SECTION 7B

MANUAL CONTROL HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM

CAUTION: Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in B unless otherwise noted.

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DESCRIPTION AND OPERATION

SYSTEM COMPONENTS –FUNCTIONAL

Compressor

All compressors are belt–driven from the engine crankshaft through the compressor clutch pulley. The compressor pulley rotates without driving the compressor shaft until on electromagnetic clutch coils energized. When voltage is applied to energize the clutch coil, the clutch plate and hub assembly are drawn toward the pulley. The magnetic force locks the clutch plate and pulley together as one unit to drive the compressor shaft.

Condenser Core

The condenser assembly in front of the radiator consists of coils which carry the refrigerant and cooling fins that provide the rapid transfer of heat. The air passing through the condenser cools the high–pressure refrigerant vapor and cause it to condense into a liquid.

Expansion Valve

The expansion valve is located on the passenger compartment side of the dash panel. The expansion valve can fail in three different positions: open, closed, or restricted. An expansion valve that fails in the open position will result in a noisy A/C compressor or no cooling. The cause can be a broken spring, a broken ball, or excessive moisture in the A/C system. If the spring or the ball is found to be detective, replace the expansion valve. If excessive moisture is found in the A/C system, recycle the refrigerant. An expansion valve that fails in the closed position will result in low suction pressure and no cooling. This may be caused by a failed power done or excessive moisture in the A/C system. If the power dome on the expansion valve is found to be defective, replace the expansion valve. If excessive moisture is found in the A/C system, recycle the refrigerant.

A restricted expansion valve will result in low suction pressure and no cooling. This may be caused by debris in the refrigerant system. If debris is believed to be cause, recycle the refrigerant, replace the expansion valve, and replace the receiver/dryer.

Evaporator Core

The evaporator is device which cools and dehumidifies the air before it enters the vehicle. High–pressure liquid refrigerant flows through the expansion tube (orifice) and becomes a low–pressure gas in the evaporator. The heat in the air passing through the evaporator core is transferred to the cooler surface of the core, which cools the air. As the process of heat transfer from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water.

Receiver–Dryer

The sealed receiver–dryer assembly is connected to the evaporator outlet pipe. It acts as a refrigerant storing container, receiving liquid and some vapor and refrigerant oil from the evaporator.

At the bottom the receiver–dryer is the desiccant, which acts as a drying agent for the moisture that may have entered the system. The receiver–dryer is serviceable only as an assembly.

Dual Cut Switch

The dual cut switch controls compressor operation when the cycling refrigerant pressure is dropped or surged.

Evaporator Thermistor

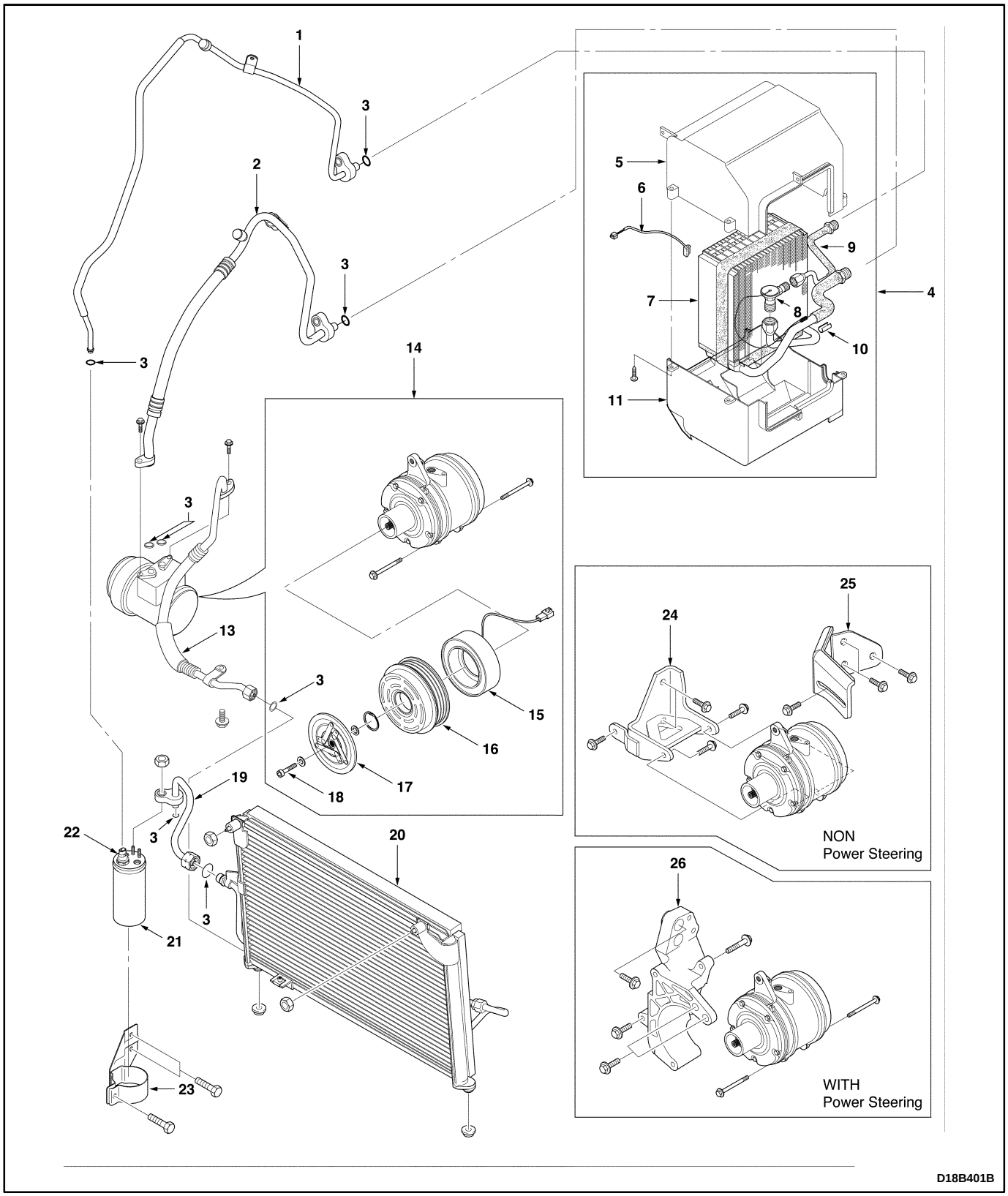
A semiconductor which resistance is noticeably changed as the change of temperature. When the refrigerant temperature of the evaporator drops to 0°C (32°F) and below, the evaporator cores get stuck with frost or ice, reducing the airflow, lowering the cooling capacity. The thermistor is a sensor which is used to prevent from frosting or icing.

The thermistor is installed on the evaporator.

COMPONENT LOCATOR

A/C SYSTEM

(Left–Hand Drive Shown, Right–Hand Drive Similar)



1. High Pressure Pipe (Receiver Dryer → Evaporator)
2. Low Pressure Hose (Evaporator → Compressor)
3. O–ring
4. Evaporator Module
5. Evaporator Upper Case
6. thermistor
7. Evaporator Core
8. Expansion Valve
9. Evaporator Inlet Pipe
10. Plate
11. Evaporator Lower Case
12. O–ring
13. High Pressure Pipe (Compressor → Condenser)
14. Compressor
15. Compressor Magnetic Clutch
16. Compressor Pulley
17. Compressor Clutch Drive
18. Shaft Bolt
19. High Pressure Pipe (Condenser → Receiver–Dryer)
20. Condenser
21. Receiver–Dryer
22. Dual Cut Switch
23. Receiver–Dryer Bracket
24. Compressor Bracket
25. Compressor Stay
26. A/C & Power Steering Bracket

DIAGNOSTIC INFORMATION AND PROCEDURES

GENERAL DIAGNOSIS

TESTING THE REFRIGERANT SYSTEM

If you suspect a problem in the refrigerant system, check for the following conditions:

1. Check the outer surfaces of the radiator and the condenser cores to be sure that the airflow is not blocked by dirt, leaves, or other foreign material. Check between the condenser and the radiator, as well as all outer surfaces.
2. Check for restrictions or kinks in the condenser core, the hoses, and the tubes.
3. Check the operation of the blower fan.
4. Check all the air ducts for leaks or restrictions. A low airflow rate may indicate a restricted evaporator core.
5. Check for slippage of the compressor clutch.
6. Check the drive belt tension.

INSUFFICIENT COOLING “QUICK CHECK” PROCEDURE

Perform the following “hand-feel” procedure to get a quick idea of whether the air conditioning (A/C) system has the proper charge of Refrigerant-134a.

1. Warm up the engine. Run the engine at idle.
2. Open the hood and all the doors.
3. Turn the A/C switch ON.
4. Set the temperature control to the full cold position.
5. Set the blower speed switch on 4.
6. “Hand-feel” the temperature of the evaporator outlet pipe. The pipe should be cold.
7. Check for other problems. Refer to “Testing the Refrigerant System” in this section.
8. Leak check the system. Refer to “Leak Testing the Refrigerant System” in this section. If you find a leak, discharge the system and repair the leak as required. After completing the repair, evacuate and charge the system.
9. If there is no leak, refer to “Insufficient Cooling Diagnosis” in this section.

PRESSURE-TEMPERATURE RELATIONSHIP OF R-134A

TEMPERATURE °C (°F)*	PRESSURE kPa (psig)*	TEMPERATURE °C (°F)*	PRESSURE kPa (psig)*
–8.89 (16)	105.70 (15.33)	37.78 (100)	856.84 (124.27)
–7.78 (18)	114.87 (16.66)	38.89 (102)	886.56 (128.58)
–6.67 (20)	124.32 (18.03)	40.00 (104)	916.35 (132.98)
–5.56 (22)	134.11 (19.45)	41.11 (106)	947.92 (137.48)
–4.44 (24)	144.24 (20.92)	42.22 (108)	979.64 (142.08)
–3.33 (26)	154.65 (22.43)	43.33 (110)	1012.11 (146.79)
–2.22 (28)	165.48 (24.00)	44.44 (112)	1045.21 (151.59)
–1.11 (30)	176.65 (25.62)	45.56 (114)	1079.14 (156.51)
0.00 (32)	188.16 (27.29)	46.67 (116)	1113.75 (161.53)
1.11 (34)	200.02 (29.01)	47.78 (118)	1149.12 (166.66)
2.22 (36)	212.30 (30.79)	48.89 (120)	1185.18 (171.89)
3.33 (38)	224.98 (32.63)	50.00 (122)	1222.07 (177.24)
4.44 (40)	238.08 (34.53)	51.11 (124)	1259.72 (182.70)
7.22 (45)	272.49 (39.52)	52.22 (126)	1298.12 (188.27)
10.00 (50)	309.58 (44.90)	53.33 (128)	1337.35 (193.96)
12.77 (55)	349.51 (50.69)	54.44 (130)	1377.35 (199.76)
15.56 (60)	392.33 (56.90)	57.22 (135)	1480.91 (214.78)
18.33 (65)	438.18 (63.55)	60.00 (140)	1589.57 (230.54)
21.11 (70)	487.27 (70.67)	62.78 (145)	1703.62 (247.08)
23.89 (75)	539.67 (78.27)	65.56 (150)	1823.04 (264.40)
26.67 (80)	609.38 (88.38)	68.33 (155)	1948.04 (282.53)
29.44 (85)	655.09 (95.01)	71.11 (160)	2078.77 (301.49)
32.22 (90)	718.39 (104.19)	73.89 (165)	2215.29 (321.29)
35.00 (95)	785.61 (113.94)	76.67 (170)	2357.81 (341.96)

* All values rounded to two decimal places.

EVAPORATOR RANGE: From –6.67 to 7.22°C (20 to 45°F), the temperatures represent the gas temperatures inside the coil and not on the coil surfaces. Add 1.67 to 5.56°C (3 to 10°F) the temperature for coil and air-off temperatures.

CONDENSER RANGE: From 110 to 160°F, temperatures are not ambient. Add 19.4 to 22.2°C (35 to 40°F) for proper heat transfer, then refer to the pressure chart.

Example: 32°C (90°F) ambient temperature
+ 22°C (40°F)
54°C (130°F)

Condenser temperature = 1379 kPa (200 psig)
Based on 48.3 km/h (30 mph) air flow.

LEAK TESTING THE REFRIGERANT SYSTEM

Test for leaks whenever you suspect a refrigerant leak in the system. You should also test for leaks whenever you perform a service operation which results in disturbing the lines or the connections. Leaks are commonly found at the refrigerant fittings or at the connections. Leaks are commonly caused by the following problems:

- Improper torque.
- Damaged O-ring seals.
- Dirt or lint on the O-ring seals.

Liquid Leak Detectors

Use a liquid leak detector solution on locations such as fittings. Apply the solution to the area in question with the swab that is supplied with the solution. Look for bubbles to appear. This will indicate the existence and location of any leak.

For areas where this is not practical, such as sections of the evaporator and the condenser, an electronic leak detector is more useful.

Electronic Leak Detectors

Follow the manufacturer's instructions for calibration, operation, and maintenance of an electronic leak detector. Battery condition is especially important to the accuracy of a portable model. Set the detector to R-134a before beginning the test.

Important: Electronic leak detectors are sensitive to windshield washing solutions, solvents and cleaners, and certain vehicle adhesives.

Surfaces must be clean to prevent false readings. Make sure that all surfaces are dry to prevent damage to the detector.

General Testing Instructions

- Follow the entire path of the refrigerant system.
- Completely circle each joint at 25 to 50 mm (1 to 2 inches) per second.
- Hold the probe tip within 6 mm (1/4 inch) of the surface.
- Do not block the air intake.

The audible tone changes from 1 to 2 clicks per second into a solid alarm if there is a leak. Adjust the balance control to maintain 1 to 2 clicks per second.

Test all of the following areas, even after one leak has been confirmed:

- Evaporator inlet and outlet.
- Receiver-drier inlet and outlet.
- Condenser inlet and outlet.
- Brazed and welded areas.
- Damaged areas.
- Hose couplings.
- Compressor rear head.
- All fittings and joints.

Testing Service Ports/Access Valves

The sealing cap is the primary seal for the service ports. This cap contains a special leak-free O-ring. Make sure that this cap is not missing or loose. Always use the correct cap.

Testing the Evaporator Core

Leaks in the evaporator core are difficult to find. Test the evaporator core using the following procedure:

1. Run the blower fan at speed setting 4 for at least 15 minutes.
2. Turn the blower to the OFF position.
3. Wait for 10 minutes.
4. Remove the blower motor resistor. Refer to "Blower Motor Resistor" in this section.
5. Insert the leak detector probe as close as possible to the evaporator core. The detector will indicate a leak with a solid alarm.
6. Use a flashlight to search for refrigerant oil in the core surface.

Testing the Compressor Shaft Seal

1. Blow shop air behind and in front of the compressor clutch/pulley for at least 15 seconds.
2. Wait 1 to 2 minutes.
3. Probe the area in front of the pulley. If the detector emits a solid alarm, there is a leak.

AIR CONDITIONING SYSTEM DIAGNOSIS

INSUFFICIENT COOLING DIAGNOSIS

Step	Action	Value(s)	Yes	No
1	Can you verify the customer complaint?	–	Go to *Step 2*	System OK
2	1. Check the fuses Ef14, Ef19, and Ef12. 2. Check the blower fan operation. 3. Check the engine cooling fan operation. 4. Check the A/C compressor belt. 5. Check the A/C condenser for restricted air flow. 6. Check the slippage of the compressor clutch. 7. Repair or replace any components as needed. 8. Check the A/C system operation. Is the A/C system operation normal?	–	System OK	Go to *Step 3*
3	1. Turn the ignition switch OFF. 2. Connect the high and the low pressure gauges. Are both pressures within the value specified?	Low Side Pressure: 200 kPa (29 Psi) High Side Pressure: 1,500 kPa (217.5 Psi)	Go to *Step 8*	Go to *Step 6*
4	Are both pressures above the specified value?		Go to *Step 5*	–
5	Are both pressures within the specified value?		Go to *Step 8*	–
6	Are both pressure below the specified value?		Go to *Step 7*	Go to *Step 4*
7	1. Add the refrigerant R–134a. 2. Check the A/C system for leaks. 3. Repair any refrigerant leaks as needed. 4. Recover, evacuate, and recharge the A/C system. Are both pressure within the specified value?		Go to *Step 8*	–
8	1. Start the engine and allow it to run at idle. 2. Set the A/C controls to following positions. ● The A/C switch to the ON position. ● The fresh air control switch to fresh air. ● The blower motor to 4. ● The temperature to full cold. Does the A/C compressor clutch engage?	–	Go to *Step 9*	Go to *Step 11*
9	1. Check for a knocking noise from the A/C compressor. 2. Cycle the A/C compressor ON and OFF in order to verify the source of the noise. Do you hear a loud knocking noise?	–	Go to *Step 10*	Go to *Step 14*
10	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the repair complete?	–	Go to *Step 14*	–
11	1. Turn the ignition switch OFF. 2. Disconnect the A/C compressor clutch coil connector. 3. Connect a jumper wire from ground to one A/C compressor clutch coil terminal. 4. Connect a fused jumper wire from the positive battery terminal to the other A/C compressor clutch coil terminal. Does the A/C clutch engage?	–	Go to *Step 12*	Go to *Step 13*

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
12	Repair the electrical circuit to the A/C compressor clutch coil. Does the A/C clutch engage?	–	Go to *Step 20*	Go to *Step 13*
13	Replace the A/C compressor clutch coil. Does the A/C clutch engage?	–	Go to *Step 9*	Go to *Step 10*
14	**Important:** Perform this test under garage conditions; 21-32°C (70-90°F) and no sun load. Follow this test carefully for accurate results. 1. Close all of the windows and the doors of the vehicle. 2. Set the A/C controls to the following positions: ● The A/C switch to the ON position. ● The fresh air control switch to fresh air. ● The blower motor to 4. ● The temperature to full cold. 3. Start the engine and follow it to run at idle for 5 minutes. 4. Feel the evaporator inlet and outlet pipes. Is there a noticeable difference in the temperature of the evaporator inlet and outlet pipes?	–	Go to *Step 16*	Go to *Step 15*
15	1. Recover the A/C system refrigerant. 2. Replace the expansion valve as needed. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. 5. Note the discharge air temperature with the A/C ON. Is the discharge temperature normal?	–	Go to *Step16*	Go to *Step 18*
16	Feel the liquid pipe between the condenser and the expansion valve. Is the pipe cold?	–	Go to *Step 19*	Go to *Step 17*
17	1. Remove the restriction of the high pressure side. 2. Check the A/C system for leaks. Is the repair complete?	–	System OK	–
18	1. Recover the A/C system refrigerant. 2. Evacuate and recharge the A/C system. 3. Check the A/C system for leaks. Is the repair complete?	–	System OK	–
19	1. Run the engine at 3,000 rpm. 2. Close all of the windows and doors of the vehicle. 3. Set the A/C controls to the following positions: ● The A/C switch to the ON position. ● The fresh air control switch to fresh air. ● The blower motor to 4. ● The temperature to full cold. 4. Turn the A/C switch ON and OFF every 20 seconds for 3 minutes. Are the A/C compressor high and the low side pressures within the specified value of each other?	Low Side Pressure: 200 kPa (29 psi) High Side Pressure: 1,500 kPa (217.5 psi)	System OK	Go to *Step 22*

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
20	1. Turn the ignition switch OFF. 2. Turn the A/C switch to the OFF position. 3. Attempt to turn the clutch driver (not the pulley). Can you turn the clutch driver freely by hand?	–	Go to *Step 23*	Go to *Step 21*
21	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. Is the repair complete?	–	System OK	–
22	1. Add the refrigerant R–134a. Does the cooling performance improve?	–	System OK	Go to *Step 23*
23	1. Recover the A/C system refrigerant. 2. Replace the compressor. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the repair complete?	–	System OK	–

SYMPTOM DIAGNOSIS

PRESSURE TEST CHART (R-134A SYSTEM)

Condition	Related Symptons	Probable Cause	Correction
Discharge (high) Pressure Abnormally High	● After stopping the compressor, the pressure drops quickly, then falls gradually.	● There is air in the system.	● Recover, evacuate and recharge the system with the specified amount of refrigerant.
	● The condenser is excessively hot.	● There is excessive refrigerant in the system.	● Recover, evacuate and recharge the system with the specified amount of refrigerant.
	● Reduced or no air flow through the condenser.	● The condenser or the radiator fins are clogged.	● Clean the condenser or the radiator fins.
		● The condenser or the radiator fan is not working properly.	● Check the voltage and the fan rpm. ● Check the fan direction.
	● Line to the condenser is excessively hot.	● Restricted flow of refrigerant in the system	● Locate and repair the restriction.
Discharge Pressure Abnormally Low	● The condenser is not hot.	● Insufficient refrigerant in the system.	● Check the system for a leak. ● Charge the system.
	● High and low pressures are balanced soon after stopping the compressor. Low side pressure is higher than normal.	● Faulty compressor.	● Repair or replace the compressor.
	● The outlet of the expansion valve is not frosted, low pressure gauge indicates vacuum.	● Faulty expansion valve.	● Replace the expansion valve.
		● Moisture in the system.	● Recover, evacuate, and recharge the system.
Suction (low) Pressure Abnormally Low	● Condenser is not hot.	● Insufficient refrigerant in the system.	● Repair the leaks. Recover, evacuate, and recharge the system.
	● The expansion valve is not frosted and the low pressure line is not cold. Low pressure gauge indicates a vacuum.	● Frozen expansion valve.	● Replace the expansion valve.
		● Faulty expansion valve.	
	● Discharge temperature is low and the air flow from the vents is restricted.	● The evaporator is frozen.	● Clear the restricted evaporator case drain.
	● The expansion valve is frosted.	● The expansion valve is clogged.	● Clean or replace the expansion valve.
	● The receiver/dryer outlet is cool and the inlet is warm.	● The receiver/dryer is clogged.	● Replace the receiver/dryer.

Pressure Test Chart (R-134a System) (Cont'd)

Condition	Related Symptons	Probable Cause	Correction
Suction Pressure Abnormally High	• Low pressure hose and check joint are cooler than the temperature around the evaporator.	• The expansion valve is opened for too long.	• Replace the expansion valve.
	• Suction pressure is lowered when the condenser is cooled by water.	• There is excessive refrigerant in the system.	• Recover, evacuate, and recharge the system.
Suction and Discharge Pressure Abnormally High	• Reduced airflow through the condenser.	• The condenser or the radiator fins are clogged.	• Clean the condenser and the radiator.
		• The radiator cooling fans are not working properly.	• Check the voltage and the radiator cooling fan rpm. • Check the fan direction.
	• Condenser is excessively hot.	• There is excessive refrigerant in the system.	• Recover, evacuate, and recharge the system.
Suction and Discharge Pressure Abnormally Low	• Low pressure hose and metal end areas are cooler than the evaporator.	• Clogged or kinked low pressure hose.	• Repair or replace the low pressure hose.
	• Temperature around the expansion valve is low compared to that around the receiver/drier.	• The high pressure line is clogged.	• Repair or replace the high pressure line.
Refrigerant Leaks	• The compressor clutch is dirty.	• The compressor shaft seal is leaking.	• Repair or replace the compressor.
	• The compressor bolts are dirty.	• Leaking around a compressor housing bolt.	• Tighten the bolt(s) or replace the compressor.
	• The compressor gasket is wet with oil.	• The compressor gasket is leaking.	• Repair or replace the compressor.
	–	• Poor tightening in the system.	• Retighten the connection (coupling, bolt etc.)
	–	• O–ring is faulty.	• Replace the O–ring.

REPAIR INSTRUCTIONS ON-VEHICLE SERVICE

GENERAL A/C SYSTEM SERVICE PROCEDURES

O-RING REPLACEMENT

Important: Even though O-rings may look identical, it is extremely important that only recommended service replacement air conditioning O-rings be used, or excessive leakage of refrigerant may occur.

Important: Always slip the O-ring onto the flange tube to ensure proper locating and sealing.

Install new DAEWOO-approved service replacement air conditioning O-rings whenever a joint or a fitting is disassembled, except when the O-rings are provided on new components.

When replacing O-rings on an air conditioning component or a joint connection, the fitting design should be identified to ensure installation of the correct air conditioning service replacement O-ring.

Before installation, verify that both O-rings and fittings have not been nicked or deformed. Deformed or nicked parts must be replaced. Failure to use the proper service replacement parts and procedures may result in excessive refrigerant leakage.

HANDLING REFRIGERANT

Caution: Always work in a well-ventilated area and avoid breathing any refrigerant fumes. If you have difficulty breathing, seek medical attention immediately. If refrigerant comes in contact with any part of your body, flush the exposed area with water. If a rash or pain develops, seek medical attention.

Air conditioning systems contain refrigerant. This is a chemical mixture which requires special handling procedures to avoid personal injury.

Always wear goggles and wrap a clean cloth around the fittings, the valves and the connections when performing work that involves opening the refrigerant system. Do not weld or steam clean on or near any vehicle-installed air conditioning lines or components.

All refrigerant drums are shipped with a heavy metal screw cap. The purpose of the cap is to protect the valve and the safety plug from damage. It is good practice to replace the cap after each use of the drum.

If it is necessary to transport or carry any container of refrigerant in a vehicle, do not carry it in the passenger compartment.

HANDLING OF REFRIGERANT LINES AND FITTINGS

Notice: Using too low or too high torque when tightening a fitting can result in loose joints or deformed joint parts. Both conditions can result in refrigerant leakage.

- Keep all metal tubing lines free of dents or kinks. Any line restrictions will cause the loss of system capacity.
- Never bend a flexible hose line to a radius of less than four times the diameter of the hose.
- Never allow a flexible hose line to come near the exhaust manifold.
- Inspect flexible hose lines regularly for leaks or brittleness.
- Replace flexible hose lines with new lines if you find signs of deterioration or leaking.
- Discharge the refrigeration system of all refrigerant before disconnecting any fitting in the refrigeration system.
- Proceed very cautiously regardless of the gauge readings.
- Open the fittings very slowly.
- Keep your face and your hands away from the fitting so that you will not be injured if there happens to be liquid refrigerant in the line.
- If you notice pressure when you loosen a fitting, allow the pressure to bleed off as described under “Discharging, Adding Oil, Evacuating and Charging Procedures for A/C System” in this section.
- Cap or tape any refrigerant line immediately after it is opened. This will prevent the entrance of moisture and dirt, which can cause internal compressor wear or plugged lines in the condenser, the evaporator core, the expansion valve or the compressor inlet screens.

Important: Use two proper wrenches to connect the O-ring fittings.

- Back up the opposing fitting to prevent distortion of the connecting lines or the components.
- Back up both the swaged fitting on the flexible hose connections and the coupling to which it is attached with two wrenches to prevent turning the fitting and damaging the ground seat.
- Keep the O-rings and the seats in perfect condition. A burr or a piece of dirt may cause a refrigerant leak.
- Dip new O-rings in clean PAG refrigerant oil before installation.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The efficient operation and life of the air conditioning system is dependent upon the chemical stability of the refrigeration system. When foreign materials, such as dirt, air, or moisture, contaminate the refrigeration system, they will change the stability of the refrigerant and the PAG compressor oil. They will also affect the pressure-temperature relationship, reduce efficient operation, and can possibly cause interior corrosion and abnormal wear of moving parts.

Observe the following practices to ensure chemical stability in the system:

- Wipe away dirt or oil at and near any connection before opening that connection. This will reduce the chance of dirt entering the system.
- Cap, plug, or tape both sides of a connection as soon as possible after opening the connection. This will prevent the entry of dirt, foreign material, and moisture.
- Keep all tools clean and dry, including the manifold gauge set and all replacement parts.
- Use a clean and dry transfer device and container to add PAG refrigerant oil. This will ensure that the oil remains as moisture-free as possible. Refer to “Discharging, Adding Oil, Evacuating and Charging Procedures for A/C System” in this section.
- Have everything you need ready to allow you to perform all operations quickly when opening an A/C system. Do not leave the A/C system open any longer than necessary.
- Evacuate and recharge any A/C system that has been opened. Refer to “Discharging, Adding Oil, Evacuating and Charging Procedures for A/C System” in this section for the instructions to perform this procedure properly.

All service parts are dehydrated and sealed before shipping. They should remain sealed until just before making connections. All the parts should be at room temperature before uncapping. This prevents condensation of moisture from the air from entering the system. Reseal all parts as soon as possible if the caps have been removed but the connections cannot be made promptly.

DISCHARGING, ADDING OIL, EVACUATING, AND CHARGING PROCEDURES FOR A/C SYSTEMS

Caution: Use only refillable refrigerant tanks that are authorized for the charging station being used. The use of other tanks may cause personal injury or void the warranty. Refer to the manufacturer’s instructions for the charging station.

Caution: To avoid personal injury, always wear goggles and gloves when performing work that involves opening the refrigeration system.

A charging station discharges, evacuates, and recharges an air conditioning system with one hook-up. Filtering during the recovery cycle together with filtering during the evacuation cycle ensures a supply of clean, dry refrigerant for A/C system charging.

Notice:

- Never use the R-134a charging station on a system charged with R-12. The refrigerants and the oils are not compatible and must never be mixed in even the smallest amount. Mixing refrigerant residue will damage the equipment.
- Never use adapters which convert from one size fitting to another. This will allow contamination which may cause system failure.

Charging Station Setup and Maintenance

Refer to the manufacturer’s instructions for all initial setup procedures and all maintenance procedures. There are many charging stations available. All perform the various tasks required to discharge the system and recover refrigerant, evacuate the system, add a measured amount of oil, and recharge an air conditioning system with a measured amount of refrigerant.

Control Panel Functions

A charging station will have controls and indicators to allow the operator to control and monitor the operation in progress. Refer to the manufacturer’s instructions for details. These can be expected to include:

1. Main Power Switch: The main power switch supplies electrical power to the control panel.
2. Display: The display shows the time programmed for vacuum and the weight of the refrigerant programmed for recharging. Refer to the manufacturer’s instructions for detailed programming information.
3. Low Side Manifold Gauge: This gauge shows the system’s low side pressure.
4. High Side Manifold Gauge: This gauge shows the system’s high side pressure.
5. Controls: This will contain the controls that control various operating functions.
6. Low Side Valve: This valve connects the low side of the A/C system to the unit.
7. Moisture Indicator: This indicator shows if the refrigerant is wet or dry.
8. High Side Valve: This valve connects the high side of the A/C system to the unit.

Refrigerant Recovery

Important: Use only a refrigerant tank that is designed for the charging station in use. The unit's overfill limitation mechanism is calibrated specifically for use with this tank. The tank's valves are also specifically for this unit.

1. Attach the high side hose with the quick disconnect coupler to the high side fitting of the vehicle's A/C system.
2. Open the coupler valve after attachment.
3. Attach the low side hose with the quick disconnect coupler to the low side fitting of the vehicle's A/C system.
4. Open the coupler valve after attachment.
5. Check the high side and the low side gauges on the unit's control panel in order to ensure that the A/C system has pressure. If there is no pressure, there is no refrigerant in the system to recover.

Important: If there is no refrigerant in the system, do not continue with the recovery operation. This will draw air into the recovery tank.

6. Open both the high side and the low side valves.
7. Open the gas and the liquid valves on the tank.
8. Drain any oil that may be in the oil separator.
9. Close the oil drain valve.
10. Plug the unit into the proper voltage outlet.
11. Turn on the main power switch.

Notice: Never reuse refrigerant oil. Damage to the A/C system may result. Dispose of the refrigerant oil properly.

12. Begin the recovery process. Refer to the manufacturer's instructions for the charging station in use.

Important: Some A/C system PAG lubricating oil may be removed with the refrigerant during recovery. The amount of oil removed varies. A charging station separates the oil from the refrigerant and allows a means of determining how much oil was removed. Replace the same amount of oil when you recharge the system. Refer to the manufacturer's instructions for the charging station in use.

13. Wait 5 minutes. Check the control panel low side gauge. If the A/C has maintained vacuum, the recovery is complete.
14. There is more refrigerant in the system if the low side gauge pressure rises above zero. Recover the additional refrigerant. Repeat this step until the system maintains vacuum for two minutes.

Important: If the control indicator shows that the refrigerant tank is full during the recovery process and the unit shuts off, install an empty unit tank to store the refrigerant needed for steps later in the procedure. Do not use any other type of tank.

Evacuation

The unit tank must contain a sufficient amount of R-134a refrigerant for charging. Check the amount of refrigerant in the tank. If there is less than 3.6 kg (8 pounds) of refrigerant, add new refrigerant to the tank. Refer to the manufacturer's instructions for adding refrigerant.

1. Verify that the high side and the low side hoses are connected to the A/C system. Open both the high side and the low side valves on the unit's control panel.
2. Open both the gas and the liquid valves on the tank.

Important: Refer to the manufacturer's instructions for the charging station in use. It is necessary to evacuate the system before recharging it with new or recycled refrigerant.

3. Start the vacuum pump and begin the evacuation process. Non-condensable gases (mostly air) are automatically vented from the tank during the recycling process. You may hear the pressure being released.
4. Check for leaks in the system. Refer to the manufacturer's instructions for the charging station in use.

Important:

- Change the vacuum pump oil frequently. Refer to the manufacturer's instructions for the charging station in use.

A/C System Oil Charge Replenishing

Any oil removed from the A/C system during the recovery process must be replenished at this time.

1. Use the correct graduated bottle of polyalkaline glycol (PAG) oil for the R-134a system.

Important:

- Keep the oil bottles tightly capped at all times to protect the oil from moisture and contamination.
- Never open the oil injection valve while there is positive pressure in the A/C system. This will result in oil blow-back through the bottle vent. You must have A/C system vacuum for this operation.
- Never let the oil level drop below the pick-up tube while charging or replenishing the system. This will allow air into the A/C system.

2. Refer to the manufacturer's instructions for the charging station in use. Add the proper amount of PAG oil to the system.
3. Close the valve when the required oil charge has been pulled into the system.

Charging

Important: Evacuate the air conditioning system before charging.

1. Close the low side valve on the control panel.
2. Open the high side valve on the control panel.

3. Refer to the manufacturer's instructions for the charging station in use.
   - Enter the amount of refrigerant needed to charge the A/C. Be sure that you are using the correct system of measurement (kg, lb).
   - Begin the charging process.

Successful Transfer Complete

1. Close the high side valve on the unit's control panel. Both valves should be closed.
2. Start the vehicle and the A/C system.
3. Let the engine run until the readings on the high side and low side gauges stabilize.
4. Compare the readings to the system specifications.
5. Check the evaporator outlet temperature to ensure that the A/C system is operating within the system specifications.
6. Keep the A/C running.
7. Close the high side coupler valve.
8. Disconnect the high side hose from the vehicle.
9. Open the high side and low side valves on the control panel.
10. The system will quickly draw in refrigerant from both hoses through the low side hose.
11. Close the low side coupler valve.
12. Disconnect the low side hose from the vehicle.

Unsuccessful Transfer

Sometimes the total charge does not transfer into the A/C system. There are two reasons why this may occur.

1. The pressure in the unit's tank and the pressure in the A/C system are roughly equal. This will cause the transfer to proceed too slowly. Refer to the manufacturer's instructions for the charging station in use.
2. There was not enough refrigerant in the unit's tank to transfer the full charge. It is necessary to recover the partial charge of refrigerant from the vehicle and evacuate and charge the A/C system again. Refer to the manufacturer's instructions for the charging station in use.

SERVICEABLE COMPONENTS

(Left–Hand Drive Shown, Right–Hand Drive Similar)

CONTROL ASSEMBLY AND CONTROL CABLES

To remove the control assembly and control cables, refer to *Section 7A, Heating and Ventilation System (Without Air Conditioning).*

BLOWER MOTOR AND COOLING HOSE

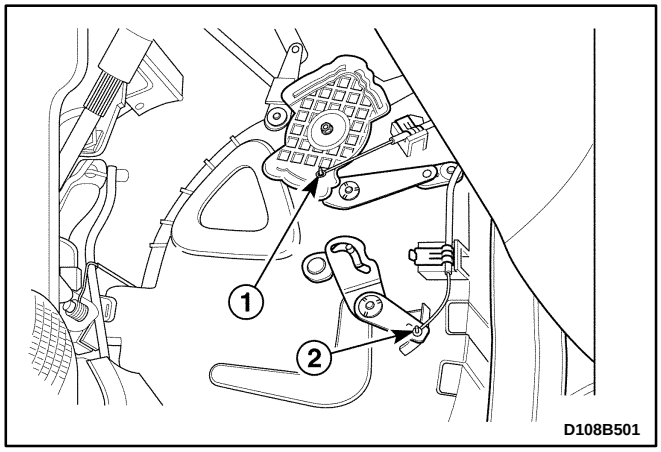
To remove the blower motor and cooling hose, refer to *Section 7A, Heating and Ventilation System (Without Air Conditioning).*

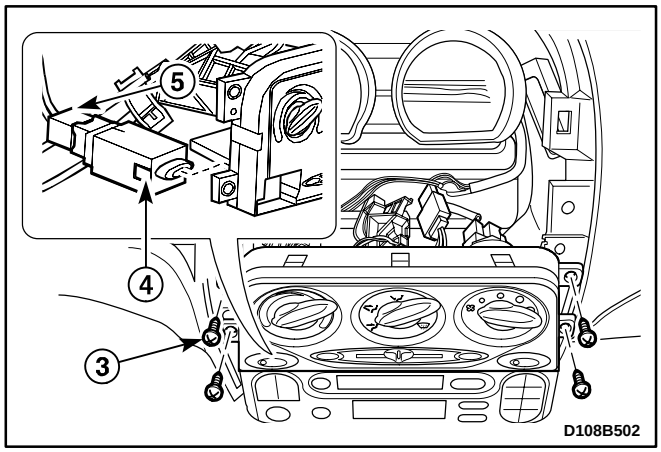
BLOWER RESISTOR

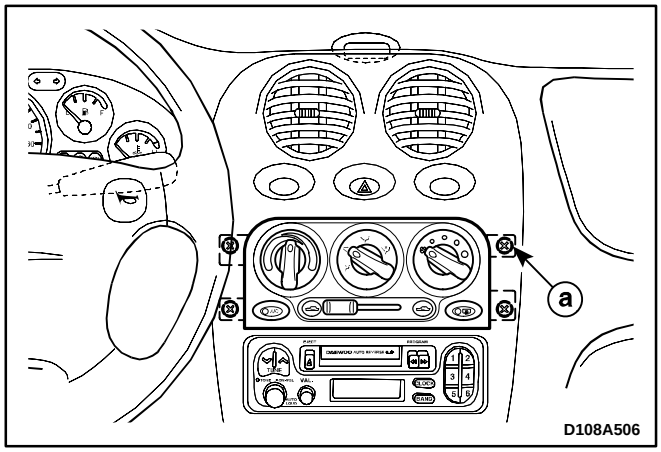
To remove the blower resistor, refer to *Section 7A, Heating and Ventilation System (Without Air Conditioning).*

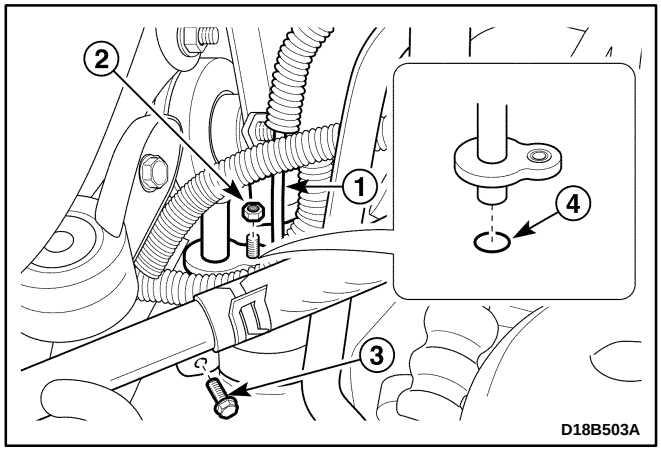
BLOWER MOTOR SWITCH

To remove the blower motor switch, refer to *Section 7A, Heating and Ventilation System (Without Air Conditioning).*









A/C PUSH KNOB

(Left–Hand Drive Shown, Right–Hand Drive Similar)

Removal Procedure

1. Remove the instrument cluster housing trim panel. Refer to *Section 9E, Instrumentation/Driver Information.*
2. Remove the A/C push knob.
   - Disconnect the temperature control cable from the heater module (1).
   - Disconnect the mode control cable from the heater module (2).
   - Remove the control assembly retaining screws (3).
   - Pull out the control assembly.
   - Remove the A/C push knob by pushing the knob lock (4).
   - Disconnect the A/C push knob electrical connector (5).

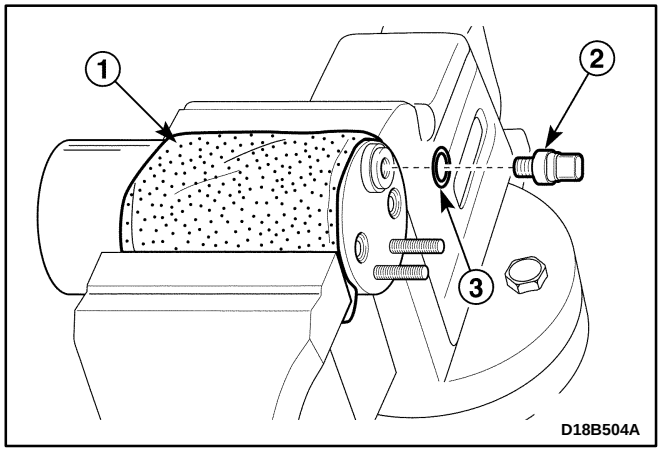
Installation Procedure

1. Install the A/C push knob to the control assembly.
2. Connect the A/C push knob electrical connector.
3. Install the control assembly with the screws.
4. Connect the mode control cable to the heater module.
5. Connect the temperature control cable to the heater module.
6. Install the instrument cluster housing trim panel. Refer to *Section 9E, Instrumentation / Driver Information.*

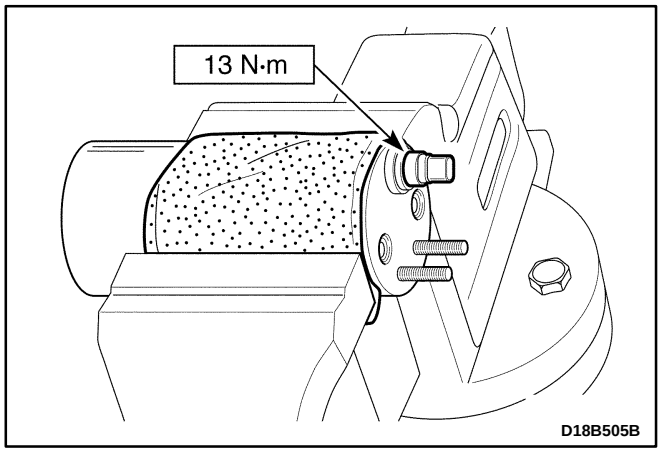
RECEIVER DRYER AND DUAL CUT SWITCH

Removal Procedure

1. Recover the refrigerant. Refer to “Discharging, Adding Oil, Evaculating, and Charging Procedures for A/C System” in this section.
2. Remove the front bumper fascia. Refer to *Section 9O, Bumpers and Fascias.*
3. Remove the receiver dryer.
   - Disconnect the dual cut switch connector (1).
   - Remove the receiver dryer flange nuts (2).
   - Remove the bracket bolt (3).
   - Discard the O–ring (4).

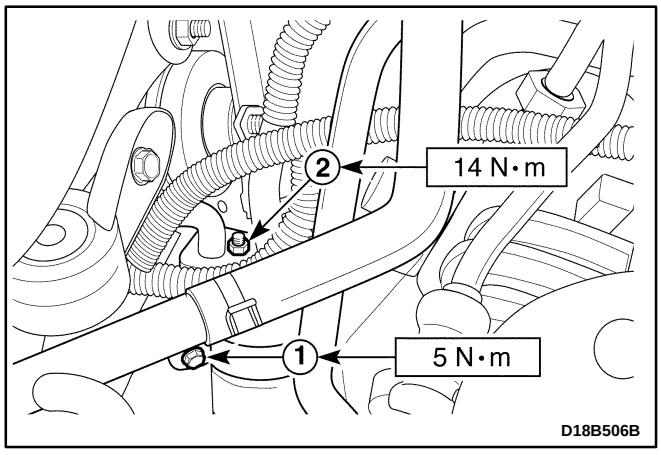


4. Remove the dual cut switch.
   - With the receiver dryer clothed, vise the receiver dryer (1).
   - Remove the dual cut switch (2).
   - Discard the O–ring (3).



Installation Procedure

1. Install the new O–ring.
2. Install the dual cut switch.
   Tighten the dual cut switch to 13 N•m (115 lb-in).



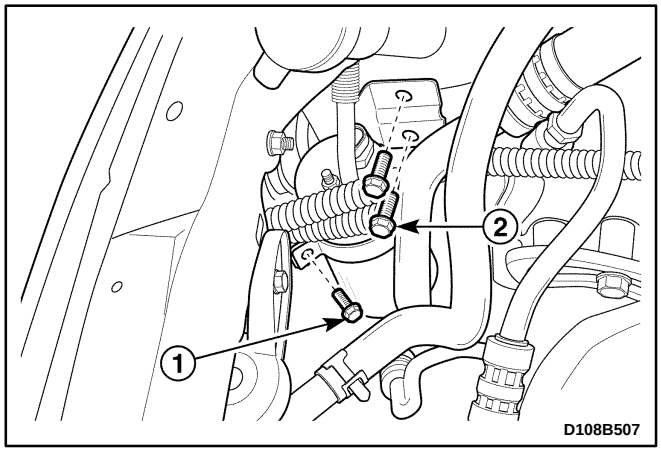
3. Install the receiver dryer.
   - Install the new O–rings.
   - Install the bracket bolt (1).

   ### Tighten

   Tighten the bracket bolt to 5 N•m (44 lb-in).
   - Install the receiver dryer flange nuts (2).

   ### Tighten

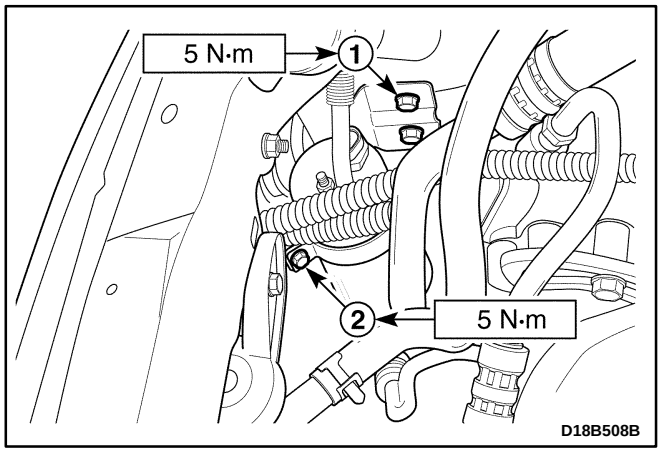
   Tighten the receiver dryer flange nut to 14 N•m (10.5 lb-ft).
   - Connect the dual cut switch connector.
4. Install the front bumper fascia. Refer to *Section 9O, Bumpers and Fascias.*
5. Evacuate and recharge the system. Refer to “Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.



RECEIVER DRYER BRACKET

Removal Procedure

1. Remove the front bumper fascia. Refer to *Section 9O, Bumpers and Fascias.*
2. Remove the receiver dryer bracket.
   - Remove the receiver dryer bracket bolt (1).
   - Remove the receiver dryer bracket–to–body bolts (2).



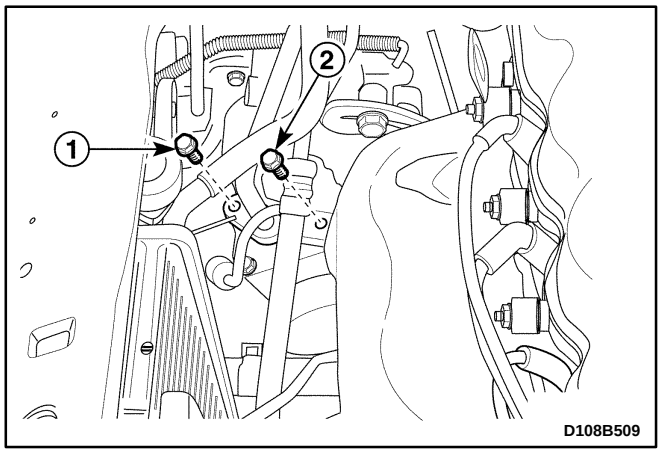
Installation Procedure

1. Install the receiver dry bracket with the bolts.

Tighten

- Tighten the receiver dryer bracket–to–body bolts to 5 N•m (44 lb-in) (1).
- Tighten the receiver dryer bracket bolt to 5 N•m (44 lb-in) (2).

2. Install the front bumper fascia. Refer to *Section 9O, Bumpers and Fascias.*



COMPRESSOR

Removal Procedure

1. Remove the receiver dryer. Refer to “Receiver Dryer and Dual Cut Switch” in this section.
2. Remove the A/C belt. Refer to *Section 6B, Power Steering Pump.*
3. Remove the compressor.
   - Discharge and recover the refrigerant. Refer to “Discharging, Adding Oil, Evacuating, and Charging Provedures for A/C System” in this section.
   - Remove the bolt securing the low pressure pipe line to the compressor (1).
   - Remove the bolt securing the high pressure pipe line to the compressor (2).
   - Disconnect the electrical connector (3).
   - Remove the upper bolt mounting the compressor–to–bracket (4).
   - Remove the lower bolts mounting the compressor–to–bracket (5).