

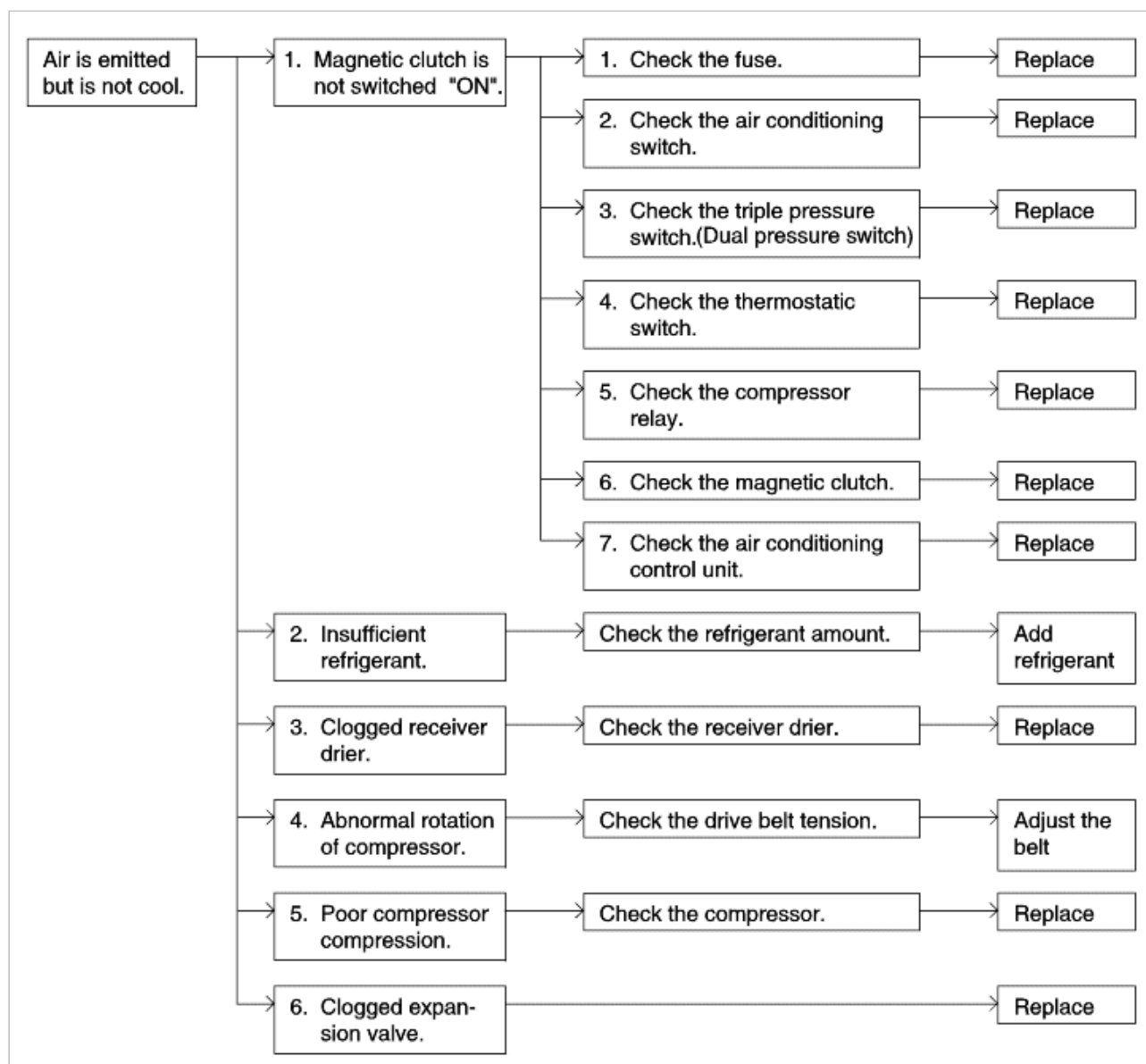


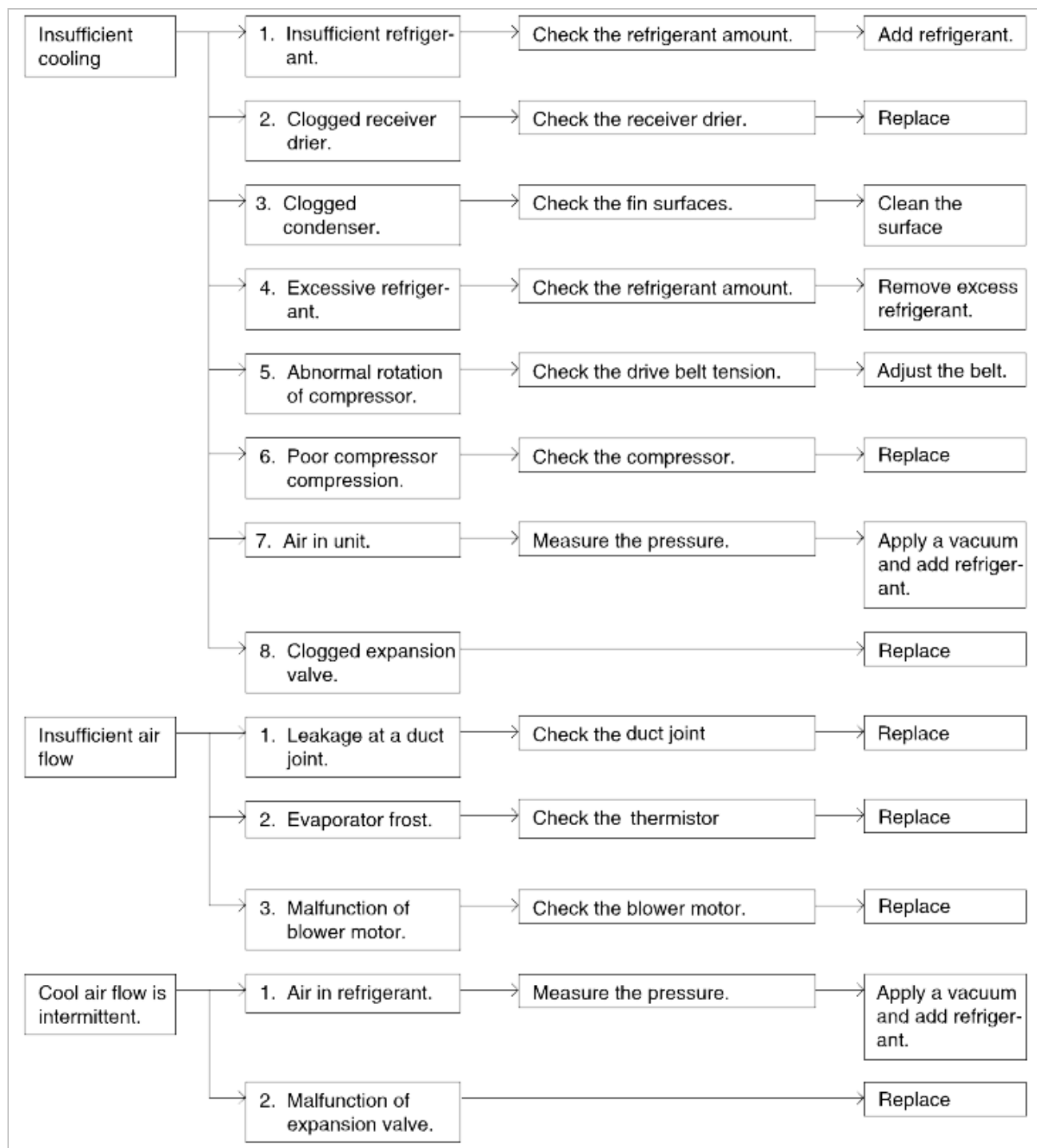
# Heating, Ventilation, Air Conditioning

General Information



## TROUBLESHOOTING







## SPECIFICATIONS

### A/CON

ITEM		GASOLINE		DIESEL
		Σ3.5	GV6	J3 TCI
Compressor	Type	HS-18 (Swash plate)	10PA17C(swash plate)	
	Oil type & Capacity	FD46XG (PAG), 210± 10cc	ND-Oil 8, 200cc	
Comp.pulley	Type	6PK	6PK	4PK
	Pulley Dia. [in(mm)]	Ø4.528 (Ø115)	Ø4.724(Ø120)	
Condenser	Type	Corrugated	←	←
Triple Pressure S/W (Dual pressure S/W)	High [psi (kg/cm <sup>2</sup> )]	455±28 (32.0 ± 2.0)	←	←
	Medium [psi (kg/cm <sup>2</sup> )]	256±11 (18.0 ± 0.8)	-	-
	Low [psi (kg/cm <sup>2</sup> )]	32.7± 3.60 (2.3± 0.25) 4.27 0.30	28.4±2.84(2.0±0.2)	
Expansion Valve Type		Block	←	←
Refrigerant	Type	R-134a	←	←
	Capacity [oz (g)]	35.27±0.88 (1,000±25)	35.27±0.88(1,000±25) : RHD 40.56±0.88(1,150±25) : Except RHD	

### BLOWER AND EVAPORATOR UNIT (Front)

ITEM		MANUAL	AUTO
Fresh and Recirculation	Operating method	Actuator	←
Blower	Rotating direction	Clockwise	←
	Speed step	1 - 4 Speed	AUTO + 7 Speed
	Speed control	Resistor	POWER TR & HI-RELAY
Evaporator	Type	Laminate	←
	Temp. control type	Thermister	←
	Thermistor	OFF: 36.5°F (2.5°C) ON: 45.5°F (7.5°C)	OFF: 34.7±32.9°F (1.5±0.5°C) ON: 38.3±32.9°F (3.5±0.5°C)
	Cooling capacity	4500 kcal/h ± 10%	←

### BLOWER AND EVAPORATOR UNIT (Rear)

ITEM		SPECIFICATION
Fresh and Recirculation	Operating method	Actuator
Blower	Rotating direction	Clockwise
	Speed step	1 - 3 Speed

	Speed control	Resistor
Evaporator	Type	Laminate
	Cooling capacity	4100 kcal/h $\pm$ 10%

#### HEATER UNIT

ITEM		FRONT	REAR
Heater mode selection	Type	Dimpled	←
	Heating capacity	4900 kcal/h $\pm$ 10%	←
	Operating method	Actuator	-
Temp selection	Operating method	Actuator	←

#### CONTROL UNIT

ITEM	MANUAL	AUTO
INCAR SENSOR	X	O
AMBIENT SENSOR	X	O
PHOTO SENSOR	X	O
HUMIDITY SENSOR	X	O
AQS SENSOR	X	O



# Heating, Ventilation, Air Conditioning

Air Conditioning System



## INSTRUCTIONS

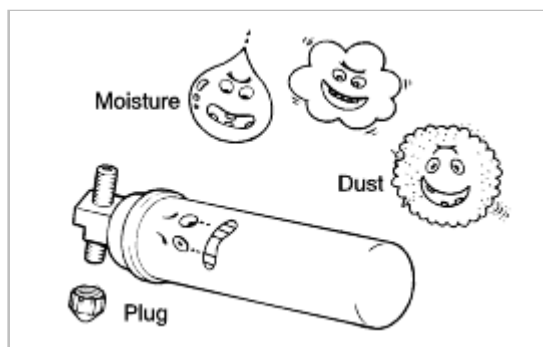
### WHEN HANDLING REFRIGERANT

1. R-134a liquid refrigerant is highly volatile. A drop on the skin of your hand could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands. If the refrigerant splashes into your eyes, wash them with clean water immediately.
3. The R-134a container is highly pressurized. Never leave it in a hot place, and check that the storage temperature is below 52°C (126°F).
4. A 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:
  - A. When removing refrigerant components from a vehicle, cap immediately the components to prevent from the entry of moisture.
  - B. When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
  - C. Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from taking on moisture.
  - D. 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.



### WHEN REPLACING PARTS ON A/C SYSTEM

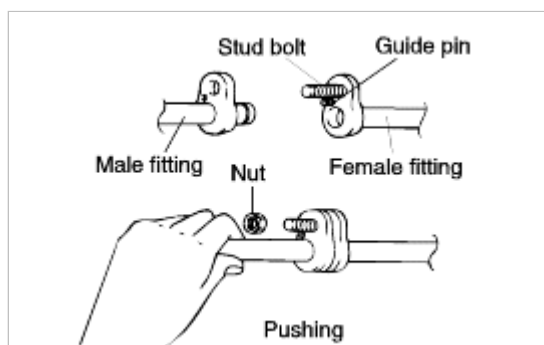
1. Never open or loosen a connection before discharging the system.
2. Seal the open fittings of components with a cap or plug immediately to prevent intrusion of moisture or dust.
3. Do not remove the sealing caps from a replacement component until it is ready to be installed.
4. Before connecting an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



## WHEN INSTALLING CONNECTING PARTS

### FLANGE WITH GUIDE PIN

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



Size	Tightening torque (N·m (kg·m, lb·ft))	
	General bolt, nut	
	4T	7T
M6	4 - 6 (0.4 - 0.6, 2.9 - 4.3)	7 - 11 (0.7 - 1.1, 5.0 - 7.9)
M8	9 - 14 (0.9 - 1.4, 6.5 - 10)	17 - 26 (1.7 - 2.6, 12 - 18)
M10	19 - 28 (1.9 - 2.8, 14 - 20)	35 - 55 (3.5 - 5.5, 25 - 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)

## 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 rebend 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.

## INSTRUCTIONS

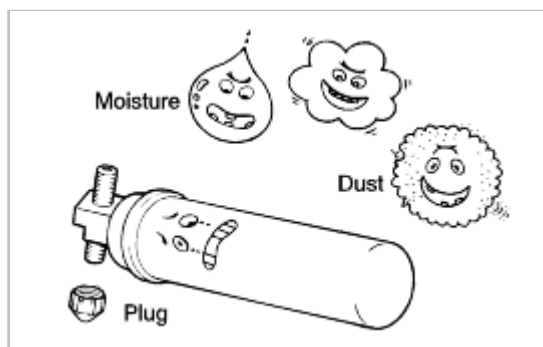
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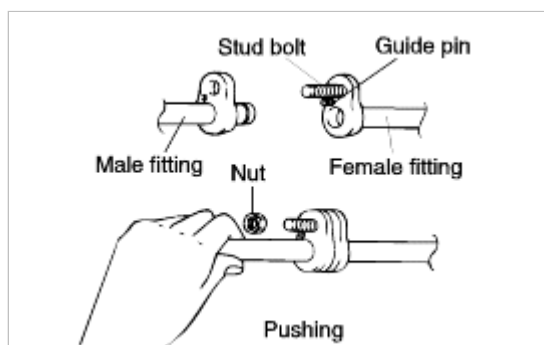
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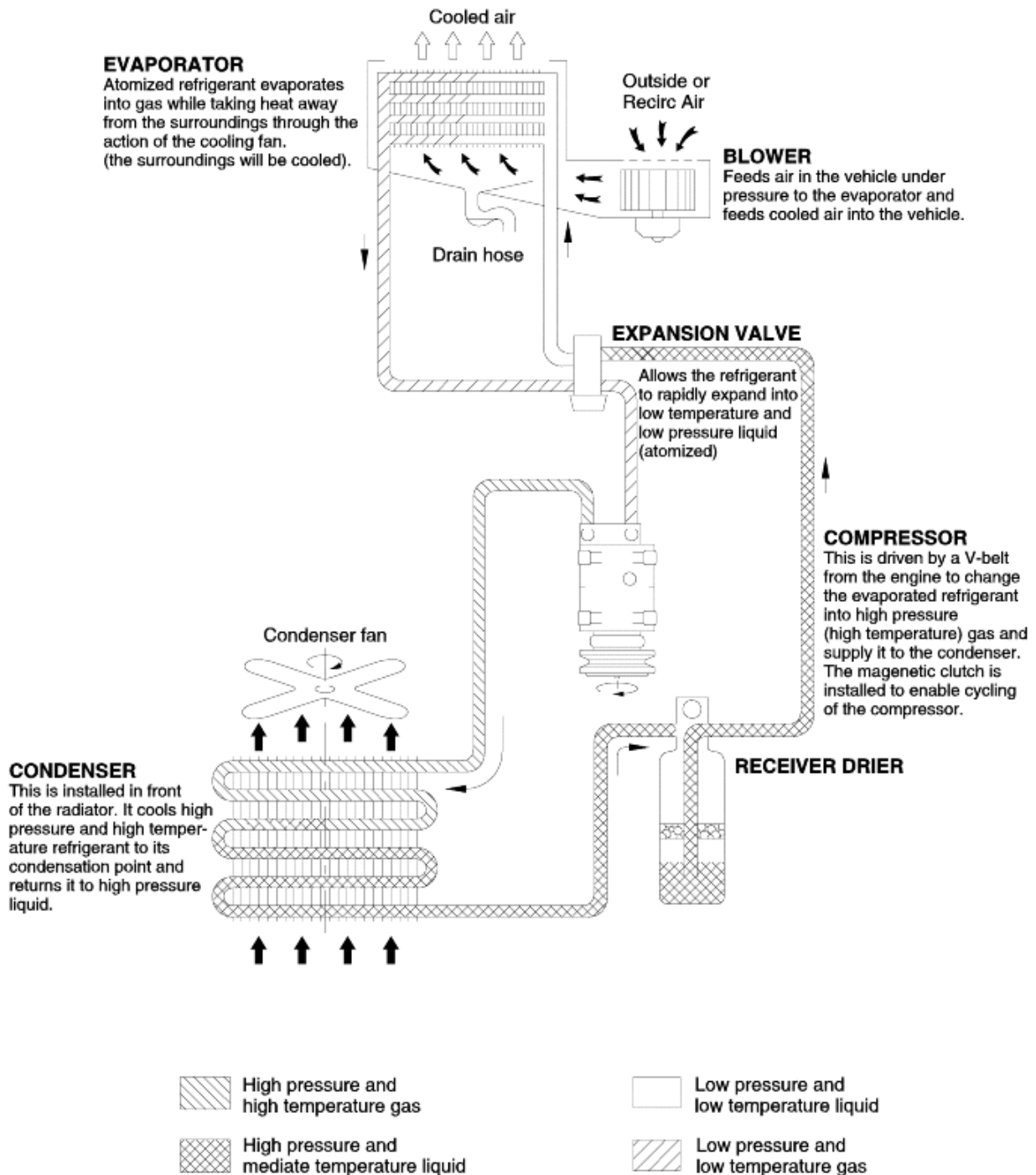
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## REFRIGERATION CYCLE





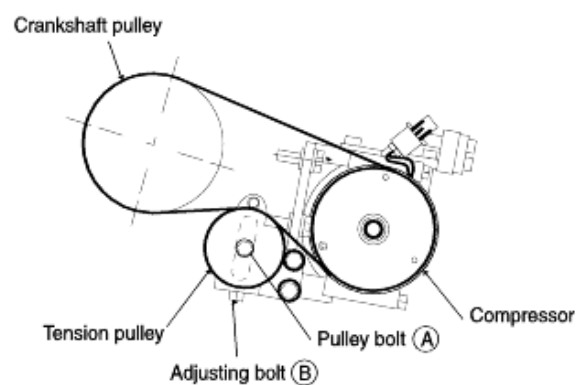
# Heating, Ventilation, Air Conditioning

Compressor

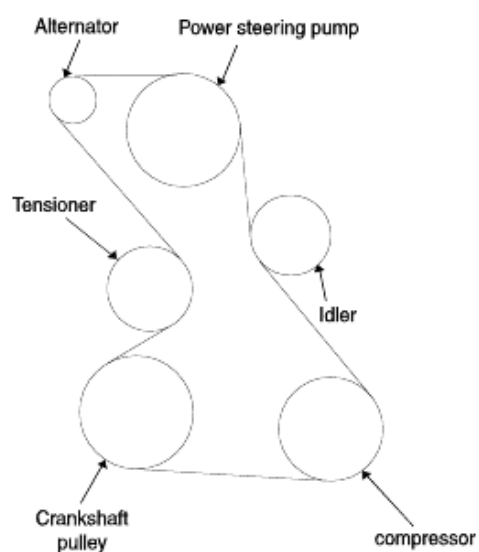


## COMPONENTS

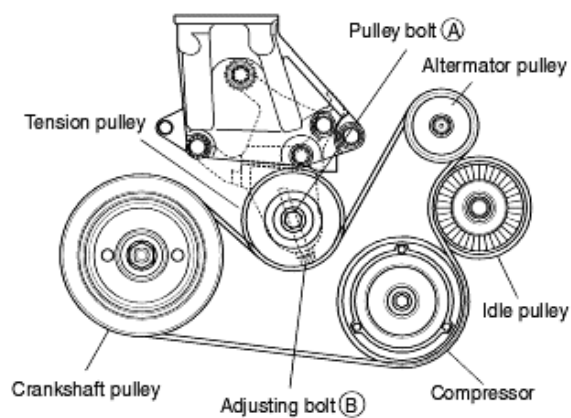
GV6 ENGINE



J3 TCI ENGINE



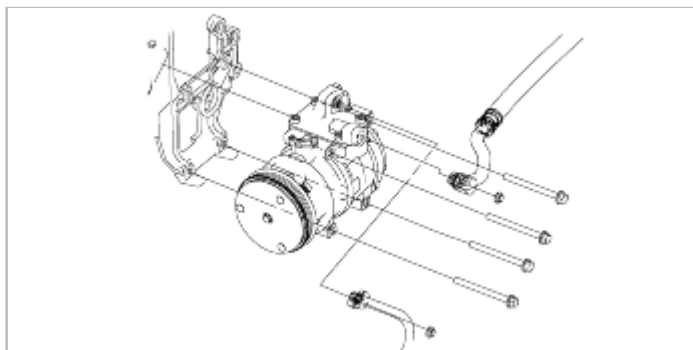
Σ3.5 ENGINE





## REMOVAL AND INSTALLATION

1. Remove the drive belt by referring to the "EM Group" (J3 TCI)
2. Remove the drive belt after loosening the tension pulley. (GV6, Σ3.5)
3. Discharge the refrigerant.
4. Remove the discharge and suction hoses.
5. Remove the compressor.



6. Installation is the reverse of removal.

### Tightening torque

20-30 N·m(2.0~3.0 kg-m, 14-21 lb-ft)-GV6, Σ3.5

24-36 N·m(2.4~3.6 kg-m, 17-26 lb-ft)-J3 TCI

## Adjustment

1. Adjust the deflection of the drive belt by referring to the "EM Group" (J3 TCI)
2. Loosen the pulley bolt A.
3. Turn the adjusting bolt B and adjust the deflection of the drive belt to the within specification.

Belt	Deflection: When applying moderate pressure 98N (10kg, 22lb)
New	8~9 (0.31~0.35 in)
Old	9~10 (0.35 ~0.39 in)

4. Tighten the pulley bolt A.



# Heating, Ventilation, Air Conditioning

Compressor Oil





## COMPRESSOR OIL

Oil lubricates the compressor and circulates in the system while the compressor is operating. Whenever replacing any component of the system, or when a large amount of gas leakage occurs, add oil to maintain the original total amount of oil.

### HANDLING OF OIL

1. The oil should be free from moisture, dust, metal filings, etc.
2. Do not mix oils.
3. The moisture content in the oil increases when exposed to the air for prolonged periods. After use, seal the container immediately.

### OIL RETURN OPERATION

To check the oil level or add the oil, idle the engine for 20-30 minutes with the controls set to maximum cooling and blower level, to return the lubricant to compressor.

### CHECKING AND ADDING OF COMPRESSOR OIL LEVEL

In order to add oil to an operating compressor, check the compressor oil using the following procedure:

1. Stop the engine, discharge the refrigerant, and dismantle the compressor from the vehicle.
2. Pour oil from the system line outlet.



3. Check the volume of the discharged oil. If it is less than 70cc, it means there is little leak. Perform the leakage test on each system connection, and repair or replace faulty parts if necessary.
4. Check the oil for contamination and replenish the oil level in the following procedure:



A. When oil is clean

Discharge	Setting
Above 70cc	Oil level is normal. Add an equal amount of discharged oil.
Below 70cc	Oil level is low. Add 70cc of oil.

B. If the oil is contaminated with metal fragments or other material, clean the receiver drier after charging

the refrigerant.

## CHECKING FOR REFRIGERANT LEAKS

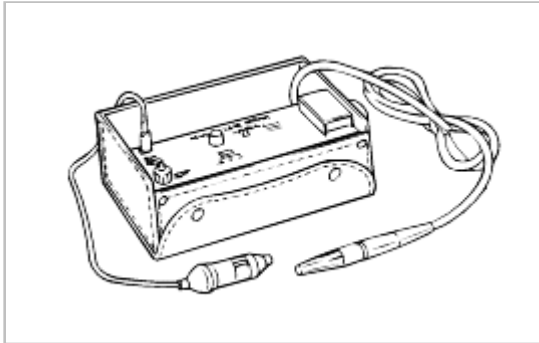
Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

### 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.





# Heating, Ventilation, Air Conditioning

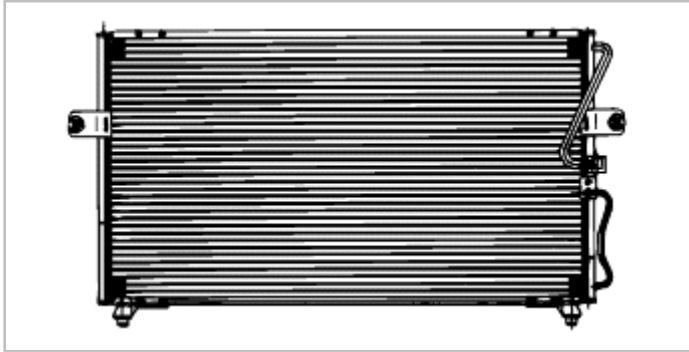
Condenser Fan & Relay



## CHECKING

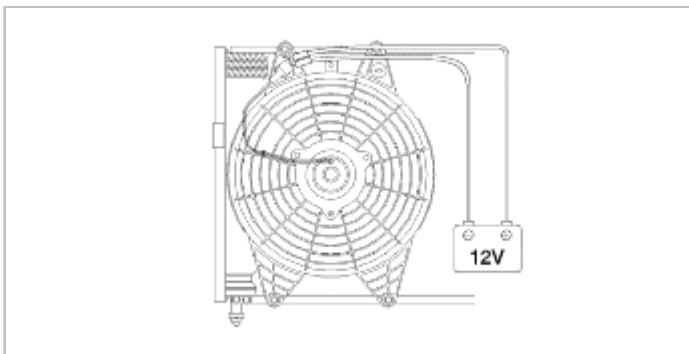
### CONDENSER

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



### 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.





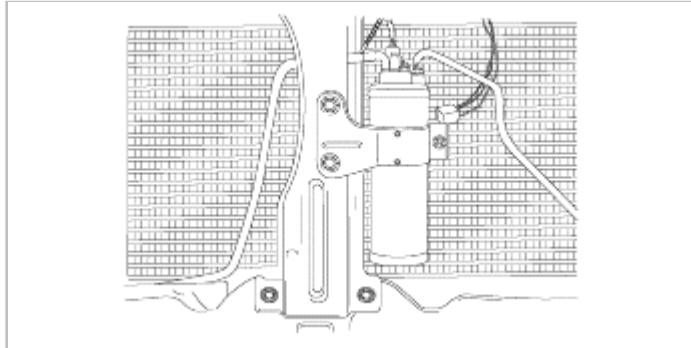
# Heating, Ventilation, Air Conditioning

Receiver / Drier



## Check

1. Check the fusible plug and the fittings for leakage, using a leak detector.
2. Run the engine at fast idle with the air conditioning "ON", and check both the inlet and outlet temperatures. If the difference in temperatures between the inlet and outlet is large, replace the receiver-drier.



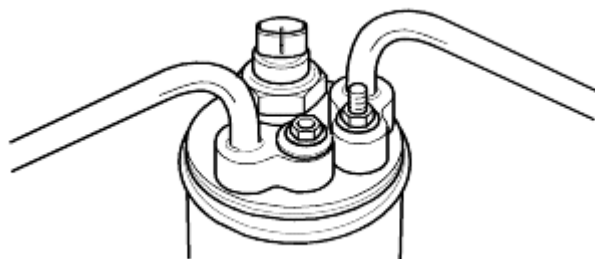
### NOTICE

1. Plug the all open fittings immediately to keep moisture out of the system.
2. Do not remove plugs until ready for connection.
3. If the receiver-drier is replaced with a new unit, add 40cc of compressor oil to the compressor.
4. Evacuate, charge and test the refrigeration system.

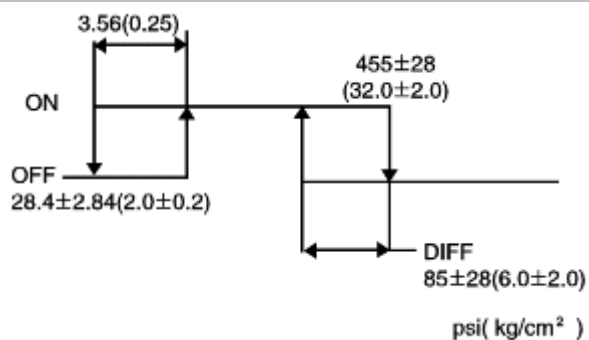


# Heating, Ventilation, Air Conditioning

Dual Pressure Switch

**DESCRIPTION (GV6, J3 TCI)****OPERATING CHARACTERISTIC**

psi( kg/cm <sup>2</sup> )		
Pressure	ON	DIFF
High	455±28(32.0±2.0)	85±28(6.0±2.0)
Low	28.4±2.84(2.0±0.2)	Max 3.56( 0.25)







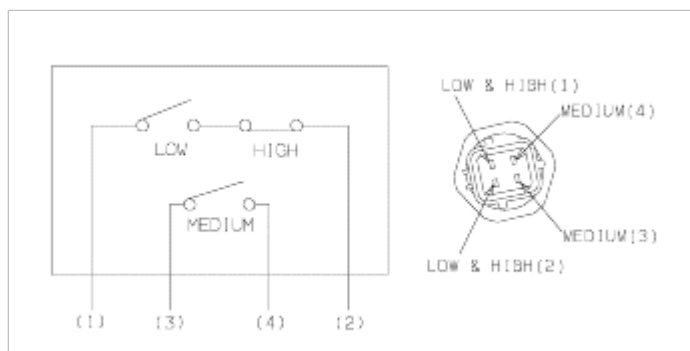
# Heating, Ventilation, Air Conditioning

Tripple Pressure Switch



## DESCRIPTION

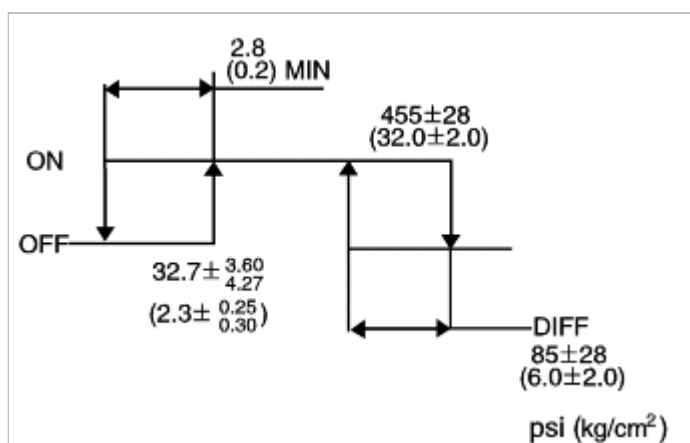
The triple switch is a combination of a medium switch as well as conventional low pressure and high pressure switches. The low pressure switch will be turned off to stop compressor operation if refrigerant pressure is low. The high pressure switch will be turned off to stop compressor operation if refrigerant 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.



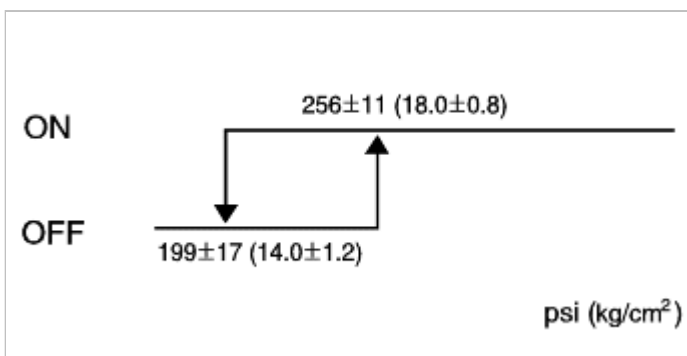
## OPERATING CHARACTERISTIC

psi (kg/cm <sup>2</sup> )		
Pressure	ON	OFF (DIFF)
High	455±28 (32.0±2.0)	85±28 (6.0±2.0)
Low	32.7± $\frac{3.60}{4.27}$ (2.3± $\frac{0.25}{0.30}$ )	2.8 (0.2)
Medium	256±11 (18.0±0.8)	199±17 (14.0±1.2)

## LOW & HIGH



## MEDIUM



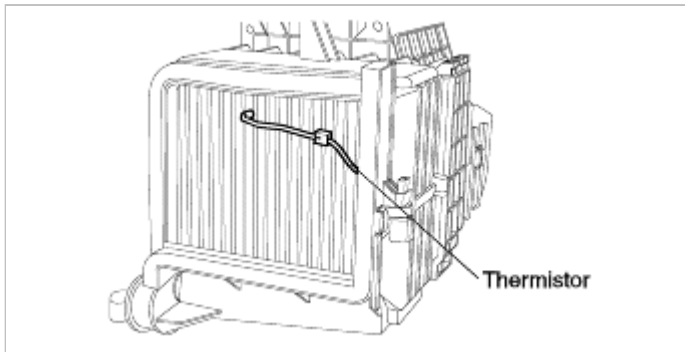


# Heating, Ventilation, Air Conditioning

Thermistor



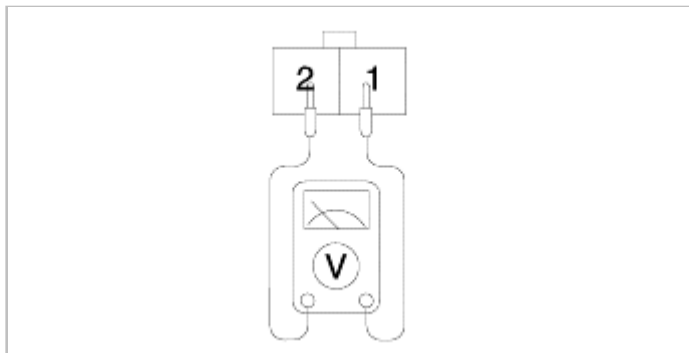
## SENSOR CHECKING



### THERMISTOR CHECK

1. Remove the glove box.
2. Start the engine.
3. Turn on the air conditioner.
4. Using the multi-tester, check the output voltage between terminals 1 and 2 in the thermistor.

Thermistor	Operating temperature (Manual)	Operatng temperature (Auto)	Output voltage
ON	45.5°F (7.5°C)	38.3±32.9°F (3.5±0.5°C)	0V
OFF	36.5°F (2.5°C)	34.7±32.9°F (1.5±0.5°C)	12V





# Heating, Ventilation, Air Conditioning

Magnetic Clutch

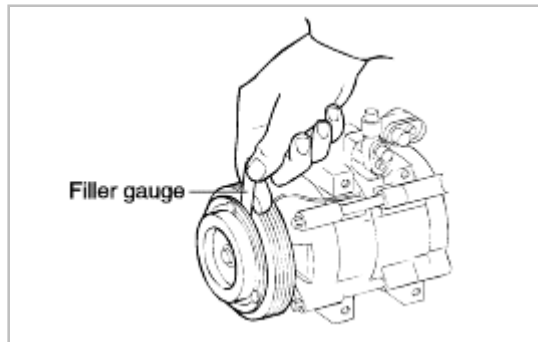


## CHECKING THE CLUTCH AIR GAP

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

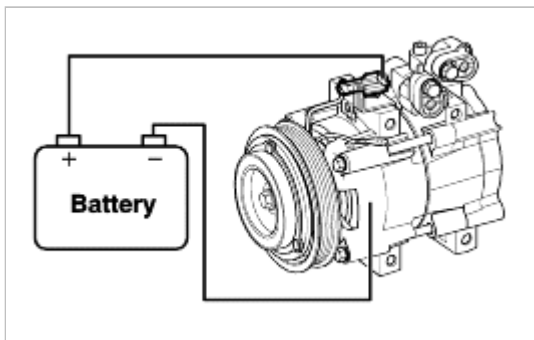
Clutch air gap : 0.35 - 0.65mm

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.





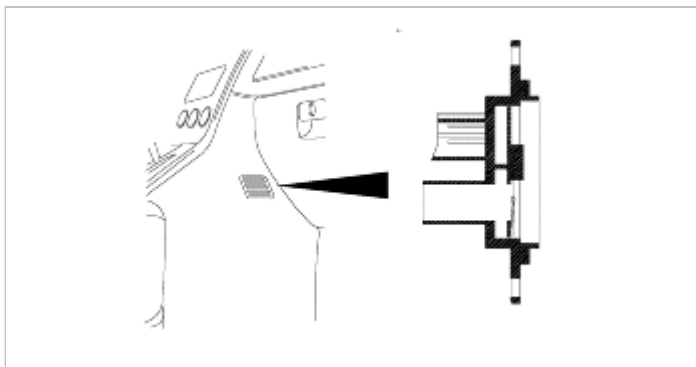
# Heating, Ventilation, Air Conditioning

In-car Sensor

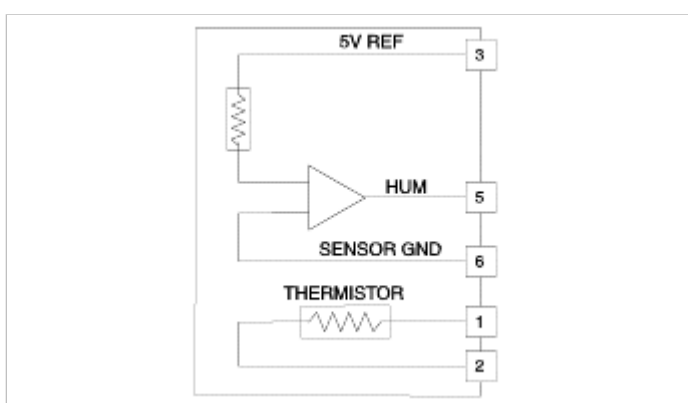




## IN-CAR AIR TEMPERATURE SENSOR



It will detect interior temperature, which will be used for discharge temperature control, sensor failsafe, temperature door control, blower motor level control, A/C auto control.

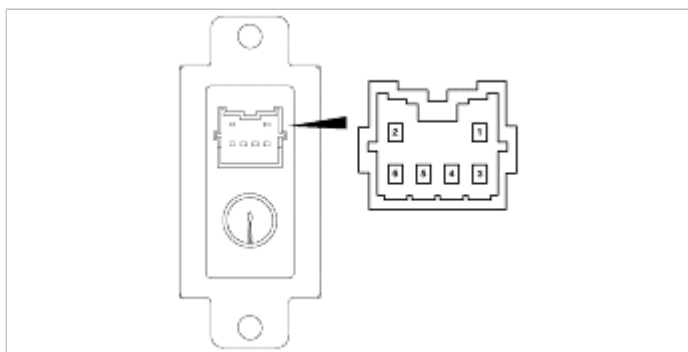


Check resistance of the sensor

Temperature [°C(°F)]	Resistance between 1 and 2 ( $\Omega$ )
18 (64.4)	3403
21 (69.8)	2976
25 (77.0)	2500
28 (82.4)	2199
32 (89.6)	1862

### NOTICE

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



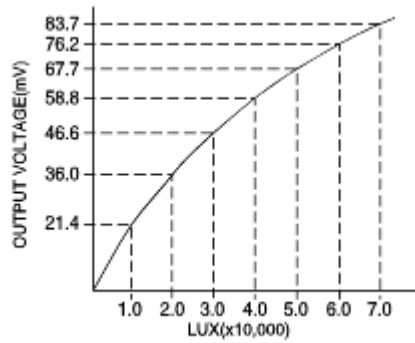


# Heating, Ventilation, Air Conditioning

Photo Sensor

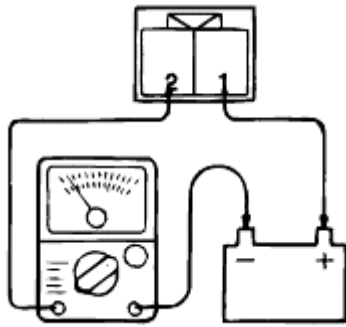


## DESCRIPTION



### NOTICE

Emit intensive light toward driver side and passenger side using a lamp, and check the voltage change between terminals 1 & 2.





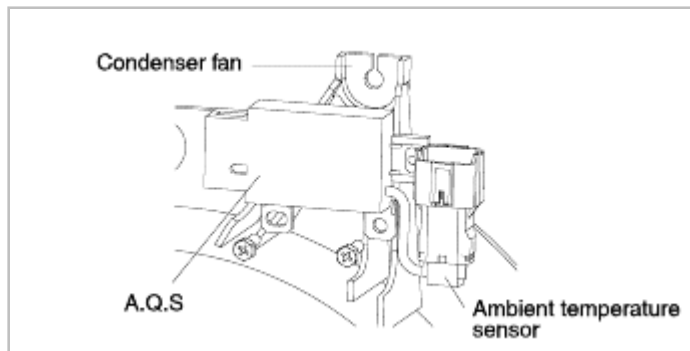
# Heating, Ventilation, Air Conditioning

Ambient Sensor

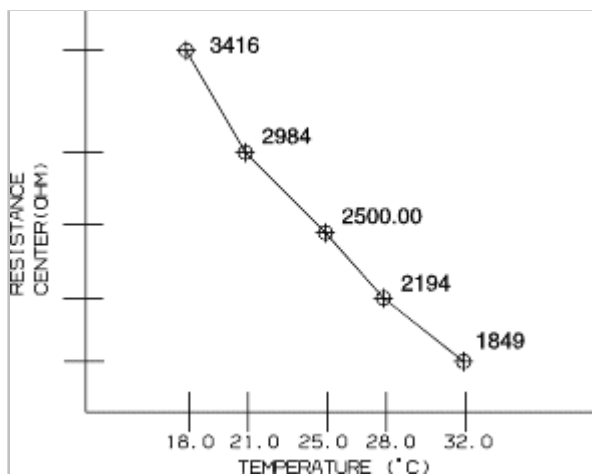


## DESCRIPTION

1. The air temperature sensor is located at the front of the condenser fan and detect ambient air temperature. It is a negative type thermistor; resistance will increase with lower temperature, and decrease with higher temperatures.

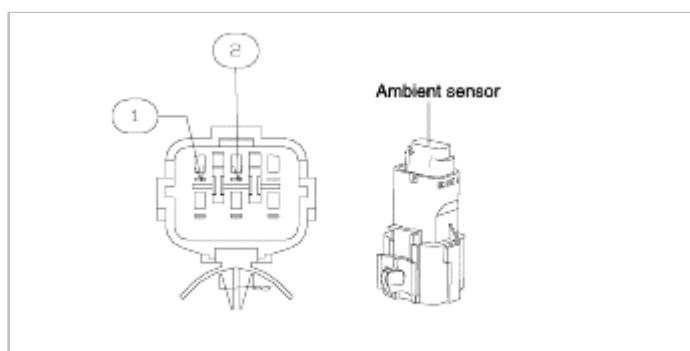


2. The sensor output will be used for discharge temperature sensor, sensor fail-safe, temperature regulation door control, blower motor level control, mix mode control and in-car humidity control.



### CHECK

Temperature [°C(°F)]	Resistance between 1 and 2(Ω)
18 (64.4)	3416
21 (69.8)	2984
25 (77.0)	2500
28 (82.4)	2194
32 (89.6)	1849





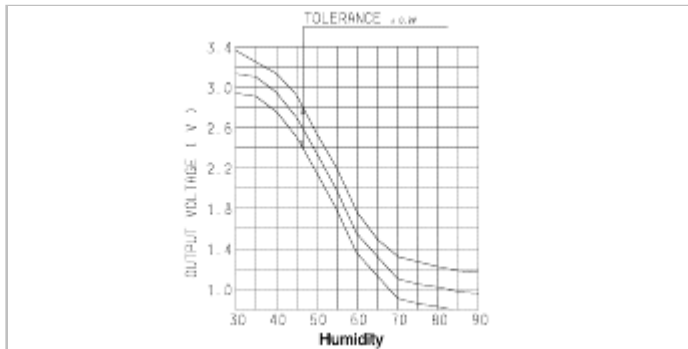
# Heating, Ventilation, Air Conditioning

The Other Air Conditioning System



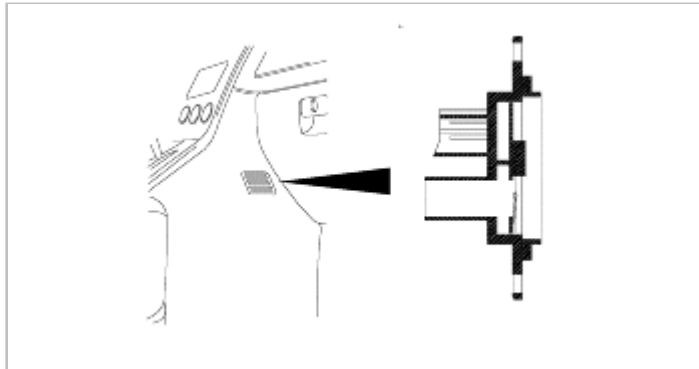
## HUMIDITY SENSOR

- Humidity sensor is located at crush pad and detected in-car humidity for in-car humidity control.



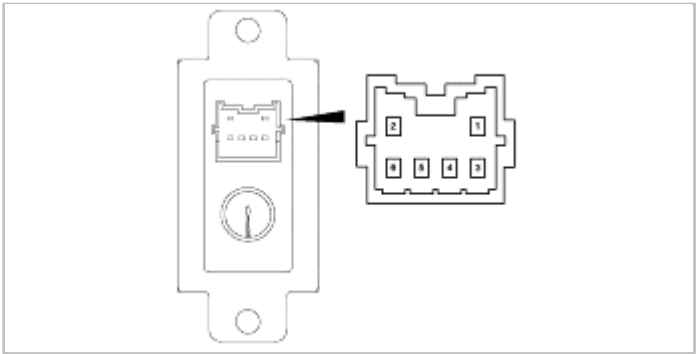
- If ambient air temperature or in-car humidity is outside certain range, it will turn on A/C to control in-car humidity preventing in-car fogging.

Air conditioner operation depending on ambient temperature and humidity



### SENSOR OUTPUT

Humidity (%)	Voltage between 5 and 6(V)
30	3.13
35	3.07
40	2.94
45	2.67
50	2.35
55	2.01
60	1.54
65	1.29
70	1.12
75	1.05
80	1.01
85	0.98
90	0.94







## 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 a R-134a refrigerant Recovery/Recycling/Charging System to the high-pressure service port and the low-pressure service port as shown, following the equipment manufacturer's instructions.



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.

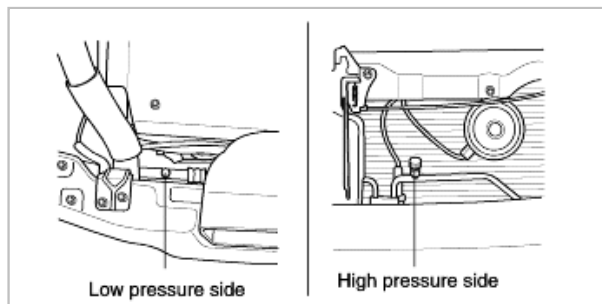
#### CAUTION

- 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 a 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 a R-134a refrigerant Recovery/Recycling/Charging System to the high-pressure service port and the low-pressure service port as shown, following the equipment manufacturer's instructions.



3. If the low-pressure does not reach more than 93.3 kPa(700 mmHg, 27.6 in.Hg) in 15 minutes, there is probably a leak in the system. Partially charge the system, and check for leaks (see Leak Test.)

### SYSTEM CHARGING

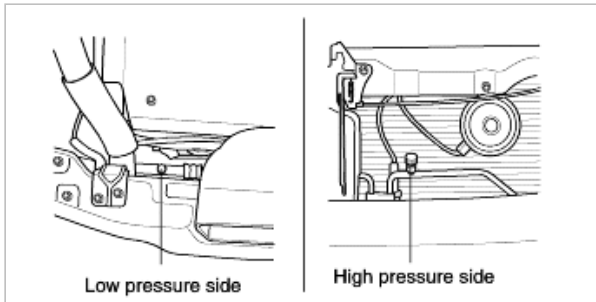
Use only service equipment that is U.L.-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

#### 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.

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



Add the same amount of new refrigerant oil to system that was removed during recovery. Use only Specified refrigerant oil. Charge the system with R-134a refrigerant. Do not overcharge the system the compressor will be damaged.

### REFRIGERANT LEAK TEST

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.

R-134a service equipment or vehicle air conditioning systems should not be pressure tested or leak tested with compressed air.

#### WARNING

- Compressed air mixed with R-134a forms a combustible vapor.
- The vapor can burn or explode causing serious injury.
- Never use compressed air to pressure test r-134a service equipment or vehicle air conditioning systems.

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

1. Connect a R-134a refrigerant Recovery/Recycling/Charging System to the high-pressure service port and the low-pressure service port as shown in the previous column, following the equipment manufacturer's instructions.
2. Open the high-pressure valve to charge the system to the specified capacity, then close the supply valve, and remove the charging system couplers.

---

Refrigerant capacity : 1000±25g (35.27±0.88 oz) - Σ3.5 E/G, RHD 1150±25g (40.56±0.88 oz) - GV6, J3TCI (Except RHD)

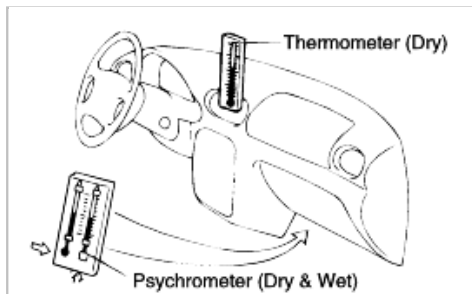
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3. Check the system for leaks using a R-134a refrigerant leak detector with an accuracy of 14g(0.5 oz) per year or better.
4. If you find leaks that require the system to be opened (to repair or replace hoses, fittings, etc.) recover the system according to the Recovery Procedure.
5. After checking and repairing leaks, the system must be evacuated.

### PERFORMANCE TEST

1. Install the manifold gauge set.
2. Run the engine at 2,000 rpm and set the controls for maximum cooling and high blower speed.

3. Keep all windows and doors open.
4. Place a dry-bulb thermometer in the cool air outlet.
5. Place a wet-dry thermometer close to the inlet of the cooling unit.
6. Check that the reading on the high pressure gauge is 1,373-1,575 kPa (14-16 kg/cm<sup>2</sup>, 199-228 psi). If the reading is too high, pour water on the condenser. If the reading is too low, cover the front of the condenser.
7. Check that the reading on the dry-bulb thermometer at the air inlet is 25-35°C (77-95°F).
8. Calculate the relative humidity from the psychrometric graph by comparing the wet and dry-bulb readings at the air inlet.



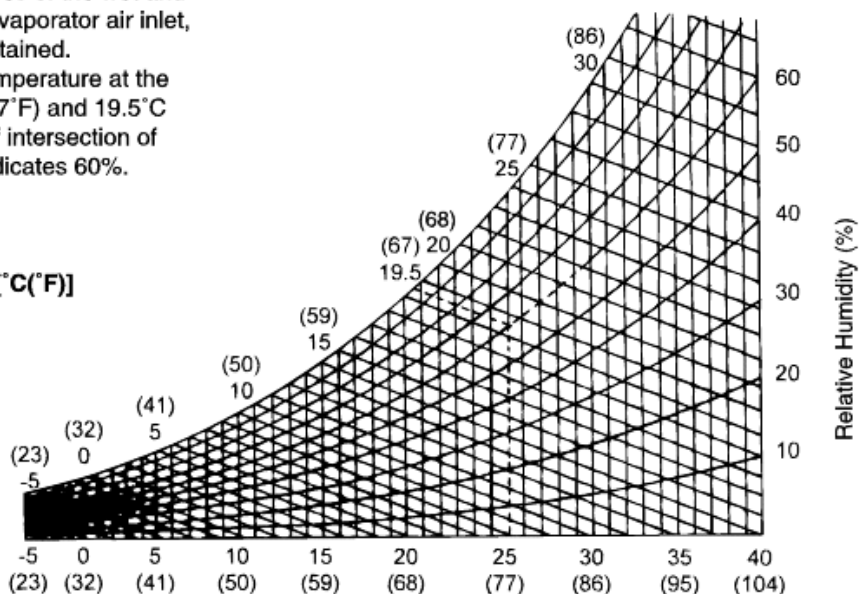
#### HOW TO READ THE GRAPH :

After measuring the temperatures of the wet and dry-bulb thermometers at the evaporator air inlet, relative humidity (%) can be obtained.

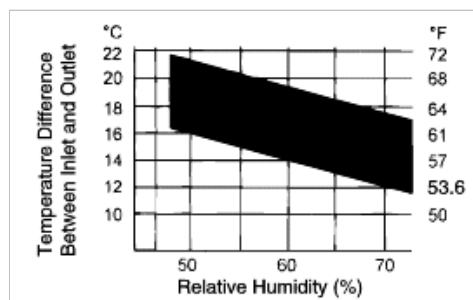
Example : Dry and wet-bulb temperature at the evaporator air inlet are 25°C (77°F) and 19.5°C (67°F) respectively, the point of intersection of the dotted lines in the graph indicates 60%.

#### WET-BULB TEMPERATURE [°C(°F)]

100	(212)
90	(194)
80	(176)
70	(158)
60	(140)
50	(122)
40	(104)
30	(86)
20	(68)
10	(50)



9. Measure the dry-bulb temperature at the cool air outlet, and calculate the difference between the inlet dry-bulb and outlet dry-bulb temperatures.
10. Check that the intersection of the relative humidity and temperature difference falls within the block below.  
If the intersection is within the block, cooling performance is satisfactory.

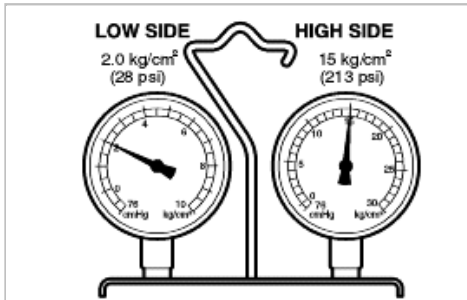


## PERFORMANCE TEST DIAGNOSIS USING MANIFOLD GAUGE

### STANDARD VALUE

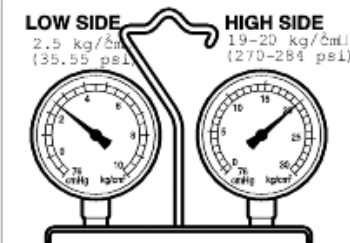
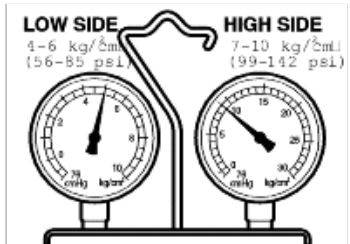
If cooling cycle is operating normally, the manifold gauge reading will be approx. 1.5-2.0 kg/cm<sup>2</sup> (21-28 psi) for the low pressure

side and approx. 14.5-15kg/cm<sup>2</sup>(206-213psi) for the high pressure side. Inlet temperature should be 30-35°C(80-95°F), with the engine at 2,000 rpm, maximum cooling selected, and the blower on highest level.



#### DIAGNOSIS

SYMPTOMS	PROBABLE CAUSES	REMEDY	MANIFOLD GAUGE READINGS
<ol style="list-style-type: none"> <li>1. Low pressure and high pressure are low.</li> <li>2. Cooler outlet air is a little cooler.</li> </ol>	<ul style="list-style-type: none"> <li>• Gas leak.</li> </ul>	<ul style="list-style-type: none"> <li>• Check and repair.</li> <li>• Add refrigerant.</li> </ul>	
<ol style="list-style-type: none"> <li>1. Low pressure and high pressure are high.</li> </ol>	<ul style="list-style-type: none"> <li>• Faulty cooling or condenser freezing.</li> <li>• Belt slip.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain the proper level of refrigerant. Clean the condenser.</li> <li>• Adjust the belt.</li> </ul>	
<ol style="list-style-type: none"> <li>1. Low pressure and high pressure are high.</li> <li>2. Low pressure pipe is not cold.</li> </ol>	<ul style="list-style-type: none"> <li>• Air in the system.</li> </ul>	<ul style="list-style-type: none"> <li>• Clean or repair the receiver drier.</li> <li>• Check for oil contamination.</li> </ul>	
<ol style="list-style-type: none"> <li>1. Low pressure side indicates negative pressure and high pressure side indicates low pressure.</li> <li>2. Frost or dew on pipes connected with receiver or expansion valve.</li> </ol>	<ul style="list-style-type: none"> <li>• Dust or moisture frozen at expansion valve.</li> <li>• Gas leak.</li> </ul>	<ul style="list-style-type: none"> <li>• Repair the receiver drier and replace the expansion valve.</li> <li>• Replace the expansion valve if the receiver-drier is faulty.</li> </ul>	
<ol style="list-style-type: none"> <li>1. Low pressure side pressure sometimes goes to negative pressure or normal.</li> </ol>	<ul style="list-style-type: none"> <li>• Intaken moisture is frozen at expansion valve hole.</li> </ul>	<ul style="list-style-type: none"> <li>• Repair and bleed receiver drier</li> </ul>	

<ol style="list-style-type: none"> <li>1. Low pressure and high pressure are high.</li> <li>2. Much frost or dew on the low pressure side piping.</li> </ol>	<ul style="list-style-type: none"> <li>• Expansion valve failure. Receiver-drier faulty.</li> </ul>	<ul style="list-style-type: none"> <li>• Repair receiver drier.</li> <li>• Check oil contamination.</li> </ul>	 <p><b>LOW SIDE</b> 2.5 kg/cm<sup>2</sup> (35.55 psi)</p> <p><b>HIGH SIDE</b> 19-20 kg/cm<sup>2</sup> (270-284 psi)</p>
<ol style="list-style-type: none"> <li>1. Low pressure side pressure is high and high pressure side pressure is low.</li> </ol>	<ul style="list-style-type: none"> <li>• Leak inside compressor.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace compressor.</li> </ul>	 <p><b>LOW SIDE</b> 4-6 kg/cm<sup>2</sup> (56-85 psi)</p> <p><b>HIGH SIDE</b> 7-10 kg/cm<sup>2</sup> (99-142 psi)</p>



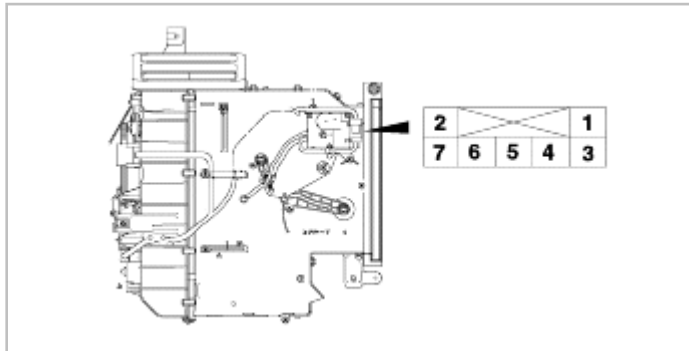
# Heating, Ventilation, Air Conditioning

Heater - Temperature Control Actuator



## INSPECTION (Front)

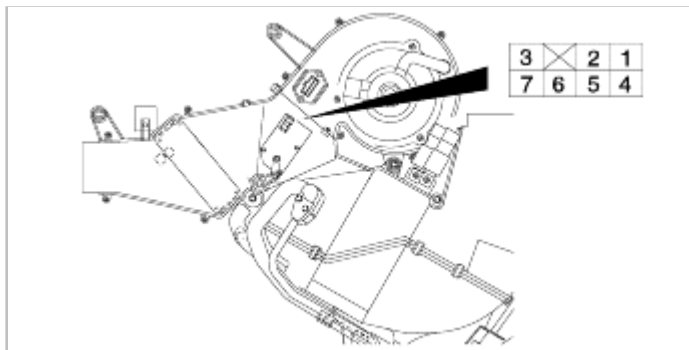
1. Temperature control actuator is installed in the heater unit case. The control switches and the vent duct switch will operate actuator to regulate the temperature and discharge air.



2. Verify that the temp actuator operates to the warm position when connecting 12V to the terminal 1 and grounding terminal 3.
3. Verify that the temp actuator operates to the cool position when connecting in the reverse.

## INSPECTION (Rear)

1. Temperature control actuator is installed in the rear heater unit case. The control switches and the vent duct switch will operate actuator to regulate the temperature and discharge air.



2. Verify that the temp actuator operates to the warm position when connecting 12V to the terminal 4 and grounding terminal 6.
3. Verify that the temp actuator operates to the cool position when grounding terminal 3.



# Heating, Ventilation, Air Conditioning

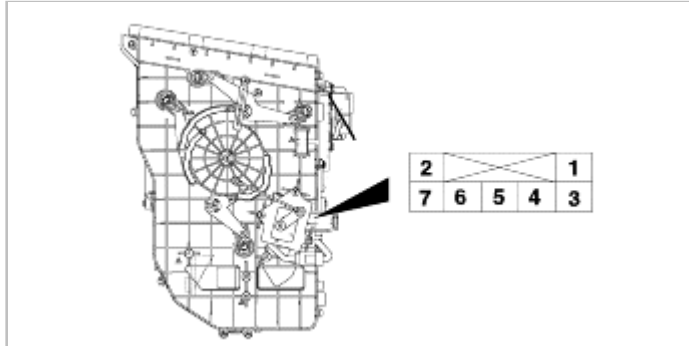
Heater - Mode Control Actuator





## INSPECTION

1. Apply 12V to mode actuator terminal 2 and ground terminal 1.
2. Verify that the mode actuator operates as below when grounding terminals 3,4,5,6 and 7 in sequence.  
VENT → BI/LEVEL → HEAT → D/F → DEF





# Heating, Ventilation, Air Conditioning

Blower



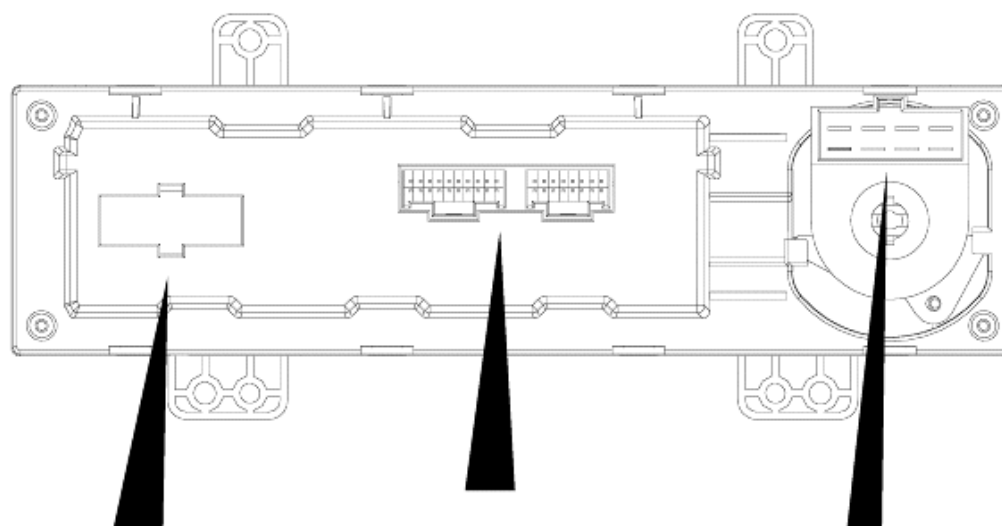
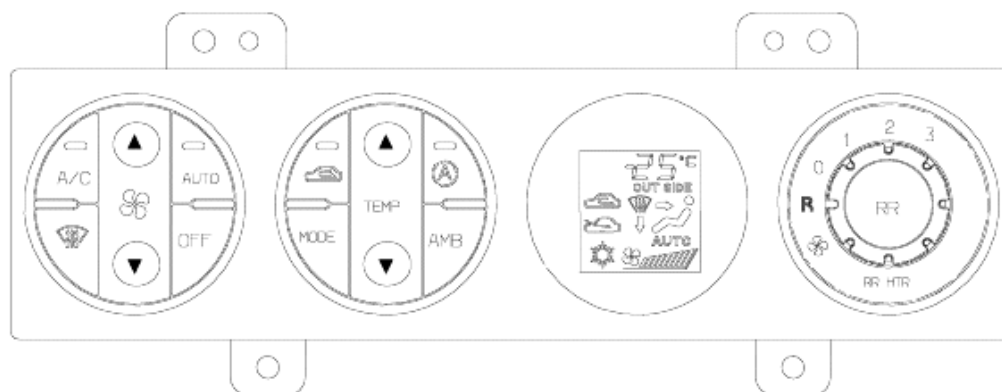
## AUTO A/CON OPERATION TABLE

Previous condition before operating switch		TEMPERATURE CONTROL	COMPRESSOR CONTROL		INTAKE CONTROL		BLOW CONTROL		MODE CONTROL	
		AUTO	AUTO	MANUAL	AUTO	MANUAL	AUTO	MANUAL	AUTO	MANUAL
Operate switch										
AUTO SW		AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO
OFF SW		AUTO	OFF	OFF	AUTO	MAINTENANCE	OFF	OFF	FIX	MAINTENANCE
BLOWER SW		AUTO	AUTO	MAINTENANCE	AUTO	MAINTENANCE	INCREASE/REDUCE BY 1 STEP	INCREASE/REDUCE BY 1 STEP	AUTO	MAINTENANCE
A/C SW		AUTO	ON -> OFF OFF -> ON	ON -> OFF OFF -> ON	AUTO	MAINTENANCE	AUTO	MAINTENANCE	AUTO	MAINTENANCE
MODE SW		AUTO	MAINTENANCE	MAINTENANCE	AUTO	MAINTENANCE	AUTO	MAINTENANCE	Vent->B/L B/L->Heat Heat->D/H D/H->Def	Vent->B/L B/L->Heat Heat->D/H D/H->Vent Def->Heat
DEF SW		AUTO	FORCIBLE TURN ON	FORCIBLE TURN ON	FRE	FRE	AUTO	MAINTENANCE	DEF	DEF
REC SW		AUTO	MAINTENANCE	MAINTENANCE	FRE, 1/3FRE -> REC REC->FRE	REC->FRE FRE->REC	AUTO	MAINTENANCE	MAINTENANCE	MAINTENANCE
AQS SW		AUTO	MAINTENANCE	MAINTENANCE	REC->FRE FRE->REC	REC->FRE FRE->REC	AUTO	MAINTENANCE	MAINTENANCE	MAINTENANCE
TEMP SW	17	MAX COLD	FORCIBLE TURN ON	MAINTENANCE	REC	MAINTENANCE	MAX HI	MAINTENANCE	VENT	MAINTENANCE
	18 ~ 31	AUTO	AUTO	MAINTENANCE	AUTO	MAINTENANCE	AUTO	MAINTENANCE	AUTO	MAINTENANCE
	32	MAX HOT	AUTO	MAINTENANCE	AUTO	MAINTENANCE	AUTO HI	MAINTENANCE	AUTO	MAINTENANCE



## FULL AUTOMATIC AIR CONDITIONER (FATC)

### CONTROL RANEL



3g	3e	3c	3a
3h	3f	3d	3b

Connector (B)

2a	2m	2k	2l	2g	2e	2c	2a
2p	2n	2j	2h	2f	2d	2b	

Main connector (A)

1s	1q	1o	1m	1k	1i	1g	1e	1c	1a
1t	1r	1p	1n	1l	1j	1h	1f	1d	1b

4g	4e	4c	4a
4h	4f	4d	4b

Rear blower  
connector (C)

### CONNECTOR PIN DESCRIPTION

Item	PIN NO.	PIN Name	Item	PIN NO.	PIN Name
Main Connector (A)	1a	ILL +	Connector (B)	3a	-
	1b	ILL -		3b	-
	1c	Intake Fre		3c	-

1d	Intake Rec		3d	-
1e	Intake 1/3 Fre		3e	-
1f	Blower on		3f	-
1g	Vcc (5V) ; sensor Vref		3g	-
1h	Sensor ground		3h	-
1i	Mix PBR			
1j	Mix cool			
1k	Mix warm			
1l	Mode vent			
1m	Mode B/L			
1n	Mode heat			
1o	Mode D/H			
1p	Mode def			
1q	Check coupler	Rear blower (C)	4a	Low
1r	B+		4b	-
1s	IG1		4c	Middle
1t	Ground		4d	Auxiary relay ground
2a	Thermistor		4e	High
2b	Incar sensor		4f	ILL +
2c	Photo sensor		4g	Ground
2d	Humidity sensor		4h	ILL -
2e	Ambient sensor			
2f	AQS sensor			
2g	A/C select low			
2h	A/C Thermo low			
2i	A/C Select high			
2j	A/C Themo high			
2k	Rear heater swich			
2l	-			
2m	-			
2n	Power transister (B)			
2o	Hi-speed relay			
2p	Power transister (C)			



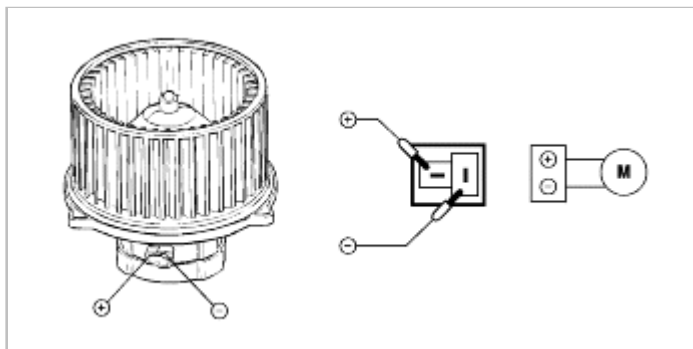
# Heating, Ventilation, Air Conditioning

Blower - Blower Motor



## CHECK

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

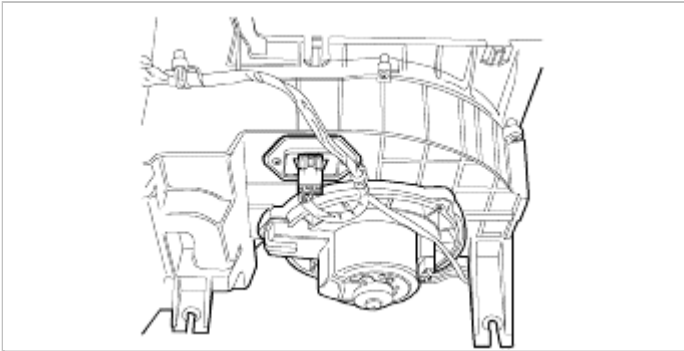




# Heating, Ventilation, Air Conditioning

Blower - Blower Resistor



**CHECK (AUTO CONTROL)**

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.

**CHECK**

Fan	Motor Voltage
First speed	4.0V
Second speed	5.3V
Third speed	6.6V
Fourth speed	7.9V
Fifth speed	9.2V
Sixth speed	10.5V
Seventh speed	12.0V (high relay operates)

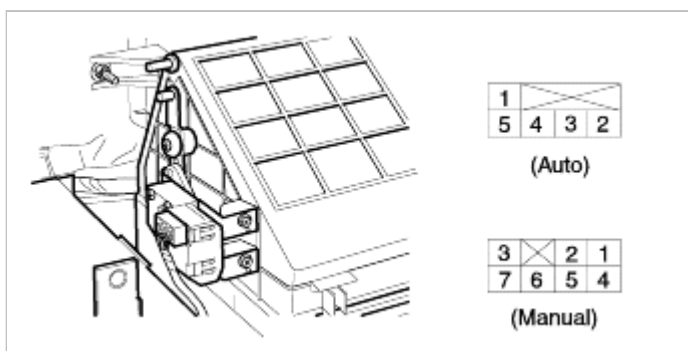


# Heating, Ventilation, Air Conditioning

Blower - Intake Actuator



## DESCRIPTION



### CHECK

Input (Manual)		Output
+	-	Fresh/recirculation shifting
4	7	Recirculation
4	5	Fresh

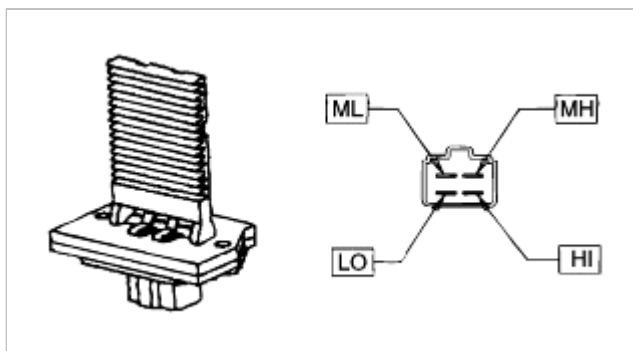
Input (Auto)		Output
+	-	Fresh/recirculation shifting
1	5	Recirculation
1	4	1/3 Fresh
1	3	Fresh

# Heating, Ventilation, Air Conditioning

Blower - Blower Speed Controller



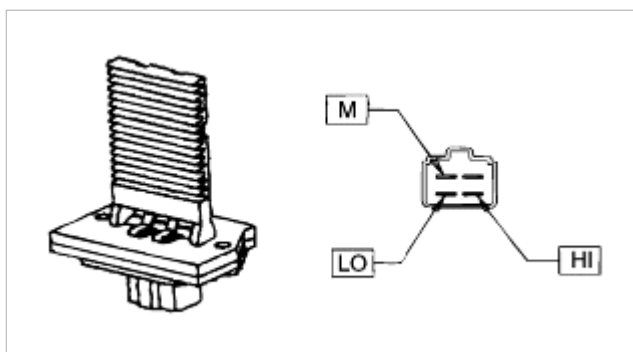
## CHECK (Front)



1. Check for continuity and resistance between terminals.

Terminal	Resistance ( $\Omega$ )
3 - 1	0.33
3 - 2	0.85
3 - 4	2.07

## CHECK (Rear)



1. Check for continuity and resistance between terminals.

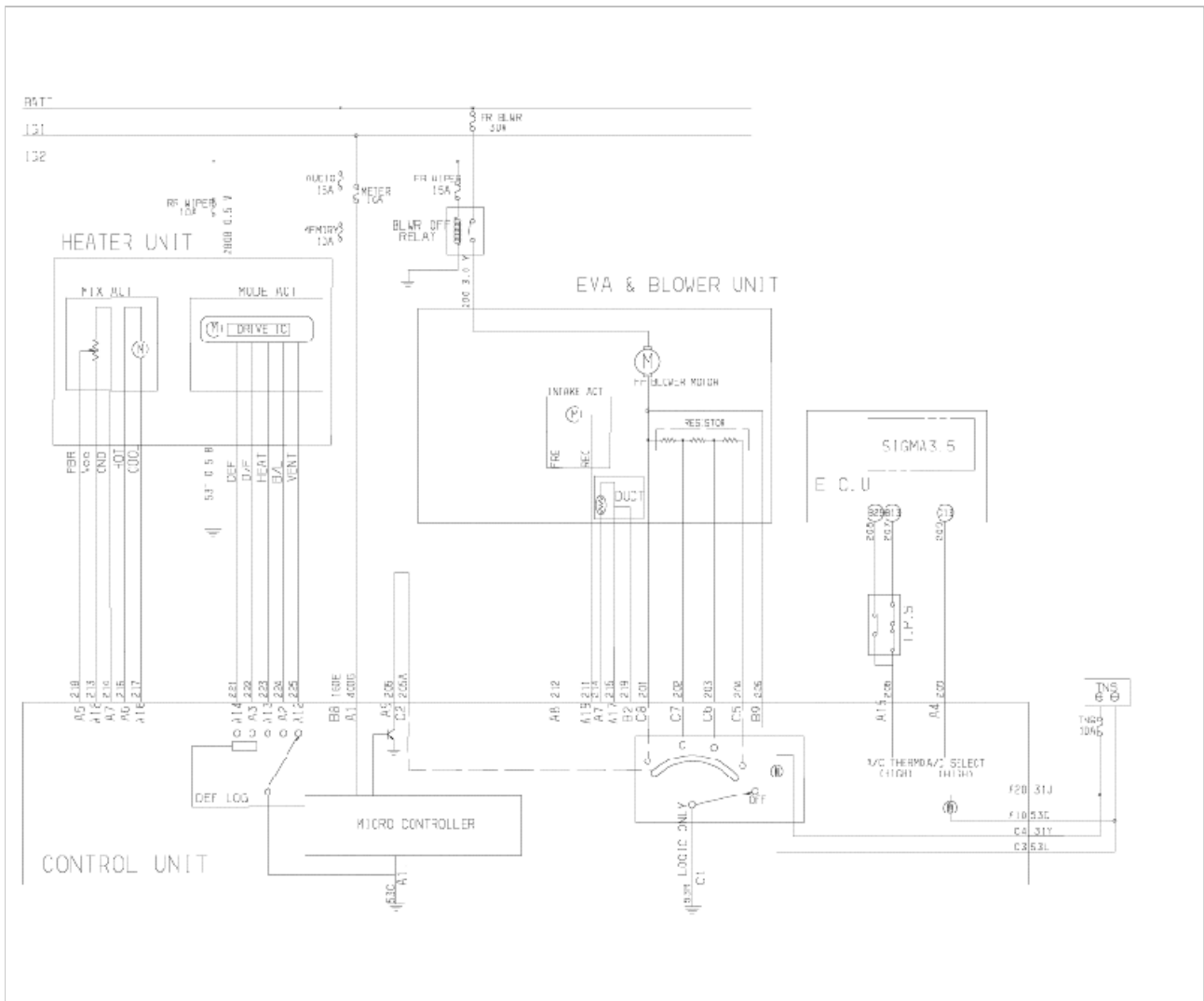
Terminal	Resistance ( $\Omega$ )
3 - 2	0.33
3 - 4	0.85



# Heating, Ventilation, Air Conditioning

Blower - Control Panel

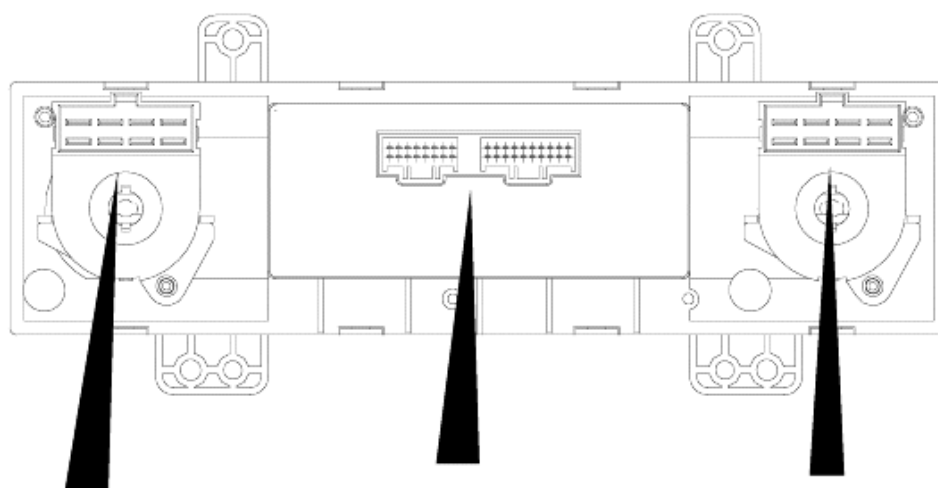
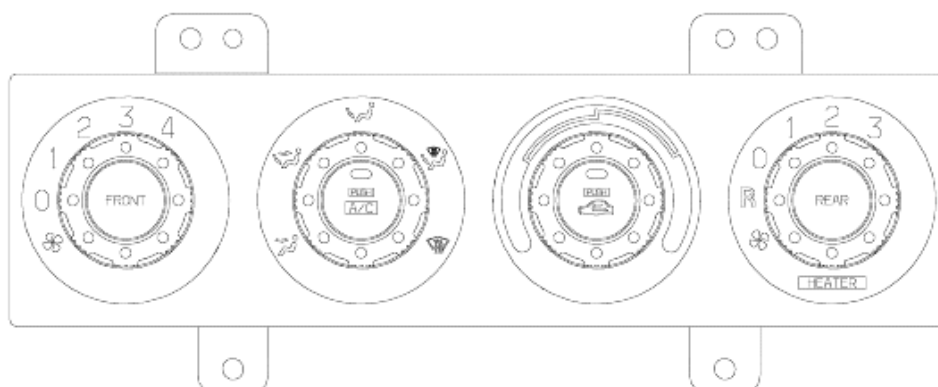








## CONTROL PANEL



Front blower  
connector (B)

Main connector (A)

Rear blower  
connector (C)

### CONNECTOR PIN DESCRIPTION

Item	PIN NO.	PIN Name	Item	PIN NO.	PIN Name
Main Connector (A)	1a	ILL +	Front blower (B)	3a	Middle low
	1b	ILL -		3b	Common
	1c	Intake Fre		3c	Middle high
	1d	Intake Rec		3d	Low

1e	-	Rear blower (C)	3e	High
1f	3b joint (Blower on)		3f	ILL+
1g	Vcc (5V) ; sensor Vref		3g	Ground
1h	Sensor ground		3h	ILL-
1i	Mix PBR			
1j	Mix cool			
1k	Mix warm			
1l	Mode vent			
1m	Mode B/L			
1n	Mode heat			
1o	Mode D/H			
1p	Mode def			
1q	Check coupler		4a	Low
1r	B+		4b	-
1s	IG1		4c	Middle
1t	Ground		4d	Auxiary relay ground
2a	Thermistor		4e	High
2b	-		4f	ILL +
2c	-		4g	Ground
2d	-		4h	ILL -
2e	-			
2f	-			
2g	A/C select low			
2h	A/C Thermo low			
2i	A/C Select high			
2j	A/C Themo high			
2k	Rear heater swich			
2l	-			
2m	-			
2n	-			
2o	-			
2p	-			



## DEFOGGING LOGIC

### 1. IG-ON Logic

Mode	A/C output	A/C indicator	Intake
Vent, B/L, Heat	Previous	Previous	Fresh
D/H, Def	ON	ON	

### 2. D/H, Def logic

Mode		A/C output	A/C indicator	Intake
D/H, Def	ON	ON	ON	Fresh
	OFF	Previous	Previous	Previous

- A. Enable to select A/C on/off & Intake switch at D/H, Def mode.
- B. Be impossible to enter D/H, Def logic again as D/H ↔ Def changing.

### 3. DISSOLUTION & REINSTATEMENT OF LOGIC

- A. Turn off the blower switch
- B. Move to def mode
- C. Push rec button 5 tiems or more whthin 3 seconds
- D. Indicator of recirculation button is flashed 3 times
- E. Complets of logic dissolution & reinstatement of function
- F. A/C & intake status is initialized to "A/C off" and "Intake Fresh"

### 4. Logic after dissolution

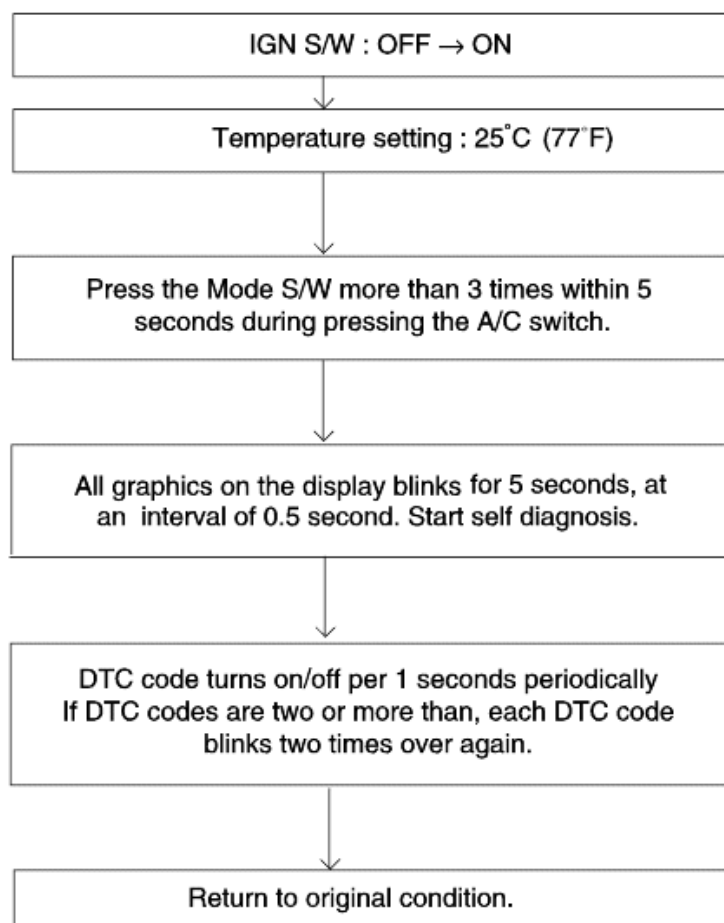
IG ON		D/H, Def	
Intake	A/C	Intake	A/C
Memory	Memory	Previous	Previous

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



## DIAGNOSIS SYSTEM

### OPERATION METHOD (SELF-DIAGNOSIS)



### FAIL SAFE FUNCTION

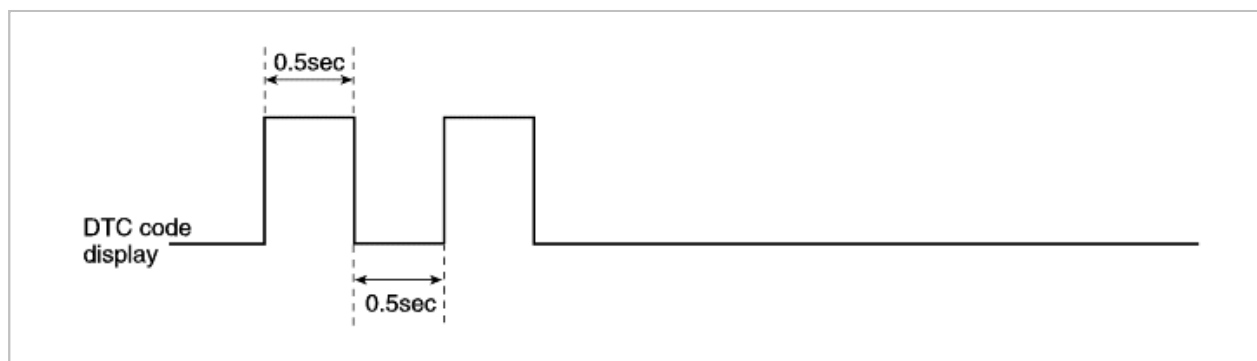
No.	Item	Failure	FAIL SAFE Function
E1	In-car temperature sensor	Open/Short	25°C (77°F) alternate value control
E2	Ambient temperature sensor	Open/Short	25°C (77°F) alternate value control
E3	Thermistor		-2°C (28.4°F) alternate value control
E5	Photo sensor (Sun sensor)	Open/Short	-
E6	Temperature door potentiometer	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 heating position.

### HOW TO READ SELF-DIAGNOSTIC CODE

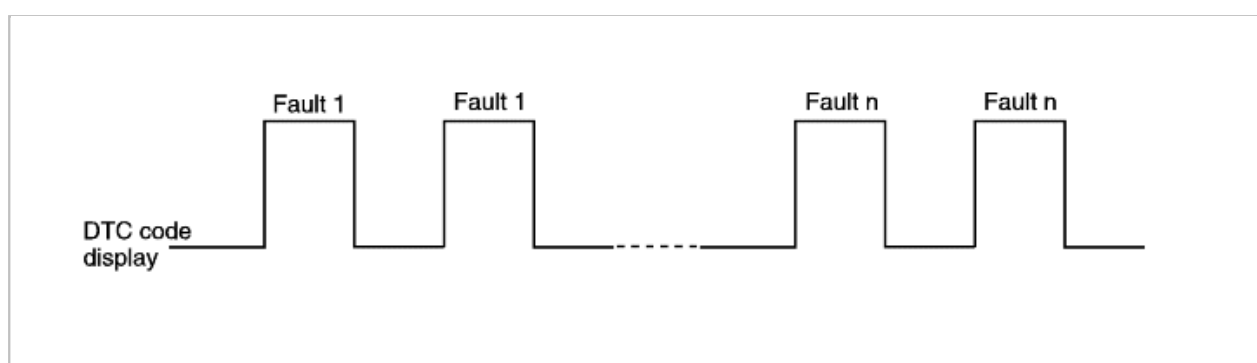
1. After the display panel flickers three times every 0.5 second, the corresponding error code flickers on the setup temperature display panel every 0.5 second and will show two figures.
2. If error code is more than two, each code flickers 2 times in sequence.

## FAULT CODE DISPLAY

1. DTC code is one



2. DTC code is more than two



## DTC CHART

1. Set the temp door at the center position and turn off the A/C system during the DTC check.
2. If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below.

DTC code	Detection item	Trouble area
E0	Normal	-
E1	Open/Shorted incar sensor circuit.	<ul style="list-style-type: none"> <li>• Incar sensor.</li> <li>• Harness or connector between incar sensor and A/C control assembly.</li> <li>• A/C control assembly.</li> </ul>
E2	Open/Shorted Ambient sensor circuit.	<ul style="list-style-type: none"> <li>• Ambient sensor.</li> <li>• Harness or connector between ambient sensor and A/C control assembly.</li> <li>• A/C control assembly.</li> </ul>
E3	Open/Shorted Thermistor sensor.	<ul style="list-style-type: none"> <li>• Thermistor sensor.</li> <li>• Harness or connector between evap. sensor and A/C control assembly.</li> <li>• A/C control assembly.</li> </ul>
E5	Open/Shorted photo sensor.	<ul style="list-style-type: none"> <li>• Photo sensor.</li> <li>• Harness or connector between photo sensor and A/C control assembly.</li> <li>• A/C control assembly.</li> </ul>
E6	Open or shorted temp. door potentiometer. Defective temp. door potentiometer.	<ul style="list-style-type: none"> <li>• Harness or connector between temp. door potentiometer and A/C control assembly.</li> <li>• Temp. door potentiometer.</li> </ul>

## DEFOGGING LOGIC

### 1. DEFOG LOGIC

MODE	INTAKE		A/C	
	IG ON	SYSTEM ON	IG ON	SYSTEM ON
VENT, B/L, FLOOR	MEMORY	MEMORY	MEMORY	MEMORY
MIX, DEF	FRESH	FRESH	ON	ON

### 2. DISSOLUTION & REINSTATEMENT OF LOGIC

- (1) Move to def mode
- (2) Push Intake button 5 tiems or more whthin 3 seconds on keeping A/C button selected
- (3) Intake indicator is flashed 3 times
- (4) Complete dissolution & reinstatement of logic
- (5) Be operated on A/C off, fresh mode

MODE	INTAKE		A/C	
	IG ON	SYSTEM ON	IG ON	SYSTEM ON
VENT, B/L, FLOOR, MIX, DEF	Memory	Memory	Momory	Momory