During Intake AUTO, operate a value of each sensor to automatically switch to fresh or recirculation.
7. Cool drive control
   1) Delay wind capacity for a regular amount of time until evaporator cools down in order to prevent hot wind from being abruptly discharged to an user on A/C operating when in-car temperature is high due to hot season.
   2) Entry condition: A/C ON (Auto or manual), evaporator, temperature being higher than 30˚C, blower OFF.
   3) During IG OFF →IG ON, control 1 cycle only.
   4) Operate cool drive control when AUTO switch is ON in manual mode (A/C OFF, blower manual) within 5 seconds after IG ON.
   5) Cool drive control overrides MAX COOL function.
   6) Release condition
      - A/C OFF, blower manual
      - No release upon reentry for 12 seconds (after IG ON) during system OFF by OFF switch during cool drive control but release upon reentry after 12 seconds.
   7) Control pattern



LQGE505B

8. Hot drive control
   1) Delay wind capacity for a regular amount of time until water warms up in order to prevent cool air from being abruptly discharged to an user when in-car temperature is low due to cold season and maintain mode door in defroster.
   2) Enery condition: auto mode, ambient < 5˚C (In-car - ambient)≤10˚C, blower auto
   3) During IG OFF to IG ON, perform 1 cycle only.
   4) Hot drive control overrides MAX HOT.
   5) Release condition
      - Upon selecting Blower manual
      - Only mode is released when operating mode switch, blower and hot drive control run for the remaining time.

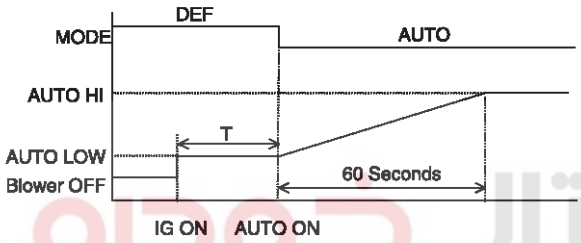
- In-car Ambient > 10˚C
- Upon selecting MAX COOL (17˚C)

6) Exceptions : Perform hot drive control for the remaining time 1 cycle only when satisfying entry condition within hot drive control time by measuring time upon initial drive (Auto switch ON within hot drive control time included).

   Gradually decrease the speed of blower for 6 seconds in maximum upon entry with an exception.

7) Overrides mix mode control

8) Control pattern



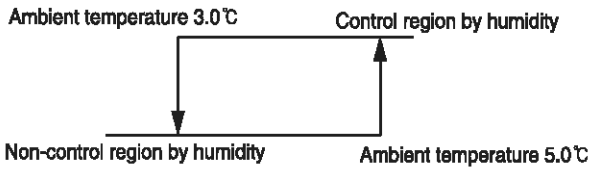
LQGE505C

Ambient temperature (˚C)	Control time "T"
Less than -15˚C	8 minutes
-14.5 ~ -10	6 minutes
-9.5 ~ -1	4 minutes
-0.5 ~ 5	2 minutes

9. Control by humidity sensor

1) Run A/C by force with values of humidity sensor and ambient sensor in order to prevent car window from being frosted.

2) Entry condition: A/C auto, when satisfying pattern by ambient sensor and humidity sensor.



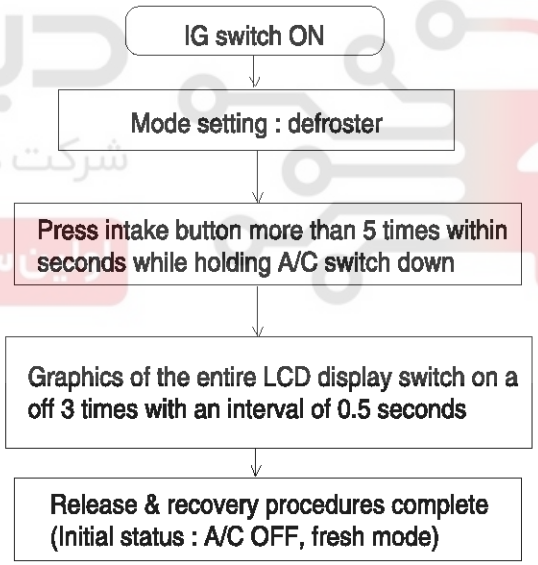
LQGE505D

10. Release and recovery of A/C & intake control logic

1) Control factor: defroster button, intake button

2) Change details when performing release logic: AQS control, defroster, mix control logic.

3) Release & recovery procedures



LQGE505E

4) Control specification

Classification		Defroster/Mix	KEY ON	When selecting OFF
Initial (Recovery) function	A/C	ON	Memory	OFF
	Intake	Fresh	Fresh	Fresh
Release function	A/C	Previous status	Memory	ON
	Intake	Previous status	Previous status	Previous status

NOTICE

- *When initially mounting battery: Perform initial (recovery) function.*
- *Do not affect release/recovery function during KEY OFF →ON.*

11. Control by AQS

1) Prevent any harmful gas from coming inside the car from outside in order to maintain fresh in-car air. switch Intake door to recirculation when any harmful gas coming inside from outside.

2) AQS operating logic [When performing initial function]

Current operating status	1st select button & operating status		2nd release button & operating status	
AUTO mode	AQS/recirculation button	- AQS mode control - AQS indicator ON - Maintain AUTO mode (Except intake)	AQS button	- Release AQS mode - Maintain AUTO (Intake auto control recovery)
			Defroster button (Mode : mix)	- Mode : defroster - Release AQS mode - Release auto function
			OFF button	- Release AQS mode - Blower OFF
			Setting to 17˚C or 32˚C	- MAX COOL or MAX HOT function - Release AQS mode - Maintain auto mode
			AUTO button	- Release AQS mode - Intake auto control

Manual mode	AQS button	- AQS mode control - AQS indicator ON	AQS button	- Release AQS mode - Control of previous status of intake
			Defroster button (Mode : mix)	- Mode : defroster - Release AQS mode
			OFF button	- Release AQS mode - Blower OFF
			Setting to 17°C or 32°C	- MAX COOL or MAX HOT function - Maintain AQS mode
			AUTO button	- Release AQS - Intake auto control

3) AQS operating logic [when performing initial (Recovery) function]

Current operating status	1st select button & operating status		2nd release button & operating status	
AUTO mode	AQS/fresh button	- AQS Mode control - AQS Indicator ON - Maintain AUTO mode (Except intake)	AQS button	- Release AQS mode - Maintain AUTO (Intake auto control recovery)
			Defroster button (Mode : mix)	- Mode : Defroster - Maintain AQS mode - Auto function release
			OFF button	- Maintain AQS mode - Blower OFF
			Setting to 17°C or 32°C	- MAX COOL or MAX HOT function - Release AQS mode - Maintain Auto mode
			AUTO button	- Release AQS - Intake Auto Control
Manual mode	AQS button	- AQS Mode Control - AQS Indicator ON	AQS button	- Release AQS mode - Control of prior status of intake
			Defroster button (Mode : mix)	- Defroster function - Maintain AQS mode
			OFF button	- Maintain AQS mode - Blower OFF
			Setting to 17°C or 32°C	- MAX COOL or MAX HOT function - Maintain AQS mode
			AUTO button	- Release AQS - Intake AUTo control

4) AQS selection is available when blower OFF or in defroster mode.

5) AQS selection is available at MAX COOL/HOT in AUTO mode.

6) Fail safe function
   - Senses whether or not signal line of AQS

sensor is short for 7 seconds while AQS sensor being preheated (34±5 seconds) regardless of AQS button select at every IG2 ON (Provided that AQS indicator is ON when selecting AQS button, and OFF when not selecting while detecting short).

- If a signal of more than 4V is detected for more than 3.5 seconds while detecting malfunction, there is determined to be AQS signal line short and so perform fail safe function as follows even though AQS button having been selected.
- Release AQS (AQS select forbidden, indicator OFF) provided that Intake maintain the previous status of AQS; Intake auto at AUTO; maintain Intake at Manual.

12. Defroster control (Modes other than Defroster)
    1) When selecting defroster button: Blower ON, A/C ON, fresh, AQS OFF, and defroster
    2) Operating in defroster Mode is as follows:

2nd select button & operating status		3rd select button & operating status	
Defroster button	- Blower ON, A/C ON, fresh, control defroster	-	-
Mode button	- Blower, A/C, Intake, AQS, Control mode in the status prior to selecting defroster	-	-
AUTO button	- Full auto control	-	-
OFF button	- Blower OFF - A/C OFF - Fresh - Defroster	Defroster button (perform defroster again)	- Blower ON - A/C ON - Fresh - Defroster
		Blower ON	- Control step number of selected blower - Control A/C with its status prior to selecting OFF button - Unconditionally fresh
		Manipulate temperature	- A/C ON - Control other function with its status prior to selecting OFF
A/C button	- Blower ON - A/C OFF - Fresh - Defroster	Defroster button, Mode button	- A/C OFF - Control other function with its status prior to selecting defroster
Intake button	- Blower ON - A/C OFF - Recirculation - Defroster	Defroster button, Mode button	- Intake : Recirculation - Control other function with its status prior to selecting defroster
AQS button	- Blower ON - A/C OFF - Control by AQS - Defroster	Defroster button, Mode button	- Control by AQS - Control other function with its status prior to selecting defroster

Blower UP/DOWN	- Control step number of selected blower - A/C ON - Fresh - Defroster	Defroster button, Mode button	- Maintain blower voltage - Control A/C, Intake, AQS, and mode with their status prior to selecting defroster
Temp. UP/DOWN	- Blower ON - A/C ON - Fresh	Defroster button, Mode button	- Blower, A/C, Intake, AQS, Control mode with the status prior to selecting defroster
IG OFF	- Driver OFF	IG ON	- perform defroster logic again

NOTICE

- *A/C OFF, A/C select & A/C output signals OFF when ambient temperature is below -3˚C during defroster logic.*

  Provided that A/C ON, A/C select & output signals ON when selecting A/C ON or 17˚C.
- *Overrides MAX control.*

13. Mix control (Vent, Bi-level, Floor mode)
    1) When selecting MIX mode: Blower ON, A/C ON, Fresh AQS OFF, Mix
    2) Operating in MIX mode is as follows:

2nd select button & operating status		3rd select button & operating status	
Defroster button	- Blower ON, A/C ON, Ambient, Control defroster	Defroster button	- Change to mix - Blower ON, A/C ON, and fresh
Vent, Bi-level, Floor	- Blower, A/C, Intake, Control the status prior to selecting AQS/ Mix	-	-
AUTO button	- Full auto control	-	-
OFF button	- Blower OFF - A/C OFF - Fresh - MIX	Mode	- Blower OFF - A/C OFF - Intake : previous status - Mode : Vent
		Blower ON	- Control step number of selected blower - Control A/C with its status prior to selecting OFF button - Unconditionally fresh - Mix
		Manipulate Temperature	- A/C ON - Control other function with its status prior to selecting OFF
A/C button	- Blower ON - A/C OFF - Fresh - MIX	Vent, Bi-level, Floor	- A/C OFF - Control blower, Intake, and AQS with their status prior to selecting MIX

Intake button	- Blower ON - A/C ON - Recirculation - MIX	Vent, Bi-level, Floor	- Recirculation - Control blower, A/C, and AQS with their status prior to selecting MIX
AQS button	- Blower ON - A/C ON - Control by AQS - MIX	Vent, Bi-level, Floor	- Control by AQS - Control blower, A/C with their status prior to selecting MIX
Blower UP/DOWN	- Control step number of selected blower - A/C ON - Fresh - MIX	Vent, Bi-level, Floor	- Maintain blower voltage - Control A/C, AQS, and Intake with their status prior to selecting MIX - Control with the selected mode
Temp. UP/DOWN	- Blower ON - A/C ON - Fresh	Vent, Bi-level, Floor	- Control blower, A/C and AQS with their status prior to selecting MIX - Control with the selected mode
IG OFF	- Drive OFF	IG ON	- Perform MIX logic again

NOTICE

- *A/C, A/C select & A/C output signals OFF when ambient temperature is below -3˚C during MIX logic.*

  Provided that A/C ON, A/C select & output signals ON when selecting A/C ON or 17˚C.
- *Overrides MAX control.*

14. Ambient temperature sensor corrective control

Classification		Control Method
When ambient temperature drops	KEY ON	• 1˚C DOWN/4 seconds delayed
	KEY OFF → ON	• Indication and auto control with the current temperature when ambient temperature upon IG being ON again is lower than the one that MICOM has remembered upon IG being OFF
		• Irrelevant with the time it takes to IG ON again after IG OFF.

When ambient temperature rises	KEY ON	Less than 10°C/3MIN		• 1°C UP/3MIN delayed
		More than 10°C/3MIN		• Determined to be abnormal temperature and so ambient indication and auto control with the temperature prior to 3 minutes
				• Customarily, indication and auto control upon ambient temperature increasing for 3 minutes (1°C UP/3MIN)
	KEY OFF → ON	Within 2°C		• Indicate and auto control with temperature sensor has detected at IG ON
				• Irrelevant with the time it takes to IG ON again after IG OFF.
		More than 2°C	Within 1 hour	• Indicate ambient temperature that is remembered at IG OFF
			After 1 hour	• Indicate temperature sensor has detected at IG ON

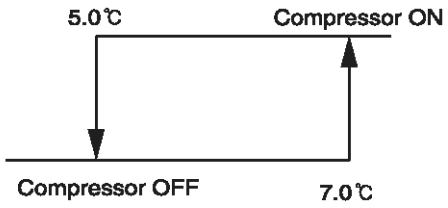
15. Corrective control according to speed sensor input.

LQGE505F

Logic 1 ⇒ Logic 2	Temperature UP	Indicate and automatically control with temperature of logic 1
	Temperature DOWN	1°C DOWN/4SEC delayed
Logic 2 ⇒ Logic 1	Temperature UP	1°C DOWN/4SEC delayed
	Temperature DOWN	Indicate and automatically control while gradually increasing to the currently sensed temperature for 10 minutes when moving to Logic 1 regardless of time at Logic 2. Follows Logic 1 after 10 minutes.

16. Control by ambient temperature

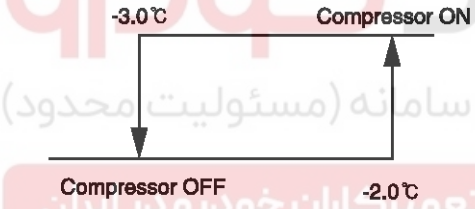
Ambient temperature controls compressor as follows to prevent compressor in winter.



LQGE451B

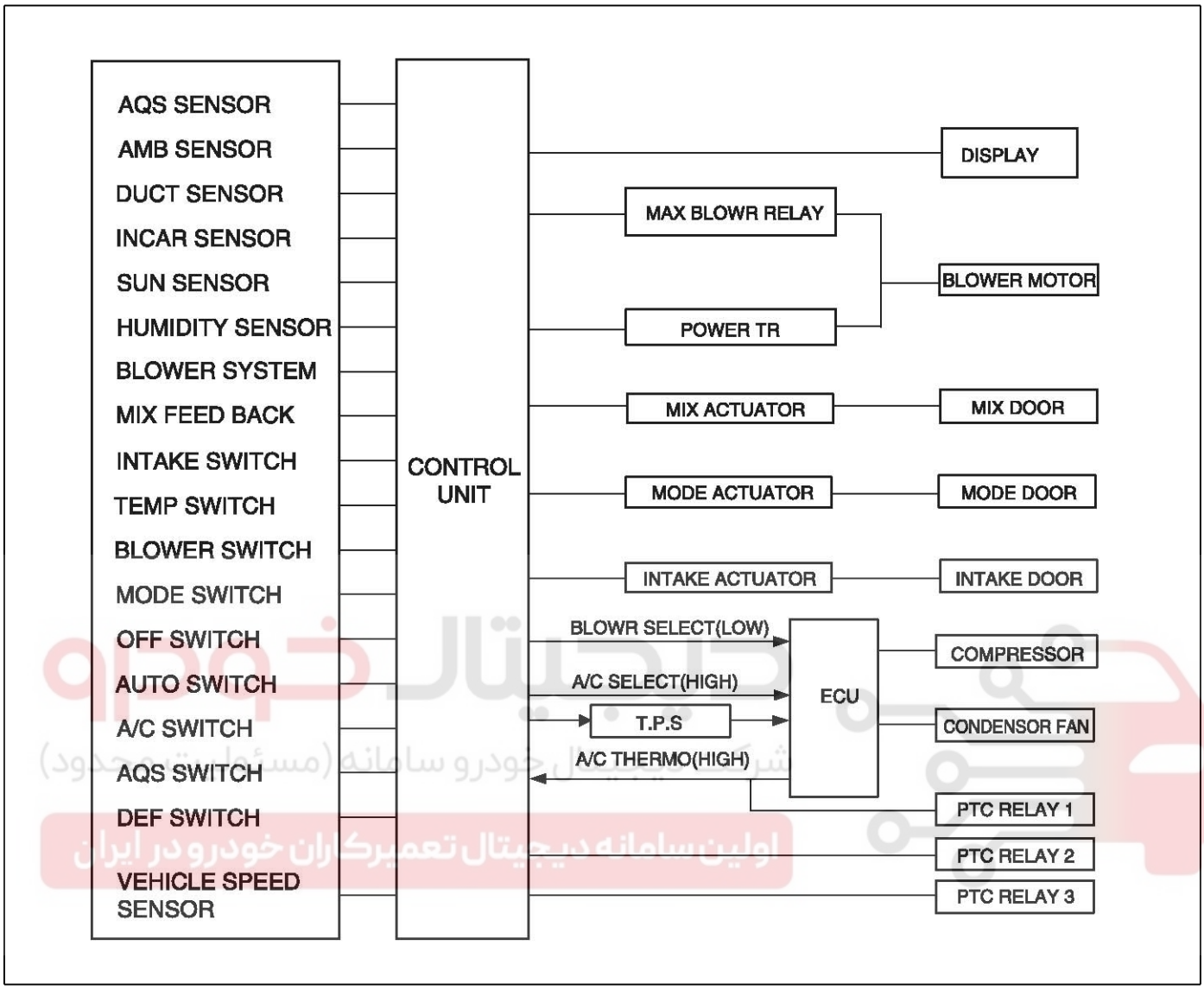
17. Control by thermistor (Duct sensor)

Have A/C output signal ON/OFF according to thermistor (duct sensor) temperature to prevent evaporator from freezing during A/C ON.



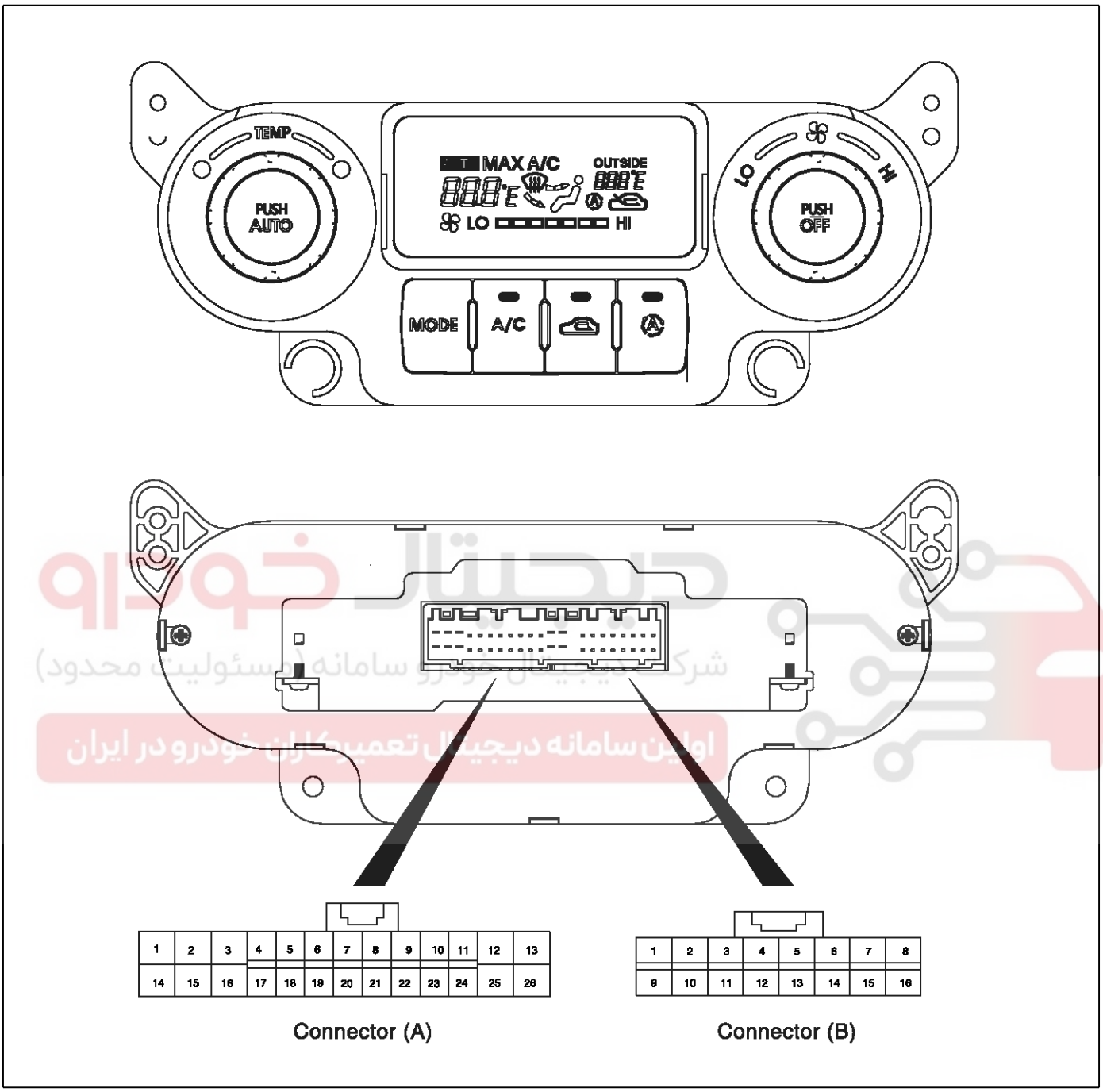
LQGE505G

OPERATION



LQGE550A

CONTROL PANEL
COMPONENT



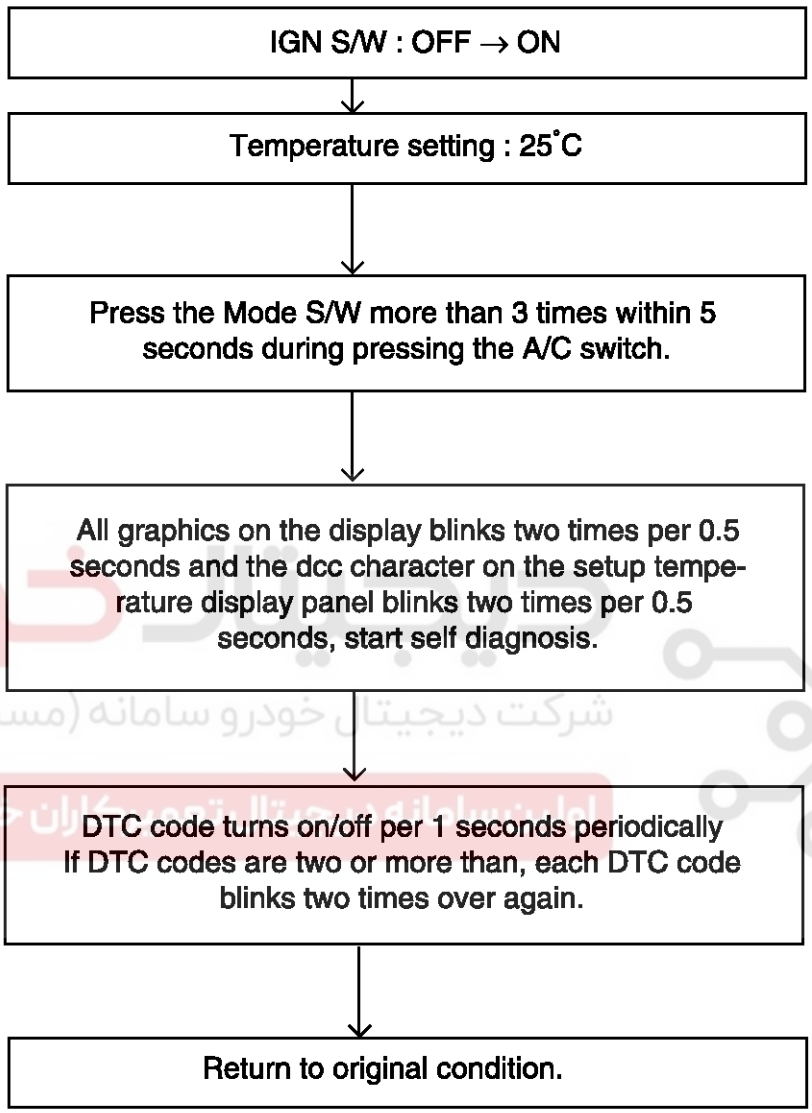
LQGE500A

CONNECTOR	PIN	FUNCTION	CONNECTOR	PIN	FUNCTION
Connector (a)	1	A/C select (High)	Connector (b)	1	IG2
	2	A/C thermo (High)		2	Sensor ground
	3	Mix warm (P2)		3	Defroster switch
	4	Intake fresh (P1)		4	Mix voltage (5V)
	5	Intake recirculation (P2)		5	Mix feed back
	6	Mode vent (P2)		6	Ambient sensor
	7	Mode defroster (P1)		7	Thermistor (Duct sensor)
	8	PTC2 relay (coil-)		8	In car sensor
	9	PTC3 relay (coil-)		9	Ground
	10	High blower relay		10	Defroster switch ground
	11	Power transistor (Base)		11	In car sensor ground
	12	Battery (+)		12	Mode voltage (5V)
	13	IG2		13	Mode feed back
	14	Rheostat		14	Photo sensor
	15	Tail lamp		15	AQS sensor
	16	Mix cool (P1)		16	Humidity sensor
	17	Defroster indicator			
	18	N.C			
	19	N.C			
	20	Speed sensor			
	21	In car motor (-)			
	22	In car motor (+)			
	23	PTC on signal (Low)			
	24	Blower select (Low)			
	25	Blower motor feed back			
	26	Ground			

DIAGNOSIS SYSTEM

OPERATION METHOD (SELF-DIAGNOSIS)

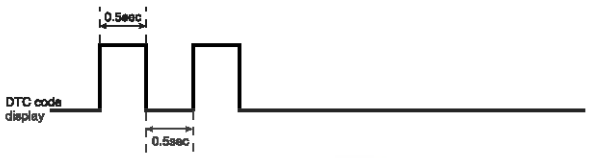
The F.A.T.C. module self test feature will detect electrical malfunction and provide error codes for system components with suspected failures.



LQGE505L

HOW TO READ SELF-DIAGNOSTIC CODE

1. Set the temperature door at the center position and turn off the A/C system during the DTC check.
2. After the display panel flickers three times every 0.5 second, the corresponding error code flickers on the setup temperature display panel every 0.5 second and will show two figures.
3. If error code is more than two, each code flickers 2 times in sequence.
4. FAULT CODE DISPLAY
   1) DTC code is one



LQGE505M

   2) DTC code is more than two

LQGE505N

5. If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below.

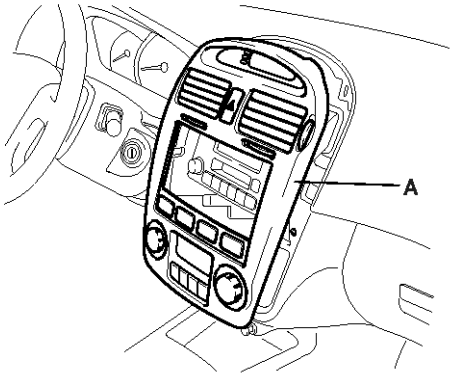
DTC code .	Detection	Trouble area
E0	Normal	-
E1	Open/Shorted in car sensor circuit.	- In car sensor - Harness or connector between in car sensor and A/C control assembly - A/C control assembly
E2	Open/shorted Ambient sensor circuit.	- Ambient sensor - Harness or connector between ambient sensor and A/C control assembly - A/C control assembly
E3	Open/Shorted Thermistor (Duct sensor)	- Thermistor (Duct sensor) - Harness or connector between thermistor sensor and A/C control assembly - A/C control assembly
E4	Oper/Shorted photo sensor	- Photo sensor - Harness or connector between Photo sensor and A/C control assembly - A/C control assembly
E5	Open or shorted temperature door actuator. Defective temperature door actuator.	- Temperature door actuator - Harness or connector between temperature door actuator and A/C control assembly - A/C control assembly

6. FAIL SAFE FUNCTION

No.	Item	Failure	FAIL SAFE Function
E0	Normal	-	-
E1	In-car temperature sensor	Open/Short	25 °C (77 °F) alternate value control
E2	Ambient temperature sensor	Open/Short	25 °C (77 °F) alternate value control
E3	Thermistor (Duct sensor)	-	-2 °C (28.4 °F) alternate value control
E4	Photo sensor (Sun sensor)	Open/Short	-
E5	Temperature door actuator	Open/Short setup temperature	For 17°C (62°F) to 24.5°C (76°F), set to maximum cooling position. For 25°C (77°F) to 32°C (90°F), set to maximum cooling position.

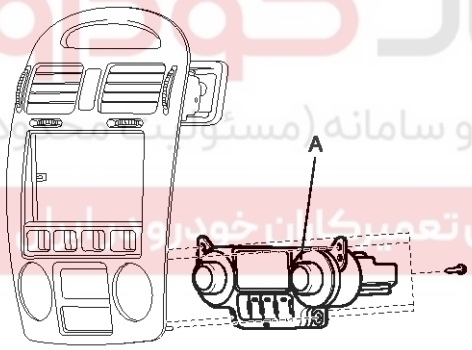
REPLACEMENT

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



ATGE021E

3. Disconnect the connectors from the center facia.
4. Remove the blower And A/C control unit(A).

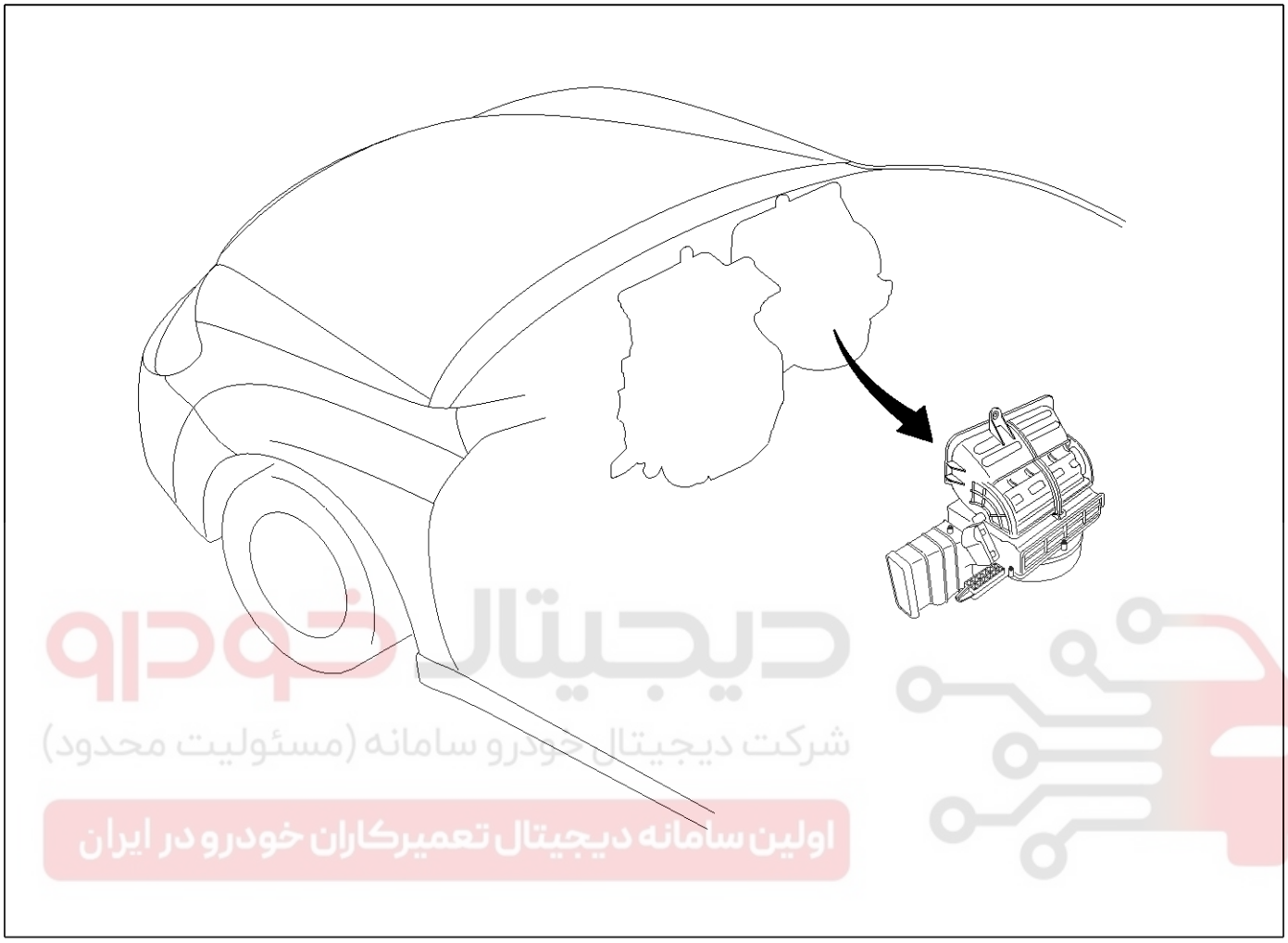


AQGE505I

5. Install in the reverse order of removal.

Blower Unit

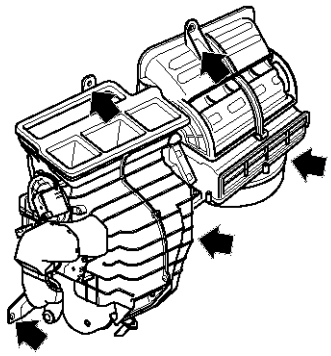
COMPONENT



AQGE350A

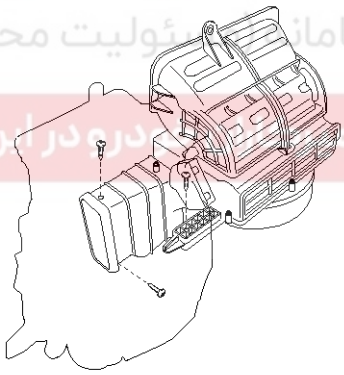
REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Remove the crash panel (Refer to the Body group)
3. Disconnect the connectors from the temp. actuator, the mode actuator and the thermistor, then remove the mounting nuts.



AQGE350B

4. Remove the heater & evaporator unit after loosening the mounting screws.



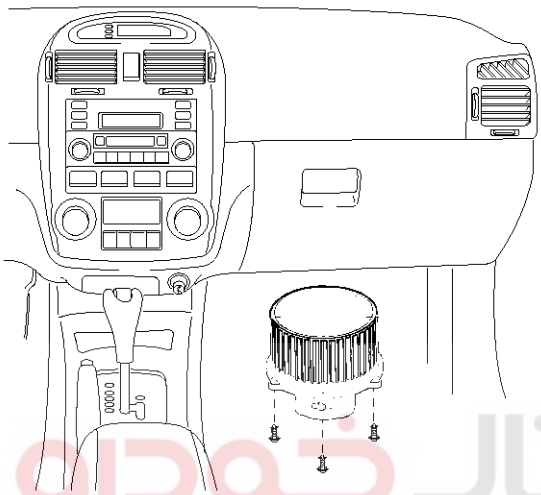
AQGE350C

5. Install in the reverse order of removal.

Blower Motor

REPLACEMENT

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

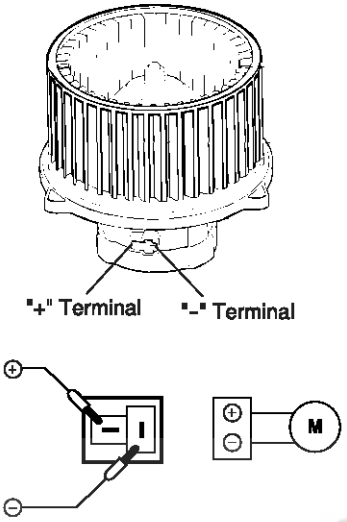


AQGE352B

4. Install in the reverse order of removal.

INSPECTION

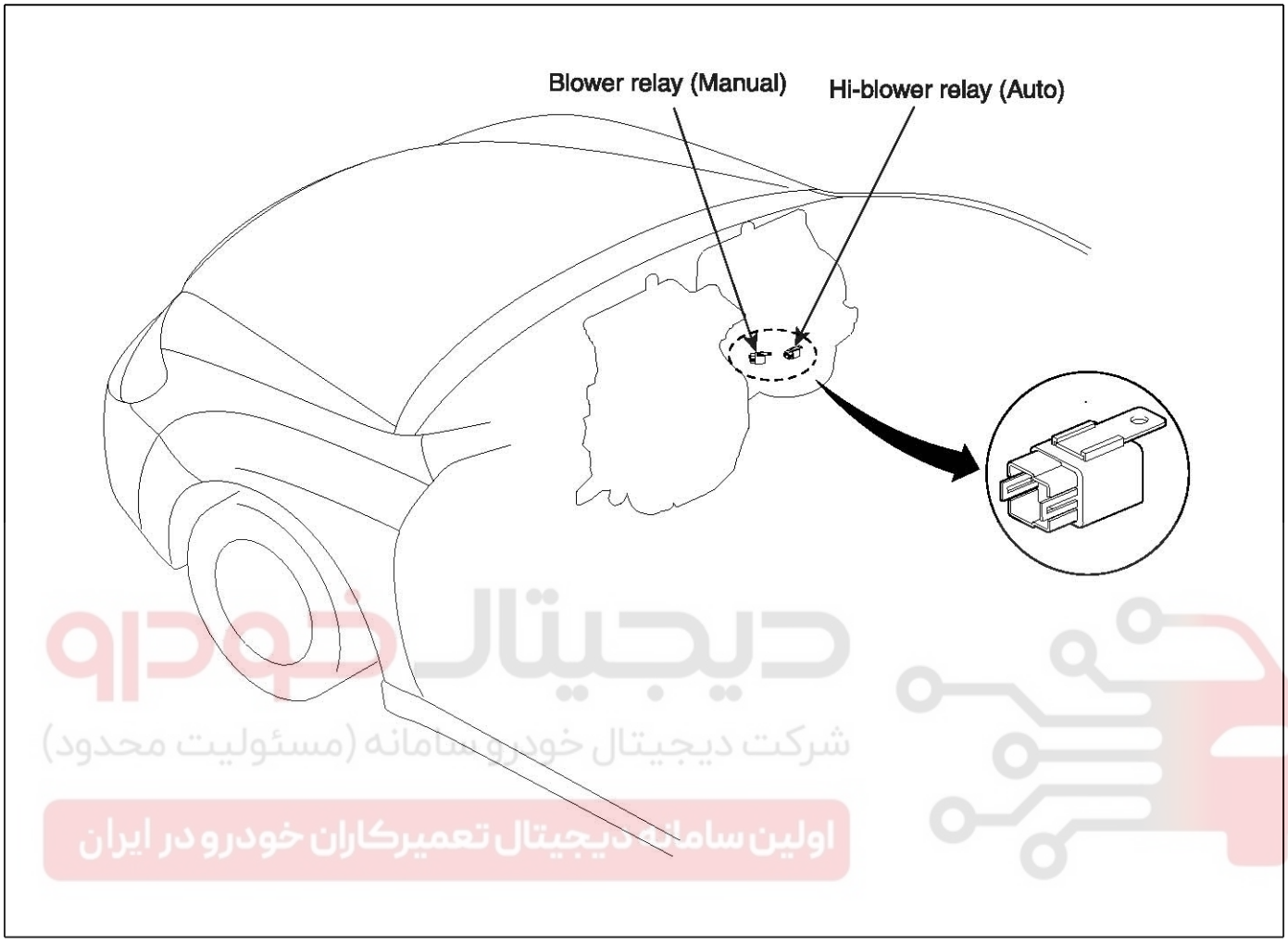
1. Connect the battery voltage and check the blower motor rotation.



LQGE352A

Blower Relay

COMPONENT

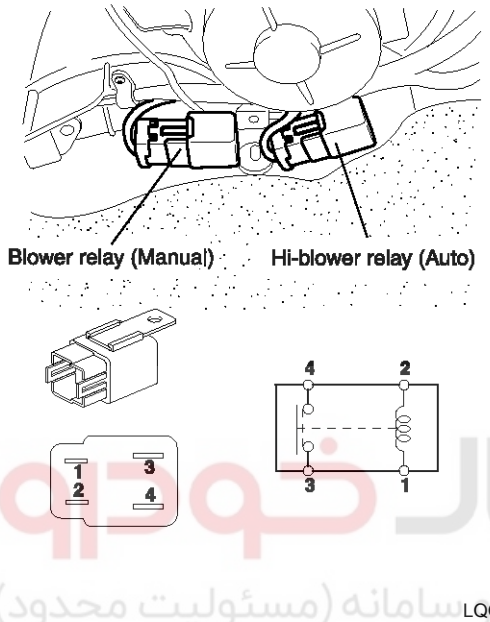


LQGE353A

INSPECTION

Check for continuity between the terminals.

1. There should be continuity between the No.3 and No.4 terminals when power and ground are connected to the No.1 and No.2 terminals.
2. There should be no continuity between the No.3 and No.4 terminals when power is disconnected.



LQGE353B

Terminal / Position	3	4	1	2
Power OFF			○	○
Power ON	○	○	⊕	⊖

LQGE353C

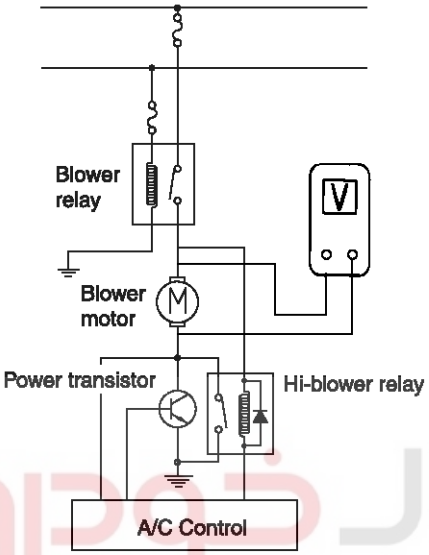
REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Disconnect the connector of the blower relay at the below blower unit.
3. Remove the blower relay after loosening the mounting screw.
4. Install in the reverse order of removal.

Power Transistor

INSPECTION

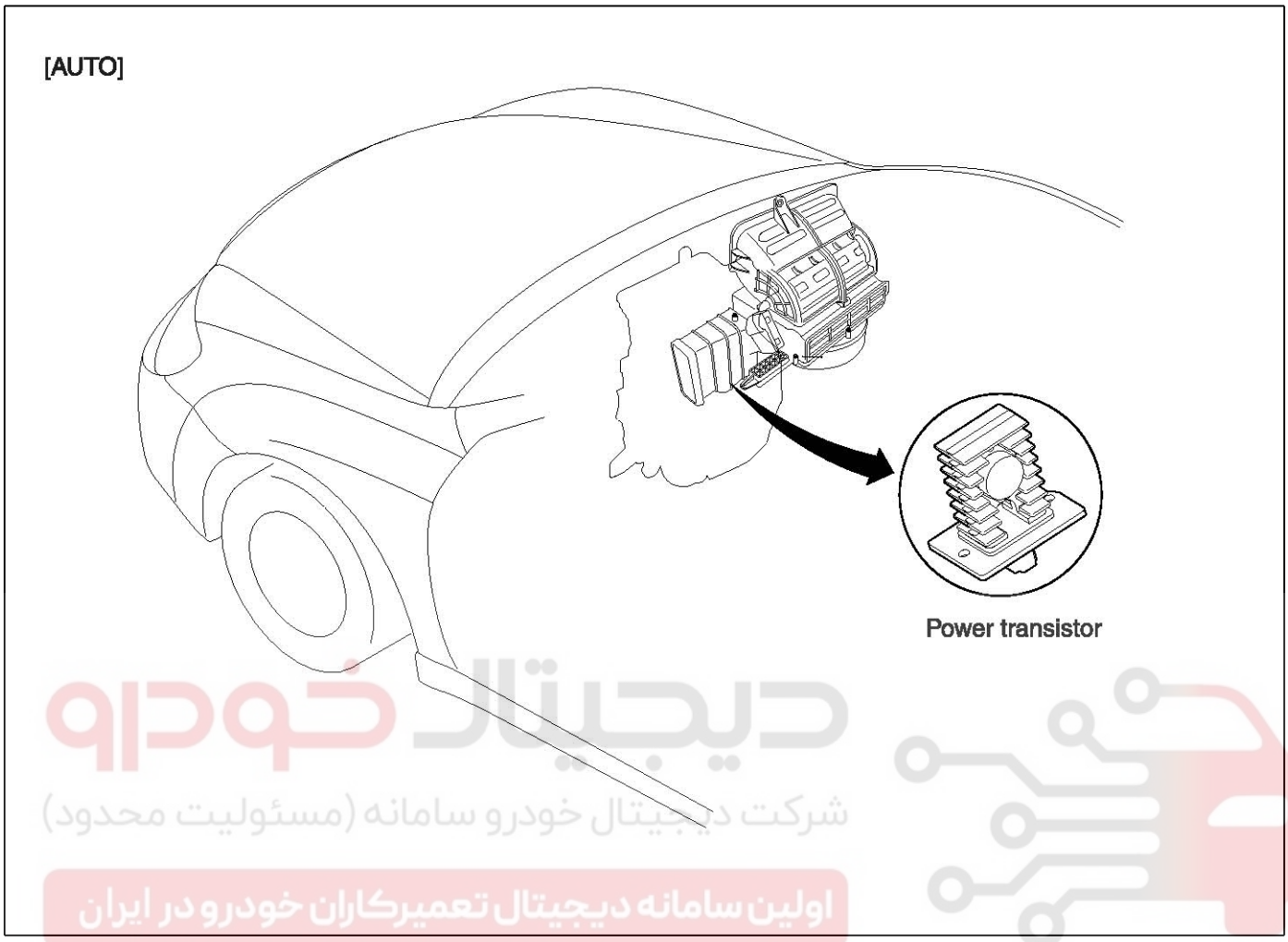
1. Manually operate the control switch and measure the voltage of blower motor between pin 1 and 2.
2. Select the control switch to raise voltage until high relay operates.



LQGE355A

Fan	Mator Voltage
First speed	4.0V ± 0.5V
Second speed	5.3V ± 0.5V
Third speed	6.6V ± 0.5V
Fourth speed	7.9V ± 0.5V
Fifth speed	9.2V ± 0.5V
Sixth speed	10.5V ± 0.5V
Seventh speed	12.0V (hing relay operates)

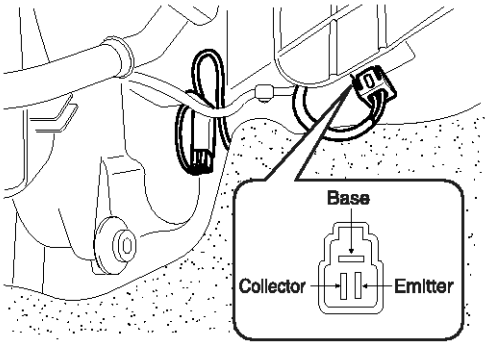
COMPONENT



LQGE355B

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Disconnect the connector(A) of the power transistor at the below blower unit.

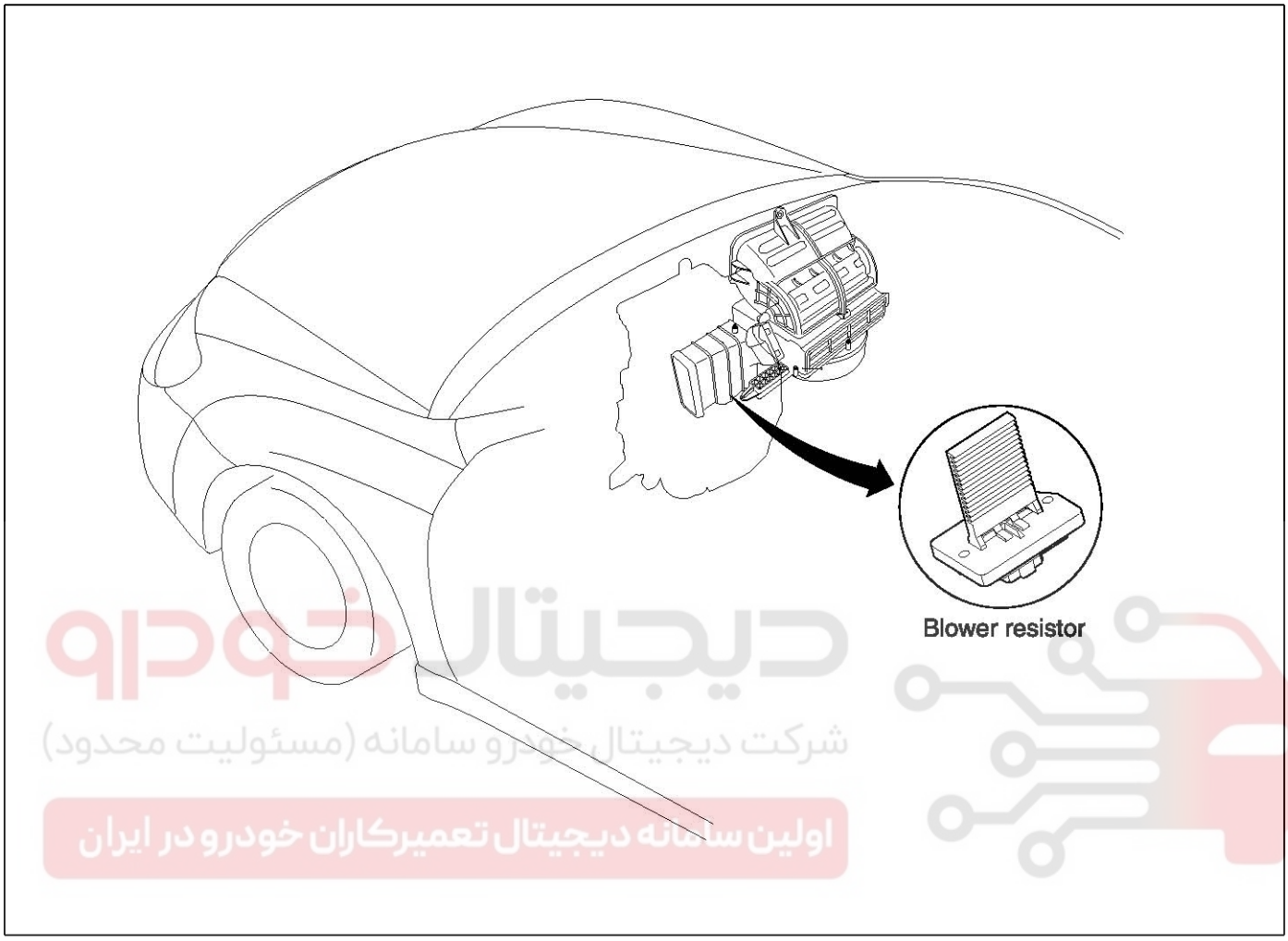


LQGE357C

3. Remove the power transistor after loosening the mounting screws.
4. Install in the reverse order of removal.

Blower Resistor

COMPONENT



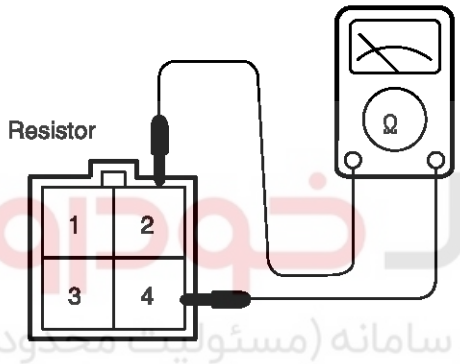
LQGE354A

INSPECTION

1. Measure terminal-to-terminal resistance of the blower resistor.
2. If measured resistance is not within specification, the blower resistor must be replaced. (After removing the resistor)

Terminal / Speed / Resistance ohmmeter	2	1	4	3	Resistance (Ω)
	MH	ML	HI	LO	
Measurement of resistance between each terminal			○—○	○—○	2.30 ± 5%
		○—○	○—○		1.0 ± 5%
	○	———	○—○		0.35 ± 5%

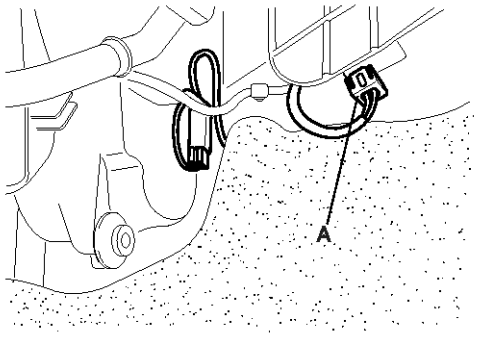
LQGE354B



LQGE354C

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Disconnect the connector(A) of the blower resistor at the below blower unit.



AQGE354D

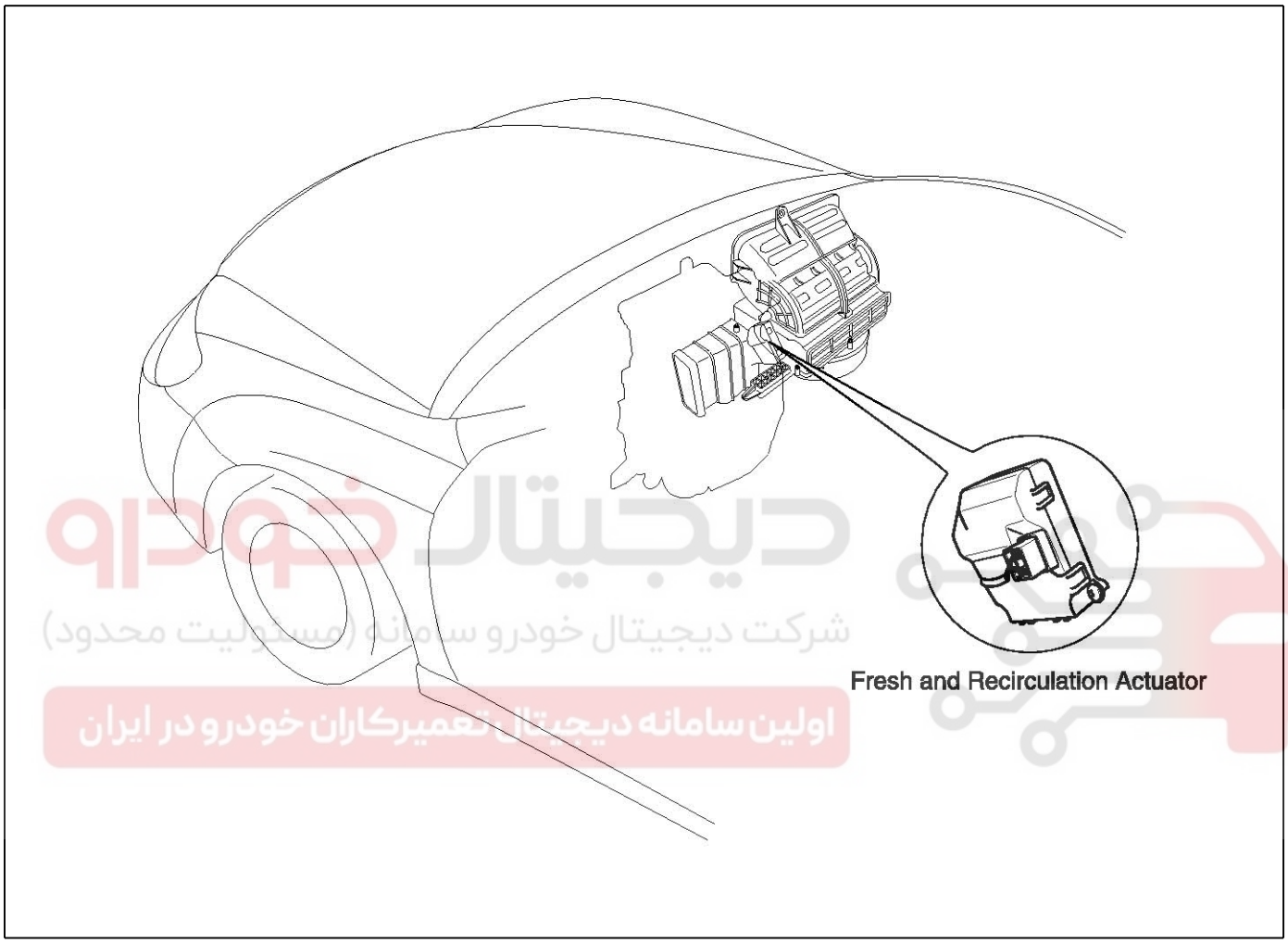
3. Remove the blower resistor after loosening the mounting screws.
4. Install in the reverse order of removal.

Intake Actuator

DESCRIPTION

Pressing the intake selection switch will shift between recirculation and fresh air modes.

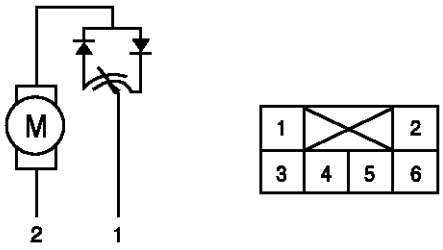
COMPONENT



LQGE211A

INSPECTION

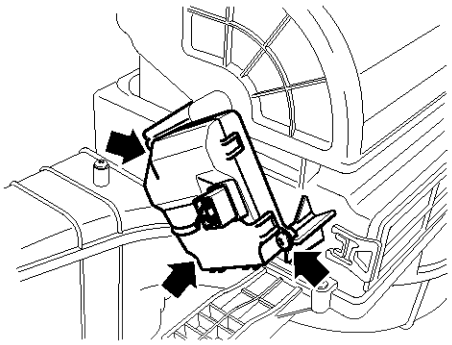
1. Verify that the fresh and recirculation actuator operates to the fresh position when connecting 12V to the terminal 1 and grounding terminal 2.
2. Verify that the fresh and recirculation actuator operates to the recirculation position when connecting in the reverse.



AQGE211B

REPLACEMENT

1. Disconnect the negative(-) battery terminal.
2. Remove the lower crush panel and the glove box (Refer to the Body group).
3. Disconnect the connector of fresh and recirculation actuator after removing the air duct.
4. Loosen the mounting screw and then remove the fresh and recirculation actuator.

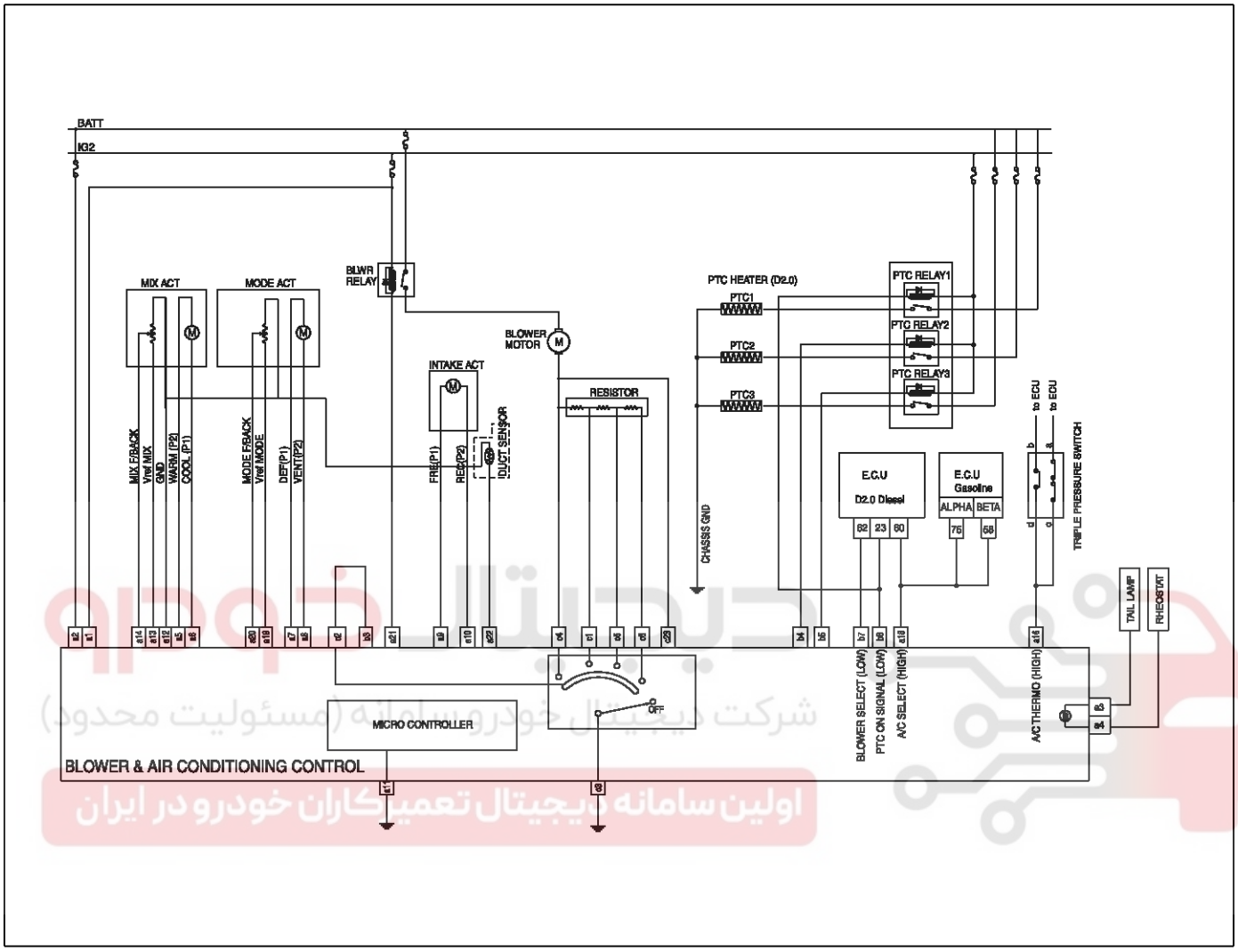


AQGE211C

5. Install in the reverse order of removal.

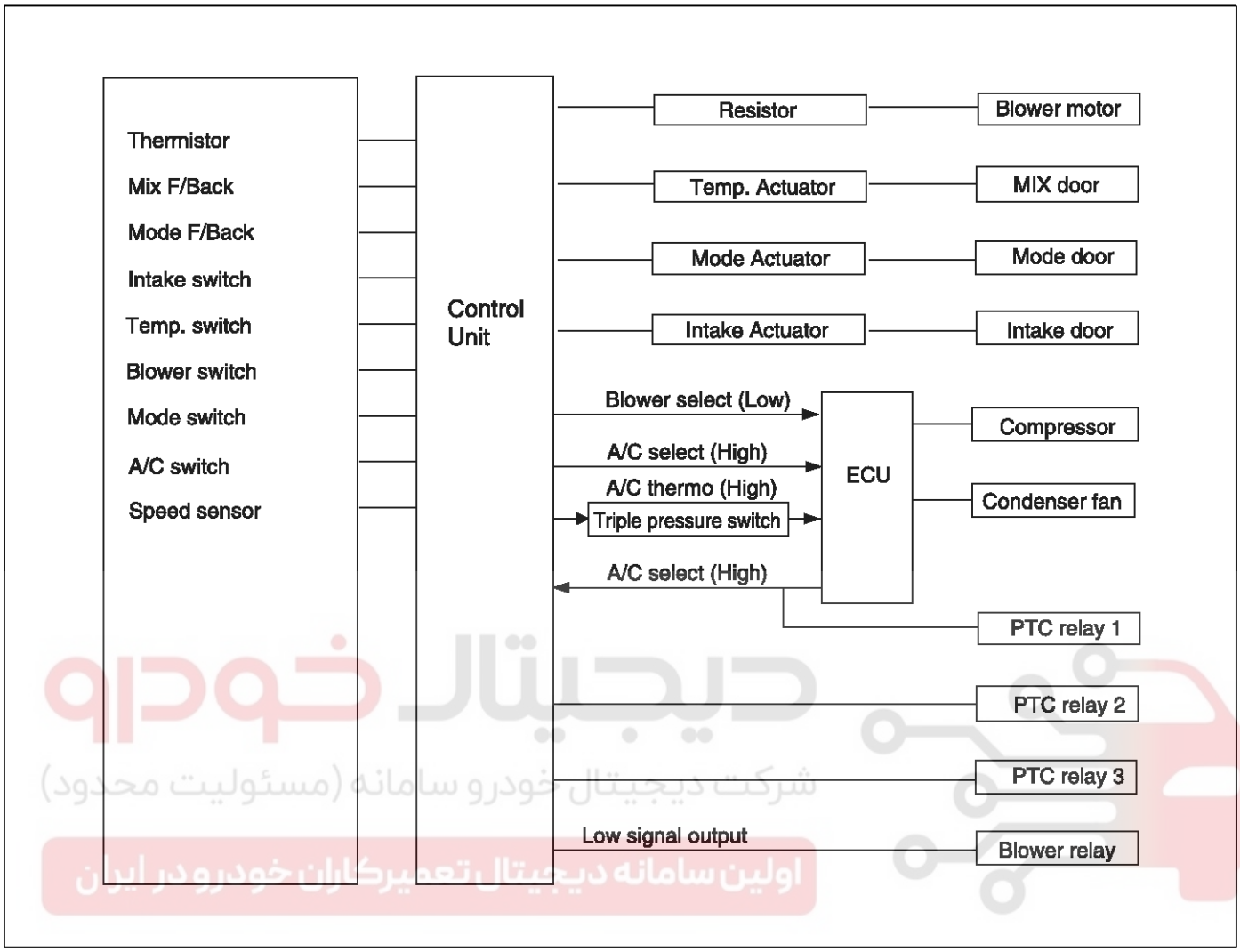
Control Panel

CURCUIT DIAGRAM



LQGE451C

OPERATION



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CONTROL LOGICS

1. Defroster, Mix control
   1) When defroster or mix selected, A/C ON, A/C indicator shall maintain its prior status, working in the fresh mode to help defrost.
   2) In doing defroster logic, the user can select the fresh/recirculation mode or A/C.
   3) Detailed control logics are as follows :

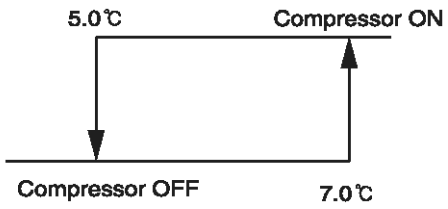
Current status	The first selection button and working status		The second selection button and working status	
	Control factor	Working status	Control factor	Working status
Vent, Bi-level, Floor	Mix, Defroster	- A/C ON (Only when blower is ON) - Fresh	Vent, Bi-level, Floor	- Prior condition of A/C - Prior condition of Fresh/Recirculation
			A/C Button	- A/C OFF - Fresh
			Recirculation Button	- A/C ON - Recirculation
			Blower OFF	- A/C OFF - Fresh

NOTICE

1. *When initial battery application and IG ON, Fresh and A/C ON with the defroster or mix is selected (Only when blower is ON).*
2. *A/C ON: A/C select & A/C output signal ON,*
   A/C OFF: A/C select & A/C output signal OFF
3. *Logic is reentered when Floor, Defroster and Mix is selected.*

2. Fresh/recirculation control in the Vent/Bi-level mode
   1) With IG OFF →ON or blower OFF⇒ON in the Vent/Bi-level mode, fresh/recirculation maintain the memory status.
   2) When returned to the Vent/Bi-level mode after being converted to the different mode, fresh/recirculation shall maintain the memory status.
3. Initialization (Initial Battery Application)
   1) With battery applied, It controls with A/C OFF and the fresh mode.
   2) With Defroster or MIX in the blower ON mode, It controls with A/C ON and the fresh mode.
4. Memory Function
   1) The system control status prior to IG OFF shall be remembered and IG ON shall be controlled with the status prior to IG OFF (A/C & Blower is ON).
   2) Fresh/Recirculation shall be controlled by fresh in the IG OFF, independently from the prior status of IG ON. (Memory is preserved in the vent/Bi-level mode)
   3) Defroster, Mix logic shall be redone (Which is done irrelevant with the status prior to IG OFF)
5. MAX A/C Control
   1) When MAX A/C is selected, It controls with A/C ON, Fresh and Vent.
   2) When MAX A/C is cancelled, A/C, fresh/recirculation, controlled following the prior status.
   3) A/C, fresh/recirculation cannot be selected by user (Including the indicator)
   4) No change by the blower and temperature switch selection
6. Fresh/recirculation control by the blower
   1) The blower OFF in the vent/Bi-level mode → Blower ON, fresh/recirculation retain memory.
7. Floor selection control
   1) When Floor is selected, controlled by fresh

8. Compressor Control: Compressor ON/OFF
   1) With A/C ON , the A/C output signal turns ON/OFF according to the temperature that is identified by the thermostat (Duct sensor) for the evaporator frost prevention.



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9. A/C Control

Current status	The first selection button and working status		The second selection button and working status	
	Control factor	Working status	Control factor	Working status
A/C OFF, Blower OFF	A/C Button	- A/C OFF	Blower ON	- A/C OFF
	Mix, Defroster	- A/C OFF	Blower ON	- A/C ON - A/C Indicator ON
A/C OFF, Blower ON	A/C Button	- A/C ON - A/C Indicator ON	A/C Button	- A/C OFF
			Blower OFF	- A/C OFF
	Mix, Defroster MAX A/C	- A/C ON	Vent, Bi-level, Floor	- A/C OFF
		- A/C Indicator ON	Blower OFF Vent, Bi-level, Floor, Blower OFF	- A/C OFF - A/C OFF
		- A/C ON		

NOTICE

1. *At initial battery application, A/C OFF (A/C ON when the mode is mix, defroster, MAX A/C when the Blower is ON)*
2. *When IG ON, A/C will be controlled by the prior status. (A/C ON when the mode is mix, defroster, MAX A/C)*

10. Fresh/Recirculation Control

Current status	The first selection button and working status		The second selection button and working status	
	Control factor	Working status	Control factor	Working status
Recirculation	Recirculation Button	Fresh	Recirculation Button	Recirculation
	Mix, Defroster	Fresh	Vent, Bi-level, Floor	Recirculation
Fresh	Recirculation Button	Recirculation	Recirculation Button	Fresh
	Mix, Defroster	Fresh	Vent, Bi-level, Floor	Fresh

NOTICE

1. *With battery application and IG ON, control with fresh irregardless of the prior status (With MAX A/C, control with recirculation).*
2. *With IG ON, Fresh/recirculation is controlled by fresh (Fresh/recirculation maintain memory in the vent/Bi-level mode)*
3. *With IG OFF, Fresh/recirculation is fixed.*

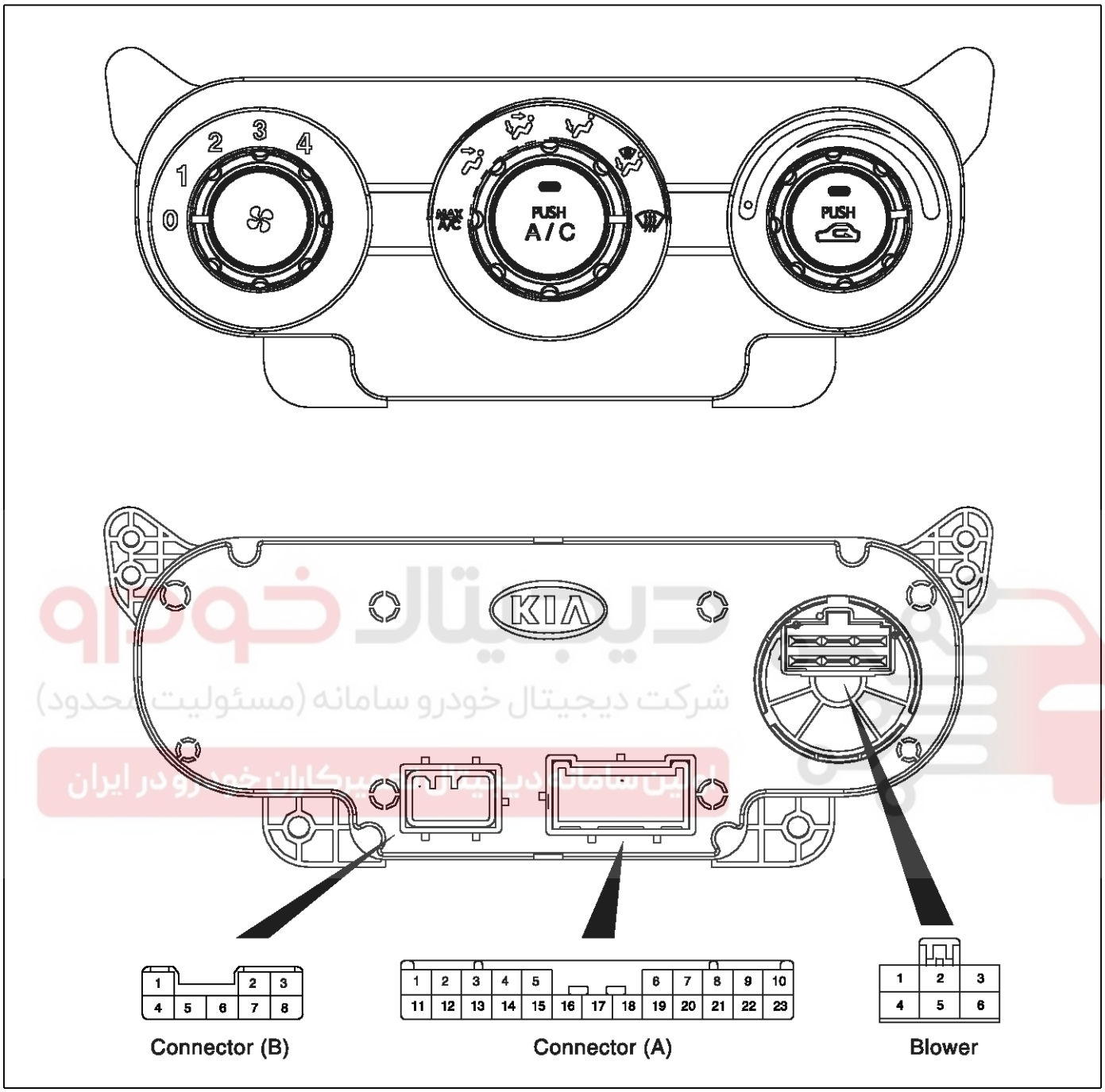
11. Dissolution & Reinstatement of logic.

1) Turn off the blower switch.
2) Move to defrost mode.
3) Press the intake button more than 5 times within 3 seconds.
4) Indicator of intake button is flashed 3 times.
5) Dissolution & reinstatement of logic is completed.
6) A/C and intake status is initialized to "A/C off" and "fresh status".

NOTICE

When the battery happens to be disconnected or discharged, the logic is reinstated.

COMPONENT



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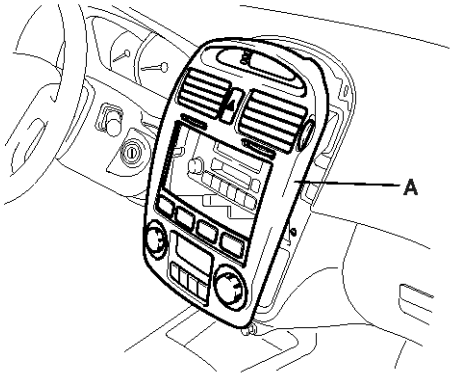
CONNECTOR PIN FUNCTION

CONNECTOR	PIN	FUNCTION	CONNECTOR	PIN	FUNCTION
Connector (a)	1	IG2	Connector (b)	1	N.C
	2	Battery (+)		2	N.C
	3	Tail lamp		3	Blower common
	4	Rheostat		4	PTC2 relay (coil-)
	5	Mix warm (P2)		5	PTC3 relay (coil-)
	6	Mix cool (P1)		6	N.C
	7	Mode defroster (P1)		7	Blower select (Low)
	8	Mode vent (P2)		8	PTC on signal (Low)
	9	Intake fresh (P1)	Blower	1	Middle high
	10	Intake recirculation (P2)		2	Blower common
	11	Ground		3	Ground
	12	Sensor ground		4	High
	13	Mix voltage		5	Middle low
	14	Mix feed back		6	Low
	15	N.C			
	16	A/C thermo (High)			
	17	N.C			
	18	A/C select (High)			
	19	Mode voltage			
	20	Mode feed back			
	21	Blower relay			
	22	Thermistor (Duct sensor)			
	23	Blower motor feed back			

REPLACEMENT

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



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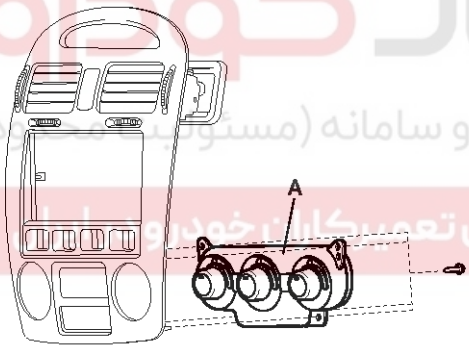
3. Disconnect the connectors from the center facia.
4. Remove the blower And A/C control unit(A).



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5. Install in the reverse order of removal.