HEATING & AIR CONDITIONING
13

CONTENTS

MANUAL TEMPERATURE CONTROL

GENERAL INFORMATION

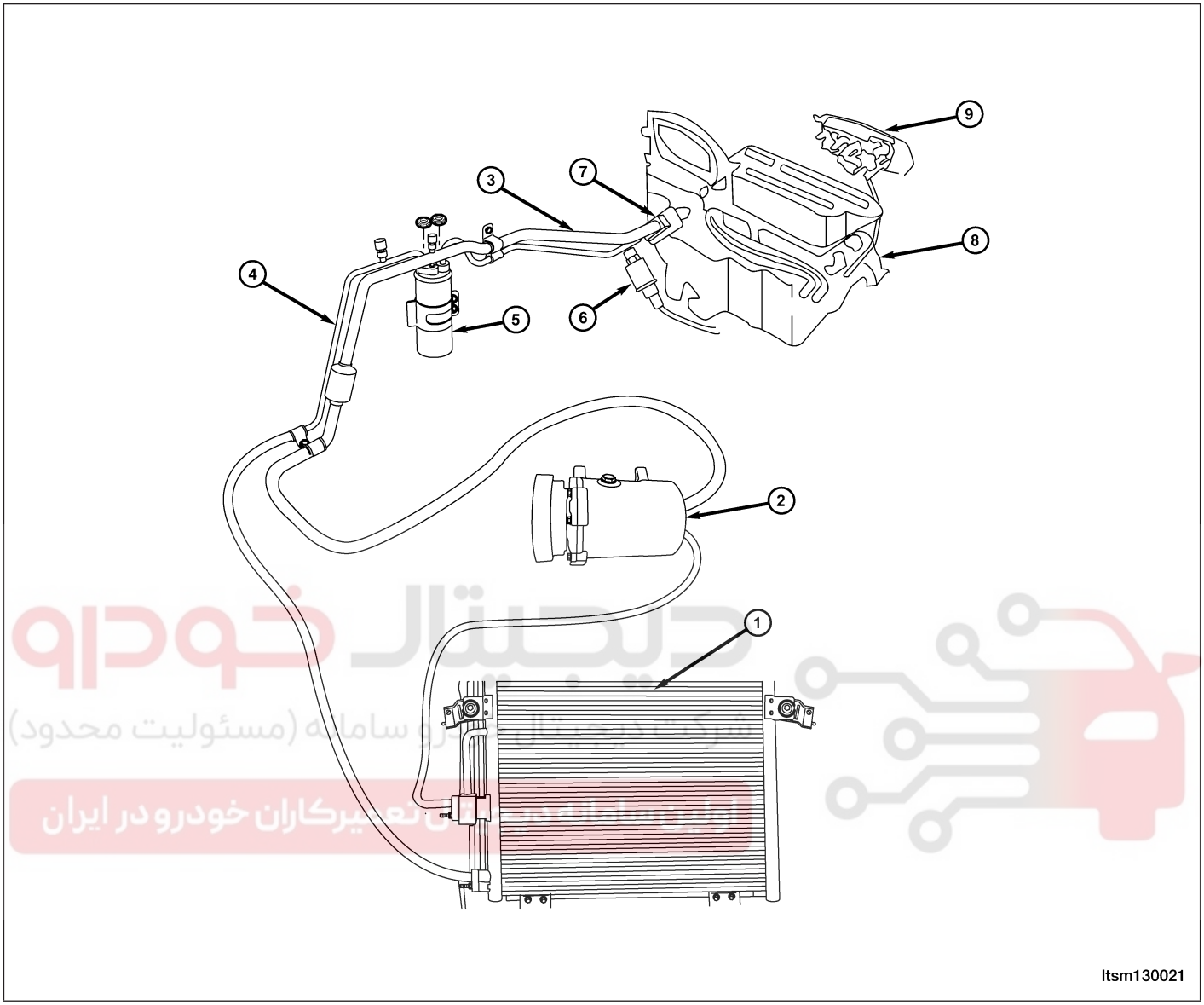
Description

This vehicle is equipped with a common HVAC housing assembly. The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel. The driver can choose the following functions from HVAC control panel:

- The inside temperature
- The speed of the blower
- Five different modes of operation
- A/C compressor clutch operation
- Recirculation door position

NOTE :

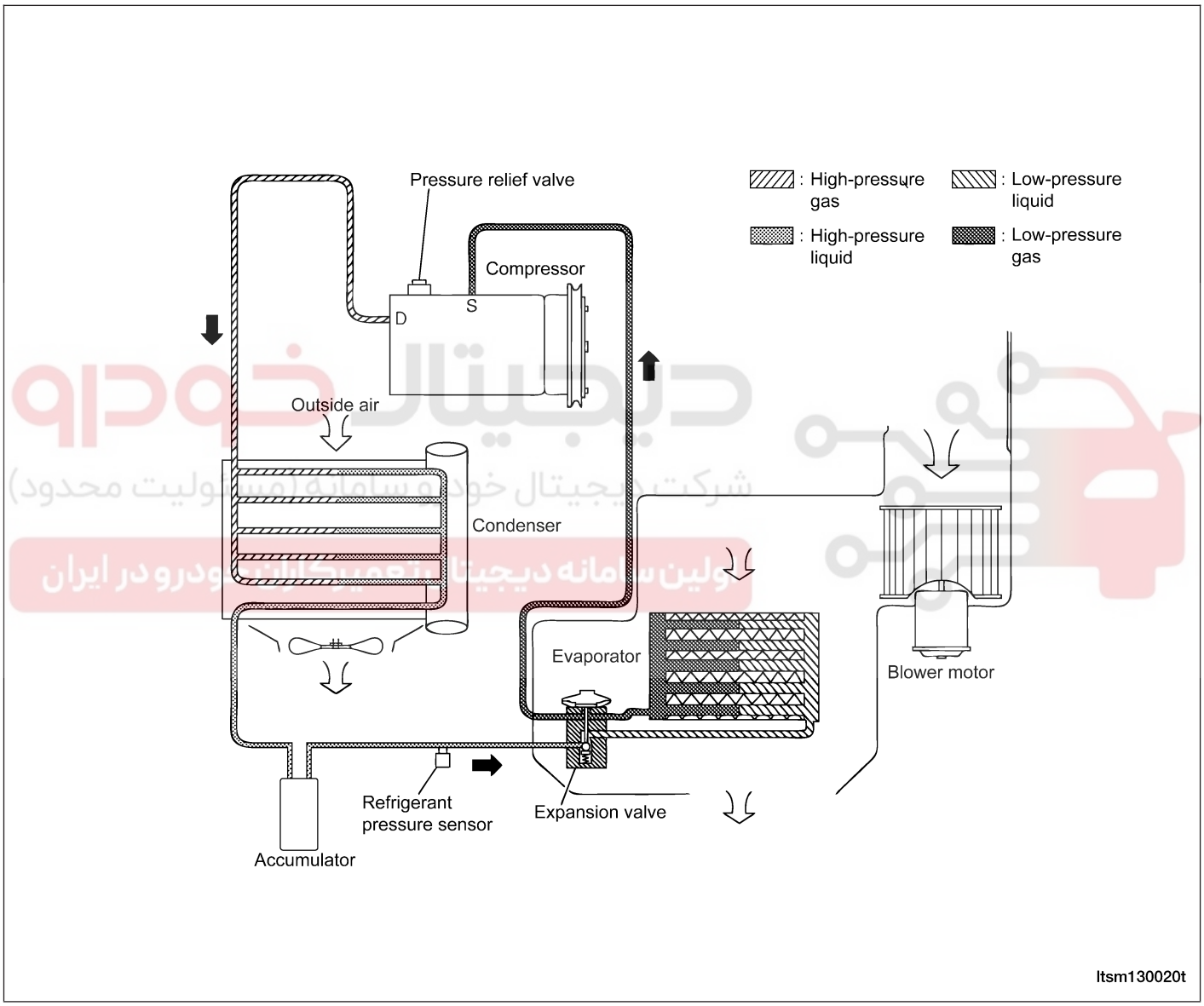
To maintain the performance level of the heating, ventilation and air conditioning (HVAC) system, the engine cooling system must be properly maintained. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems.



1 - Condenser	6 - Refrigerant Pressure Sensor
2 - Compressor	7 - Expansion Valve
3 - Suction Line	8 - HVAC Housing
4 - Liquid Line	9 - HVAC Control Panel
5 - Accumulator	

Operation

Outside fresh air enters the vehicle through the cowl top opening at the base of the windshield, and passes through a plenum chamber to the HVAC housing. Air flow can be adjusted by the blower motor speed switch on the A/C heater control panel. The fresh air then travels through the evaporator and the heater core then out into the vehicle through the side and floor vents. It is important to keep the air intake openings clear of debris such as leaf particles which are small enough to pass through the cowl plenum screen and can accumulate within the HVAC housing. The A/C compressor can be engaged by pressing the A/C (snowflake) button on the A/C-Heater control panel. It will automatically engage when the mode control is set in any Mix to Defrost position. This will remove heat and humidity from the air before it is directed through or around the heater core. The mode control on the A/C-Heater control panel is used to direct the conditioned air to the selected system outlets.



Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
All General Service Screw	2
Condenser Bolts	6
Evaporator Bolts	4

DESCRIPTION	TORQUE (N·m)
Expansion Valve Bolts	10
Pipeline Stent	4
Refrigerant Lines To A/C Accumulator	6
Refrigerant Lines To A/C Compressor Bolt	30
Refrigerant Lines	10
Refrigerant Lines To A/C Evaporator Bolt	25

A/C Pressure Specifications

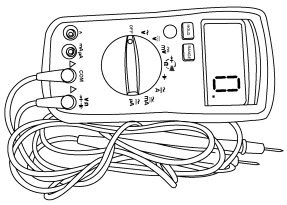
AMBIENT TEMPERATURE	A/C HIGH SIDE PRESSURE	A/C LOW SIDE PRESSURE
15.5°C	8.4 - 11.9 kgf/cm^2 120 - 170 psi	1.9 - 2.1 kgf/cm^2 28 - 31 psi
21.1°C	10.5 - 17.5 kgf/cm^2 150 - 250 psi	1.9 - 2.1 kgf/cm^2 28 - 31 psi
26.6°C	12.6 - 19.3 kgf/cm^2 180 - 275 psi	1.9 - 2.1 kgf/cm^2 28 - 31 psi
32.2°C	14.0 - 21.8 kgf/cm^2 200 - 310 psi	1.9 - 2.1 kgf/cm^2 28 - 31 psi
37.7°C	16.1 - 23 kgf/cm^2 230 - 330 psi	1.9 - 2.4 kgf/cm^2 28 - 35 psi
43.3°C	18.9 - 25.3 kgf/cm^2 270 - 360 psi	1.9 - 2.6 kgf/cm^2 28 - 38 psi

AMBIENT TEMPERATURE	VEHICLE SPEED	A/C HIGH SIDE PRESSURE	A/C LOW SIDE PRESSURE
35°C	Idle Speed	1.4 - 1.8 MPa	0.26 - 0.33 MPa
30°C	Idle Speed	1.3 - 1.8 MPa	0.26 - 0.33 MPa

A/C Refrigerant Charge Specifications

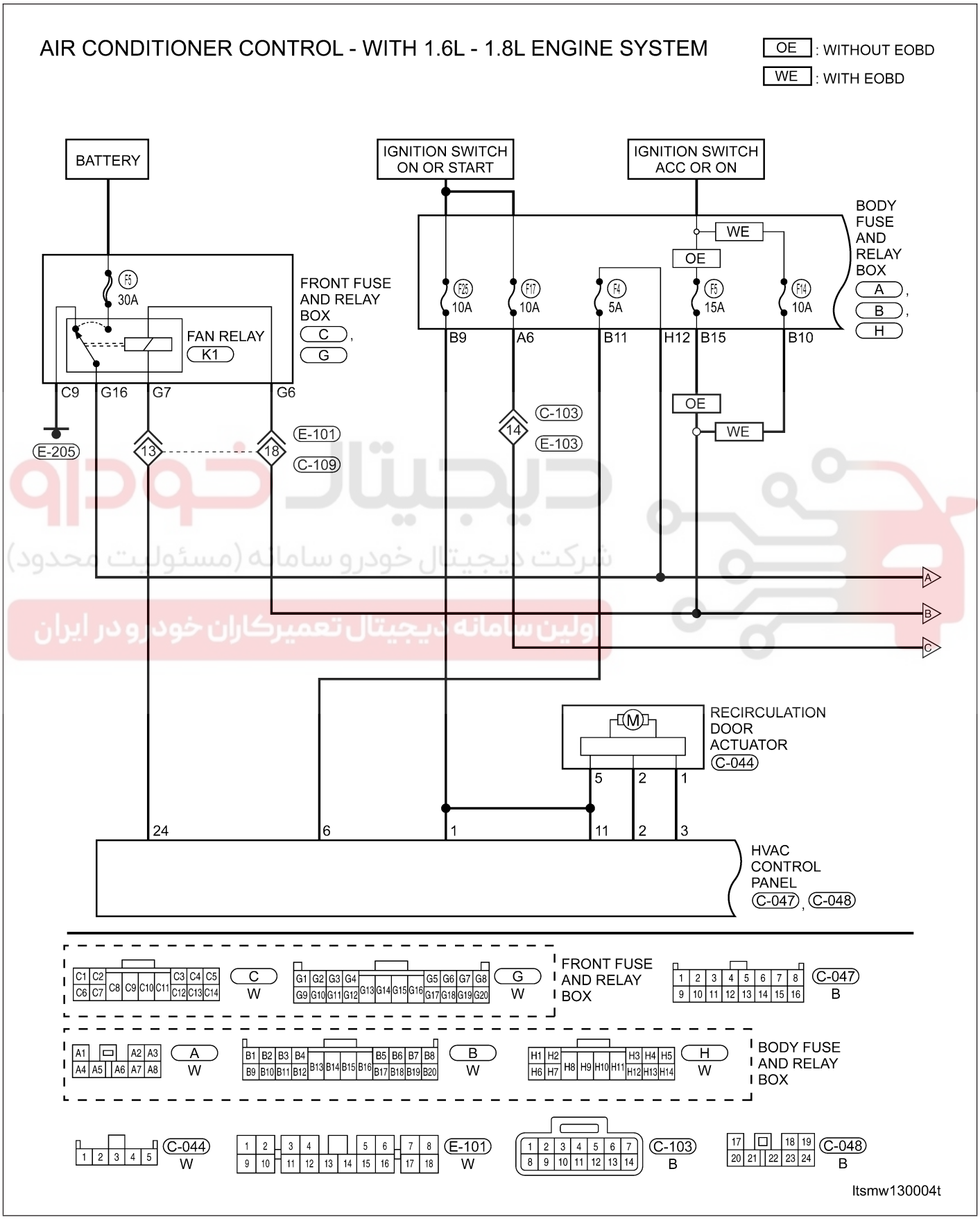
DESCRIPTION	CAPACITY (g)
R-134a Refrigerant	700

Special Tools

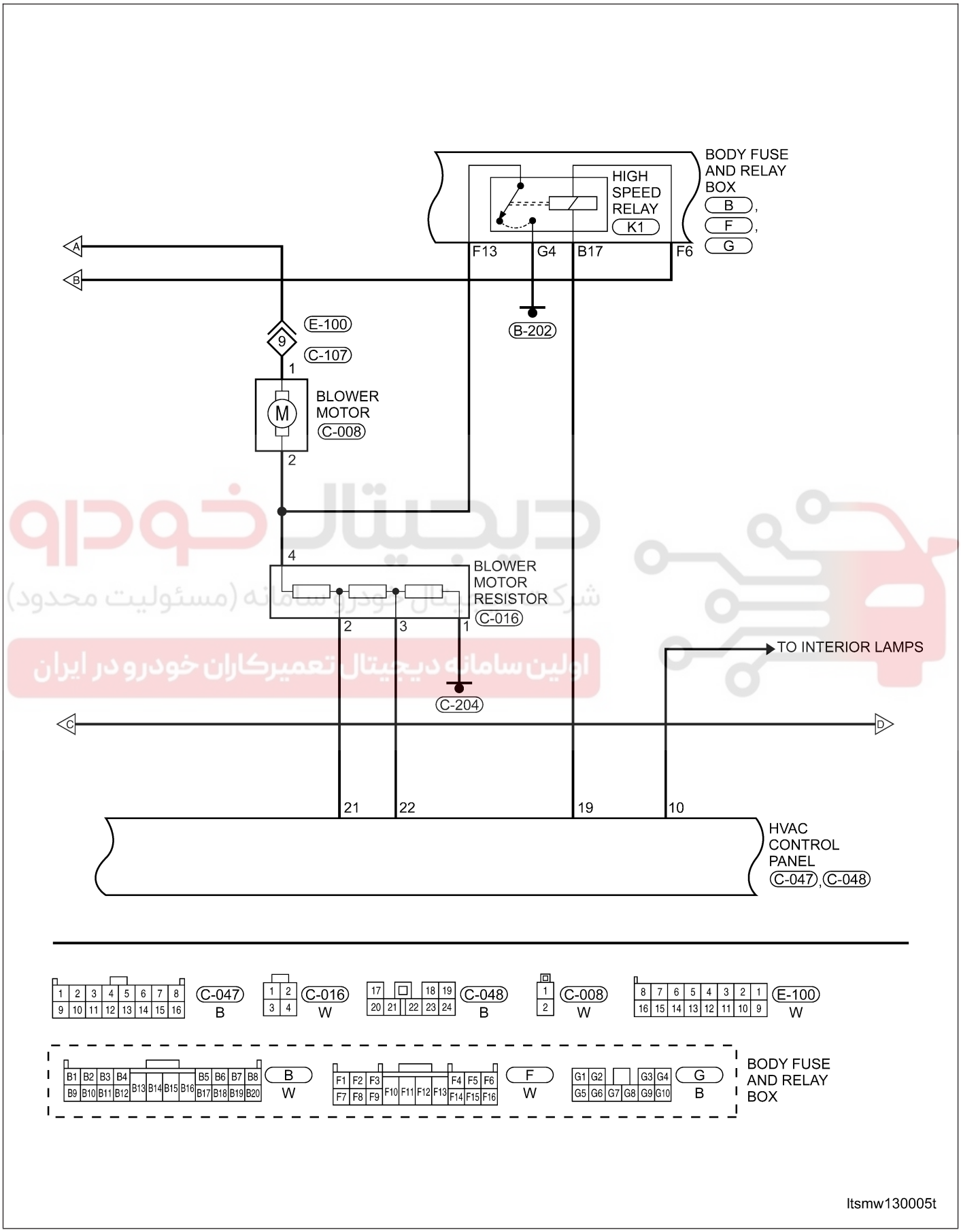
Digital Multimeter Fluke 15B & 17B	 besm030002

Electrical Schematics

Air Conditioner Control - 1.6L & 1.8L (Page 1 of 3)



Air Conditioner Control - 1.6L & 1.8L (Page 2 of 3)



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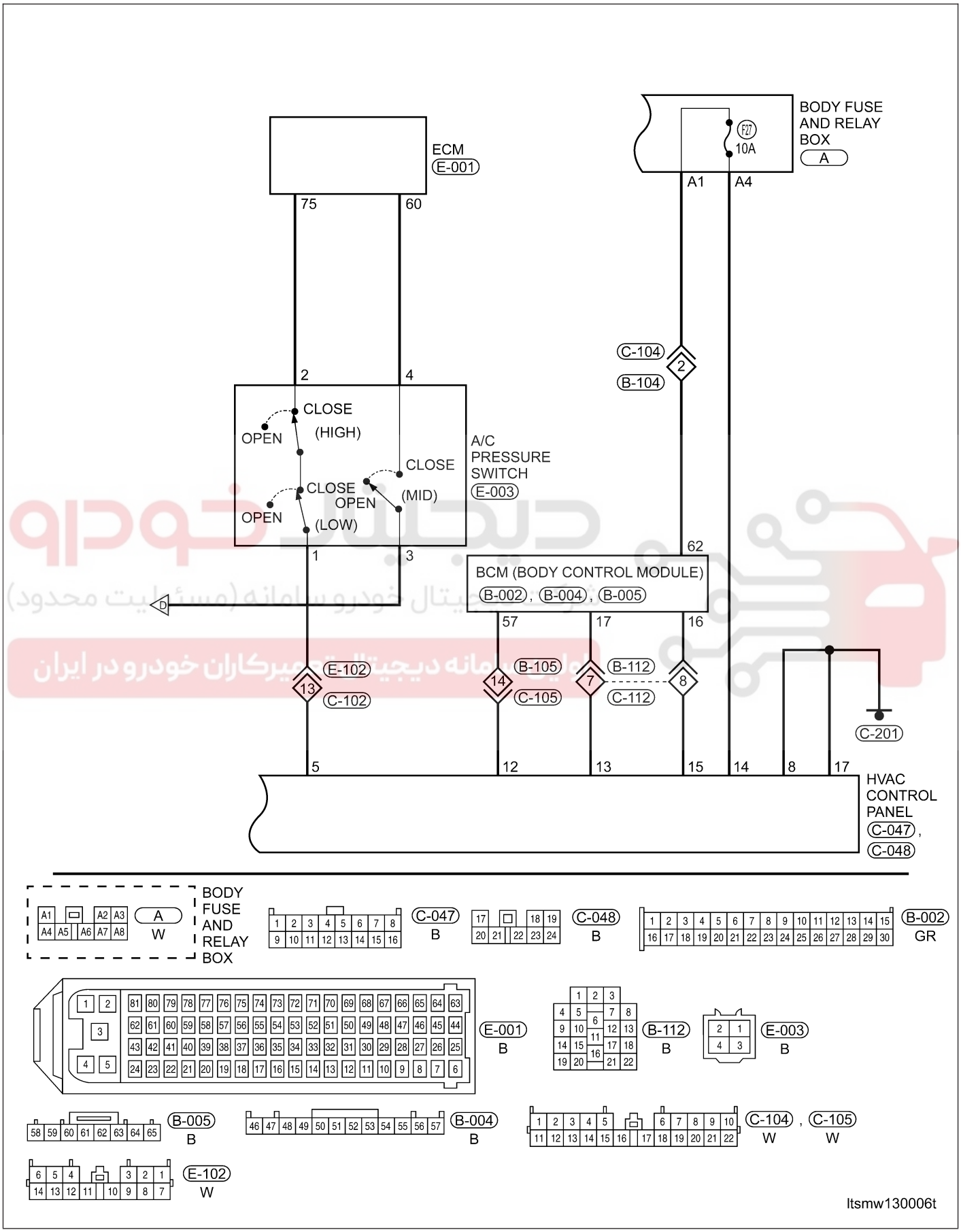
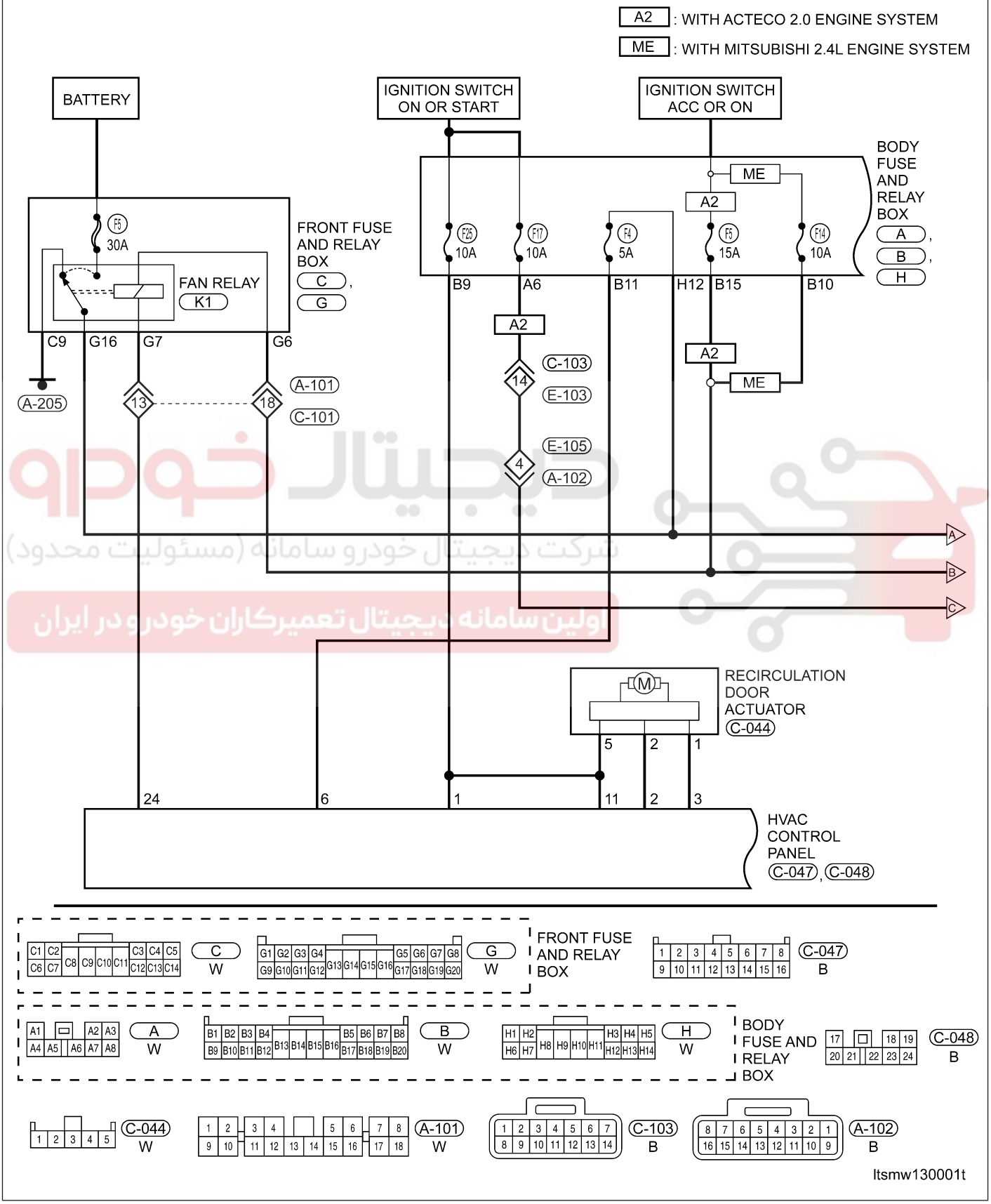
Air Conditioner Control - 1.6L & 1.8L (Page 3 of 3)

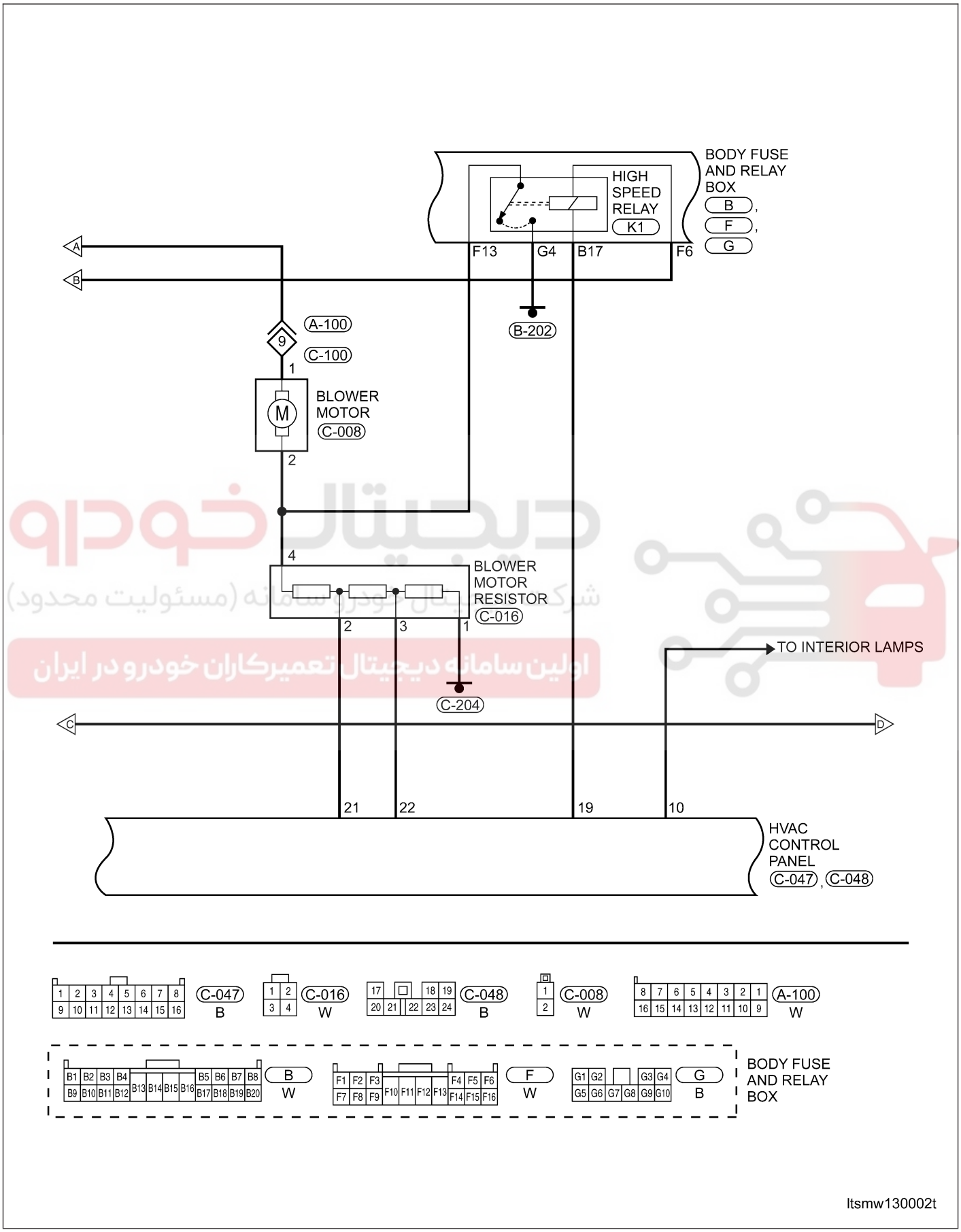


Air Conditioner Control - 2.0L & 2.4L (Page 1 of 3)

AIR CONDITIONER CONTROL - WITH 2.0L - 2.4L ENGINE SYSTEM



Air Conditioner Control - 2.0L & 2.4L (Page 2 of 3)



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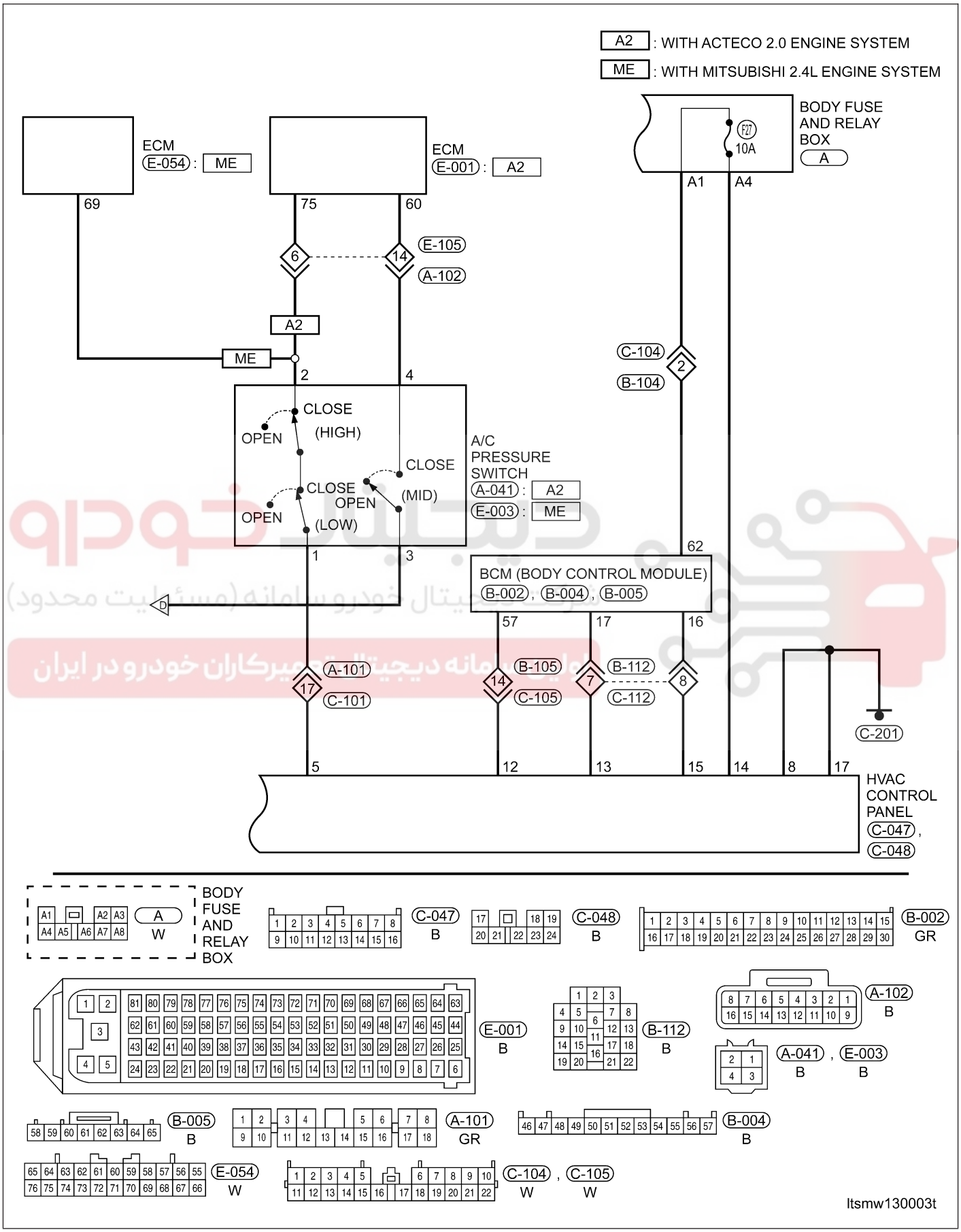
Air Conditioner Control - 2.0L & 2.4L (Page 3 of 3)



DIAGNOSIS & TESTING

A/C System Performance

The ambient air temperature must be a minimum of 21°C for this test.

1. Connect a manifold gauge set.
2. Set the A/C Heater mode control switch knob in the Panel position, the temperature control knob in the full cool position, the A/C button in the On position, and the blower motor switch knob in the highest speed position.
3. Start the engine and hold the idle at 2,000 RPM with the compressor clutch engaged.
4. The engine should be at operating temperature. The doors and windows must be open.
5. Insert a thermometer in the driver side center A/C (panel) outlet. Operate the engine for five minutes.
6. The compressor clutch may cycle, depending upon the ambient temperature and humidity.
7. With the compressor clutch engaged, record the discharge air temperature and the compressor discharge pressure.
8. Compare the discharge air temperature to the performance temperature and pressure chart.

NOTE :
The discharge air temperatures will be lower if the humidity is less than the percentages shown.

TEMPERATURE AND PRESSURE					
Ambient Air Temperature and Humidity	21°C (80% humidity)	27°C (80% humidity)	32°C (80% humidity)	38°C (50% humidity)	43°C (20% humidity)
Air Temperature at Center Panel Outlet	10 - 13°C	14 - 17°C	15 - 18°C	17 - 20°C	14 - 17°C
Evaporator Inlet Pressure at Charge Port	241 - 276 kPa	262 - 290 kPa	269 - 296 kPa	275 - 303 kPa	262 - 290 kPa
Compressor Discharge Pressure	1241 - 1792 kPa	1380 - 1930 kPa	1380 - 1930 kPa	1655 - 2206 kPa	1567 - 2068 kPa

A/C System Troubleshooting Chart

CONDITION	POSSIBLE CAUSES	CORRECTION
Rapid Compressor Clutch Cycling (ten or more cycles per minute)	· Low refrigerant system charge.	· Test the A/C system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal Pressures, But The Compressor Clutch Does Not Engage	· No refrigerant in the refrigerant system. · Faulty A/C compressor clutch coil. · Faulty A/C pressure switch. · Faulty A/C heater control module. · Faulty A/C fuse. · Faulty A/C compressor relay. · Faulty Evaporator temperature sensor.	· Test the A/C system for leaks. Repair, evacuate and charge the A/C, if required. · Test the compressor clutch coil and replace, if required. · Test the A/C high pressure switch and replace, if required. · Test the A/C heater control module and replace, if required. · Test A/C fuse and replace. · Test A/C compressor relay and replace, if required. · Test evaporator temperature sensor and replace if required.

CONDITION	POSSIBLE CAUSES	CORRECTION
Normal Pressures, But A/C Performance Test Air Temperatures At Center Panel Outlet Are Too High	· Excessive refrigerant oil in system. · Blend door inoperative or sealing improperly. · Blend door actuator faulty or inoperative.	· Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required. · Inspect the blend door for proper operation and sealing. Repair if required. · Replace if faulty.
The Low Side Pressure Is Normal Or Slightly Low, And The High Side Pressure Is Too Low	· Low refrigerant system charge. · Refrigerant flow through the accumulator is restricted. · Refrigerant flow through the evaporator is restricted. · Faulty compressor.	· Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. · Replace the restricted accumulator, if required. · Replace the restricted evaporator coil, if required. · Replace the compressor, if required.
The Low Side Pressure Is Normal Or Slightly High, And The High Side Pressure Is Too High	· Condenser air flow restricted. · Inoperative cooling fan. · Refrigerant system overcharged. · Air in the refrigerant system. · Engine overheating.	· Check the condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Clean, repair, or replace components as required. · Test the cooling fan and replace, if required. · Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required. · Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. · Test the cooling system and repair as necessary.
The Low Side Pressure Is Too High, And The High Side Pressure Is Too Low	· Accessory drive belt slipping. · Faulty compressor.	· Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required. · Replace the compressor, if required.
The Low Side Pressure Is Too Low, And The High Side Pressure Is Too High	· Restricted refrigerant flow through the refrigerant lines. · Restricted refrigerant flow through the A/C accumulator. · Restricted refrigerant flow through the condenser. · Faulty A/C expansion valve.	· Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required. · Replace the accumulator if restricted. · Replace the restricted condenser, if required. · Test A/C expansion valve and replace, if required.

Heater Performance

Engine coolant is delivered to the heater core through heater hoses. With the engine idling at normal operating temperature, set the temperature control knob in the full hot position, the mode control switch knob in the floor heat position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the HVAC housing floor outlets. Compare the test thermometer reading to the heater performance chart.

HEATER PERFORMANCE				
Ambient Air Temperature	15.5°C (60°F)	21.1°C (70°F)	26.6°C (80°F)	32.2°C (90°F)
Minimum Air Temperature at Floor Outlet	62.2°C (144°F)	63.8°C (147°F)	65.5°C (150°F)	67.2°C (153°F)

Both of the heater hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system.

Obstructed Coolant Flow

Possible locations or causes of obstructed coolant flow:
- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

Mechanical Problems

Possible locations or causes of insufficient heat:
- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend door not functioning properly.
- Trapped air in system.

Temperature Control

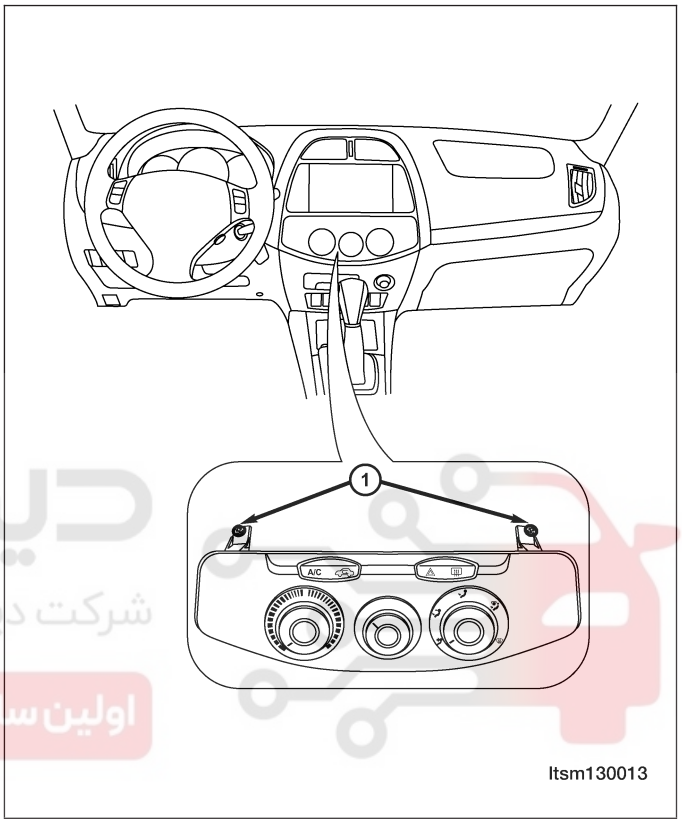
If the heater outlet air temperature cannot be adjusted with the temperature control knob(s) on the A/C heater control panel, the following could require service:
- The A/C heater control panel.
- The blend door.
- The blend door cable.
- Improper engine coolant temperature.

ON-VEHICLE SERVICE

Manual Temperature Control Module

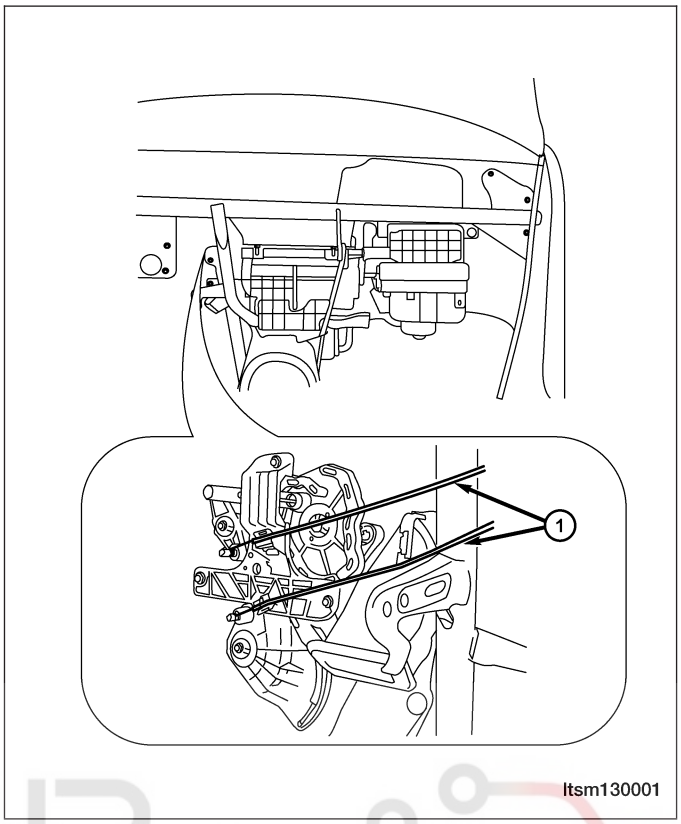
Removal & Installation

1. Disconnect the negative battery cable.
2. Remove the bezel of the central control panel.
3. Remove the bolts, and remove the CD player, and then disconnect the harness connectors.
4. Remove the mounting screws (1).



5. Disconnect the electrical connector behind the panel.

6. Loosen the two blend door and mode door control cables (1).



7. Remove the manual temperature control module.
8. Installation is in the reverse order of removal.

Blower Motor Resistor

Removal & Installation

WARNING!

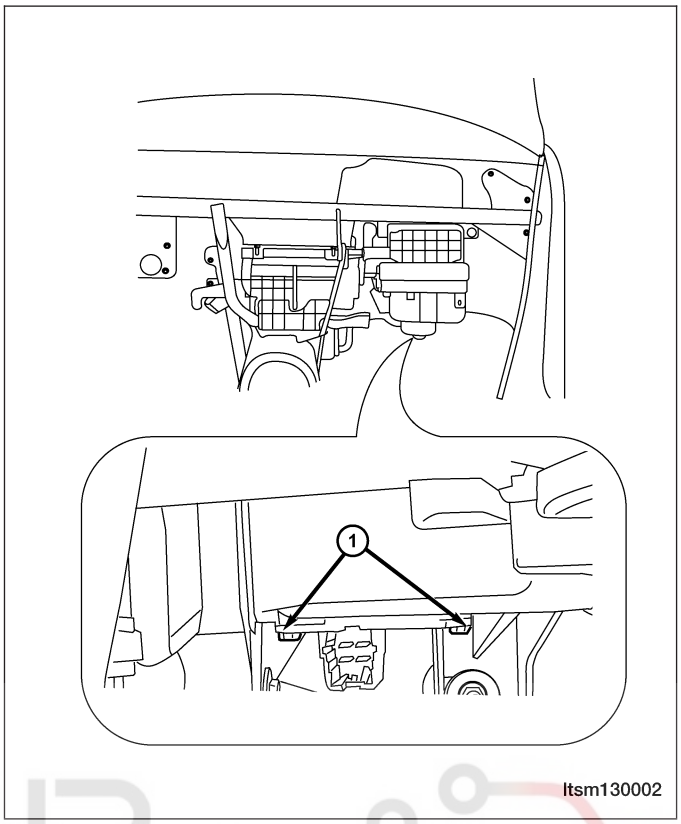
The blower motor resistor may get very hot during normal operation. If the blower motor was turned on prior to servicing the blower motor resistor, wait five minutes to allow the blower motor resistors to cool before performing diagnosis or service. Failure to take this precaution can result in possible personal injury.

CAUTION:

DON'T operate the blower motor with the blower motor resistor removed from the circuit. Failure to take this precaution can result in vehicle damage.

1. Disconnect the negative battery cable.
2. Remove the glove box (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
3. Disconnect the blower motor resistor electrical connector.

4. Remove the two bolts (1) attaching the blower motor resistor to the evaporator housing.



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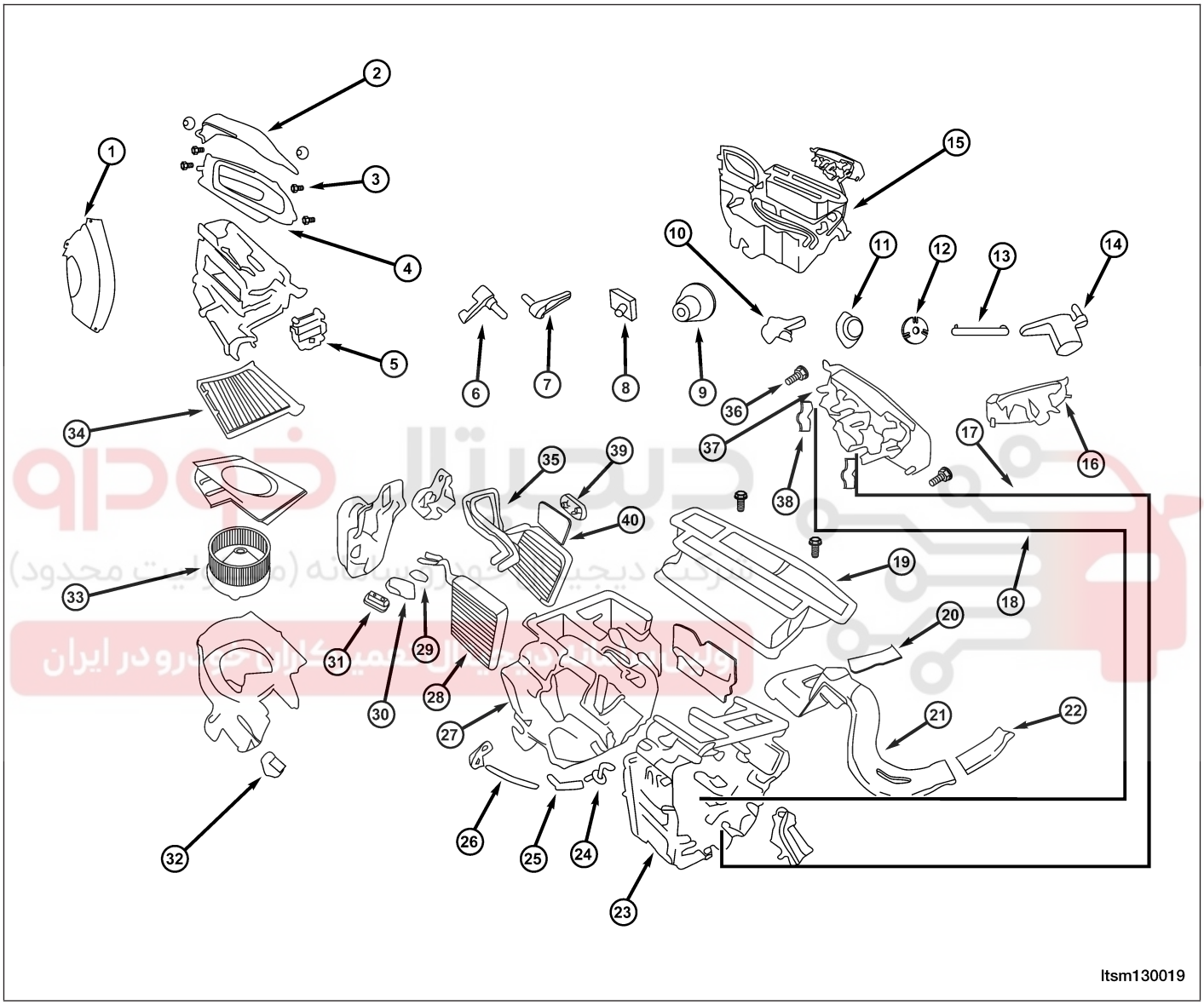
5. Remove the blower motor resistor.
6. Installation is in the reverse order of removal.

SYSTEM CONTROLS

GENERAL INFORMATION

Description

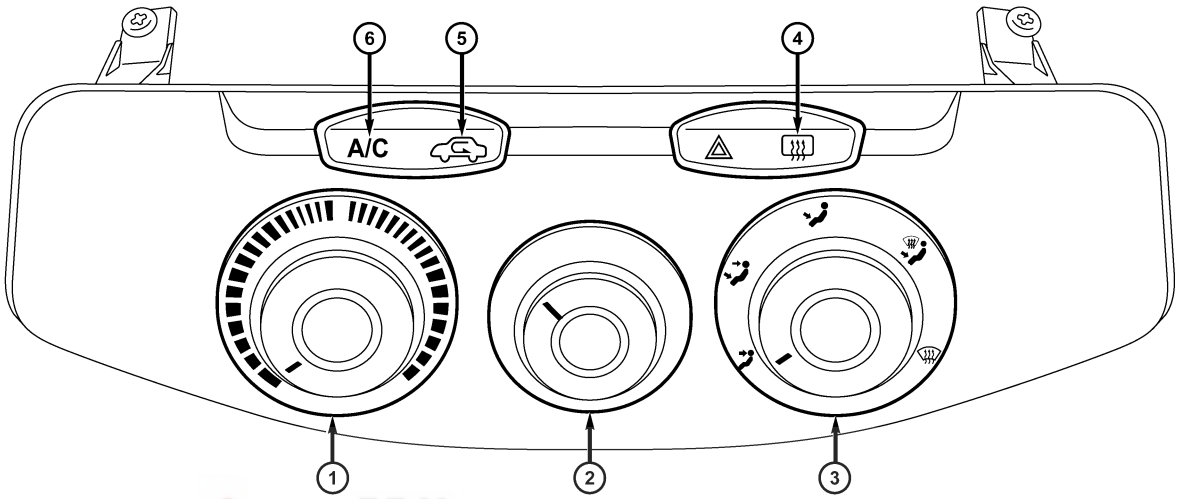
The Heating, Ventilation and Air Conditioning (HVAC) system uses a combination of electrical and vacuum controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual in the vehicle glove box for more information on the suggested operation and use of these controls.



1 - Inlet Shell Shield	21 - Left Outlet
2 - Inlets Shrouds	22 - Right Outlet
3 - Bolt (M6)	23 - Evaporator Assembly Upper Cover
4 - Inlet Shell Assembly	24 - Drain Inner Hose Assembly
5 - Recirculation Door Actuator	25 - Rubber Drain Inside Hose
6 - Mixed Door Lever	26 - Rubber Drain Outside Hose
7 - Defrost Door Lever	27 - Evaporator Assembly Lower Cover
8 - Water Hose Clamp	28 - Evaporator Core
9 - Blower Control Dial	29 - Sealed Gasket
10 - Defrost Door Linkage	30 - Sponge
11 - Mode Door Dial	31 - Expansion Valve
12 - Plastic Washer	32 - Blower Motor Resistor
13 - Mode Door Dial Linkage	33 - Blower Motor
14 - Mode Door Dial Lever	34 - HVAC Filter
15 - Evaporator Assembly	35 - Heater Core
16 - HVAC Control Panel	36 - HVAC Control Panel Bolt
17 - Temperature Control Dial Cable	37 - HVAC Control Panel
18 - Mode Door Cable	38 - Clamp
19 - Outlet Assembly	39 - Water Hose Sealed Gasket
20 - Clamp	40 - Sponge

Operation

The A/C heater control module panel is located on the instrument panel inboard of the steering column and above the radio. The A/C heater control panel contains a rotary-type temperature control dial (1), a rotary-type mode control switch dial (3), a rotary-type blower motor speed control switch (2) and an air conditioning compressor push button switch (6).



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1 - Temperature Control Switch	4 - Rear Window Defogger Switch
2 - Blower Switch	5 - Recirculation Switch
3 - Mode Control Switch	6 - A/C Switch

Temperature Control Dial

Increases or decreases the set temperature.

Recirculation Switch

- When the recirculation switch is ON, the switch indicator turns ON, and air inlet is set to recirculation.
- When recirculation switch is OFF, air inlet is set to fresh. The recirculation mode can be re-entered by pressing the recirculation switch again.

Rear Window Defogger Switch

Controls the operation of the rear window defogger.

A/C Switch

Controls the A/C compressor ON and OFF function.

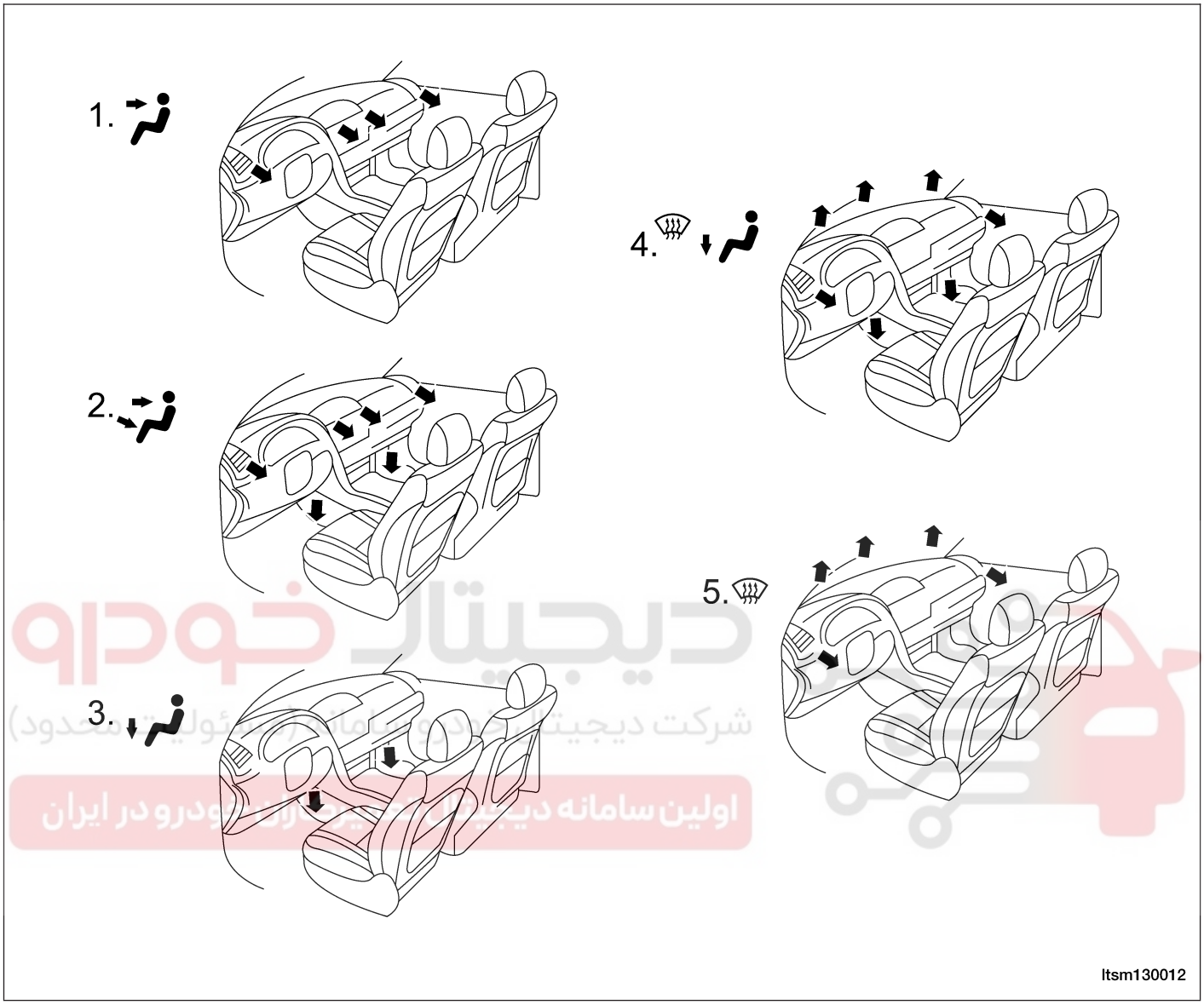
Mode Control Dial

Controls the direction of the air flow through the air discharge outlets.

Blower Control Dial

Manually controls the four blower speeds and the ON and OFF function.

Discharge Air Flow



1. Panel Mode	Air comes from the outlets in the instrument panel. Each of these outlets can be individually adjusted to direct the flow of air.
2. Bi-Level Mode	Air comes from both the instrument panel outlets and the floor outlets.
3. Floor Mode	Air comes from the floor outlets. A slight amount of air is directed through the defrost and side window demister outlets.

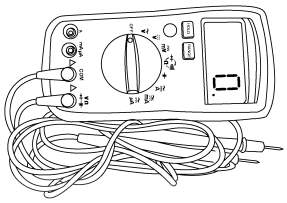
4. Defrost & Floor Mode	Air comes from the floor, defrost and side window demister outlets. This mode works best in cold or snowy conditions.
5. Defrost Mode	Air comes from the windshield and side window demister outlets. Use this setting when necessary to defrost your windshield and side windows.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
All General Service Screws	5
Recirculation door actuator screws	2

Special Tools

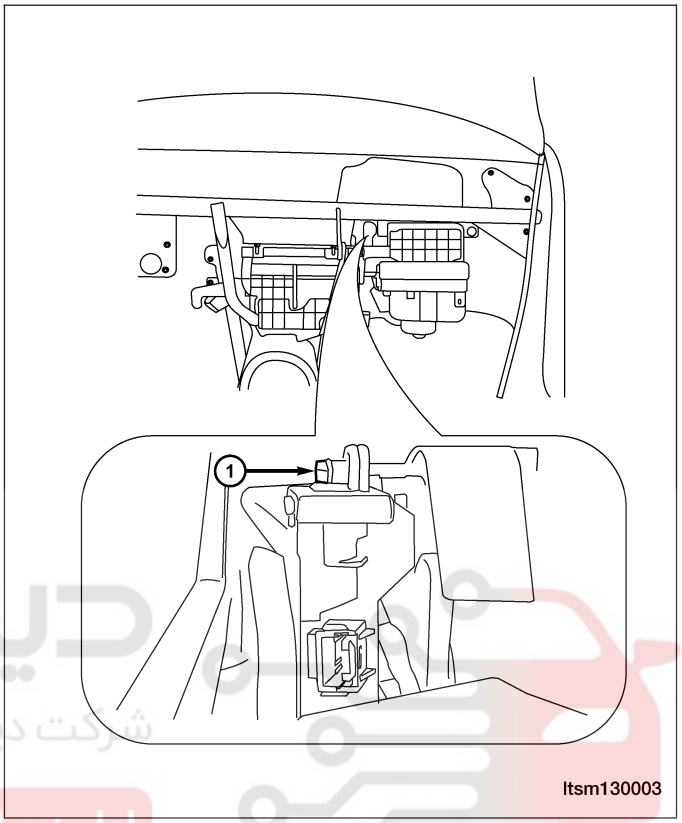
Digital Multimeter Fluke 15B & 17B	 besm030002

ON-VEHICLE SERVICE

Recirculation Door Actuator

Removal & Installation

1. Remove the rod connected to the recirculation door actuator.
2. Remove the bolt (1) connecting the recirculation door actuator to the bracket.
   (Tighten: Recirculation door actuator bolt to 2 N·m)
3. Remove the recirculation door actuator.
4. Installation is in the reverse order of removal.



AIR DISTRIBUTION

GENERAL INFORMATION

Description

All models are equipped with a common HVAC housing assembly that combines A/C and heating capabilities into a single unit mounted within the passenger compartment. The HVAC housing assembly consists of three separate housings:

- HVAC housing — The HVAC housing is mounted to the dash panel behind the instrument panel and contains the A/C evaporator. The HVAC housing has mounting provisions for the air inlet housing, blower motor and the air distribution housing.
- Air distribution housing — The air distribution housing is mounted to the rear of the HVAC housing and contains the heater core, blend-air and mode-air doors and door linkage.
- Air inlet housing — The air inlet housing is mounted to the passenger side end of the HVAC housing. The air inlet housing contains the recirculation-air door and actuator.

Operation

The A/C system is designed for the use of a non-CFC, R-134a refrigerant and uses an A/C evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. Temperature control determines the discharge air temperature by operating the temperature control cable, which moves the blend-air door. This allows an almost immediate control of the output air temperature of the system. The mode door cable operates the mode-air doors which direct the flow of the conditioned air out the various air outlets, depending on the mode selected. When equipped with A/C, the recirculation door actuator operates the recirculation-air door which closes off the fresh air intake and recirculates the air already inside the vehicle. The electric recirculation door actuator and the blower motor are connected to the vehicle electrical system by the instrument panel wire harness. The blower motor controls the velocity of air flowing through the HVAC housing assembly by spinning the blower wheel within the HVAC housing at the selected speed by use of the blower motor resistor, which is around the blower motor.

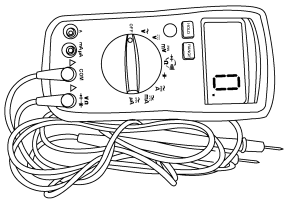
The air distribution housing must be removed from the HVAC housing and disassembled for service of the blend-air and mode-air doors. The air inlet housing must be removed from the HVAC housing and disassembled for service of the recirculation-air door. The HVAC housing must be removed from the vehicle and disassembled for service of the A/C evaporator.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
All General Service Screws	2
Evaporator Bolts	4
Expansion Valve Bolts	10
Pipeline Stent	4
Refrigerant Lines To A/C Accumulator	6
Condenser Bolts	6
Refrigerant Lines To A/C Compressor Bolt	30
Refrigerant Lines	10
Refrigerant Lines To A/C Evaporator Bolt	25

Special Tools

Digital Multimeter Fluke 15B & 17B	 besm030002

DIAGNOSIS & TESTING

Blower Motor Electrical Troubleshooting

To determine if an open condition exists within the blower motor circuit wiring, it is necessary to disconnect the negative battery cable and check for continuity within the blower motor circuits using an ohmmeter.

Possible causes of an inoperative blower motor include the following:

- Open fuse
- Inoperative blower motor switch
- Inoperative blower motor resistor
- Inoperative blower motor
- Inoperative blower motor circuit wiring or wiring harness electrical connectors

Blower Motor Noise

To determine if the blower motor is the source of the noise, simply switch the blower motor from Off to On. To verify that the blower motor is the source of the noise, unplug the blower motor wire harness connector and operate the heater-A/C system. If the noise goes away, possible causes include:

- Foreign material on fresh air inlet screen
- Foreign material in blower wheel
- Foreign material in HVAC housing
- Incorrect blower motor mounting
- Deformed or damaged blower wheel
- Worn blower motor bearings or brushes

Blower Motor Vibration

Possible causes of a blower motor vibration include:

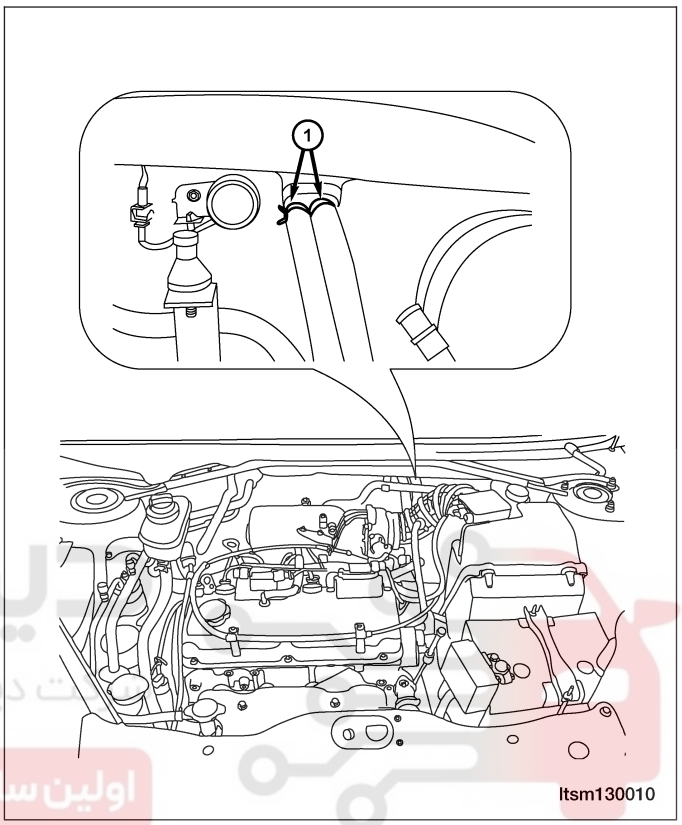
- Incorrect blower motor mounting
- Foreign material in blower wheel
- Deformed or damaged blower wheel
- Worn blower motor bearings

ON-VEHICLE SERVICE

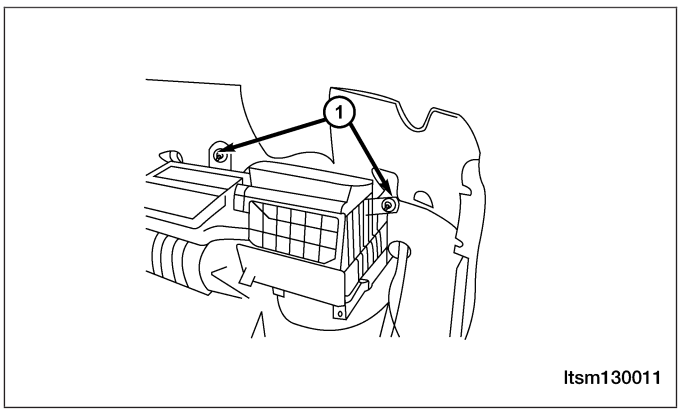
HVAC Housing

Removal & Installation

1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).
2. Drain the cooling system and then disconnect heater hoses (1). (See Cooling System Draining & Filling in Section 06 Cooling).



3. Remove the instrument panel (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
4. Remove the evaporator assembly upper retaining bolts (1).



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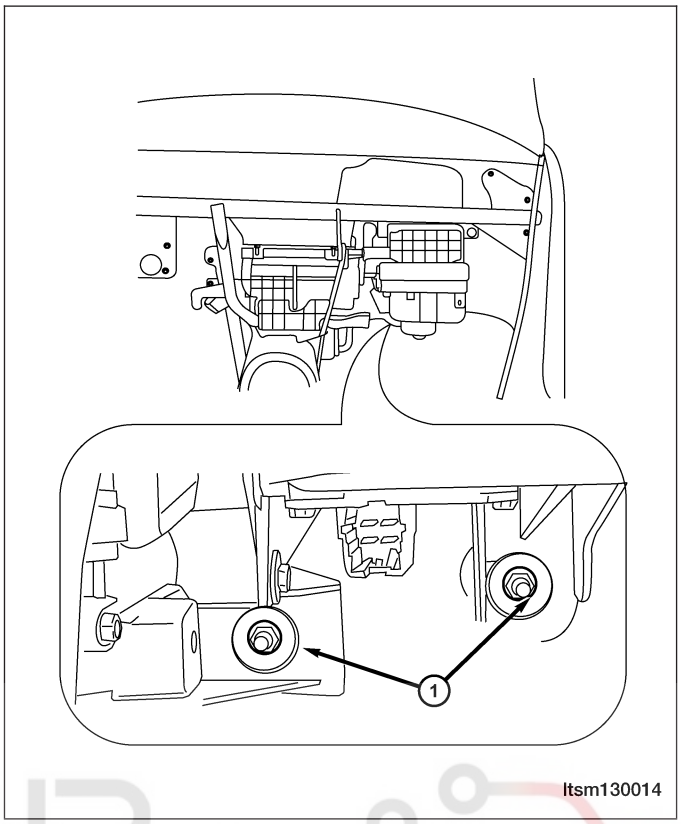
5. Remove the evaporator assembly lower retaining bolts (1).



6. Disconnect the electrical connectors. Remove the evaporator assembly.
7. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Blower Motor

Description

The blower motor is mounted in the HVAC housing. The following are blower motor functions:

- The blower motor will operate whenever the ignition switch is in the ON position and the blower motor control is in any position except Off.
- The blower motor can be accessed for service from underneath the instrument panel.
- The blower motor and blower motor wheel are factory balanced as an assembly and cannot be adjusted or repaired and must be replaced if found inoperative or damaged.

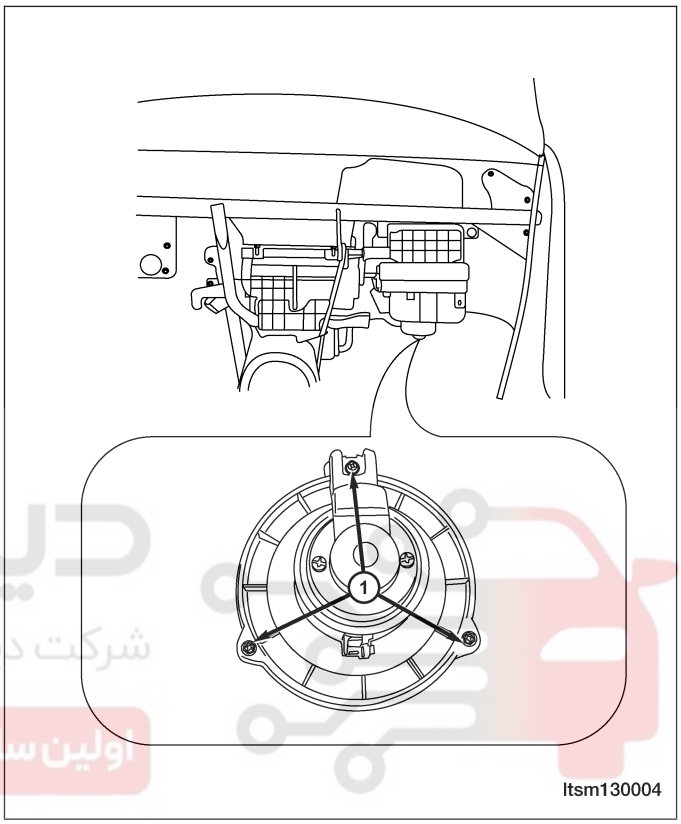
Operation

The blower motor is used to control the velocity of air moving through the HVAC housing by spinning the blower wheel within the HVAC air inlet housing at the selected speed. The blower motor is a 12-volt, direct current (DC) motor mounted within a plastic housing with an integral wire harness connector. The blower wheel is secured to the blower motor shaft and is positioned within the air inlet housing on the passenger side of the HVAC housing.

Removal & Installation

NOTE :
The blower motor is located on the bottom of the HVAC housing. The blower motor can be removed from the vehicle without having to remove the HVAC housing.

1. Disconnect the blower motor electrical connector.
2. Remove the glove box (See Instrument Panel Removal & Installation in Section 15 Body & Accessories).
3. Remove the mounting bolts (1) for the blower motor.



4. Remove the blower motor.
5. Installation is in the reverse order of removal.

SYSTEM PLUMBING

GENERAL INFORMATION

Description

The A/C refrigerant lines and pipes are used to carry the refrigerant between the various A/C system components.

Any kinks or sharp bends in the refrigerant lines and hoses will reduce the capacity of the entire A/C system and can reduce the flow of refrigerant within the system.

Operation

High pressure is produced in a refrigerant system when the A/C compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed. Depending on vehicle, model and market application, refrigerant lines are connected to each other or other A/C system components with block-type or quick-connect type fittings. To ensure the integrity of the refrigerant system, O-rings and/or gaskets may be used to seal the refrigerant system connections. The refrigerant lines and hoses cannot be repaired and must be replaced if leaking or damaged.

WARNING!

The A/C system contains refrigerant under high pressure. Repairs should only be performed by qualified service personnel. Serious or fatal injury may result from improper service procedures.
If accidental A/C system discharge occurs, ventilate the work area before resuming service. Large amounts of refrigerant released in a closed work area will displace the oxygen and cause suffocation and serious or fatal injury.

CAUTION:
Never add R-12 to a refrigerant system designed to use R-134a. Do not use R-12 equipment or parts on an R-134a A/C system. These refrigerants are not compatible and damage to the A/C system will result.

CAUTION:
Never use R-12 refrigerant oil in an A/C system designed to use R-134a refrigerant oil. These refrigerant oils are not compatible and damage to the A/C system will result.

CAUTION:
Do not run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

CAUTION:
Do not overcharge the refrigerant system. Overcharging will cause excessive compressor head pressure and can cause compressor noise and A/C system failure.

Specifications

Torque Specifications

DESCRIPTION	TORQUE (N·m)
A/C Compressor Bracket Bolts	40
A/C Compressor Line Bolts	20

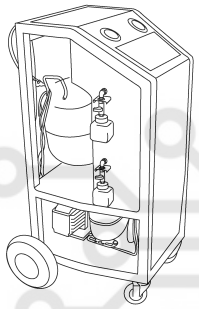
A/C Refrigerant Charge Specifications

DESCRIPTION	CAPACITY (kg)
R-134a Refrigerant	0.700

A/C Oil Specifications

DESCRIPTION	CAPACITY (ml)
Compressor	150
Condenser, Accumulator, Lines	15
Evaporator	30

Special Tools

Refrigerant Recovery/Recycling Station	 ltsm130018

DIAGNOSIS & TESTING

Mechanical Problems

Possible locations or causes of insufficient heat:
- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend door not functioning properly.
- Trapped air in system.

Temperature Control

If the heater outlet air temperature cannot be adjusted with the temperature control knob(s) on the A/C heater control panel, the following could require service:
- The A/C heater control.
- The blend door actuator(s).
- The wire harness circuits for the A/C heater control or the blend door actuator(s).
- The blend door(s).
- Improper engine coolant temperature.

A/C Compressor Noise Testing

When investigating an A/C system related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transaxle in gear or neutral, engine speed, engine temperature, and any other special conditions. Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed bearing, may be caused by loose bolts, nuts, mounting brackets or a loose compressor assembly.

NOTE :
The A/C compressor must be replaced if any unusual noise is heard from the compressor itself.

NOTE :
Drive belts are speed sensitive. At different engine speeds and depending upon drive belt tension, drive belts can develop noises that are mistaken for an A/C compressor noise. Improper drive belt tension can cause a misleading noise when the compressor is operating at maximum displacement, which may not occur when the compressor is at minimum displacement.

1. Select a quiet area for testing.
2. Duplicate the complaint conditions as much as possible.
3. Turn the A/C system On and Off several times to clearly identify any compressor noise.
4. Listen to the A/C compressor while it is operating at maximum and minimum displacement.
5. Probe the A/C compressor with an engine stethoscope or a long screwdriver with the handle held to your ear to better localize the source of the noise.
6. To duplicate high-ambient temperature conditions (high head pressure), restrict the air flow through the A/C condenser. Install a manifold gauge set or a scan tool to ensure that the discharge pressure does not exceed 2600 kPa.
7. Check the condition of the accessory drive belt.
   NOTE: The A/C compressor must be replaced if the drive hub is broken or if the compressor shaft does not rotate smoothly.
8. Check the compressor hub and pulley and bearing assembly. Ensure that the hub and pulley are properly aligned and that the pulley bearing is mounted securely to the A/C compressor.
9. Check the refrigerant system plumbing for incorrect routing, rubbing or interference, which can cause unusual noises. Also check the refrigerant lines and hoses for kinks or sharp bends that will restrict refrigerant flow, which can cause noises.
10. Loosen all of the compressor mounting hardware and retighten.
    CAUTION: Do not run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.
11. If the noise is from opening and closing the high pressure relief valve, recover, evacuate and recharge the refrigerant system. If the high pressure relief valve still does not seat properly, replace the A/C compressor.

12. If the noise is from liquid refrigerant slugging in the A/C suction line, replace the A/C accumulator and check the refrigerant oil level and the refrigerant system charge.
13. If a slugging condition still exists after replacing the A/C accumulator, replace the A/C compressor.

Refrigerant System Leaks

WARNING!

R-134a service equipment or vehicle A/C systems should not be pressure tested or leak tested with compressed air. Mixture of air and R-134a can be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing property damage, personal injury or death. Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved service equipment meeting SAE requirements to discharge an R-134a system. If accidental system discharge occurs, ventilate work area before resuming service.

NOTE :
If the A/C refrigerant system charge is empty or low, a leak in the A/C system is likely. Inspect all A/C lines, fittings and components for an oily residue. Oil residue can be an indicator of an A/C system leak location.

NOTE :
The only way to correctly determine if the refrigerant system is fully charged with R-134a is to completely evacuate and recharge the A/C system.

Refrigerant System Empty

1. Evacuate the refrigerant system to the lowest degree of vacuum possible. Determine if the system holds a vacuum for 15 minutes. If vacuum is held, a leak is probably not present. If system will not maintain vacuum level, proceed to STEP 2.
2. Prepare and dispense 0.3 kilograms of R-134a refrigerant into the evacuated refrigerant system and proceed to STEP 1 of the System Low procedure.

Refrigerant System Low

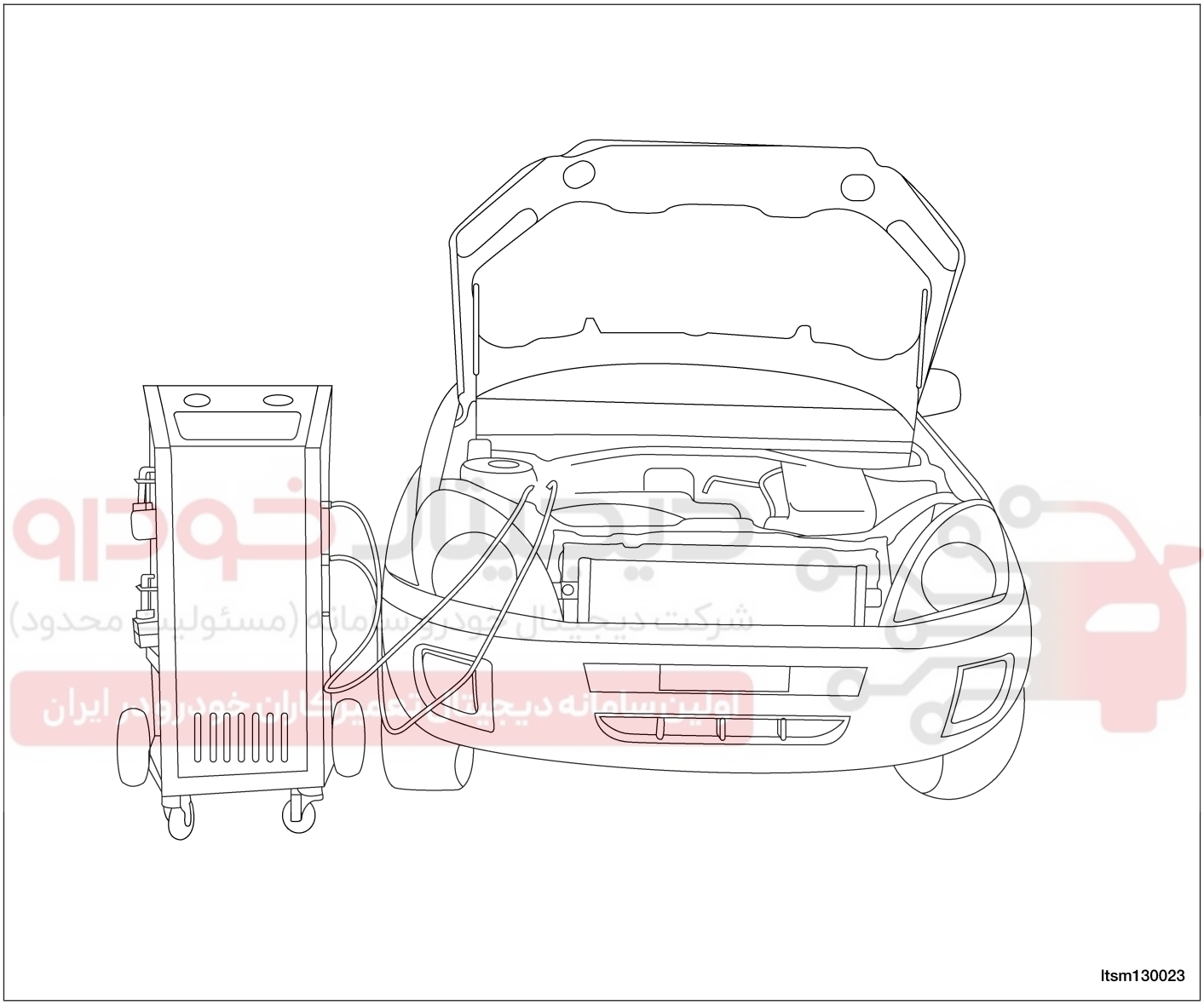
1. Position the vehicle in a wind-free work area. This will aid in detecting small leaks.
2. Operate the heating-A/C system with the engine at idle under the following conditions for at least 5 minutes: Doors or windows open, transaxle in Park or Neutral with the parking brake set (depending on application), A/C-Heater controls set to outside air, full cool, panel mode, high blower and with A/C compressor engaged.
3. Shut the vehicle Off and wait 2 - 7 minutes. Then use an electronic leak detector that is designed to detect R-134a refrigerant and search for leaks. Fittings, lines or components that appear to be oily usually indicate a refrigerant leak. To inspect the A/C evaporator for leaks, insert the leak detector probe into the drain tube opening or an air outlet. A dye for R-134a is available to aid in leak detection. Use only approved refrigerant dye.

CAUTION:
A leak detector only designed for R-12 refrigerant will not detect leaks in an R-134a refrigerant system.

ON-VEHICLE SERVICE

A/C System Evacuation and Recharge

Connecting Refrigerant Recovery/Recycling Station



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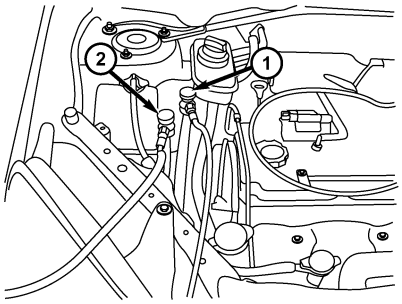
WARNING!

The A/C system is under high pressure, use caution when servicing the A/C system.

1. Connect the refrigerant recovery/recycling station to the vehicles high and low side A/C line connectors.

   NOTE: The refrigerant recovery/recycling station connectors are connected to the vehicle in the following way:

- BLUE connector (1) is connected to the A/C low side fitting.
- RED connector (2) is connected to the A/C high side fitting.



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A/C System Evacuation

CAUTION:
Do NOT run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

NOTE :
Special effort must be used to prevent moisture from entering the A/C system oil. Moisture in the oil is very difficult to remove and will cause a reliability problem with the A/C compressor.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be filled. Moisture and air mixed with the refrigerant will raise the compressor high pressure above acceptable operating levels. This will reduce the performance of the A/C system and damage the A/C compressor. Moisture will boil at near room temperature when exposed to vacuum.

NOTE :
When connecting the service equipment coupling to the line fitting, verify that the valve of the coupling is fully closed. This will reduce the amount of effort required to make the connection.

To evacuate the refrigerant system:

1. With the engine OFF, connect a suitable charging station, refrigerant recovery machine or a manifold gauge set with vacuum pump and refrigerant recovery equipment. Do not operate the engine with a vacuum on the A/C system.
2. Open the suction and discharge valves and start the vacuum pump. The vacuum pump should run a minimum of 45 minutes prior to charge to eliminate all moisture in system. When the suction gauge reads to the lowest degree of vacuum possible for 30 minutes, close all valves and turn off vacuum pump. If the system fails to reach specified vacuum, the refrigerant system likely has a leak that must be corrected. If the refrigerant system maintains specified vacuum for at least 30 minutes, start the vacuum pump, open the suction and discharge valves. Then allow the system to evacuate an additional 10 minutes.
3. Close all valves.
4. Turn off and disconnect the vacuum pump.
5. Charge the refrigerant system.

A/C System Recharge

After all refrigerant system leaks have been repaired and the refrigerant system has been evacuated, a refrigerant charge can be injected into the system.

CAUTION:
A small amount of refrigerant oil is removed from the A/C system each time the refrigerant system is recovered and evacuated. Before charging the A/C system, you MUST replenish any oil lost during the recovery process.

1. Evacuate the refrigerant system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

2. A manifold gauge set and an R-134a refrigerant recovery/recycling/charging station that meets SAE standard J2210 should be connected to the refrigerant system.
3. Open both the suction and discharge valves, then open the charge valve to allow the refrigerant to flow into the system.
4. When the transfer of refrigerant has stopped, close both the suction and discharge valves.
5. If all of the refrigerant charge did not transfer from the dispensing device, open all of the windows in the vehicle and set the heating-A/C system controls so that the A/C compressor is operating and the blower motor is running at its lowest speed setting. Run the engine at a steady high idle (about 2000 RPM).
6. Open the low-pressure valve to allow the remaining refrigerant to transfer to the refrigerant system.

WARNING!

Take care not to open the discharge (high pressure) valve at this time. Failure to follow this warning could result in possible personal injury or death.

7. Disconnect the refrigerant recovery/recycling station from the refrigerant system service ports.
8. Reinstall the caps onto the refrigerant system service ports.

Compressor

Description

Vehicles equipped with the 1.6L & 1.8L & 2.0L engine use a SD7V16 clutch-less compressor. The 2.4L equipped vehicles use a V5 clutch-less compressor. The compressor is a variable displacement compressor. The largest displacement is 161.3 ml/r, displacement range of 5% to 100%.

CAUTION:

DON'T run the engine with a vacuum pump in operation or with a vacuum present within the A/C system. Failure to follow this caution will result in serious A/C compressor damage.

NOTE :

The compressor drive hub and the pulley and bearing assembly cannot be serviced separately from the A/C compressor. In the event of drive hub or pulley and bearing assembly damage or failure, the A/C compressor, drive hub and pulley and bearing must be replaced as an assembly.

Operation

The A/C compressor is controlled by the Engine Control Module (ECM), depending on engine application. The ECM calculates compressor displacement required by A/C system load and demand by monitoring vehicle speed, A/C high side pressure, engine speed, evaporator temperature, accelerator pedal position, ambient temperature and A/C-Heater request signals. The ECM then sends a pulse width modulated signal to the A/C compressor control solenoid to increase or decrease refrigerant flow through an orifice located within the compressor housing. The amount of refrigerant allowed to pass through the orifice in the compressor determines the head pressure which controls the angle of the swash plate, which in turn, determines the amount of compressor displacement. When there is no demand for A/C, the swashplate is adjusted to nearly a zero degree angle, which removes compressor torque drag from the engine.

NOTE :

The A/C compressor cannot be repaired and it must be replaced if found inoperative or damaged. If an internal failure of the A/C compressor has occurred, the A/C accumulator and the A/C liquid line must also be replaced.

Removal & Installation - 1.6L & 1.8L & 2.0L

WARNING!

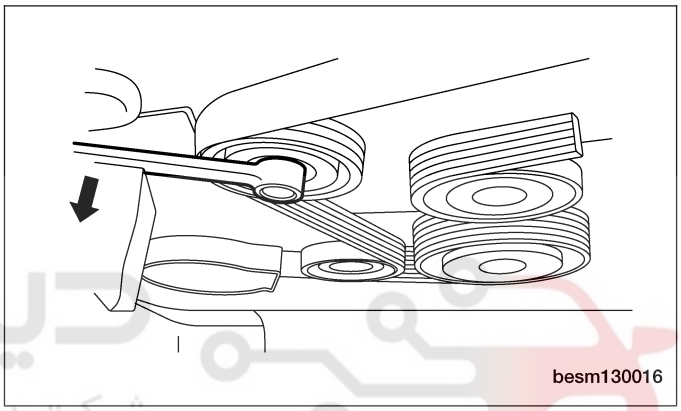
Review safety precautions and warnings in this group before performing this procedure. Failure to follow the warnings and cautions could result in possible personal injury or death.

CAUTION:
The A/C accumulator and the A/C liquid line must be replaced if an internal failure of the A/C compressor has occurred. Failure to replace the A/C accumulator and the A/C liquid line can cause serious damage to the replacement A/C compressor.

NOTE :
When replacing multiple A/C system components, determine how much oil should be removed from the new A/C compressor.

NOTE :
Replacement of the refrigerant line O-ring seals and gaskets is required anytime a refrigerant line is opened. Failure to replace the rubber O-ring seals and metal gaskets could result in a refrigerant system leak.

1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).
2. Disconnect the A/C compressor electrical connector.
3. Remove the engine drive belt (See Drive Belt Removal & Installation in Section 02 Engine).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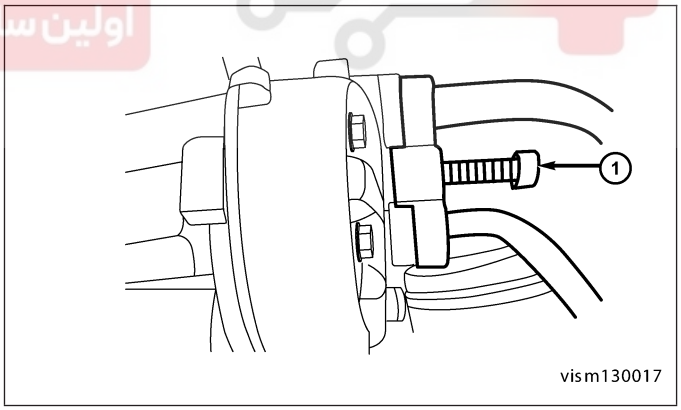
4. Remove the intake manifold (See Intake Manifold Removal & Installation in Section 02 Engine).
5. Remove the A/C compressor line bolt (1) from the A/C compressor.
   (Tighten: A/C compressor line bolt to 20 N·m)
   NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.



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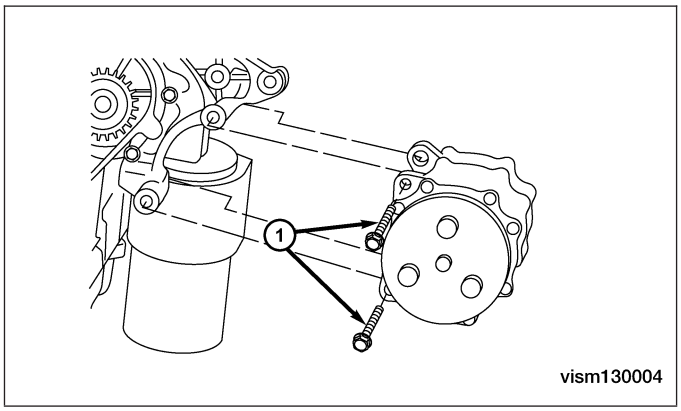
6. Loosen the A/C compressor bracket bolt connecting the A/C compressor and bracket.
   (Tighten: A/C compressor bracket bolt to 40 N·m)

7. Remove the A/C compressor bracket bolts (1). (Tighten: A/C compressor bracket bolts to 40 N·m)
8. Carefully remove the A/C compressor and bracket assembly.
9. Installation is in the reverse order of removal.

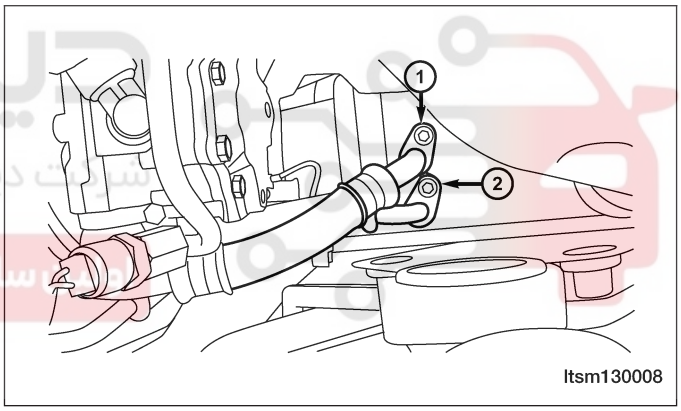


Installation Notes:

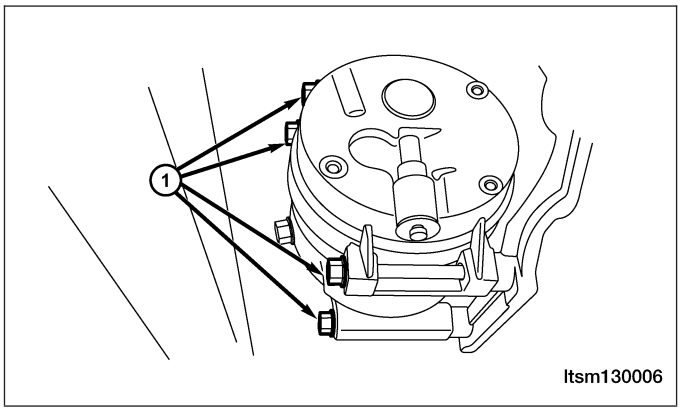
- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Removal & Installation - 2.4L

1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).
2. Disconnect the A/C compressor electrical connector.
3. Remove the engine drive belt (See Drive Belt Removal & Installation in Section 02 Engine).
4. Remove the A/C compressor low-pressure line bolt (1) and high-pressure line bolt (2) from the A/C compressor. (Tighten: A/C compressor line bolts to 20 N·m)



5. Remove the A/C compressor mounting bolts (1). (Tighten: A/C compressor bracket bolt to 40 N·m)



6. Carefully remove the A/C compressor assembly.
7. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.

- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Evaporator

Description

The evaporator core is located in the HVAC housing, under the instrument panel. The evaporator coil is positioned in the HVAC housing so that all air that enters the housing must pass over the fins of the evaporator before it is distributed through the system ducts and outlets. However, air passing over the evaporator core fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator coil tubes.

Operation

Refrigerant enters the evaporator from the orifice tube as a low-temperature, low-pressure liquid. As air flows over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas before it leaves the evaporator. The evaporator core housing directs airflow from the blower motor through the evaporator core and heater core. All airflow from the blower motor passes through the evaporator core. The airflow is then directed through or around the heater core by the temperature blend door(s).

Removal & Installation

1. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).
2. Remove the expansion valve.
3. Remove the HVAC housing (See HVAC Housing Removal and Installation in Section 13 Heating & Air Conditioning).
4. Remove the retaining bolts and screws.
5. Remove the evaporator core.
6. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Condenser

Description

The condenser is located in the air flow in front of the engine cooling radiator. The condenser transforms the refrigerant from a gas into a liquid. It is attached to the vehicle with bolts and the A/C lines with fittings.

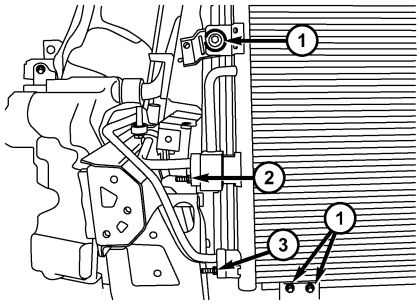
Operation

When the heat is removed from the refrigerant, it condenses. When the refrigerant leaves the condenser, it becomes a high-pressure liquid refrigerant. The volume of air flowing over the condenser fins is critical to the proper cooling performance of the air conditioning system. Therefore, it is important that there are no objects placed in front of the radiator grille openings in the front of the vehicle or foreign material on the condenser fins that might obstruct proper air flow. Also, any factory-installed air seals or shrouds must be properly reinstalled following radiator or condenser service.

Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).
3. Remove the front bumper (See Front Bumper Removal & Installation in Section 15 Body & Accessories).
4. Remove the nut (3) that secures the A/C high-pressure liquid line to the A/C condenser. Remove and discard the O-ring seal and gasket.

   NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.
5. Remove the nut (2) that secures the A/C high-pressure gas line to the A/C condenser. Remove and discard the O-ring seal and gasket.
6. Remove the condenser mounting bolts (1).



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7. Remove the condenser from the engine compartment.
8. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Accumulator

Description

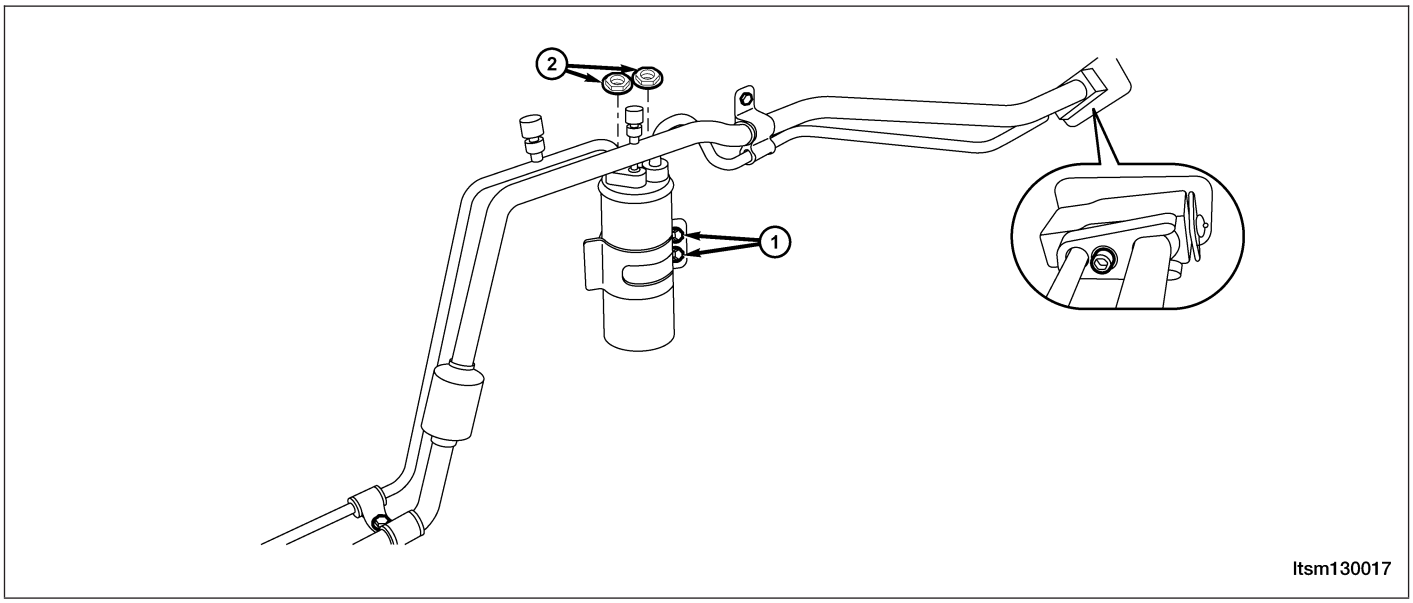
The accumulator is connected directly between the condenser and the expansion valve. Accumulator is used on systems that use an orifice tube to meter refrigerants into the evaporator.

Operation

The primary function of the accumulator is to isolate the compressor from any damaging liquid refrigerant. The accumulator removes debris and moisture from the air conditioning system.

Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).



3. Remove the nuts (2) connecting the suction lines to the accumulator.
4. Remove the accumulator mounting bolts (1).
5. Remove the accumulator. Remove and discard the O-ring seals and gaskets.
   NOTE: After removing the A/C lines, plug the A/C lines to prevent any debris from entering the A/C system.
6. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Liquid Line

Description

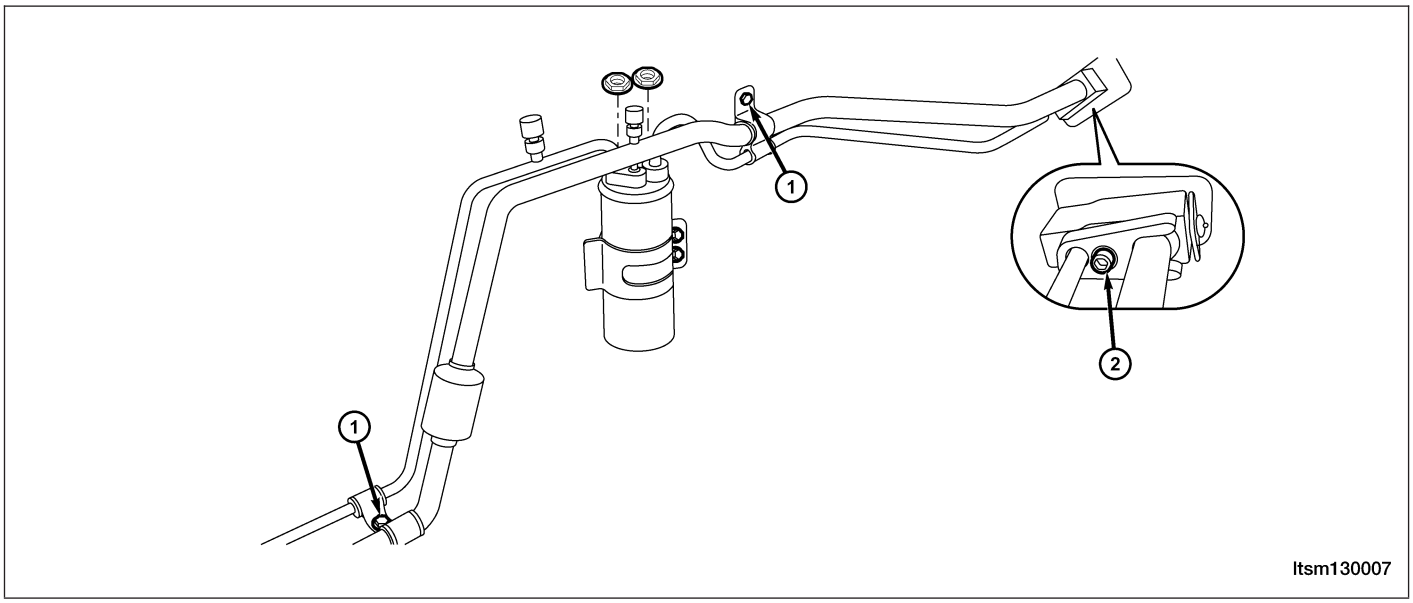
The A/C liquid line connects the A/C condenser to the A/C evaporator.

Operation

The high pressure A/C liquid line is the refrigerant line that carries refrigerant from the A/C condenser to the A/C accumulator. Air conditioning hoses are designed to control liquid and gas at high pressures and temperatures. The hoses are usually flexible and equipped with special metal fittings at the ends to prevent leaks and provide a sure seal and connection between components.

Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).



3. Remove the bolt (2) that secures the A/C liquid and suction line assembly to the A/C expansion valve.
4. Remove the lines retaining bolts (1).
5. Remove the A/C liquid line assembly from the A/C evaporator to compressor and remove and discard the seals.
6. Install plugs in, or tape over the opened refrigerant line fittings and the evaporator ports.
7. Remove the A/C liquid line assembly from accumulator to condenser and from accumulator to evaporator.
8. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Suction Line

Description

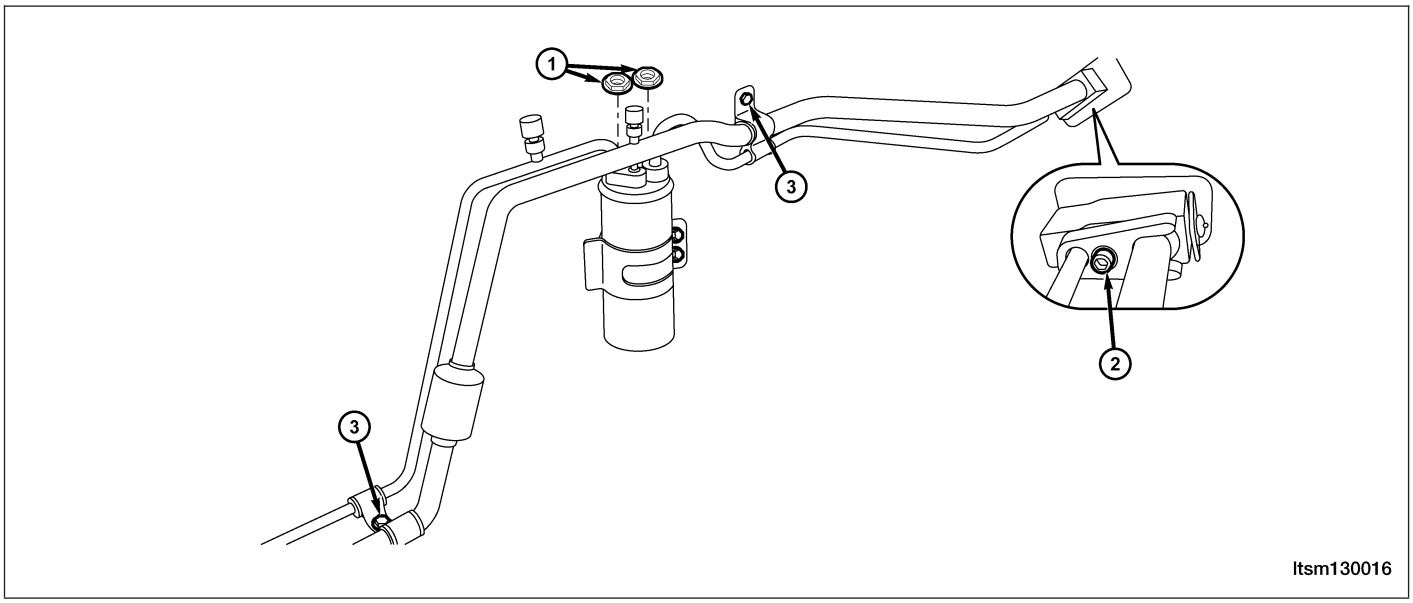
The A/C suction line connects the A/C compressor to the A/C accumulator.

Operation

The low pressure A/C suction line is the refrigerant line that carries refrigerant from the A/C accumulator to the A/C compressor. Air conditioning hoses are designed to control liquid and gas at high pressures and temperatures. The hoses are usually flexible and equipped with special metal fittings at the ends to prevent leaks and provide a sure seal and connection between components.

Removal & Installation

1. Disconnect the negative battery cable.
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).



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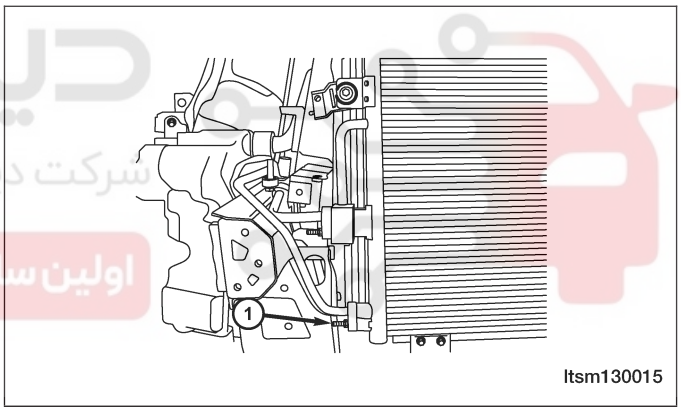
3. Remove the bolt (2) that secures the A/C liquid and suction line assembly to the A/C expansion valve.
4. Remove the nuts (1) that connect the suction lines to the A/C accumulator.
5. Remove the lines retaining bolts (3).
6. Remove the nut (1) that connect the suction line to the A/C compressor.



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7. Install plugs in, or tape over the opened refrigerant line fittings and the evaporator ports.
8. Remove the A/C suction line assembly from evaporator to compressor.
9. Installation is in the reverse order of removal.

Installation Notes:

- Lubricate new rubber O-ring seals with clean refrigerant oil and install them and new gaskets onto the refrigerant line fittings.
- Use only the specified O-rings as they are made of a special material for the R-134a system.
- Use only refrigerant oil of the type recommended for the A/C compressor in the vehicle.
- Recharge the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).

Heater Core

Description

The heater core is located in the HVAC housing. The heater core is a heat exchanger made of rows of tubes with fins and is positioned within the air distribution housing so that only the selected amount of air entering the housing passes through the heater core before it is distributed through the heating-A/C system ducts and outlets. One end of the heater core is fitted with a tank that includes the fittings for the heater core tubes. The heater core can only be serviced by removing the HVAC housing from the vehicle.

Operation

Engine coolant is circulated through the heater hoses to the heater core at all times. As the coolant flows through the heater core, heat is removed from the engine and is transferred to the heater core tubes and fins. Air directed through the heater core picks up the heat from the heater core fins. The blend-air door allows control of the heater output air temperature by regulating the amount of air flowing through the heater core. The blower motor speed controls the volume of air flowing through the HVAC housing.

Removal & Installation

1. Drain the cooling system (See Cooling System Draining Procedure in Section 06 Cooling System).
2. Evacuate the A/C system (See A/C System Evacuation and Recharge in Section 13 Heating & Air Conditioning).
3. Remove the HVAC housing assembly and place it on a workbench (See HVAC Housing Removal & Installation in Section 13 Heating & Air Conditioning).
4. Remove the retaining bolts and clamps.
5. Remove the heater core.
6. Installation is in the reverse order of removal.

Installation Notes:

- Verify the cooling system is filled to proper specifications.