
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 LOCK unless otherwise noted.

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SPECIFICATIONS

A/C SYSTEM CHARGING CAPACITY

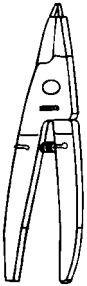
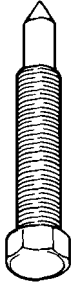
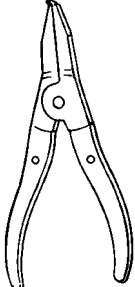
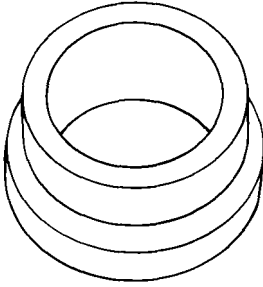

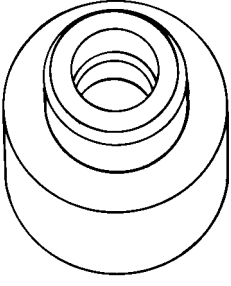

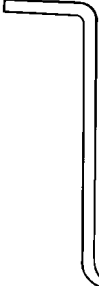
Application	Description
R-134a System	720 " 20 g
Refrigerant Oil in A/C System	Synthetic PAG 265 ml

FASTENER TIGHTENING SPECIFICATIONS

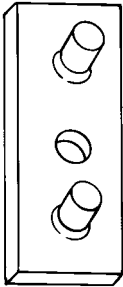
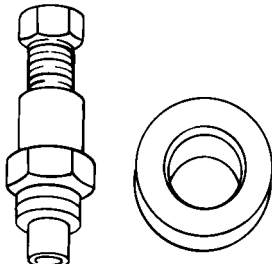
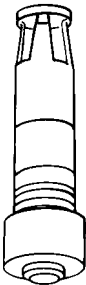

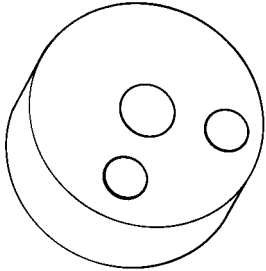
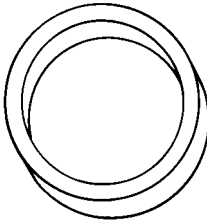
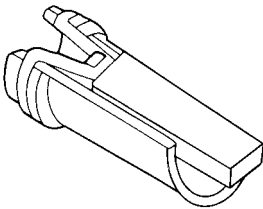
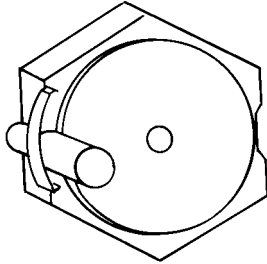
Application	N•m	Lb-Ft	Lb-In
A/C System Hose Connector Retaining Nut	33	24	-
Air Cleaner Housing Assembly Bolts	12	-	106
Clutch Plate and Hub Assembly Nut	17	13	-
Compressor Bracket Bolt	27	19	-
Compressor Front Head-to-Rear Head Through-Bolts	10	-	89
Condenser Upper Mount Nuts	3	-	27
Control Assembly Retaining Screws	2	-	18
Discharge Hose-to-Condenser Pipe Connector Block Retaining Nut	16	12	-
Expansion Valve Retaining Bolts	12	-	106
Heater/Air Distribution Case Assembly Screws (Fire Wall Side)	8	-	71
Idler Pulley Lock Nut	50	36	-
Liquid Condenser Pipe Connector Block-to-Receiver-Dryer Bolt	12	-	106
Liquid Evaporator Pipe Connector Block Nuts	12	-	106
Liquid Evaporator Pipe Connector Block-to-Liquid Condenser Pipe Connector Block Retaining Bolt	12	-	106
Pressure Relief Valve	17	12	
Pressure Transducer	8	-	71
Suction Hose Connector Block Retaining Nuts	12	-	106
Suction Hose Support Clamp Bolt	4	-	35

SPECIAL TOOLS

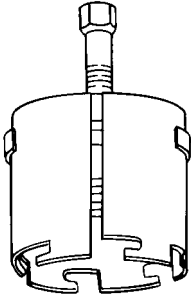
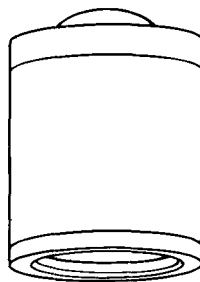

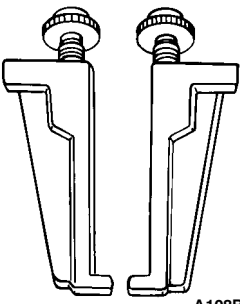
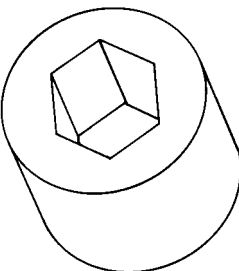
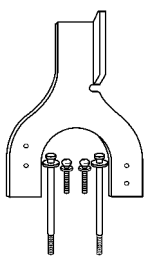
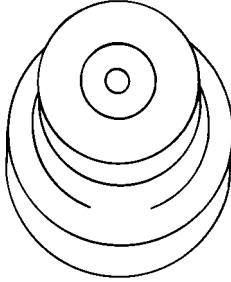
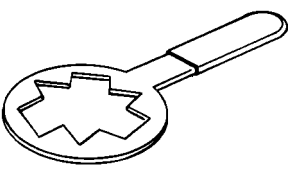
SPECIAL TOOLS TABLE

 <p>A108B078</p>	<p>J-5403 Snap Ring Pliers</p>	 <p>A108B082</p>	<p>J-8433-3 Forcing Screw</p>
 <p>A108B079</p>	<p>J-6083 Snap Ring Pliers</p>	 <p>A108B084</p>	<p>J-9398-A Bearing Remover</p>
 <p>A108B080</p>	<p>J-8092 Driver Handle</p>	 <p>A108B085</p>	<p>J-9481 Bearing Installer</p>
 <p>A108B081</p>	<p>J-8433-1 Puller Crossbar</p>	 <p>A108B086</p>	<p>J-9553-1 O-Ring Remover</p>

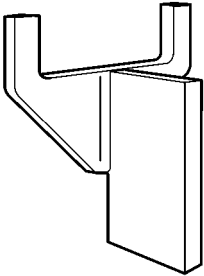
SPECIAL TOOLS TABLE (Cont'd)

 <p>A108B087</p>	<p>J-9625-A Pressure Test Set Connectors</p>	 <p>A108B091</p>	<p>J-33013-B Hub and Drive Plate Remover and Installer</p>
 <p>A108B088</p>	<p>J-23128-A Seal Seat Remover and Installer</p>	 <p>A108B092</p>	<p>J-34993 Cylinder Alignment Rods</p>
 <p>A108B089</p>	<p>J-35372 Support Block</p>	 <p>A108B093</p>	<p>J-33017 Pulley Rotor and Bearing Assembly Installer</p>
 <p>A108B090</p>	<p>J-33011 O-Ring Installer</p>	 <p>A108B094</p>	<p>J-33019 Bearing Staking Tool Set Includes: J-33019-1 Bearing Staking Guide J-33019-2 Bearing Staking Pin</p>

SPECIAL TOOLS TABLE (Cont'd)

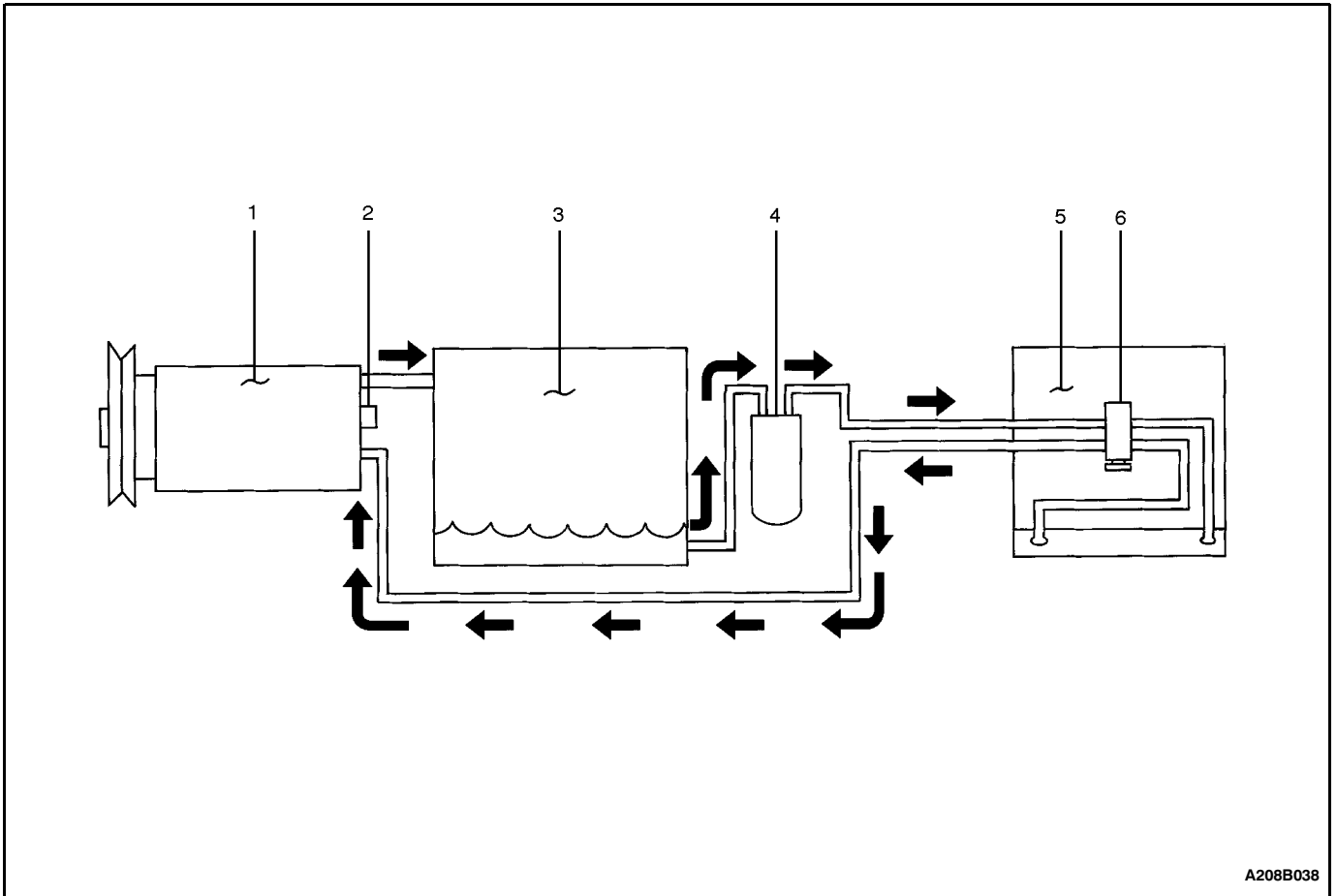
 <p>A108B095</p>	<p>J-33020 Pulley Puller</p>	 <p>A108B099</p>	<p>J-33024 Clutch Coil Installer Adapter</p>
 <p>A108B096</p>	<p>J-34614 Shaft Seal Protector</p>	 <p>A108B100</p>	<p>J-33025 Clutch Coil Puller Legs</p>
 <p>A108B097</p>	<p>J-33022 Shaft Nut Socket</p>	 <p>A108B101</p>	<p>J-34992 Compressor Holding Fixture</p>
 <p>A108B098</p>	<p>J-33023-A Puller Pilot</p>	 <p>A108B102</p>	<p>J-33027 Clutch Hub Holding Tool</p>

SPECIAL TOOLS TABLE (Cont'd)

 <p>A108B111</p>	<p>J-42428 Compressor Holding Fixture</p>
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SCHEMATIC AND ROUTING DIAGRAMS

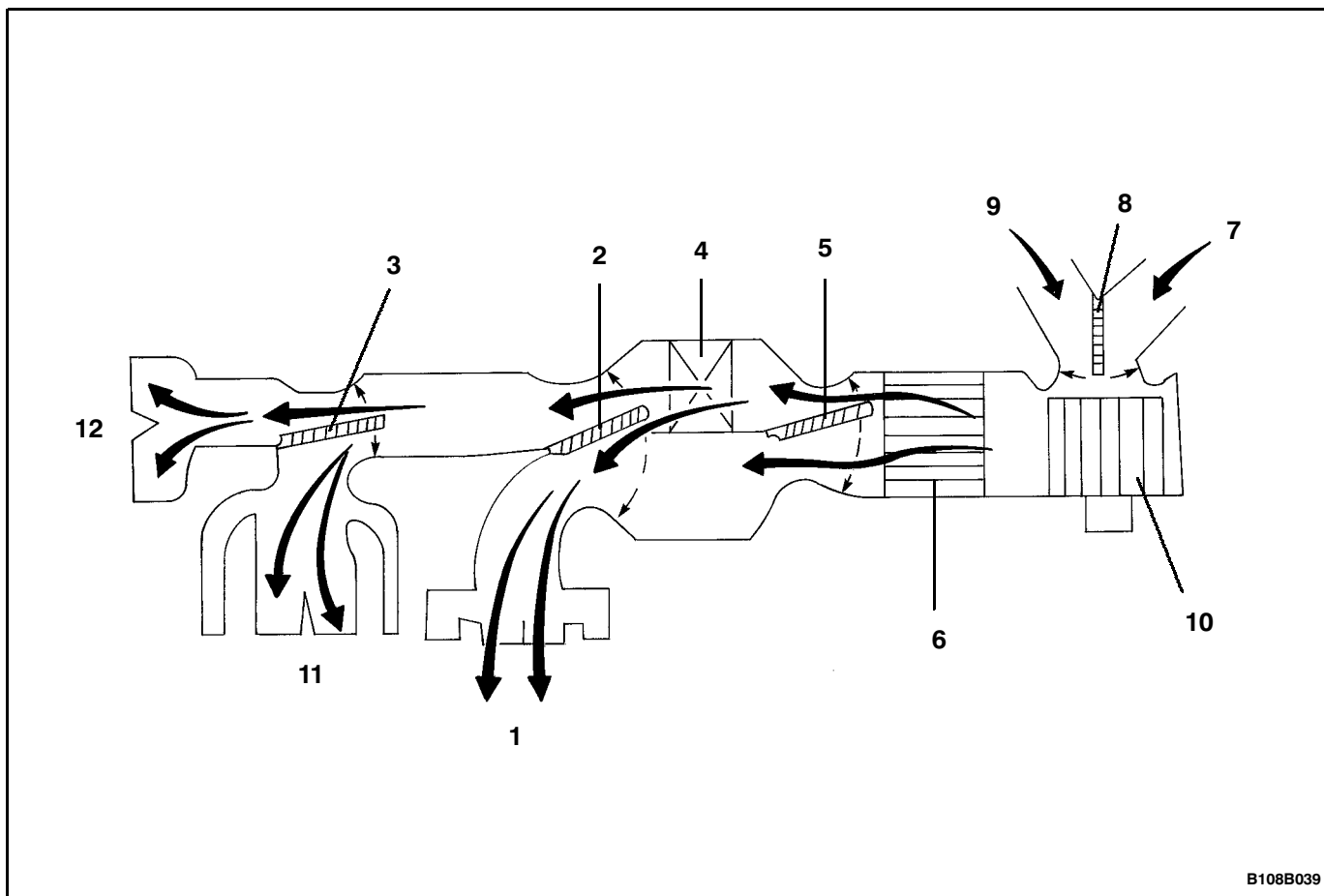
A/C SYSTEM (TYPICAL)



- 1 Compressor
- 2 Pressure Relief Valve
- 3 Condenser

- 4 Receiver/Dryer
- 5 Evaporator
- 6 Expansion Valve

AIRFLOW (TYPICAL)

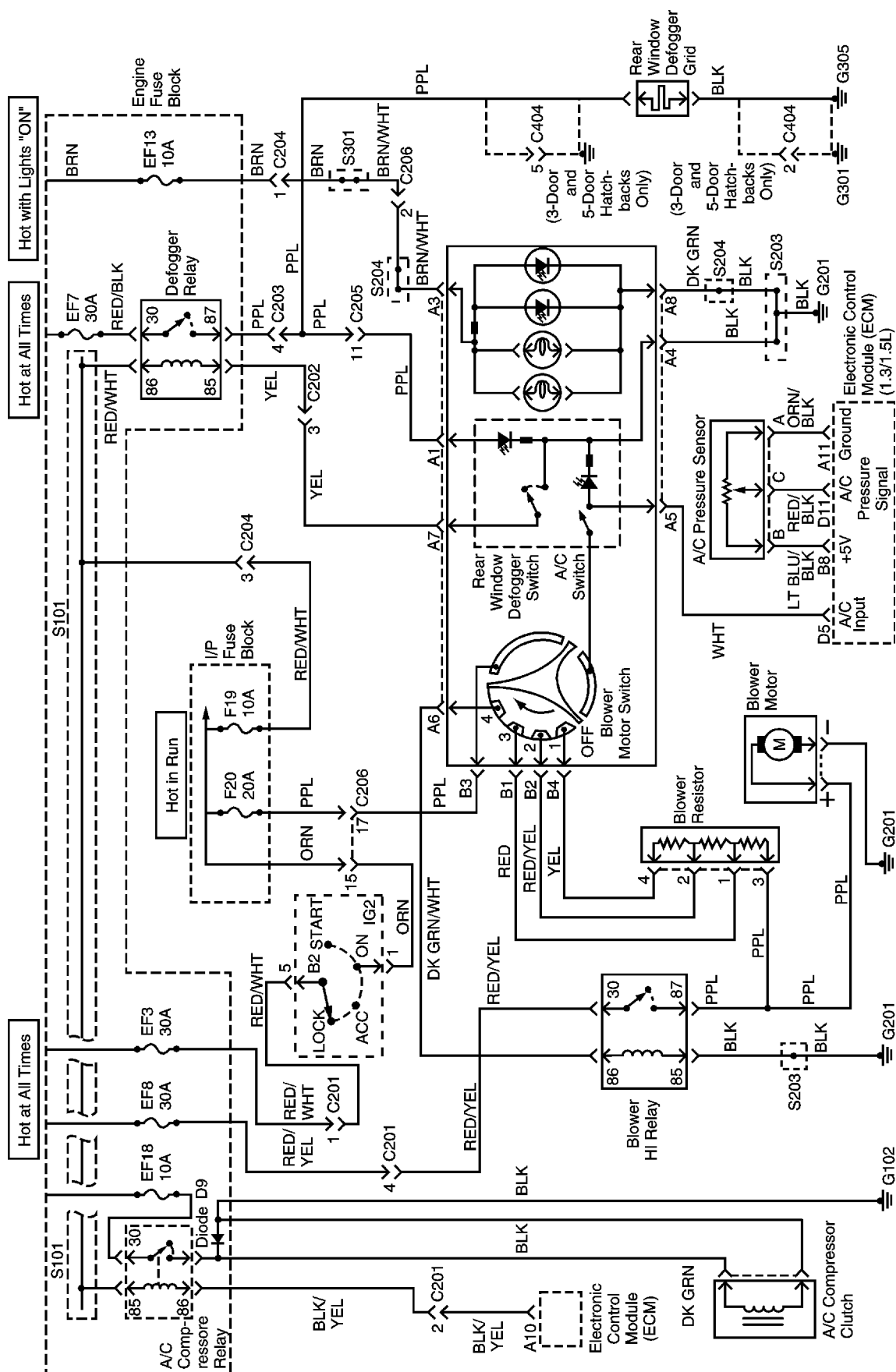


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- 1 Heater Outlets
- 2 Heater/Defroster Door
- 3 Mode Door
- 4 Heater Core
- 5 Heater (Air Mix) Door
- 6 Evaporator (A/C Only)

- 7 Outside Air Inlet
- 8 Fresh Air/Recirculating Air Door
- 9 Inside Air Inlet
- 10 Blower
- 11 Vent Outlets
- 12 Defroster Outlets

A/C DIAGRAM, 1.3/1.5L SOHC (IEFI-6 ECM)



A308B040



DIAGNOSIS

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 serpentine accessory 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. The air temperature must be above 21 °C (70 °F) for most models.

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.

A/C PERFORMANCE TEST

RELATIVE HUMIDITY (%)	AMBIENT AIR TEMPERATURE °C °F	LOW SIDE PRESSURE kPa psig	ENGINE SPEED (RPM)	CENTER DUCT AIR TEMPERATURE °C °F	HIGH SIDE PRESSURE kPa psig
20	21 70 27 81 32 90 38 100	200 29 200 29 207 30 214 31	2000	4 39 7 45 9 48 14 57	1034 150 1310 190 1689 245 2103 305
30	21 70 27 81 32 90 38 100	200 29 207 30 214 31 221 32	2000	6 43 8 46 11 52 16 61	1034 150 1413 205 1827 265 2241 325
40	21 70 27 81 32 90 38 100	200 29 207 30 221 32 269 39	2000	7 45 9 48 13 55 18 64	1138 165 1482 215 1931 280 2379 345
50	21 70 27 81 32 90 38 100	207 30 221 32 234 34 276 40	2000	8 46 12 54 15 59 21 70	1241 180 1620 235 2034 295 2413 350
60	21 70 27 81 32 90 38 100	207 30 228 33 248 36 296 43	2000	9 48 13 55 17 63 23 73	1241 180 1655 240 2068 300 2482 360
70	21 70 27 81 32 90 38 100	207 30 234 34 262 38 303 44	2000	10 50 14 57 18 64 24 75	1276 185 1689 245 2103 305 2517 365
80	21 70 27 81 32 90	207 30 234 34 269 39	2000	10 50 15 59 19 66	1310 190 1724 250 2137 310
90	21 70 27 81 32 90	207 30 248 36 290 42	2000	10 50 17 63 22 72	1379 200 1827 265 2275 330

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 one to two clicks per second into a solid alarm if there is a leak. Adjust the balance control to maintain one to two 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.

V5 SYSTEM AIR CONDITIONING 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 A/C fuse. 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 clutch coil connection. 7. Repair or replace any components as needed. 8. Check the discharge air temperature with the A/C turned on. Is the discharge air temperature normal?	At least 7°C below ambient air temperature	System OK	Go to Step 3
3	1. Turn the ignition switch to LOCK. 2. Connect the high and the low pressure gauges. Are both pressures within the value specified?	69-345 kPa (10-50 psi)	Go to Step 4	Go to Step 5
4	1. Check the A/C system for leaks. 2. Repair any refrigerant leaks as needed. 3. Recover, evacuate, and recharge the A/C system. Are both pressures above the value specified?	345 kPa (50 psi)	Go to Step 7	-
5	Observe the two pressure gauges. Are both pressures below the value specified?	69 kPa (10 psi)	Go to Step 6	Go to Step 7
6	1. Add 0.45 kg (1 pound) of 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 pressures above the value specified?	345 kPa (50 psi)	Go to Step 7	-
7	1. Start the engine and allow it to run at idle. 2. Set the A/C controls to the following positions: <ul style="list-style-type: none"> • The A/C switch to the ON position. • The fresh air control switch to fresh air (indicator lamp OFF). • The blower motor to 4. • The temperature to full cold. Does the A/C compressor clutch engage?	-	Go to Step 8	Go to Step 10
8	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 9	Go to Step 13
9	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 compressor running normally?	-	Go to Step 13	-

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
10	<ol style="list-style-type: none"> 1. Turn the ignition switch to LOCK. 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. <p>Does the A/C clutch engage?</p>	-	Go to Step 11	Go to Step 12
11	<p>Repair the electrical circuit to the A/C compressor clutch coil.</p> <p>Does the A/C clutch engage?</p>	-	Go to Step 8	-
12	<p>Replace the A/C compressor clutch coil.</p> <p>Does the A/C clutch engage?</p>	-	Go to Step 8	-
13	<p>Important: Perform this test under garage conditions; 21-32°C (70-90°F) and no sun load. Follow this test carefully for accurate results.</p> <ol style="list-style-type: none"> 1. Close all of the windows and the doors of the vehicle. 2. Set the A/C controls to the following positions: <ul style="list-style-type: none"> • 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 allow it to run at idle for 5 minutes. 4. Feel the evaporator inlet and outlet pipes. <p>Is there a noticeable difference in the temperature of the evaporator inlet and outlet pipes?</p>	-	Go to Step 15	Go to Step 14
14	<ol style="list-style-type: none"> 1. Turn the ignition switch to LOCK. 2. Recover the A/C system refrigerant. 3. Examine the high-pressure pipe for an obstruction. 4. Examine the expansion valve for a malfunction if there is no obstruction. 5. Repair the obstruction or replace the expansion valve as needed. 6. Evacuate and recharge the A/C system. 7. Check the A/C system for leaks. 8. Note the discharge air temperature with the A/C ON. <p>Is the discharge temperature normal?</p>	At least 7°C (12°F) below ambient air temperature	Go to Step 15	Go to Step 13
15	<ol style="list-style-type: none"> 1. Record the low and the high side pressures after the A/C system has been operating for 5 minutes or more and the engine cooling fan is ON. 2. Locate the intersection of the low and the high side pressures. Refer to "Low and High Side Pressure Relationship Chart" in this section. <p>Do the low and the high side pressures intersect in the white area of the chart?</p>	-	System OK	Go to Step 16
16	<p>Check the high-side and low-side pressures.</p> <p>Do the low and the high pressures intersect in the gray area of the chart?</p>	-	Go to Step 17	Go to Step 20

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
17	Feel the liquid pipe between the condenser and the expansion valve. Is the pipe cold?	-	Go to Step 18	Go to Step 19
18	1. Examine the condenser for any restriction of the air flow. 2. Check the cooling fans for proper operation. 3. Remove the restriction or repair the fan(s) as required. Is the pipe temperature normal now?	-	Go to Step 13	-
19	1. Recover, evacuate, and recharge the A/C system. 2. Check the A/C system for leaks. Is the system leak tight?	-	Go to Step 13	-
20	Observe the readings on the pressure gauges. Are the A/C compressor high and the low side pressures within the specified value of each other?	207 kPa (30 psi)	Go to Step 21	Go to Step 26
21	1. Run the engine at 3,000 rpm. 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. Close all of the windows and the doors of the vehicle. 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?	207 kPa (30 psi)	Go to Step 22	Go to Step 13
22	Observe the pressure rise on both gauges and the temperatures of both the compressor suction pipe and the discharge pipe. Is the pressure rise on both gauges slow and the suction pipe warm with the discharge pipe very hot?	-	Go to Step 25	Go to Step 23
23	1. Turn the ignition switch to LOCK. 2. Check that the compressor clutch is disengaged. 3. Attempt to turn the clutch driver (not the pulley). Can you turn the clutch driver freely by hand?	-	Go to Step 25	Go to Step 24
24	1. Start the engine. 2. Observe the low-side pressure gauge while running the engine between 3,000 and 3,800 rpm. Does the low-side pressure rise rapidly?	-	Go to Step 32	Go to Step 25
25	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. Is the compressor functioning normally?	-	Go to Step 13	-
26	Check the low-side pressure. Is the low side pressure within the specified value?	172-241 kPa (27-38 psi)	Go to Step 27	Go to Step 32
27	Feel the high-side pipe leading up to the expansion valve connecting block. Is the pipe cold before the connecting block?	-	Go to Step 28	Go to Step 29

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
28	1. Check for a restriction in the high-side pipe before the expansion valve. 2. Repair or replace the high-side pipe. Is the pipe performing normally?	-	Go to Step 13	-
29	Add the specified amount of refrigerant to the A/C system. Does the cooling performance improve?	0.40 kg (14 ounces)	Go to Step 30	Go to Step 31
30	1. Check the A/C system for leaks. 2. Repair any refrigerant leaks as needed. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the system leak free?	-	Go to Step 13	-
31	1. Recover the refrigerant. 2. Check the expansion valve for obstructions. 3. Repair or replace the expansion valve as required. 4. Evacuate and recharge the system. 5. Leak check the system. Is the system leak free?	-	Go to Step 13	-
32	Important: Perform this test exactly as described to obtain accurate results. 1. Run the engine for 5 minutes at 2,000 rpm. 2. Set the A/C controls to the following positions: • The A/C switch to the ON position. • The fresh air control switch to recirculate (indicator lamp ON). • The blower motor to 1. • The temperature to full cold. 3. Close all of the windows and the doors of the vehicle. 4. Open the vehicle hood. Is the low side pressure within the specified value?	172-241 kPa (25-35 psi)	Go to Step 13	Go to Step 33
33	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor control valve. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the system leak free?	-	Go to Step 13	-

SYMPTOM DIAGNOSIS

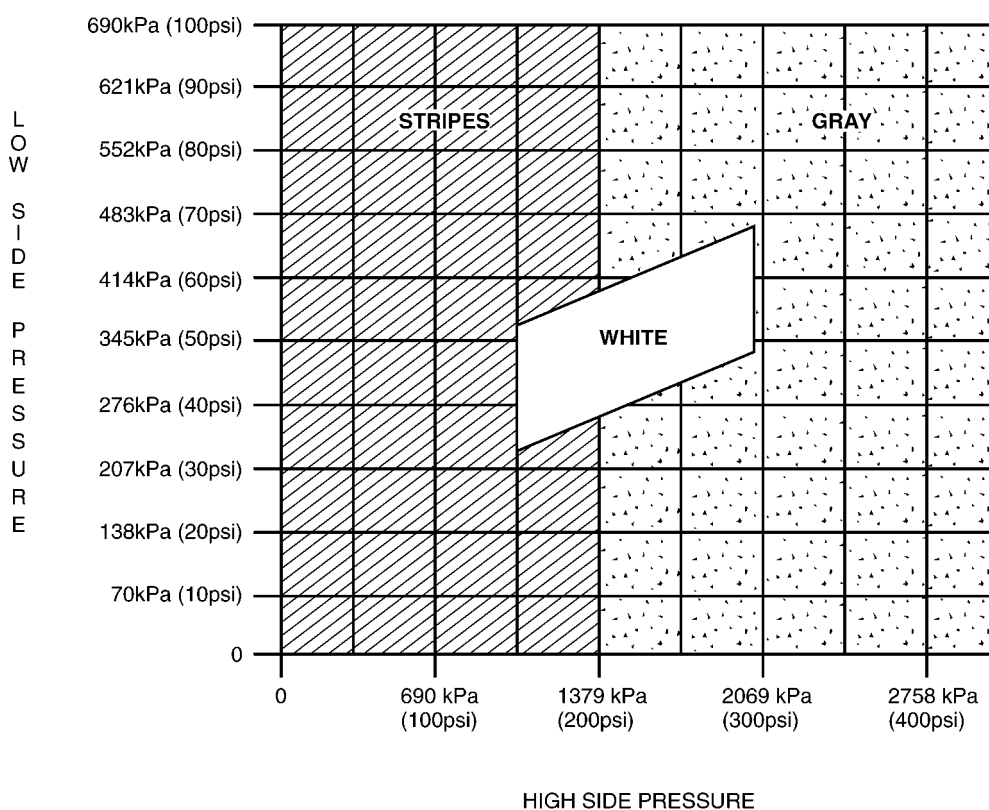
PRESSURE TEST CHART (R-134A SYSTEM)

TEST RESULTS	RELATED SYMPTOMS	PROBABLE CAUSE	REMEDY
Discharge (high) pressure abnormally high	After stopping the compressor, the pressure drops about 299 kPa (28 psi) 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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 pressure relief valve.	Repair or replace the compressor.
		Faulty compressor seal.	
	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/drier outlet is cool and the inlet is warm.	The receiver/drier is clogged.	Replace the receiver/drier.
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.
		A capillary tube is loose.	

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

TEST RESULTS	RELATED SYMPTOMS	PROBABLE CAUSE	REMEDY
Suction pressure abnormally high	Suction pressure is lowered when the condenser is cooled by water.	There is excessive refrigerant in the system.	Recover, evacuate, and recharge the system.
	High and low pressure are equalized as soon as the compressor is stopped and both gauges fluctuate while the compressor is running.	A gasket is faulty.	Repair or replace the compressor.
		The high pressure valve is faulty.	
		Foreign particles are stuck in the high pressure valve.	
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.	<ul style="list-style-type: none"> • 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.

LOW AND HIGH SIDE PRESSURE RELATIONSHIP CHART



A108B110

MAINTENANCE AND REPAIR

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. Some joint connections and components will implement a “captured” O-ring design fitting that uses a groove to retain the O-ring. Others do not have a groove and use a “non-captured” or “standard” O-ring. Assembly and tightening procedures are the same for both designs, but the O-rings are different.

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 within 63.5 mm (2-1/2 inches) of 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 polyalkaline glycol (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 polyalkaline glycol (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 SYSTEM

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 set-up 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.

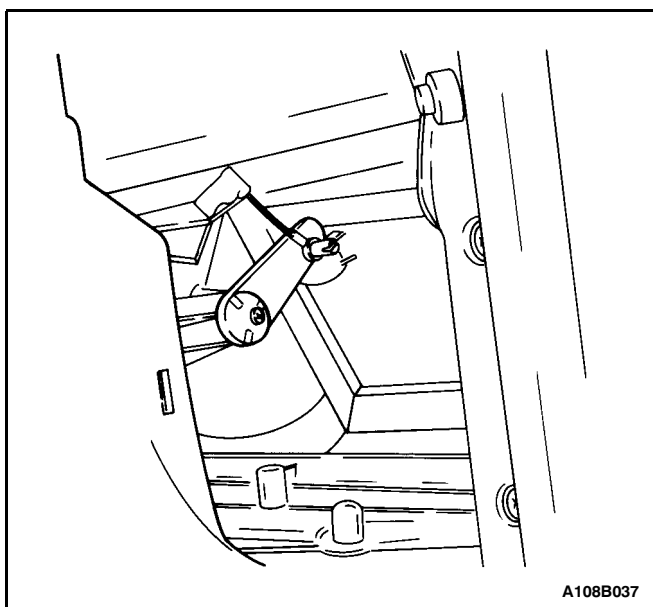
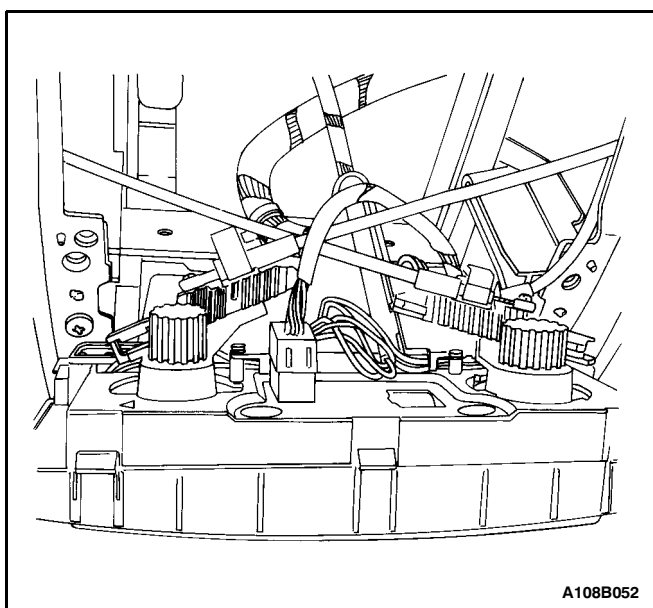
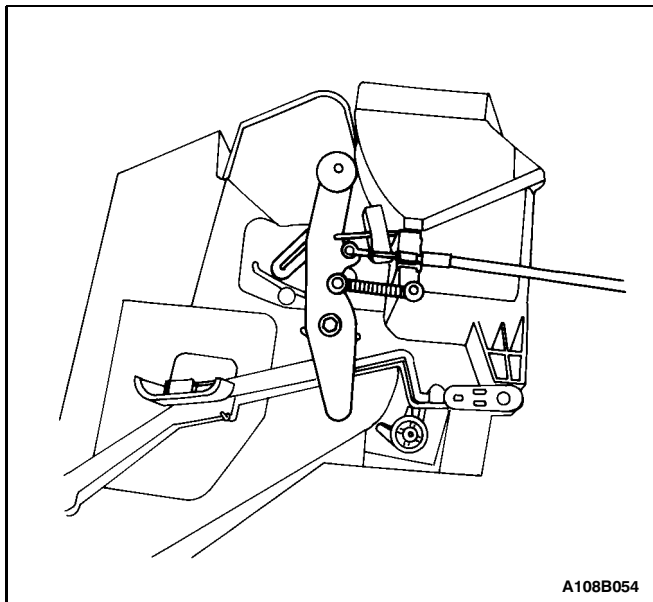
1. The pressure in the unit's tank and the pressure in the A/C system are roughly equal. This will cause the transfer to proceed too slowly. Refer to the manufacturer's instructions for the charging station in use.
2. There was not enough refrigerant in the unit's tank to transfer the full charge. It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

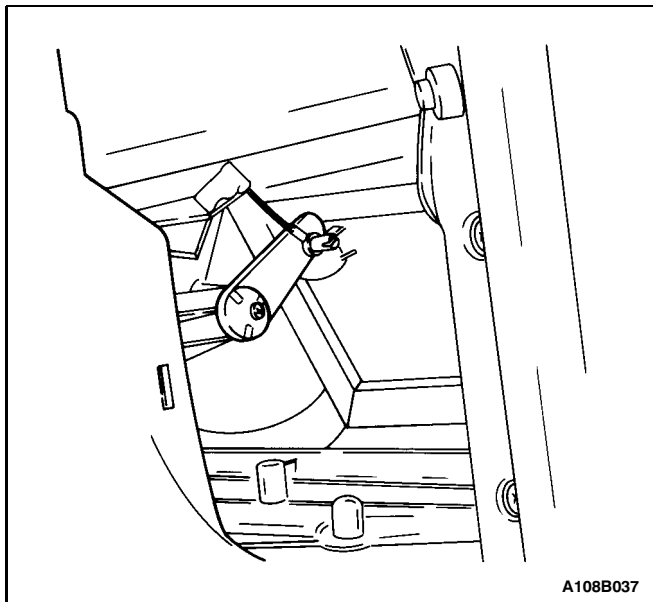
SERVICEABLE COMPONENTS

HVAC CABLES

Removal Procedure

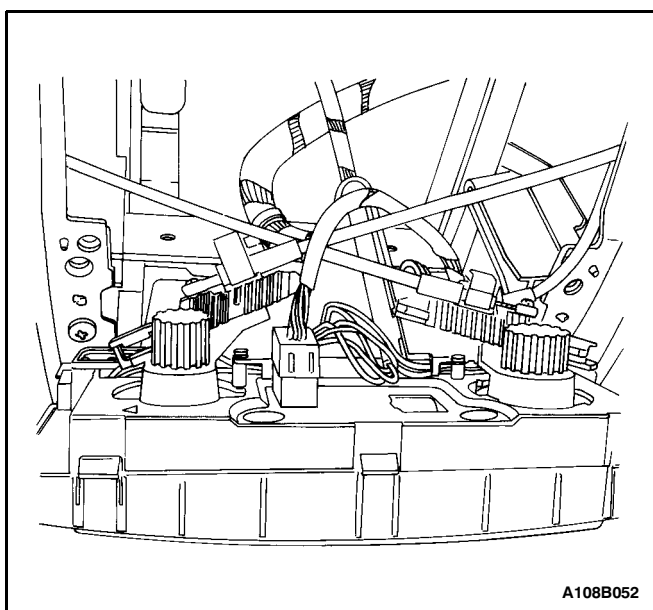
1. Disconnect the negative battery cable.
2. Remove the audio system. Refer to Section 9F, Audio Systems.
3. Remove the HVAC controller. Refer to "Control Assembly" in this section.
4. Disconnect the heater/defrost cable eyelet from the post. (Left-hand drive shown, right-hand drive similar.)
5. Snap the cable housing clip out of the slide position.
6. Remove the dash end trim panel.
7. Disconnect the vehicle recirculating/fresh air door cable through the dash end panel opening by gently removing the cable eyelet from the post and snapping the housing clip from the retainer.
8. Repeat the procedure for the temperature control cable which is accessed from the lower passenger compartment.





Installation Procedure

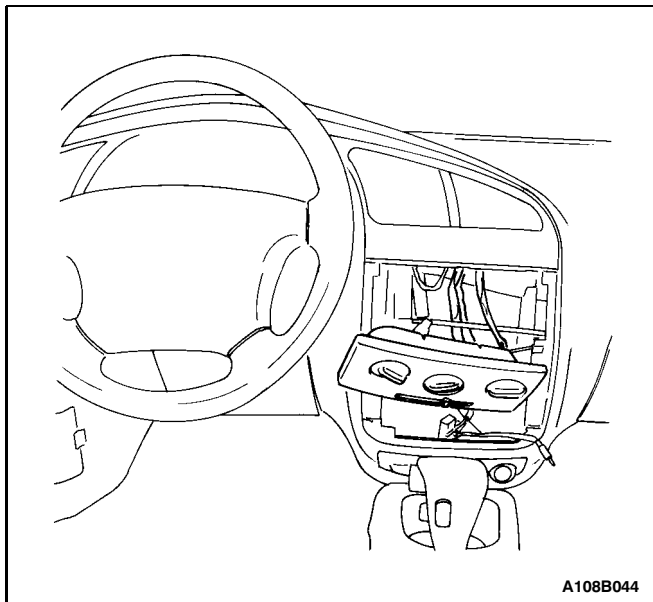
1. Connect the vehicle recirculating/fresh air door cable to the appropriate door by attaching the eyelet to the post and the cable housing to the slide.



2. Move the cable to verify the smooth operation and function of the door and the cable.
3. Install the remaining cables.
4. Install the HVAC controller. Refer to "Control Assembly" in this section.
5. Install the audio system. Refer to Section 9F, Audio Systems.
6. Install the dash end panel.
7. Connect the negative battery cable.
8. Operate the heating/cooling systems to verify proper function.

TEMPERATURE CABLE ADJUSTMENT

The temperature cable is not adjustable. The cable and the housings are of a fixed length. Also, the heater/air distribution case linkage does not provide for adjustment. If a malfunction is suspected, verify the proper operation of the controller and the heater/air distribution mechanical doors.

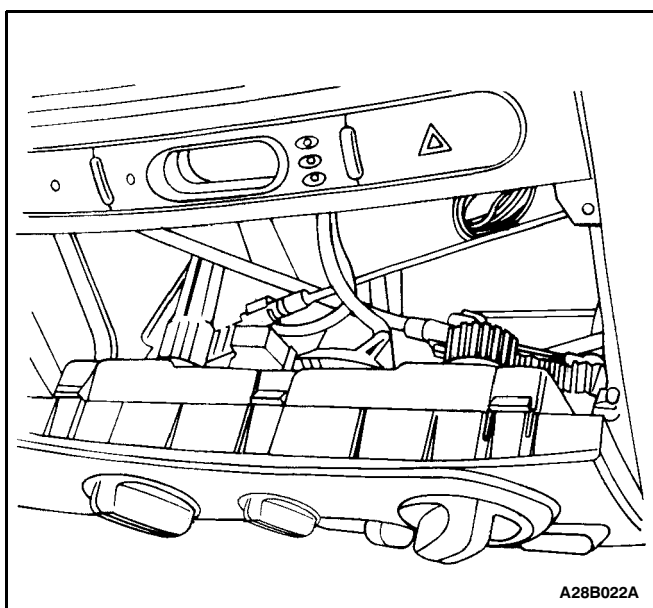


CONTROL ASSEMBLY

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

Removal Procedure

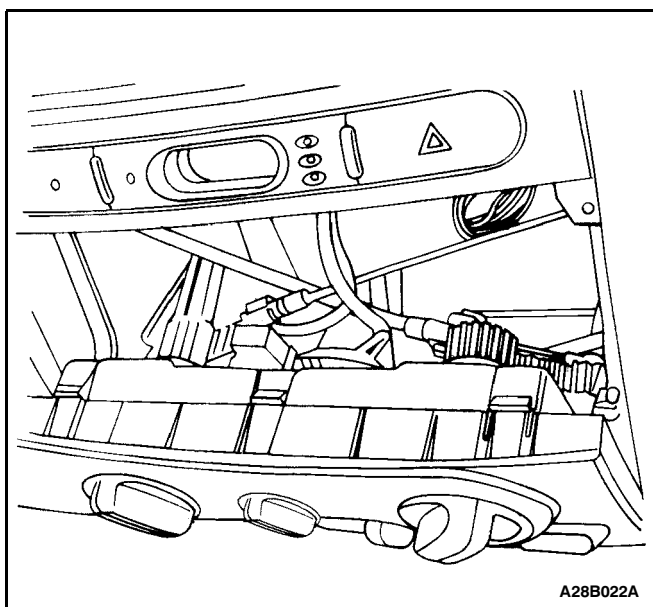
1. Disconnect the negative battery cable.
2. Remove the audio system. Refer to Section 9F, Audio Systems.
3. Remove the lower left and right controller retaining screws.
4. Pull out the controller to provide clearance for cable removal.

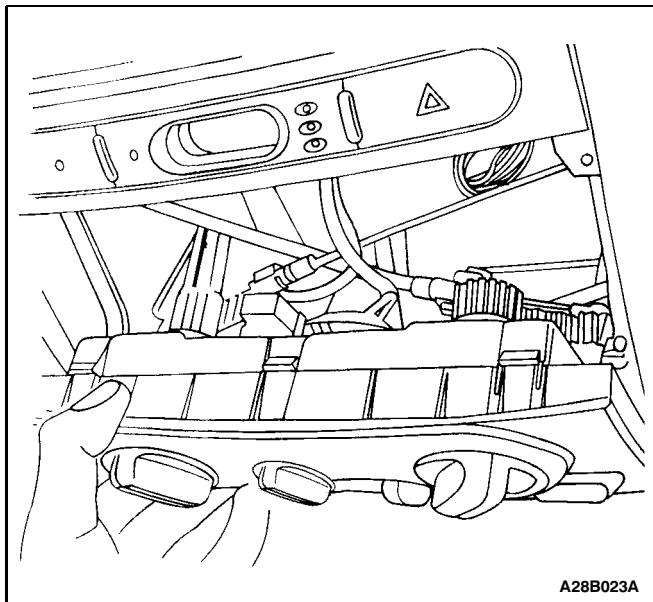


5. Disconnect the mechanical control cables by gently prying the cable eyelet off. Unsnap the cable housing from the mechanical slide. Note the location of the cables and the housings for ease of installation.
6. Disconnect the electrical connectors.

Installation Procedure

1. Connect the electrical connectors to the sockets on the back of the controller.





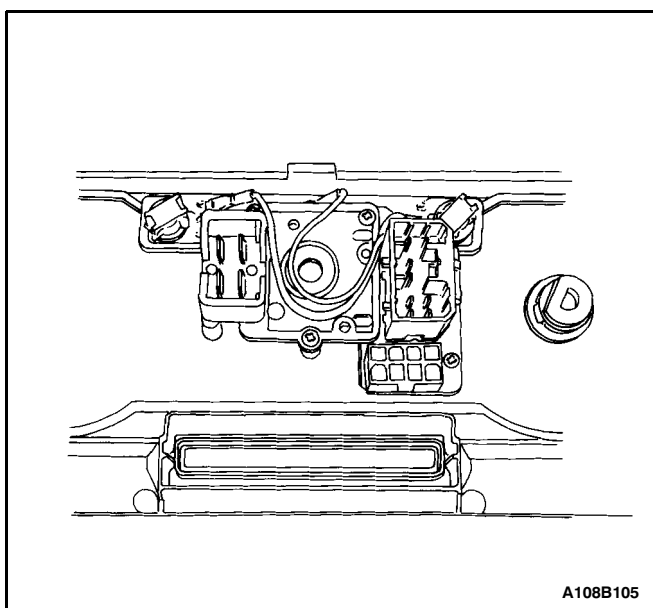
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2. Attach the mechanical cable housings to their original control positions.
3. Press the cable end eyelet onto the post.
4. Gently insert the controller into position on the center console.
5. Install the lower left and right retaining screws.

Tighten

Tighten the control assembly retaining screws to 2 N•m (18 lb-in).

6. Install the audio system. Refer to Section 9F, Audio Systems.
7. Connect the negative battery cable.
8. Operate all of the positions of the controller to ensure proper function.



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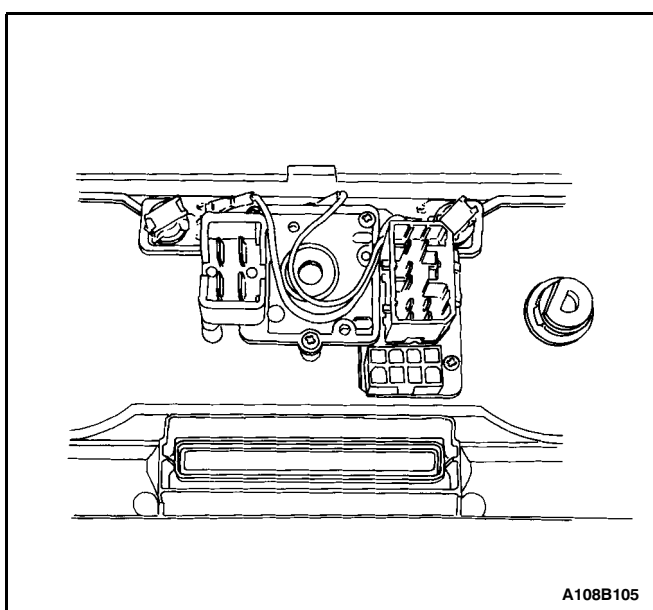
CONTROL ASSEMBLY KNOB LIGHTING

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the HVAC control assembly. Refer to "Control Assembly" in this section.
3. Turn the bulb holder to the left and pullout the bulb.

Installation Procedure

1. Install the bulb into the holder and turn the bulb to the right.
2. Install the control assembly. Refer to "Control Assembly" in this section.
3. Connect the negative battery cable.
4. Check knob lighting for proper operation.



A108B105

BLOWER MOTOR

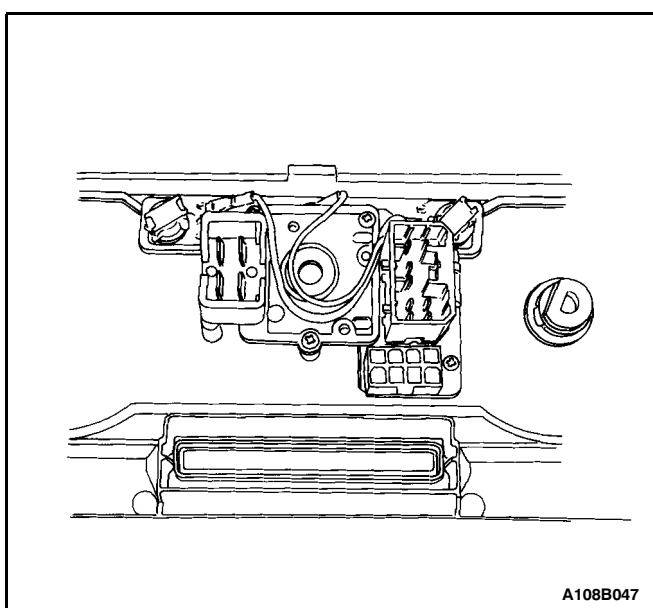
To remove the blower motor, refer to Section 7A, Heating and Ventilation System (Without Air Conditioning).

HIGH-BLOWER RELAY

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

BLOWER MOTOR RESISTOR

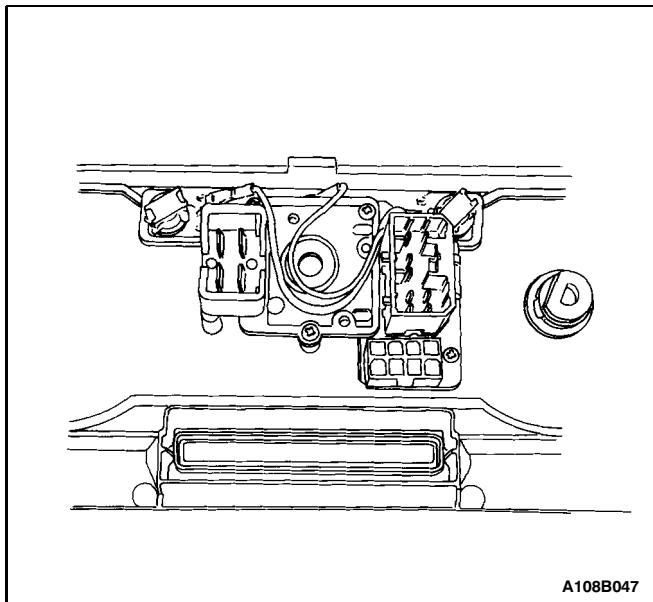
To remove the blower motor resistor, refer to Section 7A, Heating and Ventilation System (Without Air Conditioning).



BLOWER SWITCH

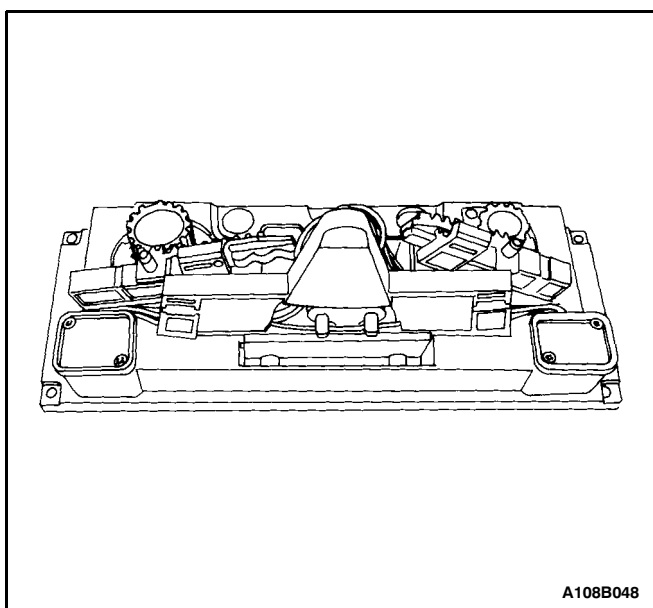
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the HVAC control assembly. Refer to "Control Assembly" in this section.
3. Disconnect the electrical connector.
4. Remove the retaining screws securing the rear case to the front fascia.
5. Separate the two case halves.
6. Disconnect the electrical wires from the light terminals.
7. Remove the screws securing the switch assembly to the knob mount support.
8. Remove the switch assembly. Note the position of the spring, the electrical contact washer and the contact key/keyway on the knob post.



Installation Procedure

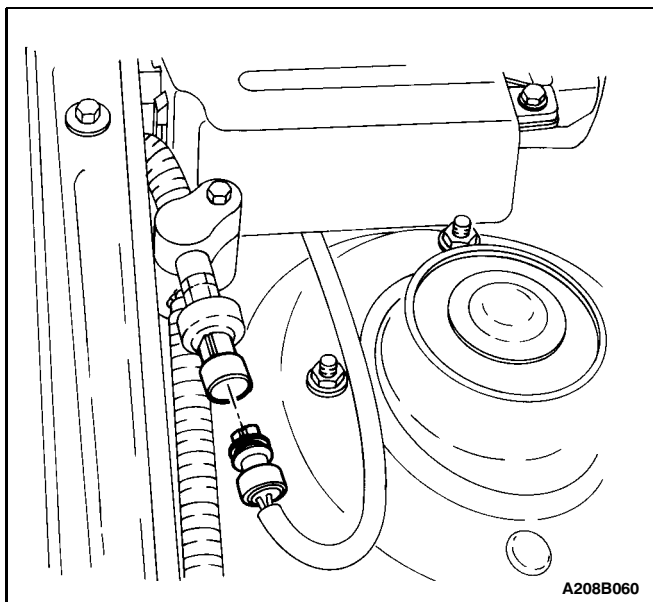
1. Install the spring and the electrical contact washer over the blower switch knob post.
2. Align the contact key with the post keyway.
3. Position the switch assembly over the mount posts.
4. Install the switch assembly with the screws.
5. Connect the electrical wires to the light terminals.
6. Reassemble the two case halves. Note that the knob post shafts are a half-moon shape and must be inserted into the mechanical drive in the correct position.
7. Install the rear case to the front fascia with the retaining screws.



8. Connect the electrical connectors to the rear of the control assembly.
9. Install the HVAC control assembly. Refer to "Control Assembly" in this section.
10. Connect the negative battery cable.
11. Perform an operational check of the blower switch positions.

A/C DEFOGGER SWITCH ASSEMBLY

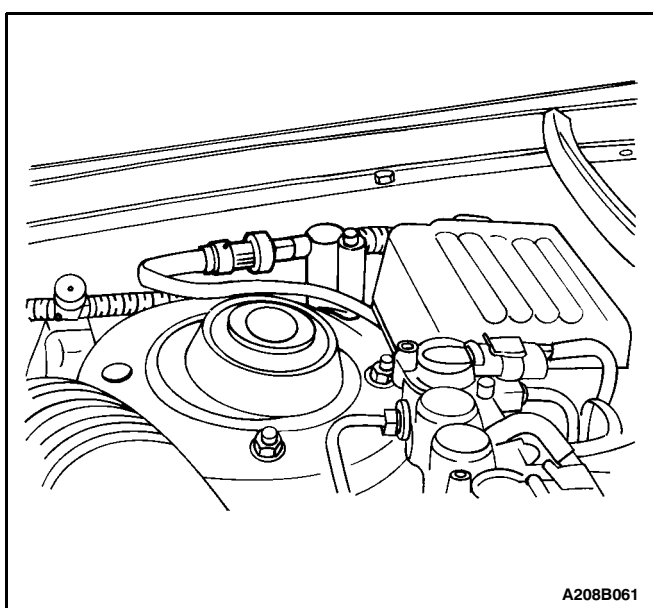
These switches cannot be replaced in the field. If one fails, replace the control assembly. Refer to "Control Assembly" in this section for instructions.



A/C PRESSURE TRANSDUCER

Removal Procedure

1. Disconnect the negative battery cable.
2. Release the connector lock and pull the air conditioning (A/C) pressure transducer wire connector out.
3. Hold the line fitting boss with one wrench and remove the A/C pressure transducer with another wrench.
4. Discard the O-ring seal.



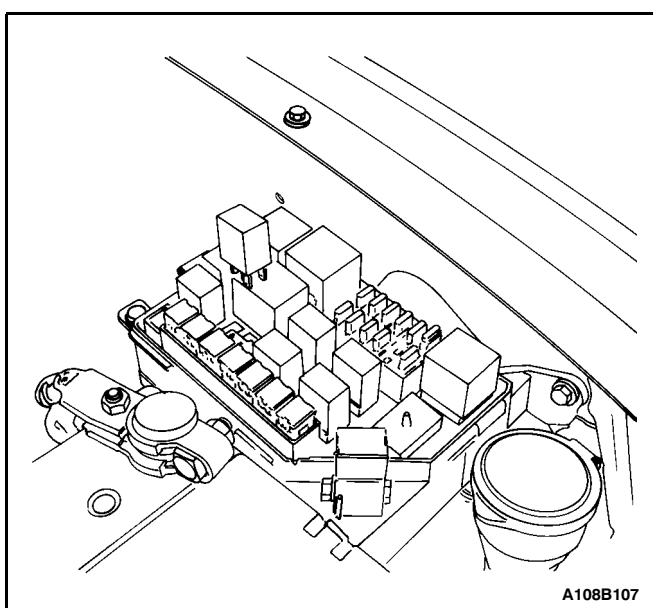
Installation Procedure

1. Install the new seal on the A/C pressure transducer.
2. Install the A/C pressure transducer. (Left-hand drive shown, right-hand drive similar.)

Tighten

Tighten the pressure transducer (using two wrenches) to 8 N·m (71 lb-in).

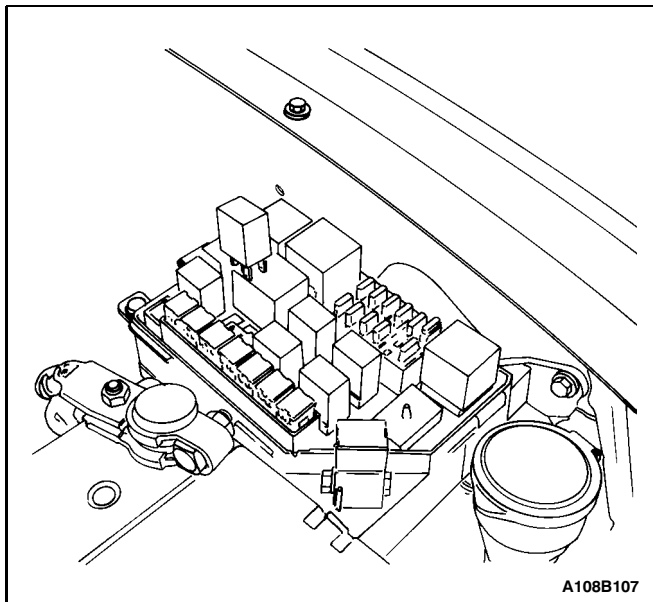
3. Install the wire connector.
4. Connect the negative battery cable.



A/C COMPRESSOR RELAY

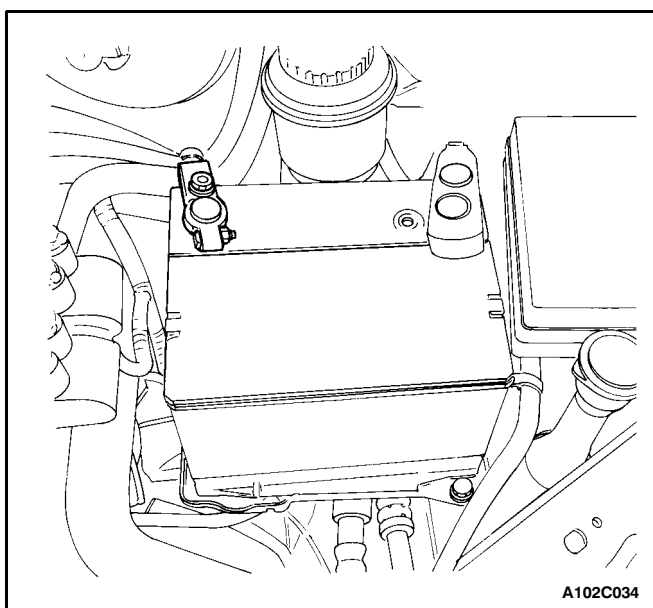
Removal Procedure

1. Disconnect the negative battery cable.
2. The relay is located in the fuse junction box in the engine compartment on the left-hand side.
3. Pull the relay straight up and out.



Installation Procedure

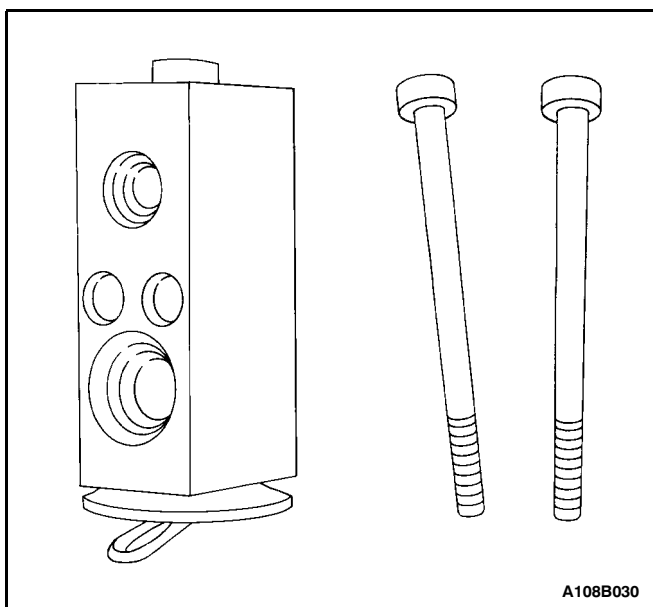
1. Align the relay terminal contacts with the base receptacle.
2. Push the relay into the base until it is seated.
3. Connect the negative battery cable.

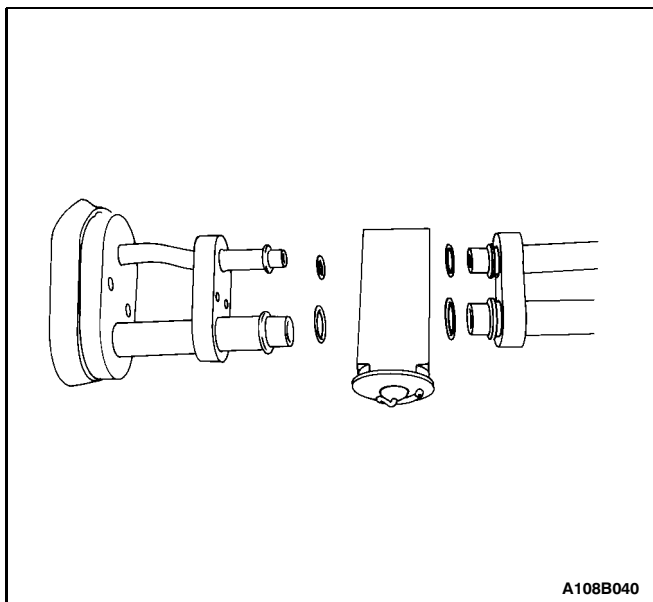


A/C EXPANSION VALVE

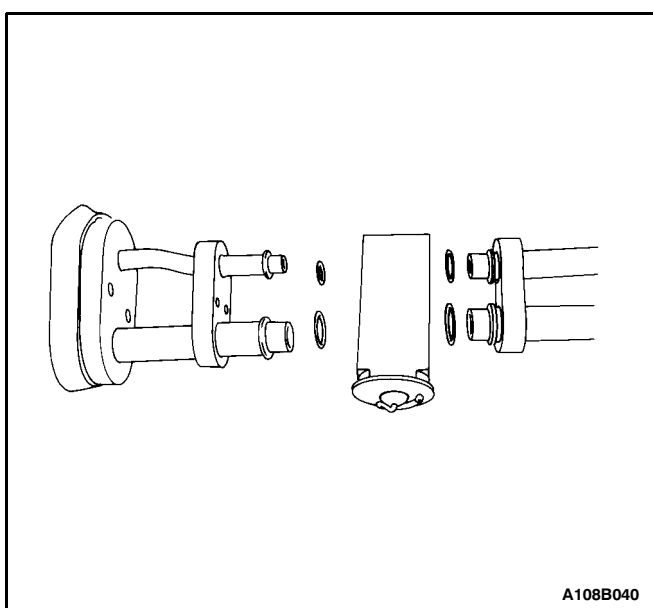
Removal Procedure

1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
4. Remove the heater/air distribution case assembly. Refer to "Heater/Air Distribution Case Assembly" in this section.
5. Remove the evaporator. Refer to "Evaporator Core" in this section.
6. Remove the expansion valve connector block retaining bolts.
7. Remove the expansion valve.





8. Discard the O-rings.



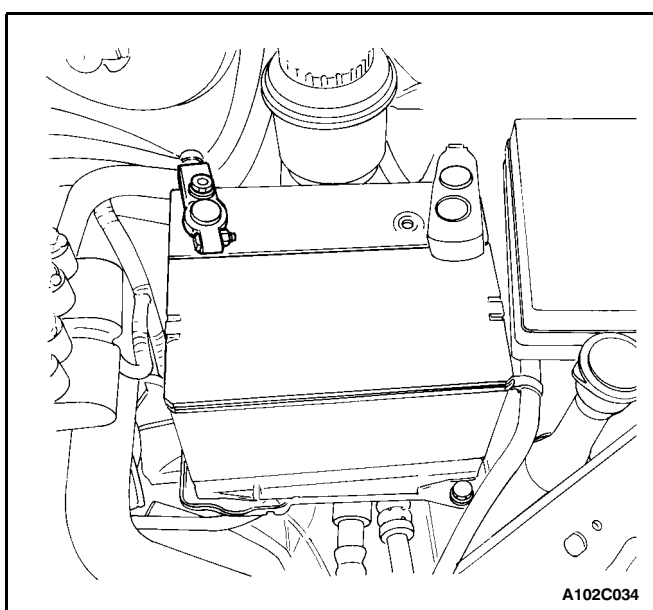
Installation Procedure

1. Clean the O-ring surface areas of dirt or contamination.
2. Install new O-rings on the evaporator tubes.
3. Install a new expansion valve onto the evaporator tubes.
4. Install the expansion valve retaining bolts.

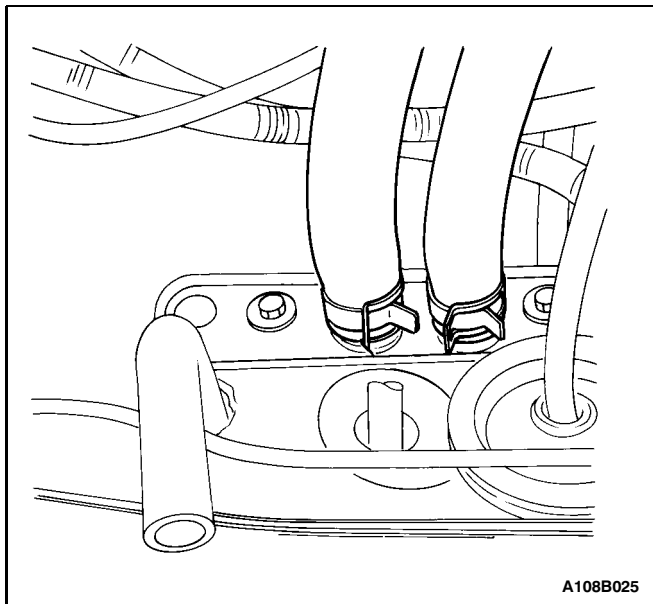
Tighten

Tighten the expansion valve retaining bolts to 12 N•m (106 lb-in).

5. Install the evaporator into the heater/air distribution case. Refer to "Evaporator Core" in this section.



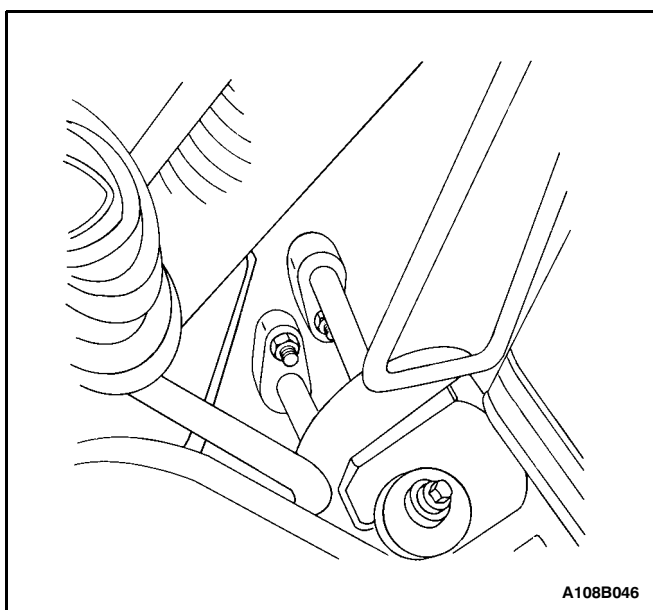
6. Install the heater/air distribution case assembly. Refer to "Heater/Air Distribution Case Assembly" in this section.
7. Install the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
8. Connect the negative battery cable.
9. Evacuate and recharge the system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



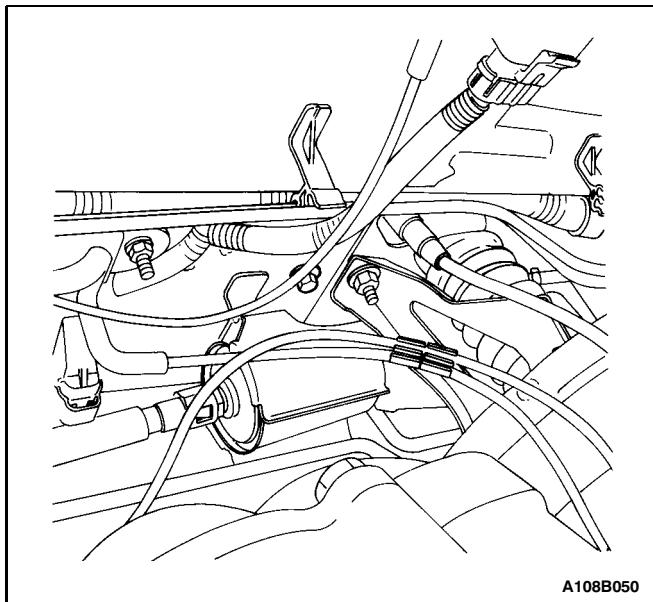
HEATER/AIR DISTRIBUTION CASE ASSEMBLY

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
3. Drain the cooling system. Refer to Section 1D, Engine Cooling.
4. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
5. Raise and suitably support the vehicle.
6. Compress the heater hose clamps at the fire wall and slide the clamps toward the engine.
7. Remove the two heater hoses from the core lines at the fire wall.
8. Turn the condensation drain hose and pull the hose off.
9. Remove the two screws, one on each side of the heater core lines, which secure the heater/air distribution case to the fire wall.



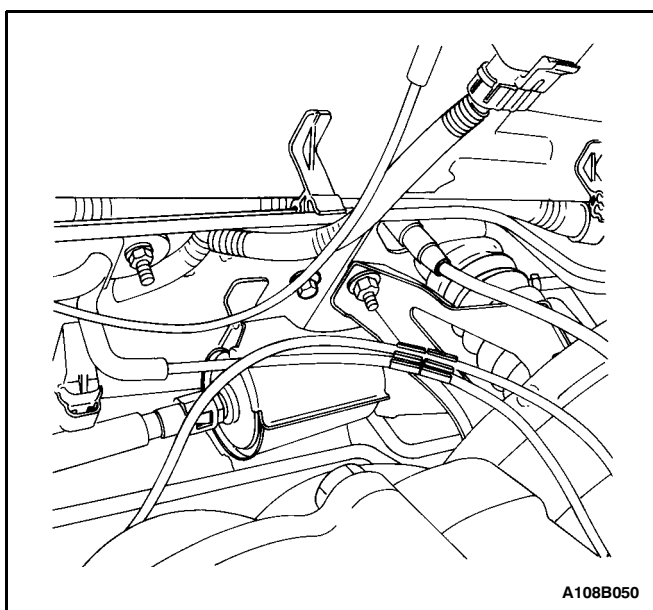
10. Lower the vehicle.
11. Remove the nuts that secure the A/C suction hose and the liquid evaporator pipe block at the fire wall. For right-hand drive and non-ABS vehicles, you can reach them from above. To access the connecting blocks on left-hand drive vehicles equipped with ABS, perform the following steps:
 - 11.1. Remove the front wheel next to the connecting blocks.
 - 11.2. Remove the steering arm access plate.
 - 11.3. Reach through the opening at the steering arm to remove the A/C suction hose and the liquid pipe from the evaporator connecting block.



12. Have an assistant support the heater/air distribution case from inside the vehicle and, working from the engine side of the fire wall, remove the screw that secures the case assembly at the fuel filter, and the two screws that secure the case assembly to the fire wall at the evaporator connecting block.

Notice: Handle the case carefully to avoid damage to the mechanical door operating linkage.

13. Remove the heater/air distribution case assembly from the vehicle.



Installation Procedure

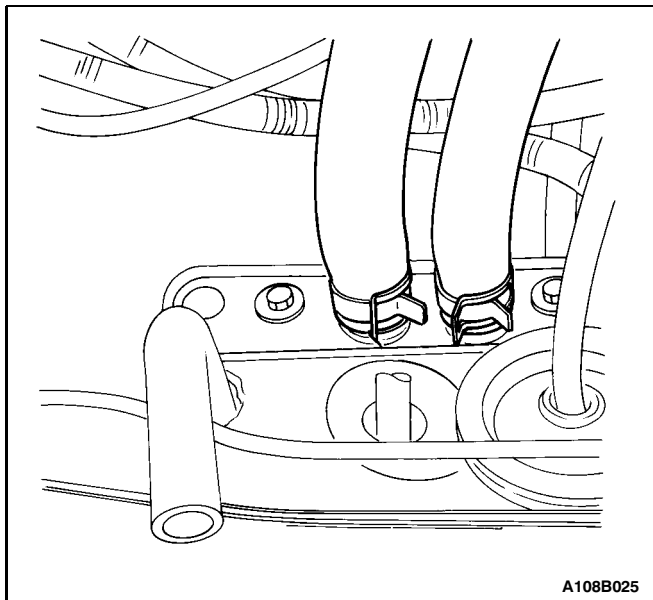
1. Clean the O-ring surfaces to remove any dirt or contamination.
2. Install two new O-rings onto the A/C suction hose and the liquid evaporator pipe at the fire wall in the engine compartment. Note, access for ABS-equipped vehicles is through the steering arm access panel in the right wheel well. For non-ABS vehicles, access is gained from above the tubes at the fire wall.

Notice: Ensure that the heater core tubes do not contact the fire wall opening, or damage to the heater core tubes could occur.

3. Position the heater/air distribution case in the vehicle.
4. Slowly raise the heater/air distribution case into position. The case must be held in position while the first three screws are installed and tightened from the engine side of the fire wall.
5. Install the two screws at the evaporator connecting block and the screw at the fuel filter through the fire wall from the engine compartment side.

Tighten

Tighten the heater/air distribution case screws to 8 N·m (71 lb-in).



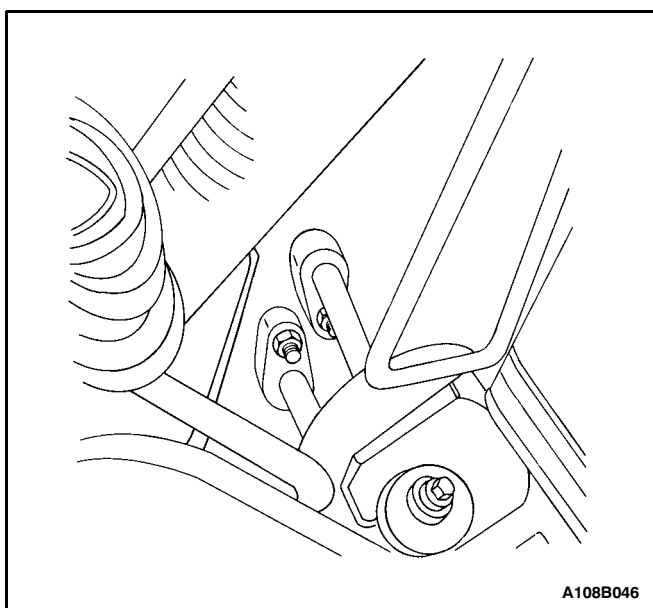
A108B025

6. Raise and suitably support the vehicle and install the two screws that secure the heater/air distribution case on either side of the heater core pipes.

Tighten

Tighten the heater/air distribution case screws to 8 Nwm (71 lb-in).

7. Connect the two heater hoses to the heater core tubes.
8. Slide the heater hose clamps into position.
9. Install the case condensation drain tube hose.



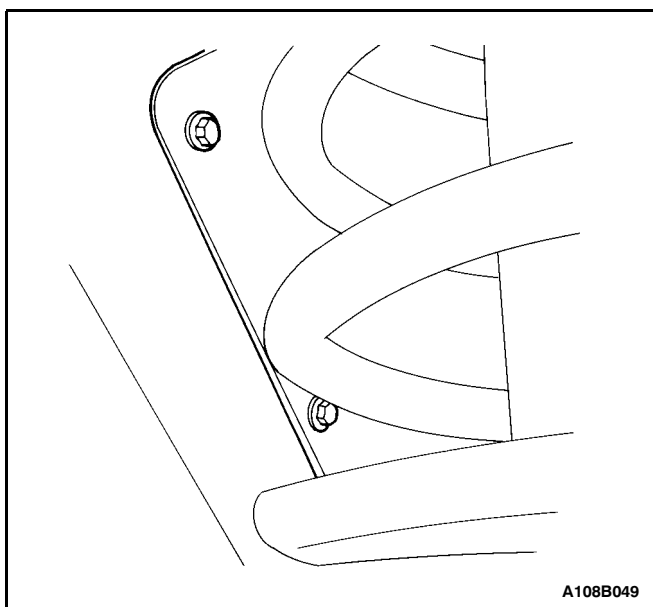
A108B046

10. Lower the vehicle.

11. Install the A/C suction hose and the liquid evaporator pipes onto the evaporator connecting block screws.

Tighten

Tighten the liquid evaporator pipe and the suction hose connector block retaining nuts to 12 Nwm (106 lb-in).



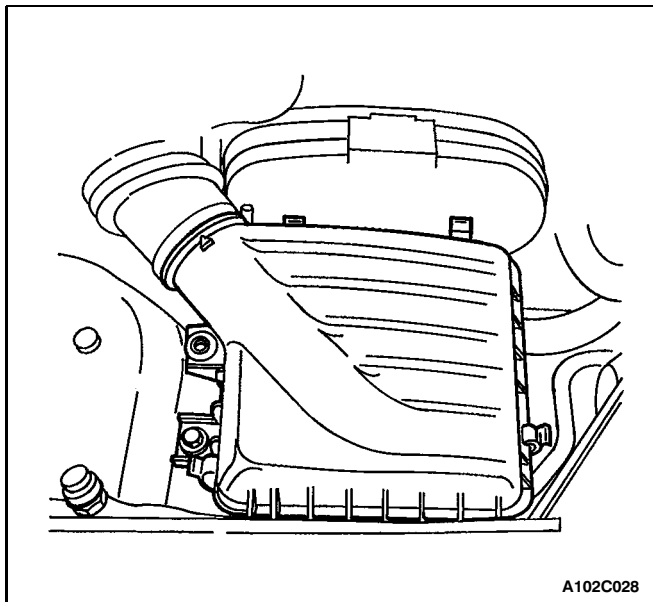
A108B049

12. For left-hand drive vehicles equipped with ABS, perform the following procedures:

- 12.1. Install the steering arm access plate.

- 12.2. Install the front wheel. Refer to Section 2E, Tires and Wheels.

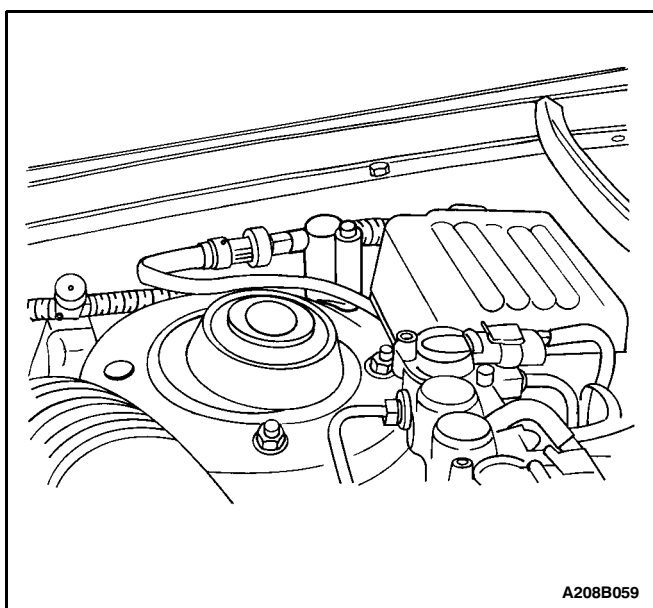
13. Install the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
14. Connect the negative battery cable.
15. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
16. Fill the cooling system. Refer to Section 1D, Engine Cooling.
17. Operate the HVAC control to verify the proper function of the heating and cooling systems.



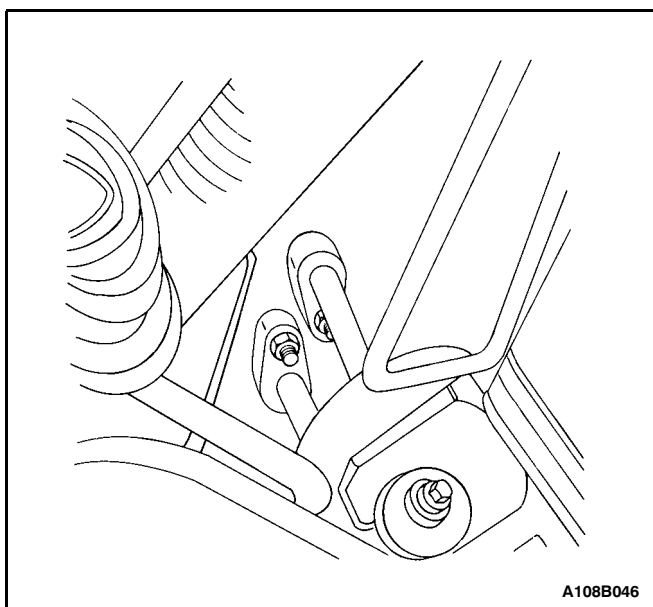
A/C HIGH-PRESSURE PIPE LINE

Removal Procedure

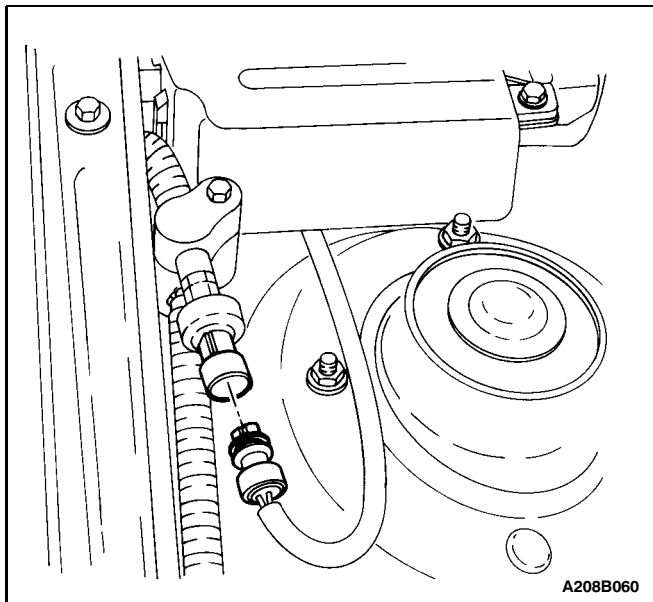
1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the air cleaner housing bolts and the air filter housing assembly.



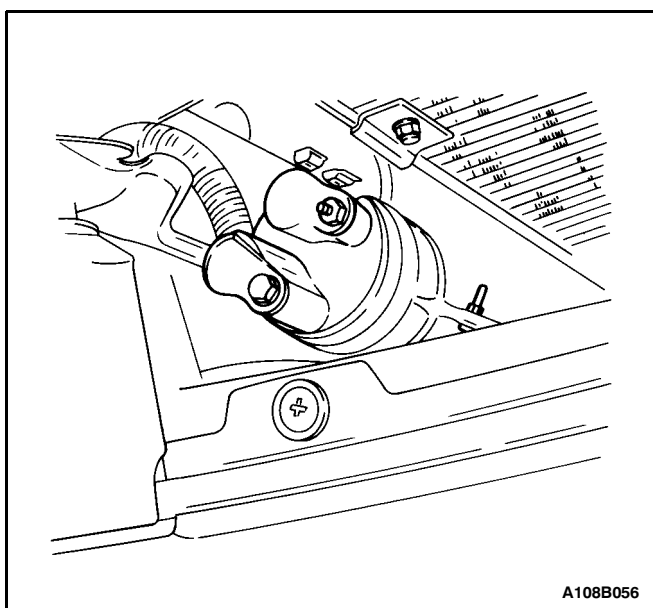
4. Remove the bolt securing the liquid evaporator pipe connector block to the liquid condenser connector block and separate the pipes.



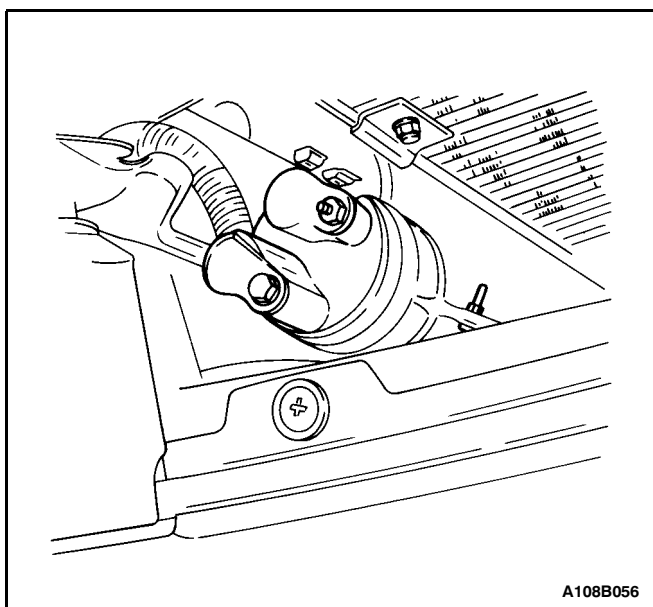
5. Remove the liquid evaporator pipe connector block retaining nut at the fire wall opening.
6. Cap the liquid evaporator pipe opening to prevent contamination.
7. Remove the liquid evaporator pipe from the vehicle.



8. Disconnect the electrical connector at the pressure transducer.



9. Remove the liquid condenser pipe connector block bolt at the receiver-dryer.
10. Remove the liquid condenser pipe from the vehicle.
11. Cap the opening at the receiver-dryer to prevent contamination.

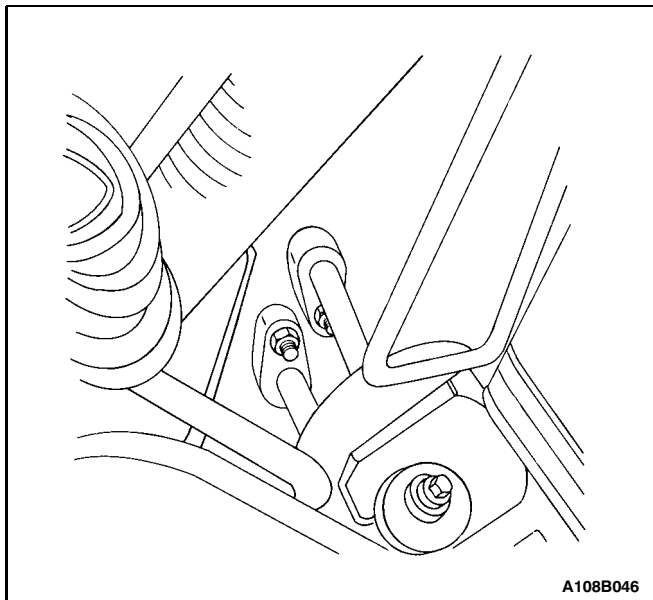


Installation Procedure

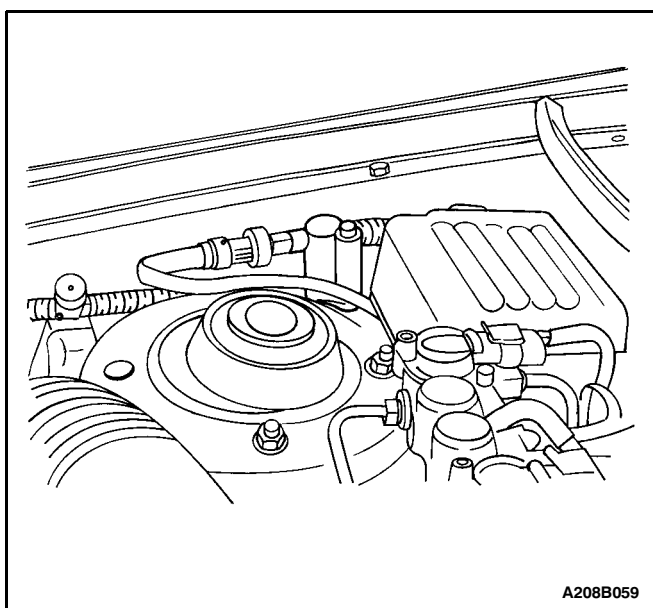
1. Position the liquid condenser pipe section into the vehicle.
2. Install a new O-ring on the connector block at the receiver-dryer.
3. Install a new O-ring at the liquid condenser to evaporator plate pipe connector block.
4. Install the bolt securing the liquid condenser pipe connector block to the receiver-dryer.

Tighten

Tighten the liquid condenser pipe connector block-to-receiver-dryer bolt to 12 N•m (106 lb-in).



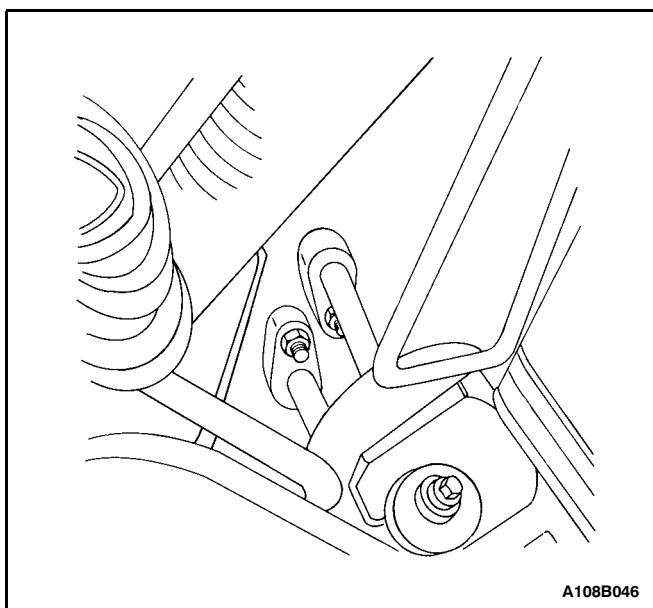
5. Position the liquid evaporator pipe into the vehicle.



6. Install the liquid evaporator pipe connector block-to-the liquid condenser pipe connector block with the retaining bolt.

Tighten

Tighten the liquid evaporator pipe connector block-to-to liquid condenser pipe connector block retaining bolt to 12 N•m (106 lb-in).

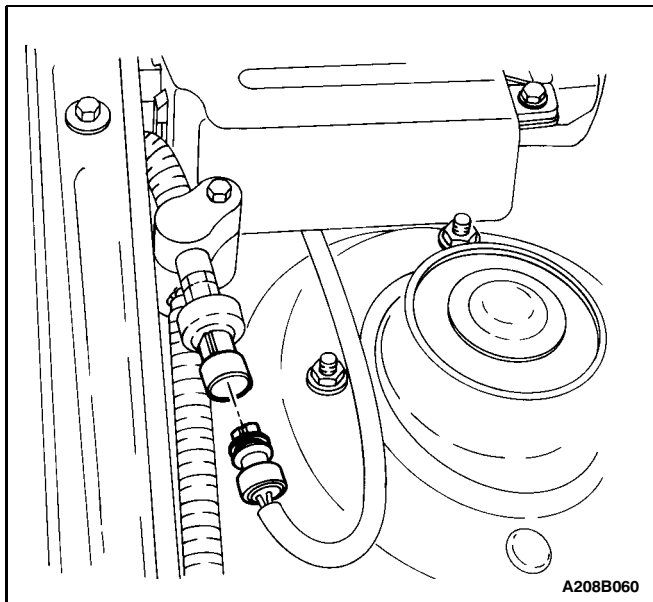


7. Install a new O-ring on the liquid evaporator pipe.

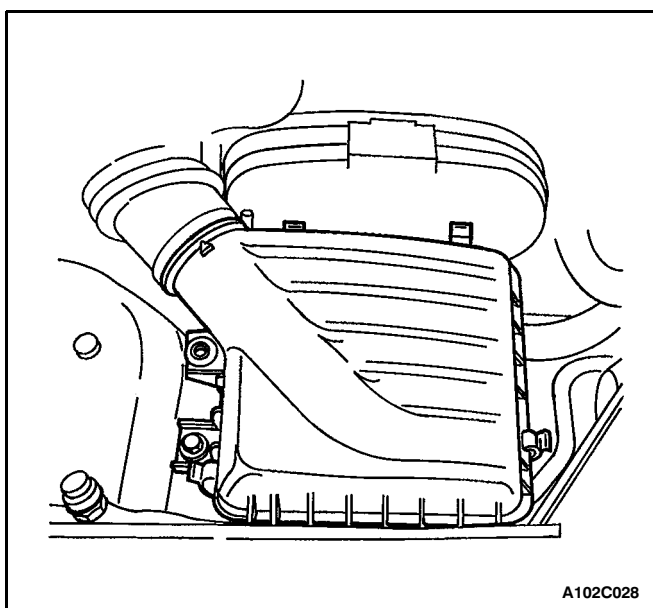
8. Install the nut at the liquid evaporator pipe connector block at the evaporator flange.

Tighten

Tighten the liquid evaporator pipe connector block nut to 12 N•m (106 lb-in).



9. Connect the electrical connector to the pressure transducer.



10. Install the air cleaner housing assembly with the retaining bolts.

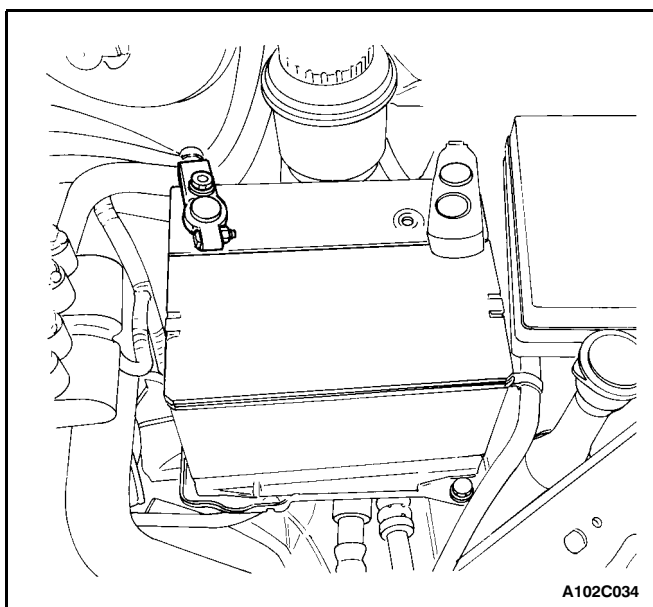
Tighten

Tighten the air cleaner housing assembly retaining bolts to 12 N·m (106 lb-in).

11. Connect the negative battery cable.
12. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.

HEATER HOSES

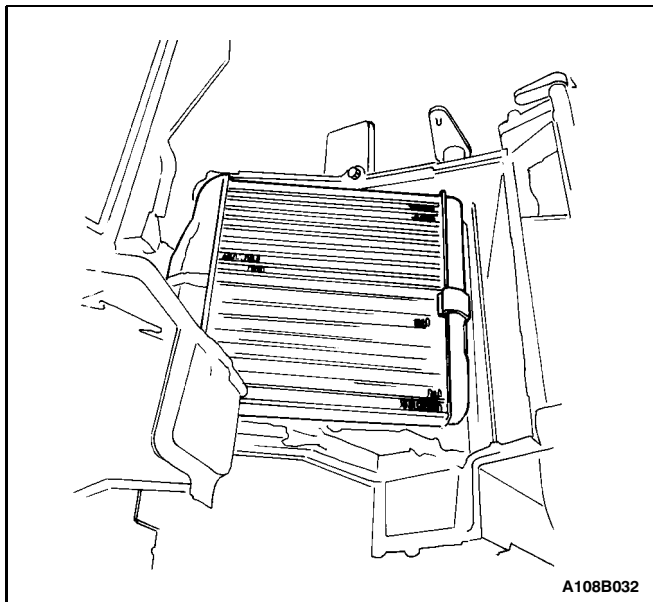
To remove heater hoses, refer to Section 7A, Heating and Ventilation Systems.



HEATER CORE

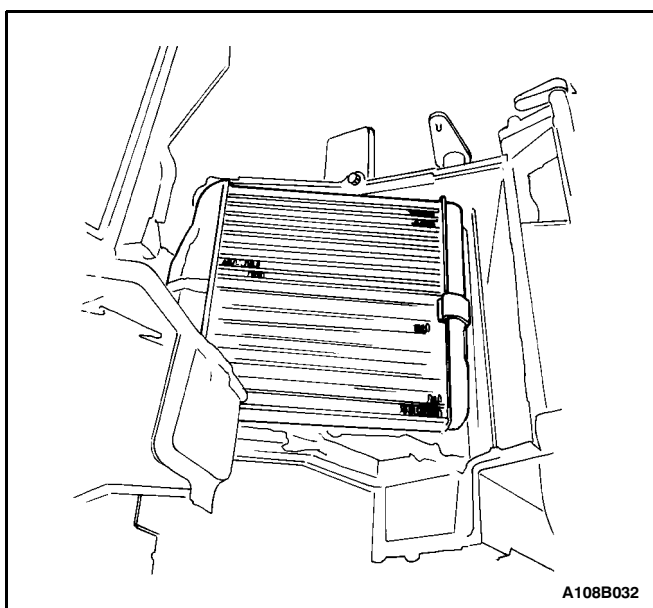
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
3. Remove the heater/air distribution case assembly. Refer to "Heater/Air Distribution Case Assembly" in this section.



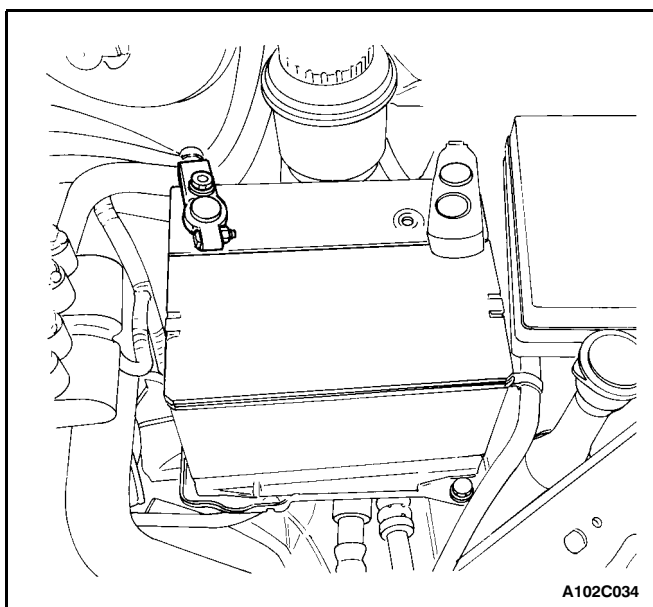
Notice: Handle the case carefully to avoid damage to the linkage levers.

4. Remove the heater core from the heater/air distribution case assembly.

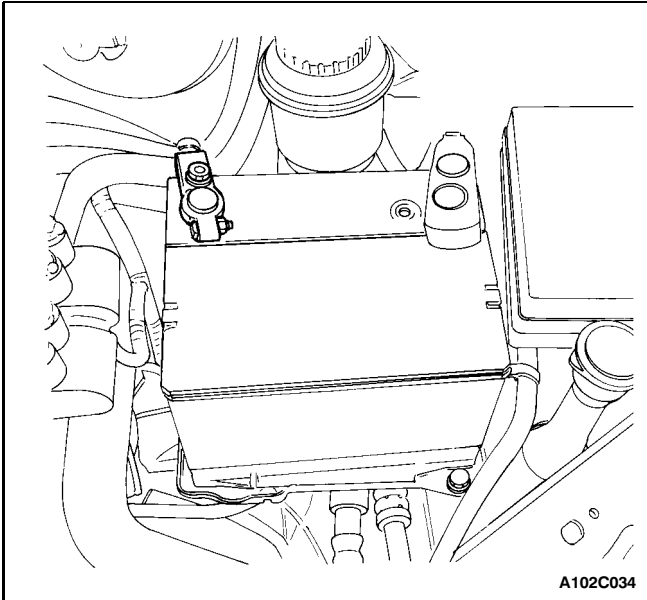


Installation Procedure

1. Install the heater core into the heater/air distribution case assembly.



2. Install the heater/air distribution case assembly. Refer to "Heater Air/Distribution Case Assembly" in this section.
3. Install the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
4. Fill the cooling system. Refer to Section 1D, Engine Cooling.
5. Connect the negative battery cable.
6. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



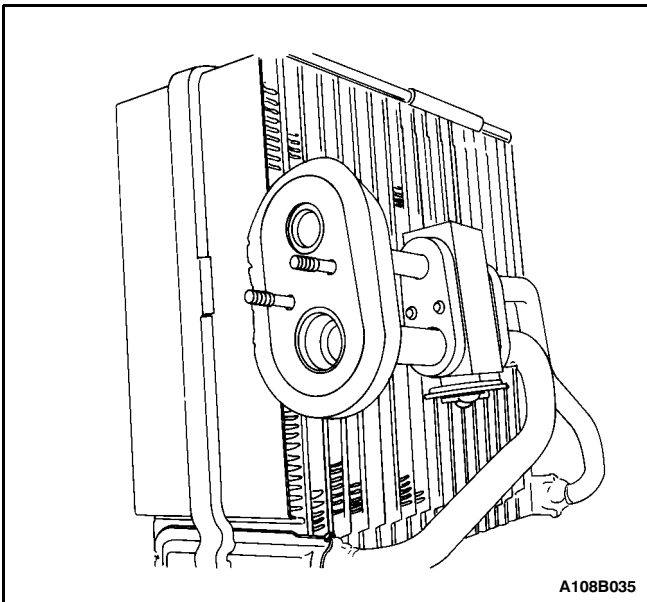
EVAPORATOR CORE

Removal Procedure

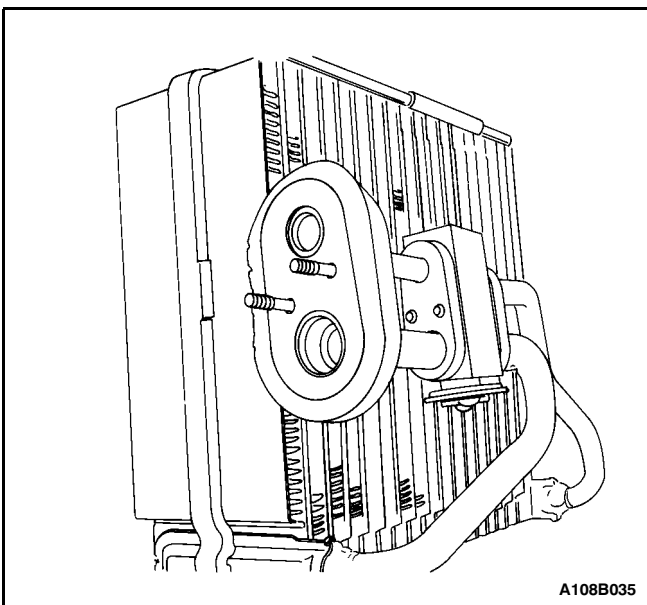
1. Disconnect the negative battery cable.
2. Remove the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.

Notice: Handle the case carefully to avoid damage to the door actuating linkage.

3. Remove the heater/air distribution case assembly. Refer to "Heater/Air Distribution Case" in this section.

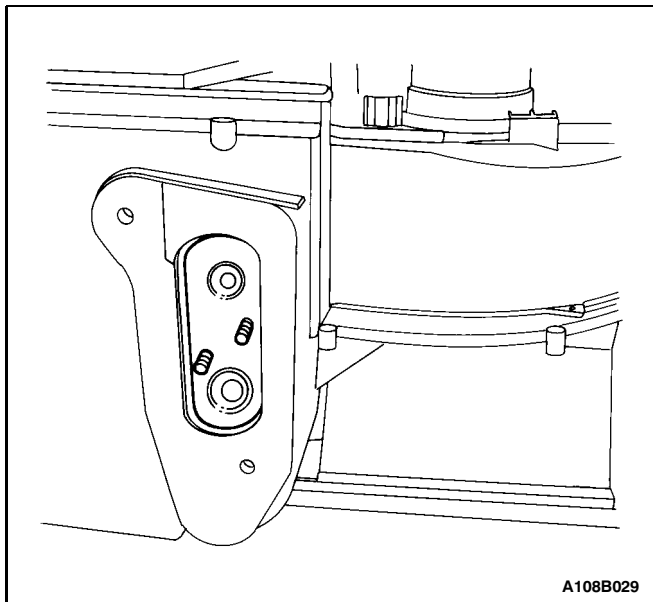


4. Remove the screws that secure the evaporator case cover.
5. Remove the cover.
6. Slide the evaporator flange support plate upward to facilitate evaporator removal.
7. Remove the evaporator from the case.

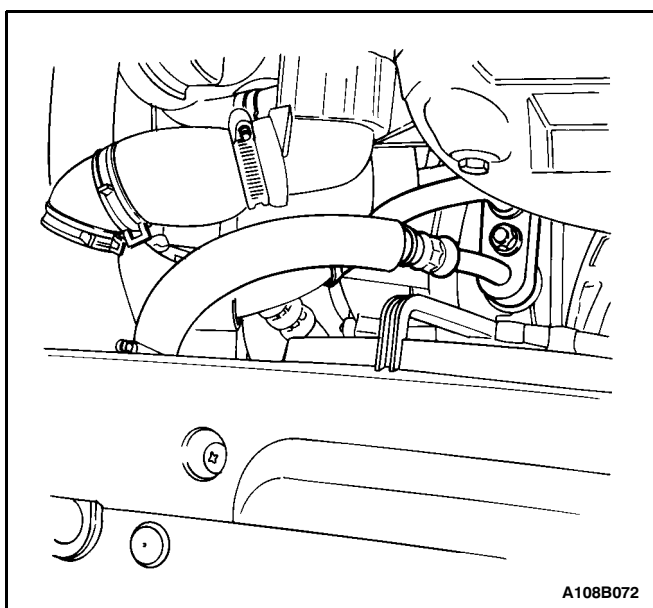


Installation Procedure

1. Install new O-rings onto the evaporator tubes.
2. Install the evaporator core into the case. Center the evaporator flange in the case opening.



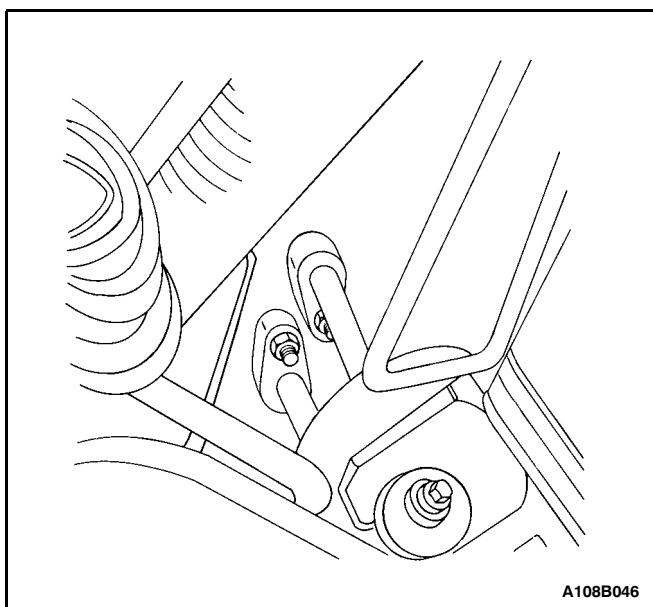
3. Install the evaporator core case cover with the screws.
4. Install the heater/air distribution case. Refer to "Heater/Air Distribution Case" in this section.
5. Install the instrument panel carrier assembly. Refer to Section 9E, Instrumentation/Driver Information.
6. Connect the negative battery cable.
7. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.

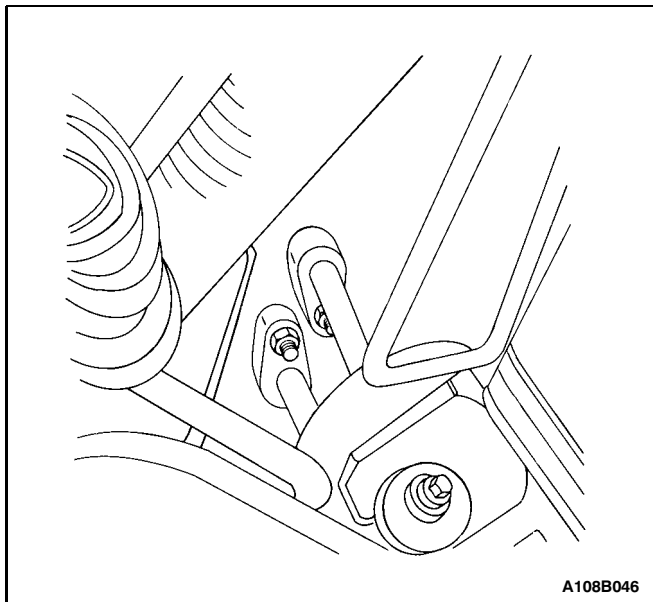


A/C HOSE ASSEMBLY

Removal Procedure

1. Cap all openings to prevent contamination.
2. Disconnect the negative battery cable.
3. Discharge and recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
4. Remove the retaining nut and disconnect the A/C hose assembly connector block at the top rear of the compressor. Discard the sealing washers.
5. Separate the A/C hose from the discharge hose connector block.
6. Remove the hose support clamp bolt and the clamp along the left side of the engine compartment fender well.
7. Remove the nuts and disconnect the A/C hose at the fire wall evaporator flange connector block. Discard the O-ring.
8. Remove the A/C hose.
9. Cap the opening to the evaporator flange to prevent contamination.
10. Remove the nut securing the discharge hose to the condenser pipe connector block.
11. Remove the discharge hose.





Installation Procedure

1. Install a new O-ring on the tube end to the evaporator flange.
2. Position the hose assembly and the support clamp in the vehicle.
3. Insert the suction hose tube end into the evaporator flange.
4. Install the suction hose connector block retaining nut.

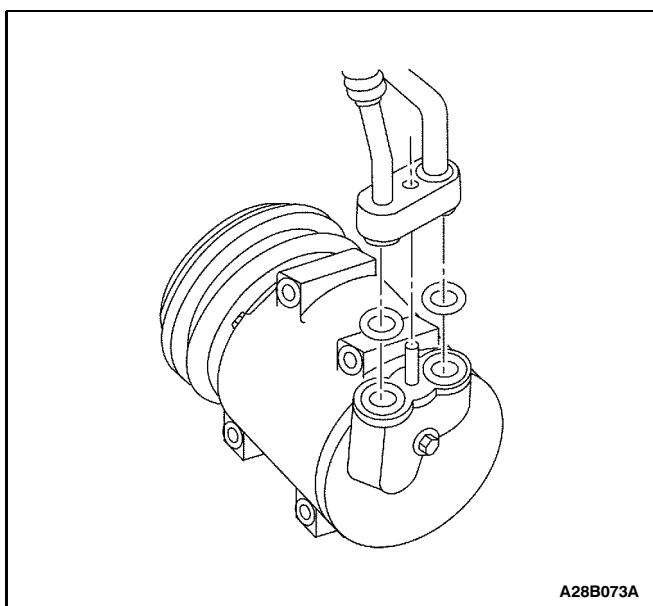
Tighten

Tighten the suction hose connector block retaining nut to 12 N•m (106 lb-in).

5. Install the suction hose support clamp bolt and tighten.

Tighten

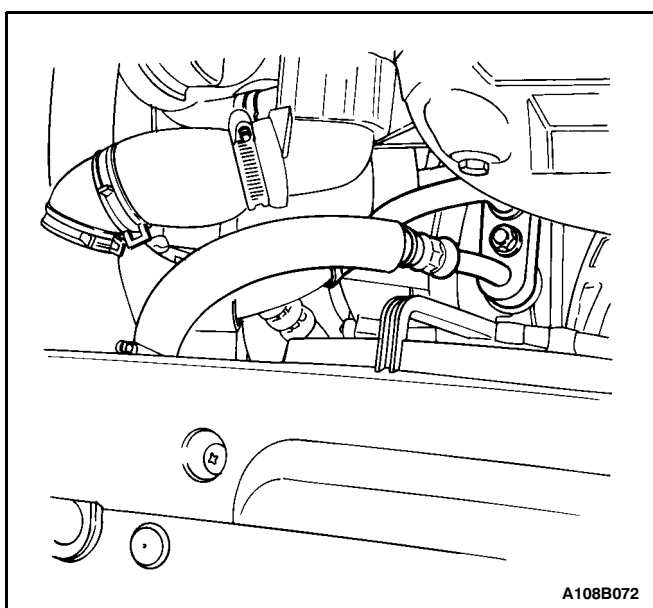
Tighten the suction hose support clamp bolt to 4 N•m (35 lb-in).



6. Install new sealing washers onto the pilots of the suction/discharge block fitting. The washers must be seated against the surface of the block fitting.
7. Position the discharge hose assembly with the A/C hose connector block.
8. Install a new O-ring and mate the discharge hose to the condenser pipe connector block.
9. Install the discharge hose condenser pipe connector block retaining nut.

Tighten

Tighten the discharge hose-to-condenser pipe connector block retaining nut to 16 N•m (12 lb-ft).

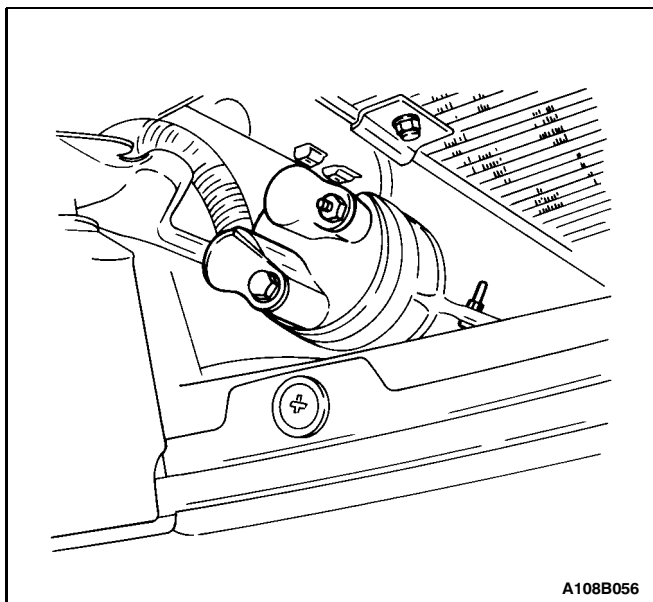


10. Mate the A/C system hose connector block to the compressor. Hold it in place while tightening the retaining nut.

Tighten

Tighten the A/C system hose connector retaining nut to 33 N•m (24 lb-ft).

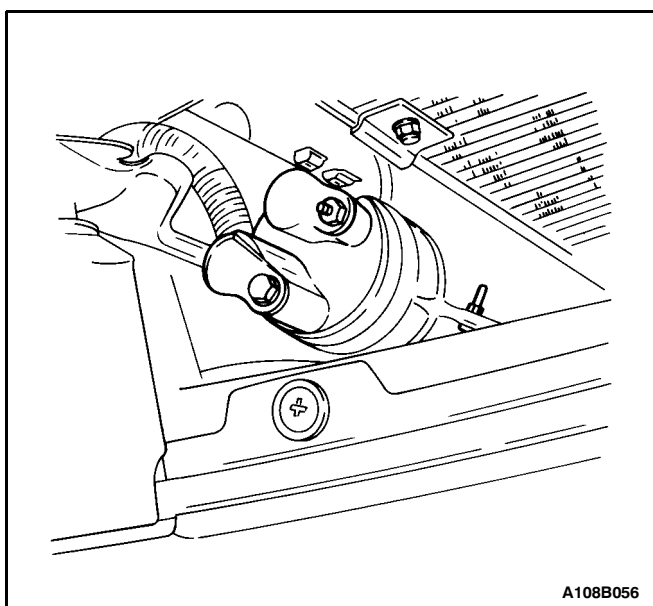
11. Connect the negative battery cable.
12. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



RECEIVER-DRYER

Removal Procedure

1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the nut and bolt securing the connector block to the top of the receiver-dryer.
4. Cap the open connections to prevent contamination.
5. Remove the bolt securing the receiver-dryer band clamp.
6. Remove the receiver-dryer.
7. Drain the oil from the receiver-dryer into a container. Measure the amount of oil drained from the receiver-dryer and then discard this used oil.



Installation Procedure

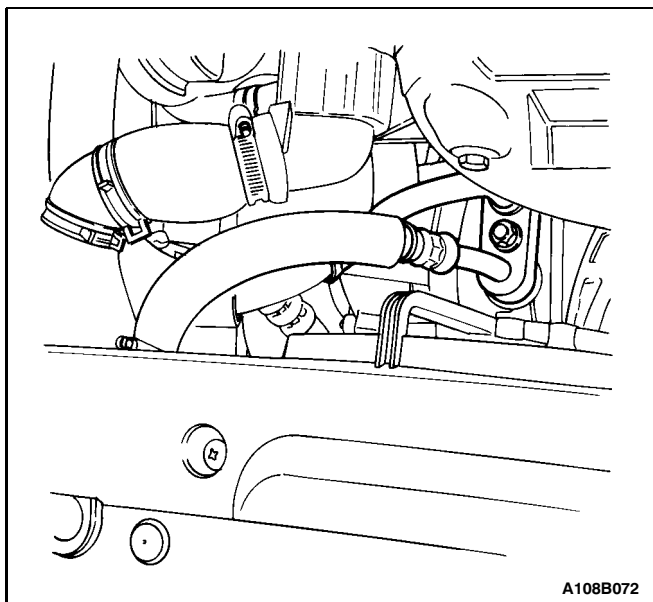
Important: Do not uncap new unit until just prior to installation.

1. Add oil to the new receiver-dryer. Use the exact amount of oil that you drained from the receiver-dryer.
2. Install new O-rings in the seal area recess of the new receiver-dryer.
3. Install the receiver-dryer into the clamp position.
4. Install the connector block retaining nut and bolt to the receiver-dryer.

Tighten

Tighten the liquid condenser pipe connector block-to-receiver-dryer bolt to 12 N•m (106 lb-in).

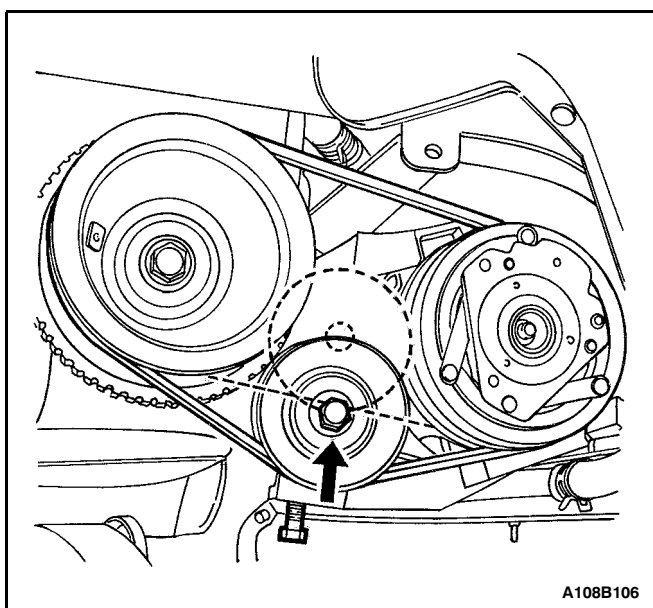
5. Install the band clamp bolt and tighten.
6. Connect the negative battery cable.
7. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



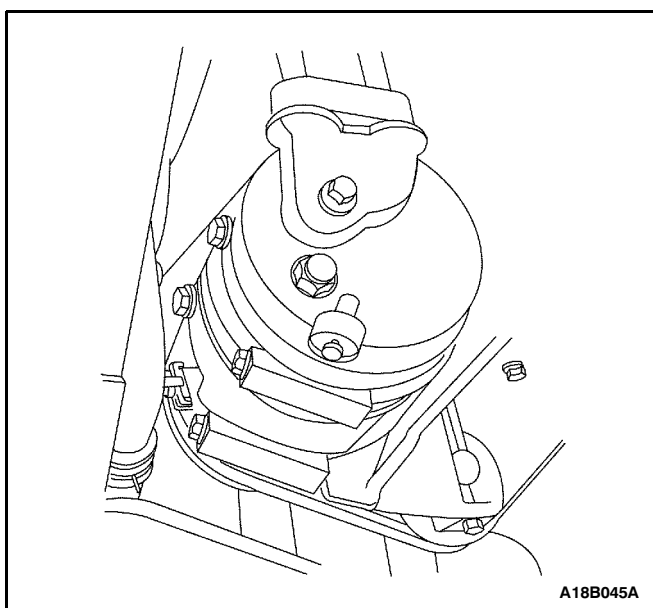
COMPRESSOR

Removal Procedure

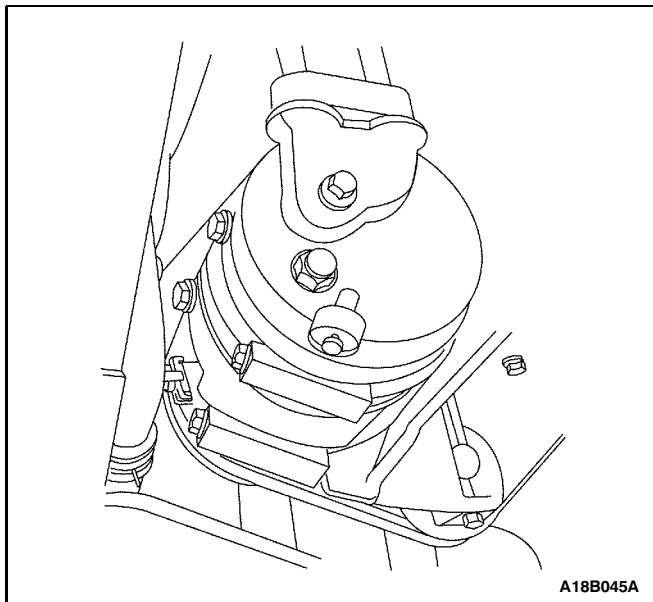
1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the compressor A/C hose assembly connector block fitting nut.
4. Raise and suitably support the vehicle.
5. Disconnect the electrical connector at the compressor.



6. Loosen the idler pulley lock nut.
7. Relieve the A/C belt tension by loosening the idler pulley tension adjusting bolt.
8. Remove the A/C belt.



9. Remove the A/C compressor-to-bracket bolts.
10. Remove the compressor.
11. Drain the oil from the compressor into a container. It is important to drain the oil completely to get an accurate measure of the amount of oil to add to the new compressor at installation.
 - Remove the drain plug from the compressor body and drain the oil from the crankcase.
 - Drain oil from the suction and discharge ports on the compressor.
 - Measure the amount of oil drained, then discard the used oil.

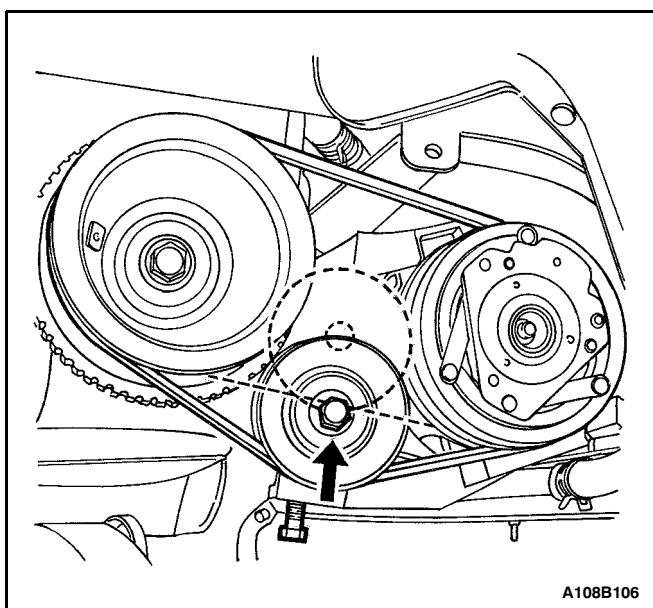


Installation Procedure

1. Add oil to the new compressor. Use the exact amount of oil that you drained from the old compressor.
2. Install the compressor.
3. Install the compressor-to-bracket mounting bolts.

Tighten

Tighten the compressor bracket bolt to 27 N•m (19 lb-ft).

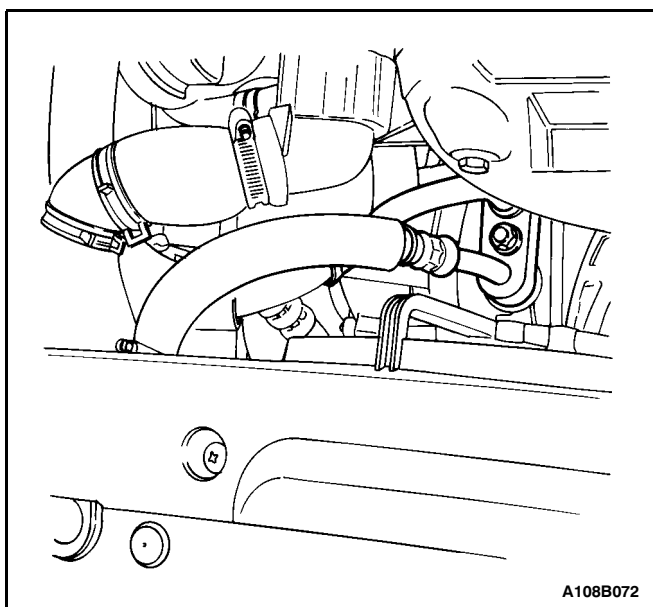


4. Install the A/C drive belt.
5. Adjust the idler pulley tension bolt to adjust the drive belt tension.
6. Tighten the idler pulley lock nut.

Tighten

Tighten the idler pulley lock nut to 50 N•m (36 lb-ft).

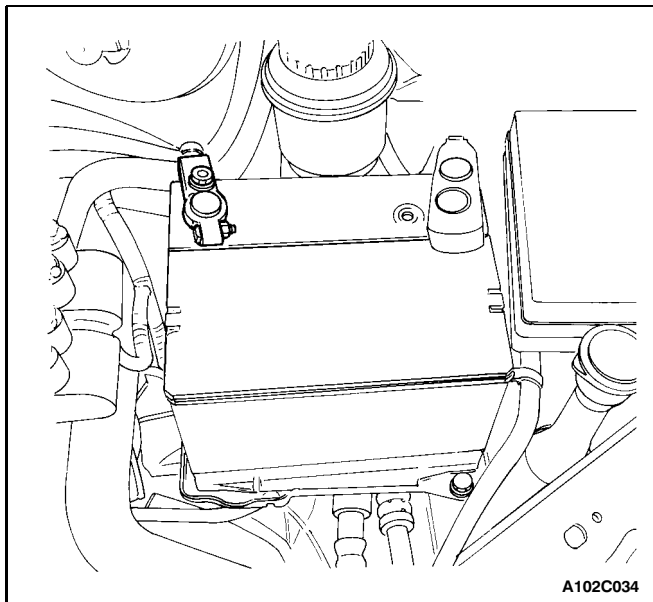
7. Lower the vehicle.



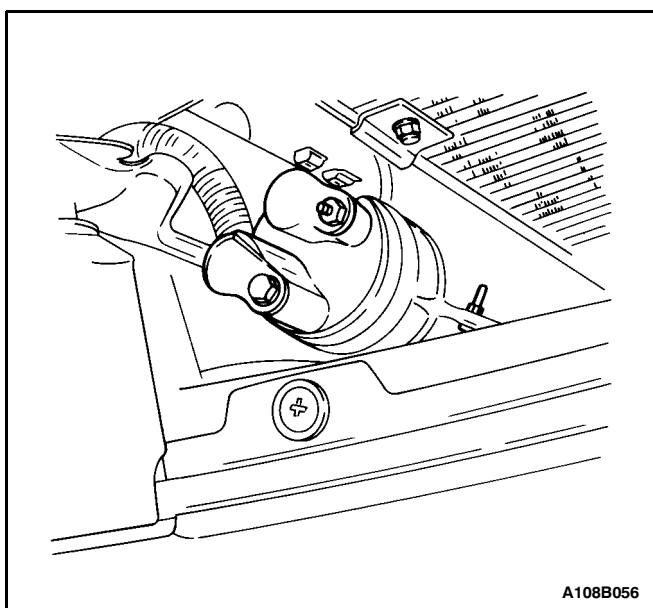
8. Install new sealing washers to the A/C hose assembly connector block fitting.
9. Install the compressor hose assembly connector block fitting and hold while tightening the retaining nut.

Tighten

Tighten the A/C system hose connector retaining nut to 33 N•m (24 lb-ft).



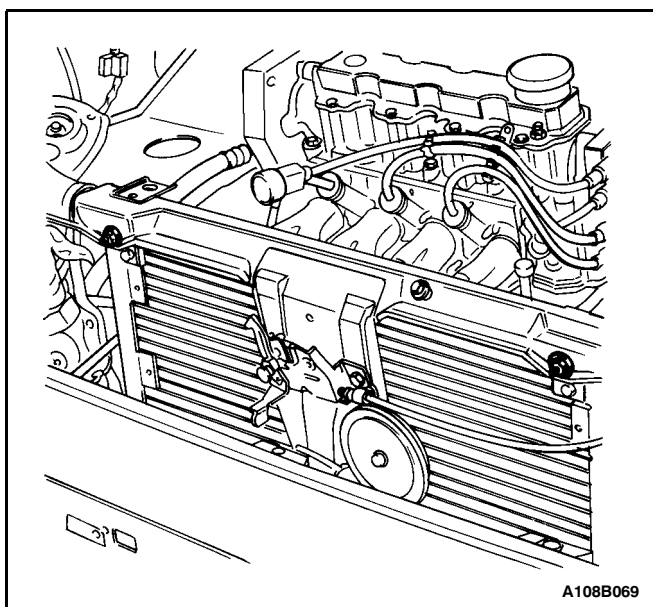
10. Connect the electrical connector at the compressor.
11. Connect the negative battery cable.
12. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



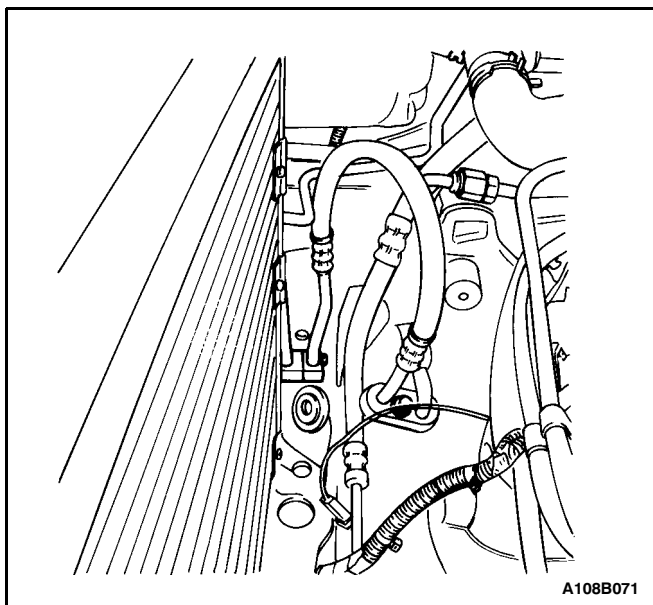
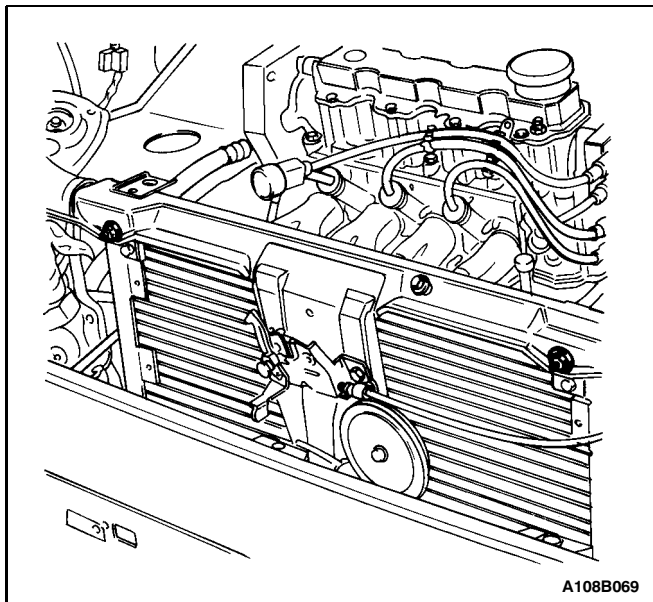
CONDENSER

Removal Procedure

1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the radiator. Refer to Section 1D, Engine Cooling.
4. Remove the bolt that secures the liquid condenser connector block at the receiver-dryer.
5. Remove the A/C compressor discharge hose connector block nut.



6. Remove the upper condenser mount nuts and the washers.
7. Move the condenser to the rear, away from the radiator mount support.
8. Lift the condenser up and out of the engine compartment.
9. Remove the condenser pipe-to-receiver-dryer connector block nut.
10. Loosen the receiver-dryer band clamp screw.
11. Remove the receiver-dryer.
12. Cap all the openings to prevent contamination.



Installation Procedure

1. Install new O-rings onto the receiver-dryer tube fittings.
2. Install the receiver-dryer to condenser pipe connector block with the nut.
3. Tighten the band clamp bolt.
4. Ensure that the condenser rubber mounts are in place.
5. Install the condenser into the vehicle. The lower mount shock protectors must fit into the holes provided.
6. Move the condenser forward into the radiator support mount holes.
7. Install the upper mount nuts and washers.

Tighten

Tighten the condenser upper mount nuts to 3 N•m (27 lb-in).

8. Install a new O-ring onto the A/C compressor discharge hose connector block fitting.
9. Install the A/C compressor discharge hose to the condenser pipe connector block and install the retaining nut.

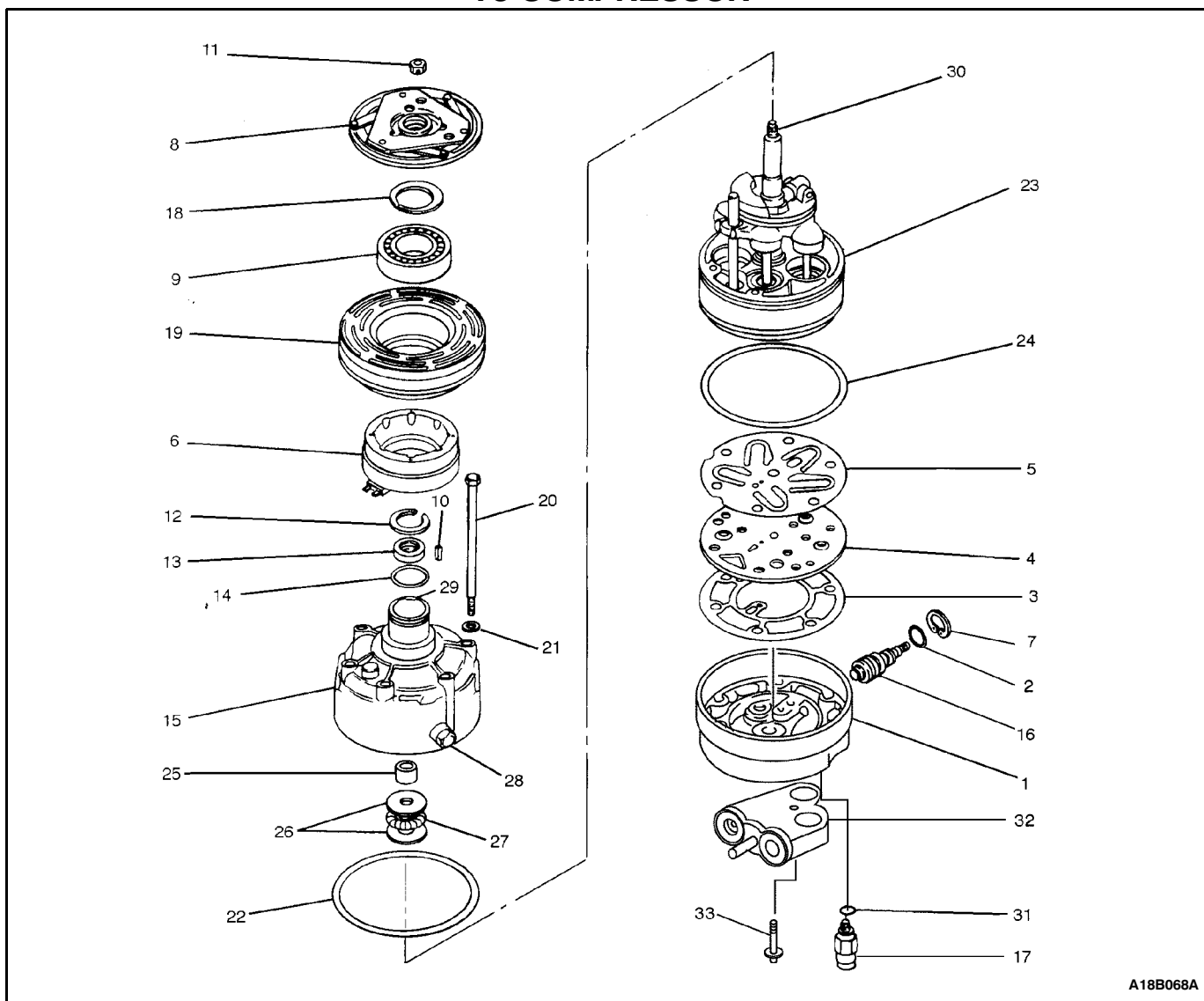
Tighten

Tighten the discharge hose-to-condenser pipe connector block retaining nut to 16 N•m (12 lb-ft).

10. Install the radiator. Refer to Section 1D, Engine Cooling.
11. Connect the negative battery cable.
12. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.

UNIT REPAIR COMPONENT LOCATOR

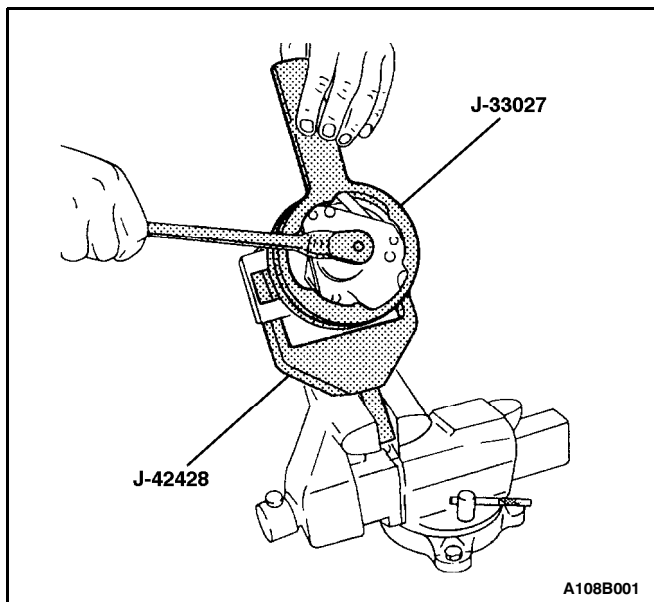
V5 COMPRESSOR



A18B068A

- 1 Rear Head Compressor
- 2 Control Valve O-Ring
- 3 Rear Head Gasket
- 4 Valve Plate
- 5 Suction Reed
- 6 Clutch Coil
- 7 Retaining Ring
- 8 Drive Plate Clutch
- 9 Pulley Bearing
- 10 Clutch Hub Key
- 11 Shaft Nut
- 12 Seal Retaining Ring
- 13 Shaft Lip Seal
- 14 Shaft Seal O-Ring
- 15 Compressor Housing
- 16 Compressor Control Valve

- 17 Pressure Relief Valve
- 18 Pulley Bearing to Head Retaining Ring
- 19 Rotor Pulley
- 20 Through-Bolt
- 21 Through-Gasket
- 22 Compressor Housing-to-Cylinder O-Ring
- 23 Shaft and Guide Pin Assembly Cylinder
- 24 Rear Head O-Ring
- 25 Thrust Washer
- 26 Race
- 27 Bearing
- 28 Oil Drain Plug
- 29 Clutch and Hub Keyway
- 30 Compressor Shaft
- 31 Pressure Relief Valve O-ring
- 32 Adaptor Compressor
- 33 Adaptor Bolt



V5 AIR CONDITIONING COMPRESSOR OVERHAUL

CLUTCH PLATE AND HUB ASSEMBLY

Tools Required

J-33013-B Hub and Drive Plate Remover/Installer

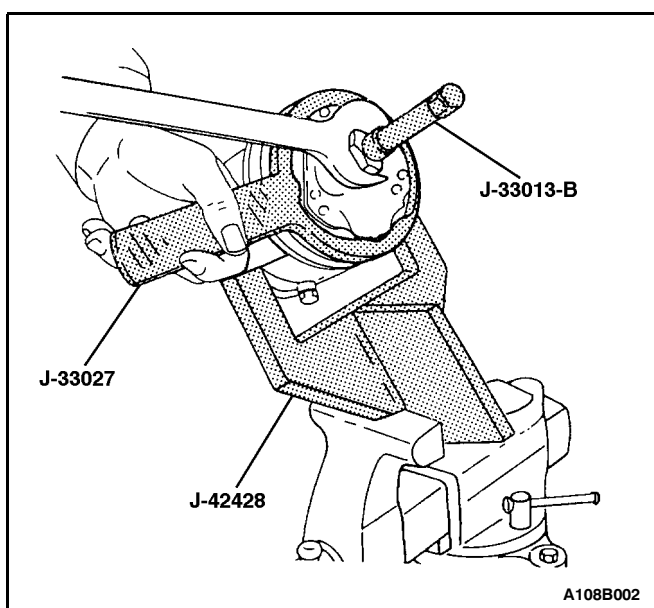
J-33022 Shaft Nut Socket

J-33027 Clutch Hub Holding Tool

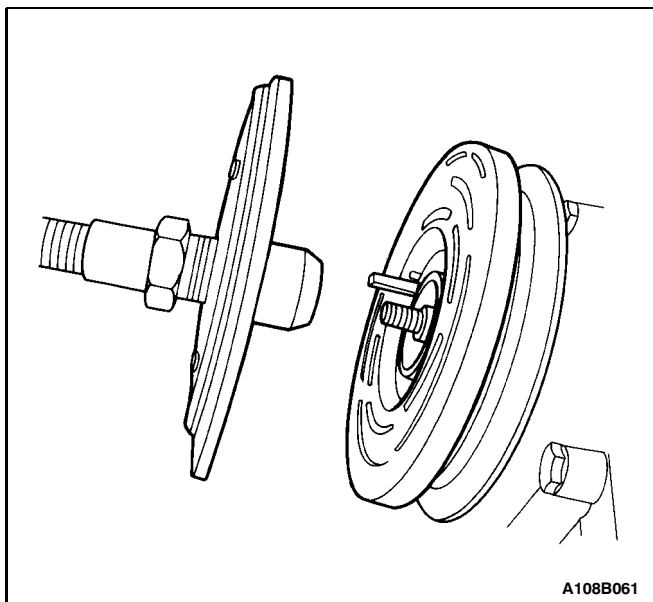
J-42428 Compressor Holding Fixture

Disassembly Procedure

1. Remove the compressor. Refer to "Compressor" in this section.
2. Install the compressor holding fixture J-42428 to the compressor and hold the compressor holding fixture using a bench vise.
3. Use the clutch hub holding tool J-33027 to keep the clutch drive plate and the hub assembly from turning. Remove the shaft nut.



4. Thread the hub and drive plate remover J-33013-B into the hub. Hold the body of the remover with a wrench and turn the center screw into the remover body to remove the clutch drive plate and the hub assembly.
5. Remove the clutch hub key. Retain the key for assembly.

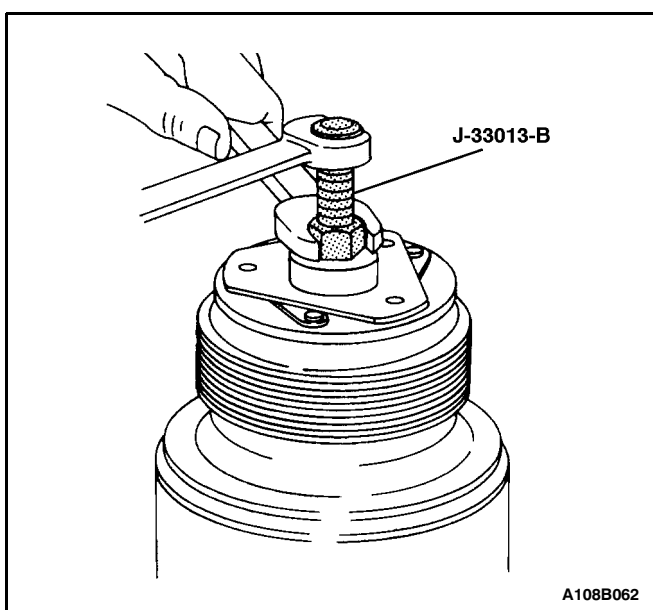


Assembly Procedure

1. Install the clutch hub key into the hub keyway. Allow the key to project approximately 3.2 mm (1/8 inch) out of the keyway. The hub key is curved slightly to provide an interference fit in the hub key groove.
2. Be sure the frictional surface of the clutch plate and the pulley rotor are clean before installing the clutch drive plate and the hub assembly.

Notice: Do not drive or pound on the clutch hub or the shaft. Internal damage to compressor may result.

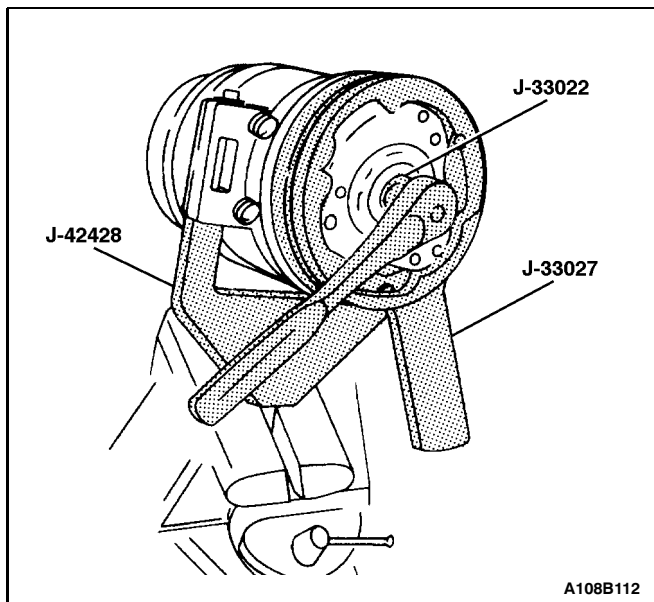
3. Align the clutch hub key with the shaft keyway. Place the clutch drive plate and the hub assembly onto the compressor shaft.



4. Remove the hub and drive plate remover/installer J-33013-B center bolt and reverse the body direction on the center bolt. The body of the hub and drive plate remover/installer J-33013-B should be backed off sufficiently to allow the center bolt to be threaded onto the end of the compressor shaft.

Important: If the center bolt is threaded fully onto the end of the compressor shaft, or if the body of the hub and drive plate remover/installer J-33013-B is held and the center bolt is rotated, the key will wedge and could break the clutch drive plate and the hub assembly.

5. Install the hub and drive plate remover/installer J-33013-B and the bearing onto the clutch drive plate. Thread the center bolt onto the compressor shaft.
6. Hold the center bolt with a wrench. Tighten the hex portion of the hub and drive plate remover/installer J-33013-B body to press the hub onto the shaft. Tighten the body several turns.
7. Remove the hub and drive plate remover/installer J-33013-B and check to see that the clutch hub key is still in place in the keyway before installing the clutch drive plate and the hub assembly to its final position. The air gap between frictional surfaces of the clutch drive plate and the clutch pulley rotor should be 0.38 to 0.64 mm (0.015 to 0.025 inch.).



8. Remove the hub and drive plate remover/installer J-33013-B. Check for proper positioning of the clutch hub key. It should be even or slightly above the clutch hub.

9. Install the shaft nut. Hold the clutch drive plate and the hub assembly with the clutch hub holding tool J-33027. Use the shaft nut socket J-33022 and tighten the nut against the compressor shaft shoulder.

Tighten

Tighten the clutch plate and hub assembly nut to 17 N•m (13 lb-ft).

10. Spin the pulley rotor by hand to verify that the pulley is not rubbing the clutch drive plate.

11. Remove the compressor from the bend vise and remove the J-42428 compressor holding fixture on the compressor.

12. Install the compressor. Refer to "Compressor" in this section.

CLUTCH ROTOR AND BEARING

Tools Required

J-8433-3 Forcing Screw

J-6083 Snap Ring Pliers

J-9398-A Bearing Remover

J-9481 Bearing Installer

J-33020 Pulley Puller

J-33023-A Puller Pilot

J-33019 Bearing Staking Tool Set

Includes: J-33019-1 Bearing Staking Guide

J-33019-2 Bearing Staking Pin

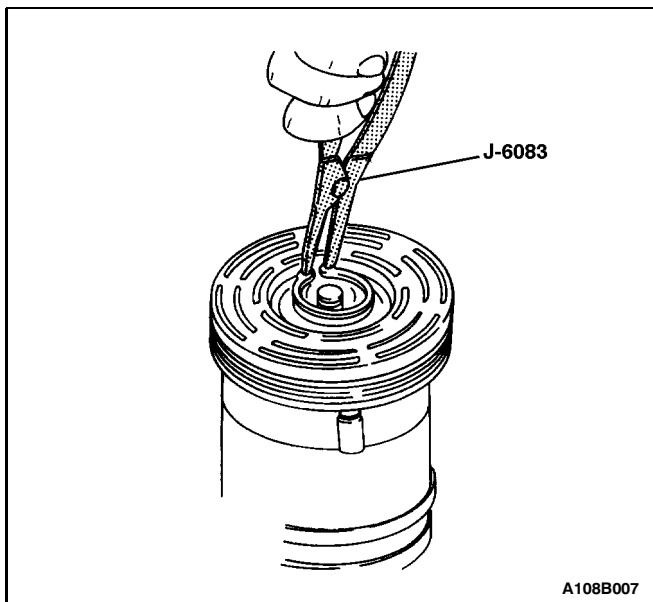
J-33017 Pulley Rotor and Bearing Assembly Installer

J-8433-1 Puller Crossbar

J-34992 Compressor Holding Fixture

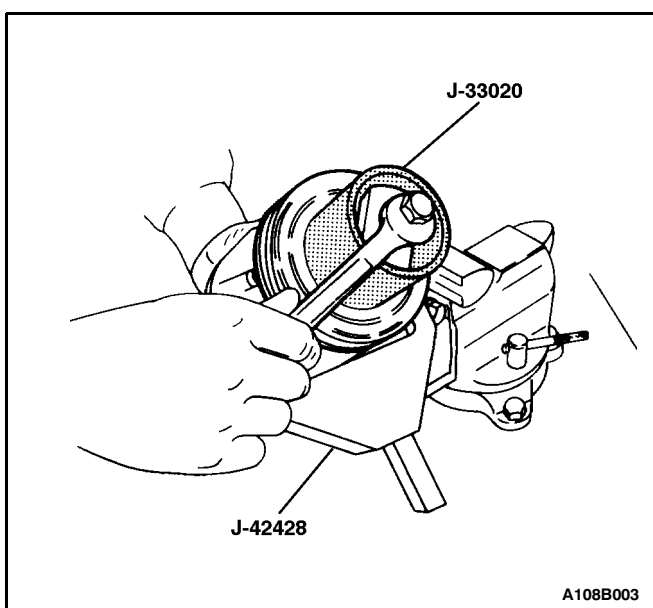
J-42428 Compressor Holding Fixture

J-8092 Driver Handle

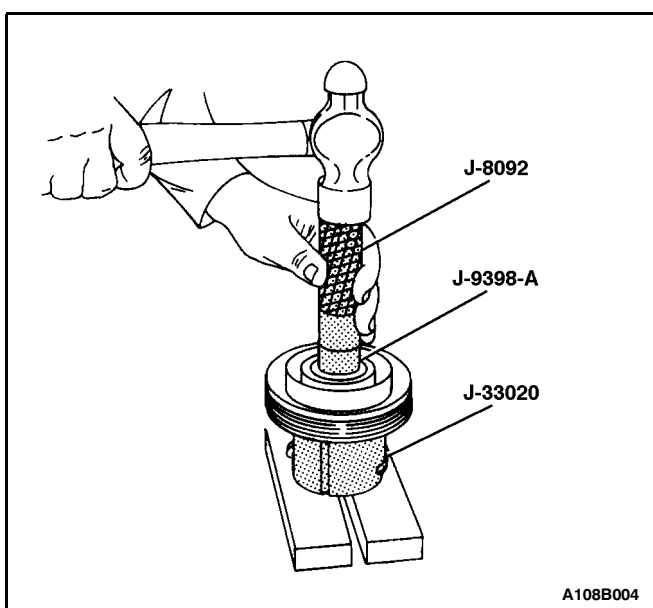


Disassembly Procedure

1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging for A/C System" in this section.
3. Remove the compressor. Refer to "Compressor" in this section.
4. Remove the clutch drive plate and the hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
5. Remove the pulley rotor and the bearing assembly retaining ring using the snap ring pliers J-6083.



6. Install the pulley puller J-33020 into the inner circle of slots in the pulley rotor. Turn the pulley puller J-33020 clockwise in the slots to engage the pulley tangs with the segments between the slots in the rotor.
7. Hold the pulley puller J-33020 in place and tighten the puller bolt against the compressor shaft to remove the pulley rotor and the bearing assembly.

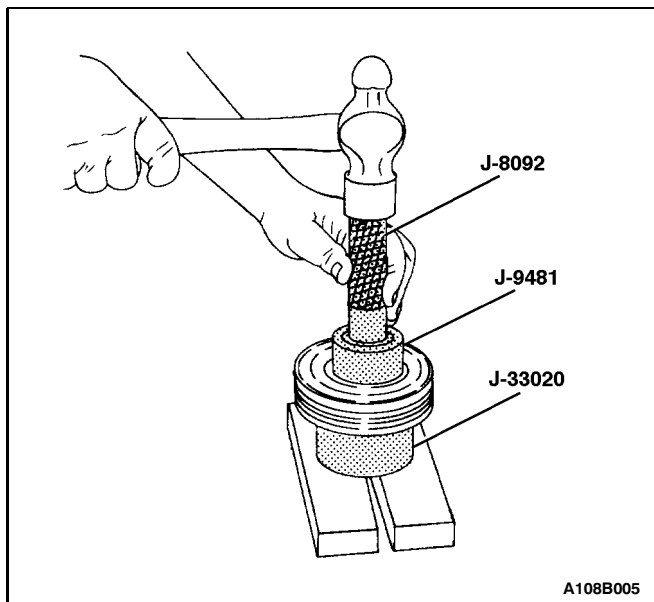


Notice: The rotor hub must be properly supported to prevent damage to the pulley rotor during bearing removal.

8. Remove the puller bolt from the pulley puller J-33020. With the puller tangs still engaged in the rotor slots, invert the assembly onto a solid flat surface or blocks.

Notice: It is not necessary to remove the staking in front of the bearing to remove the bearing. It will be necessary to file away the old stake metal for proper clearance for the new bearing to be installed into the rotor bore or the bearing may be damaged.

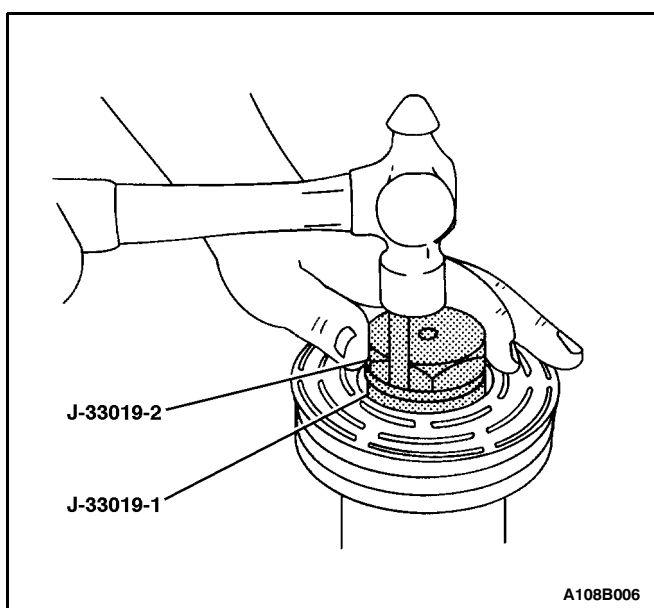
9. Drive the bearing out of the rotor hub with the bearing remover J-9398-A and the driver handle J-8092.



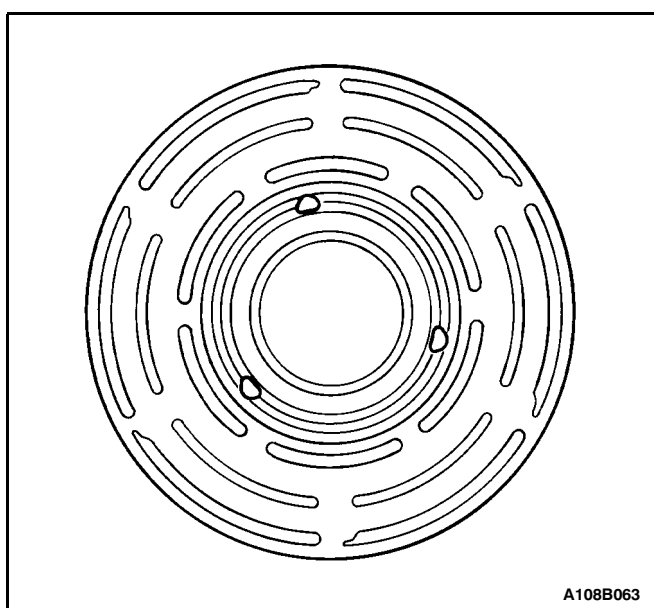
Assembly Procedure

Notice: Do not support the rotor by resting the pulley rim on a flat surface during the bearing installation or the rotor face could be damaged.

1. Invert the pulley rotor and place it on a support block to fully support the rotor hub during bearing installation.
2. Align the new bearing squarely in the pulley bore. Use the bearing installer J-9481 and the driver handle J-8092, drive the bearing fully into the pulley bore.



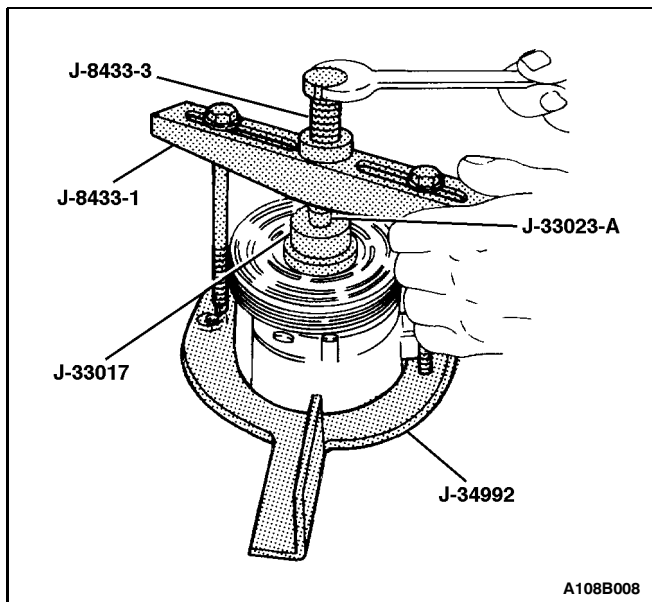
3. Place the bearing staking guide J-33019-1 and the bearing staking pin J-33019-2 in the rotor hub core. Shift the rotor and bearing assembly on the block to give full support to the hub under the staking pin location. A heavy-duty rubber band may be used to hold the staking tool pin in the guide. The pin should be properly positioned in the guide after each impact on the pin.



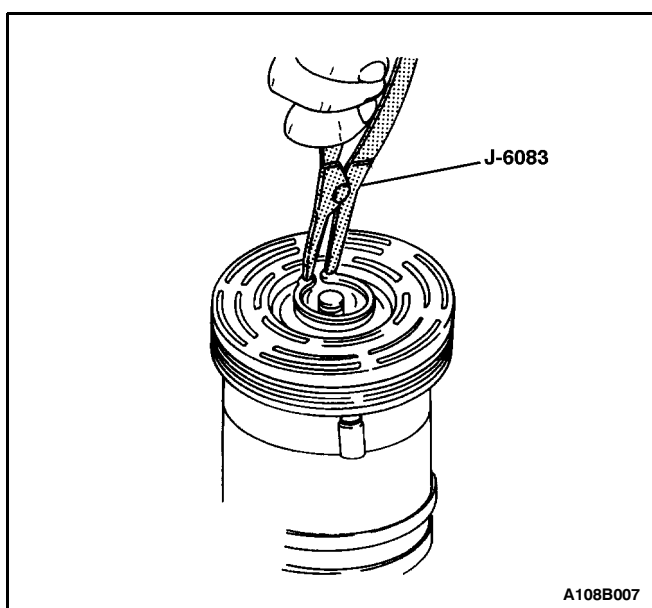
Caution: When striking the pin with a hammer, take care to avoid personal injury.

Notice: Make sure the metal stake does not contact the outer race of the bearing. Otherwise the outer race may become distorted.

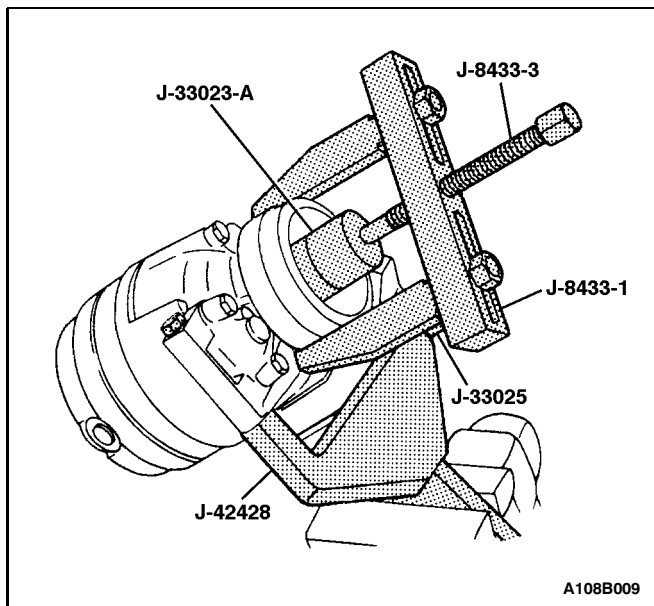
4. Strike the pin with a hammer until a metal stake, similar to the original, is formed down to, but not touching, the bearing. The metal stake should not contact the outer race of the bearing to avoid the possibility of distorting the outer race. Stake in three places 120 degrees apart.



5. With the compressor mounted to the holding fixture J-34992, position the rotor and the bearing assembly on the compressor housing.
6. Position the pulley rotor and bearing assembly installer J-33017 and the puller pilot J-33023-A directly over the inner race of the bearing.
7. Position the puller crossbar J-8433-1 center forcing bolt on the puller pilot J-33023-A and assemble the two through-bolts and the washers through the puller crossbar J-8433-1 slots. Thread them into the holding fixture J-34992. The thread of the through-bolts should engage the full thickness of the fixture.
8. Tighten the center forcing screw J-8433-3 in the puller crossbar J-8433-1 to force the pulley rotor and the bearing assembly onto the compressor housing.



9. Install the rotor and the bearing assembly retainer ring using the snap ring pliers J-6083.
10. Reinstall the clutch drive plate and the hub assembly. Refer to "Clutch Drive Plate and Hub Assembly" in this section.
11. Install the compressor. Refer to "Compressor" in this section.
12. Connect the negative battery cable.
13. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging A/C System" in this section.



CLUTCH COIL

Tools Required

J-8433-1 Puller Crossbar

J-8433-3 Forcing Screw

J-33023-A Puller Pilot

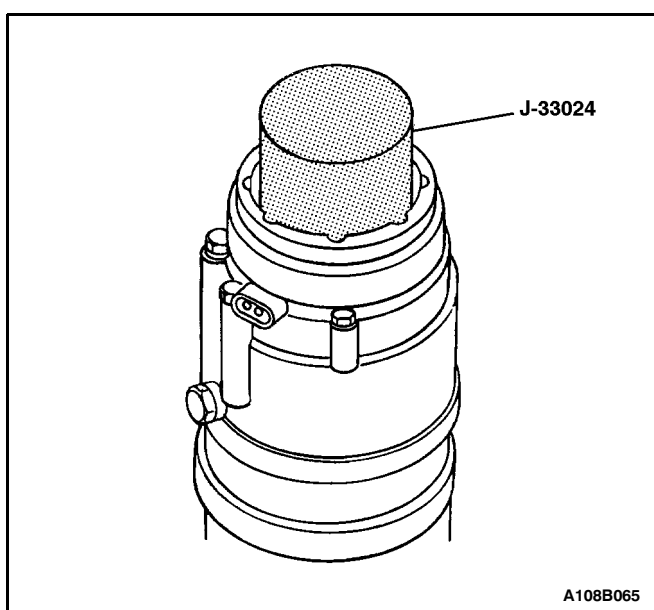
J-33024 Clutch Coil Installer Adapter

J-33025 Clutch Coil Puller Legs

J-34992 Compressor Holding Fixture

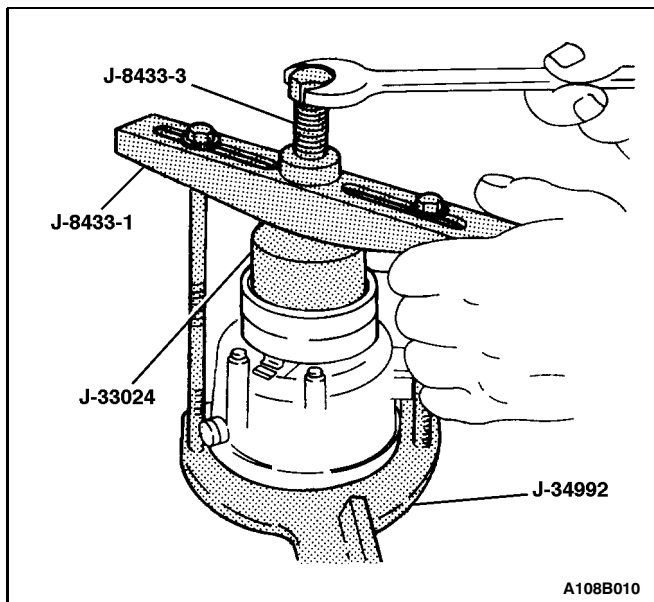
Disassembly Procedure

1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the compressor. Refer to "Compressor" in this section.
4. Remove the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
5. Remove the clutch rotor and bearing. Refer to "Clutch Rotor and Bearing" in this section.
6. Mark the clutch coil terminal location on the compressor housing.
7. Install the puller pilot J-33023-A on the compressor housing. Also install the puller crossbar J-8433-1 with the clutch coil puller legs J-33025.
8. Tighten the forcing screw J-8433-3 against the puller pilot J-33023-A to remove the clutch coil.



Assembly Procedure

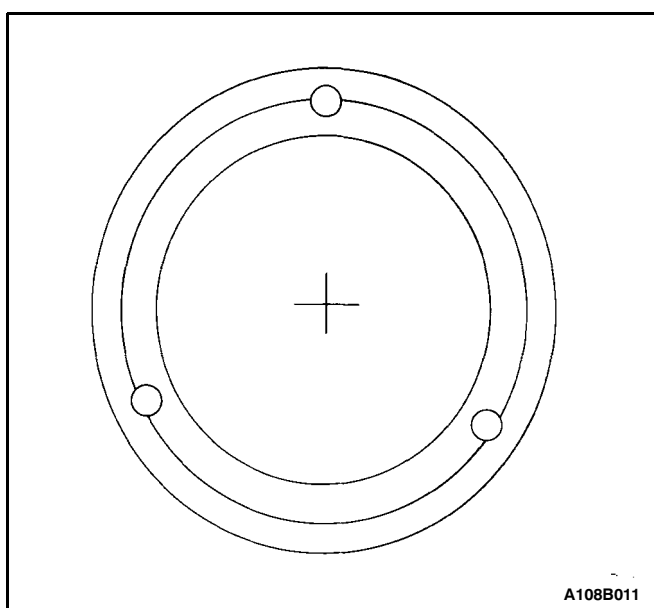
1. Place the clutch coil assembly on the compressor housing with the terminals positioned at the "marked" location.
2. Place the clutch coil installer adapter J-33024 over the internal opening of the clutch coil housing and align the clutch coil installer adapter J-33024 with the compressor housing.



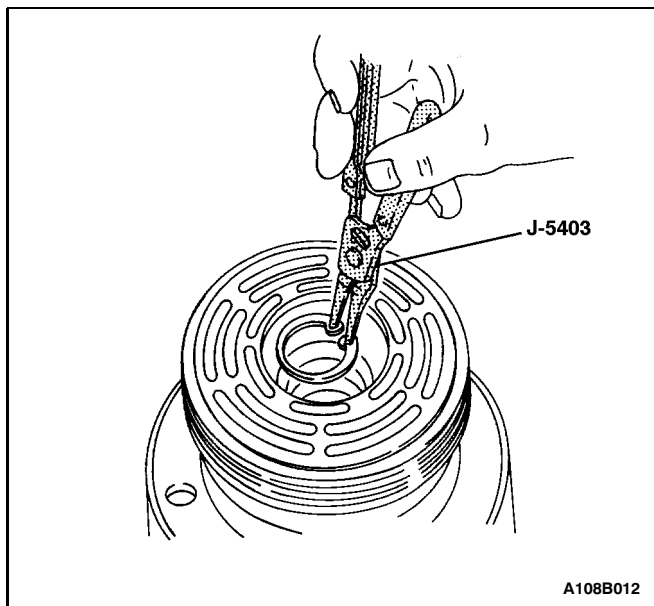
3. Center the puller crossbar J-8433-1 in the counter-sunk center hole of the clutch coil installer adapter J-33024. Install the compressor holding fixture J-34992 through-bolts and the washers through the crossbar slots. Thread them into the holding fixture to the full thickness of the holding fixture.

Important: Be sure the clutch coil and the installer stay "in-line" during installation.

4. Turn the forcing screw J-8433-3, or use a suitable vise, to force the clutch coil onto the compressor housing.



5. When the clutch coil is fully seated on the compressor housing, use a 3 mm (1/8 inch) diameter drift punch and stake the housing at three places, 120 degrees apart, to ensure that the clutch coil will remain in position. Stake point size should be only one-half the area of the punch tip and approximately 0.28 to 0.35 mm (0.010 to 0.015 inch) deep.
6. Install the clutch rotor and bearing assembly. Refer to "Clutch Rotor and Bearing" in this section.
7. Install the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
8. Install the compressor. Refer to "Compressor" in this section.
9. Connect the negative battery cable.
10. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



SHAFT SEAL REPLACEMENT

Tools Required

J-5403 Snap Ring Pliers

J-9553-1 O-Ring Remover

J-23128-A Seal Seat Remover/Installer

J-33011 O-Ring Installer

J-34614 Shaft Seal Protector

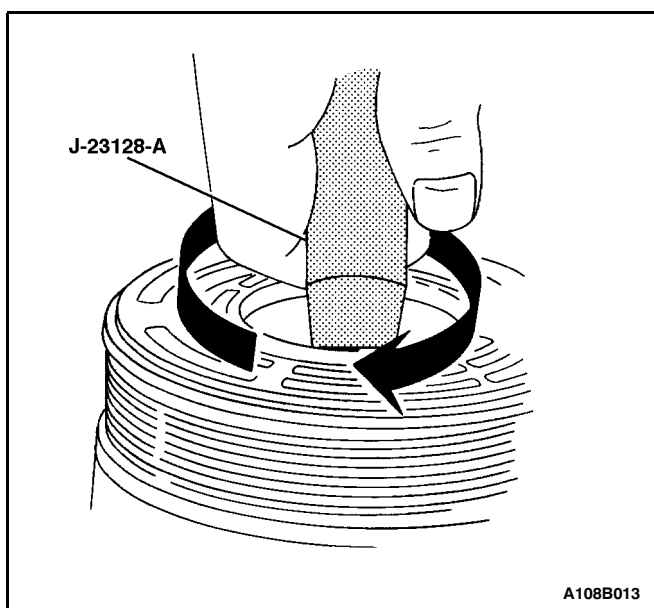
Important: A shaft seal should not be replaced because a small amount of oil is found on the adjacent surface. The seal is designed to leak some oil for lubrication purposes. A shaft seal should be changed only when a large amount of sprayed oil is found and then only after actual refrigerant leakage is found by using an approved leak detection procedure. Refer to "Leak Testing the Refrigerant System" in this section.

Should a compressor shaft seal ever have to be replaced, the receiver-dryer in this system must also be removed from the vehicle. The oil in the receiver-dryer must then be drained, measured and replaced. Refer to "Adding Oil to the Air Conditioning Refrigerant System" in this section.

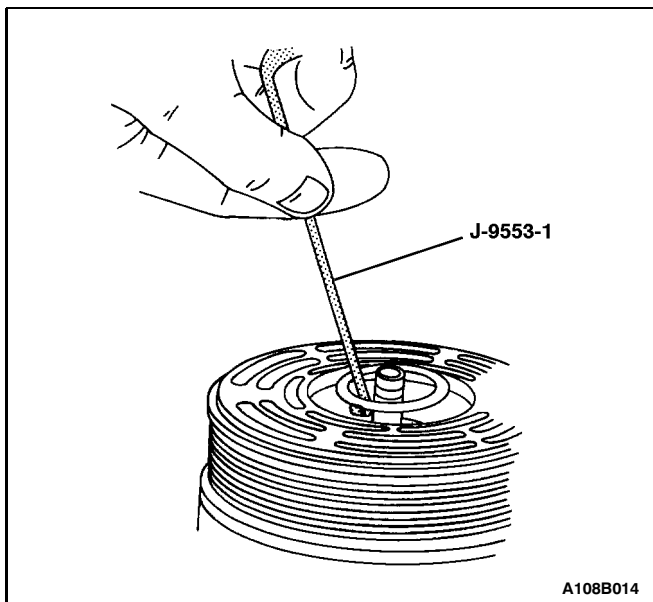
Disassembly Procedure

1. Disconnect the negative battery cable.
2. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Loosen and reposition the compressor in the mounting brackets.
4. Remove the clutch drive plate and hub assembly from the compressor. Refer to "Clutch Plate and Hub Assembly" in this section.
5. Use the snap ring pliers J-5403 to remove the shaft seal retaining ring.

Notice: Any dirt or foreign material that enters the compressor may cause damage.



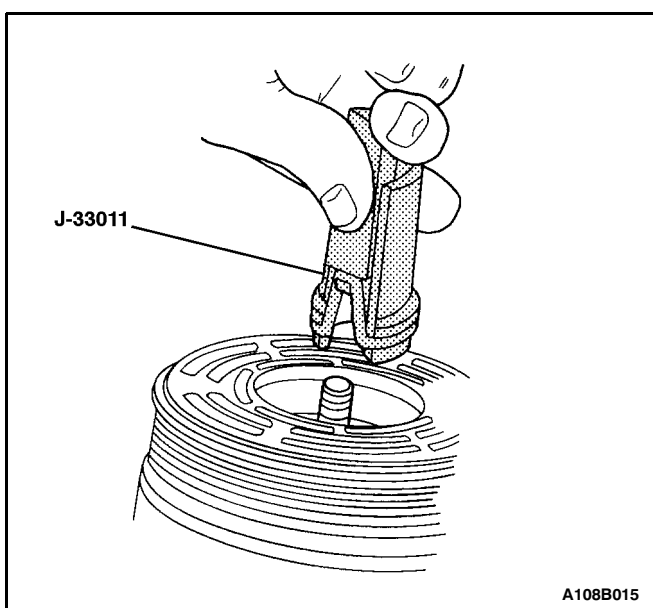
6. Thoroughly clean the inside of the compressor housing area surrounding the shaft, the exposed portion of the seal, the shaft itself, and the O-ring groove.
7. Fully engage the knurled tangs of the seal seat remover/installer J-23128-A into the recessed portion of the seal by turning the handle clockwise. Remove and discard the seal from the compressor with a rotating-pulling motion. The handle should be hand-tightened securely. Do not use a wrench or pliers to tighten the handle.



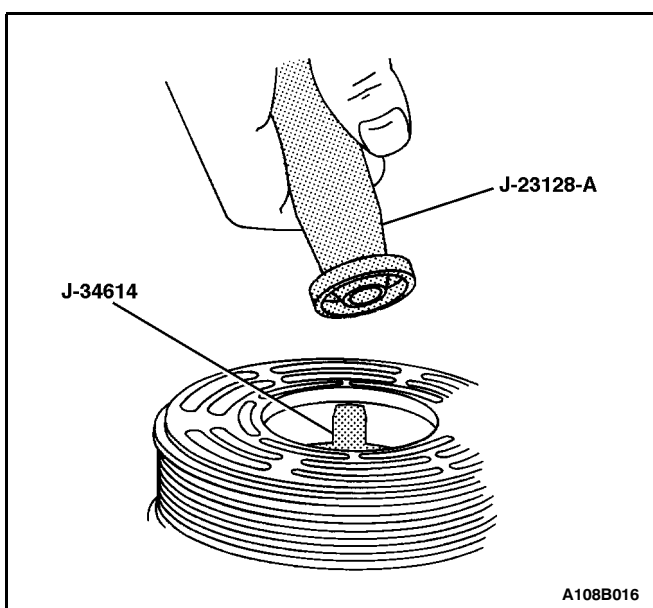
8. Remove and discard the O-ring from the compressor neck using the O-ring remover J-9553-1.
9. Thoroughly clean the seal O-ring groove in the compressor housing.
10. Inspect the shaft and the inside of the compressor housing neck for dirt or foreign material. These parts must be perfectly clean before installing any new parts.

Assembly Procedure

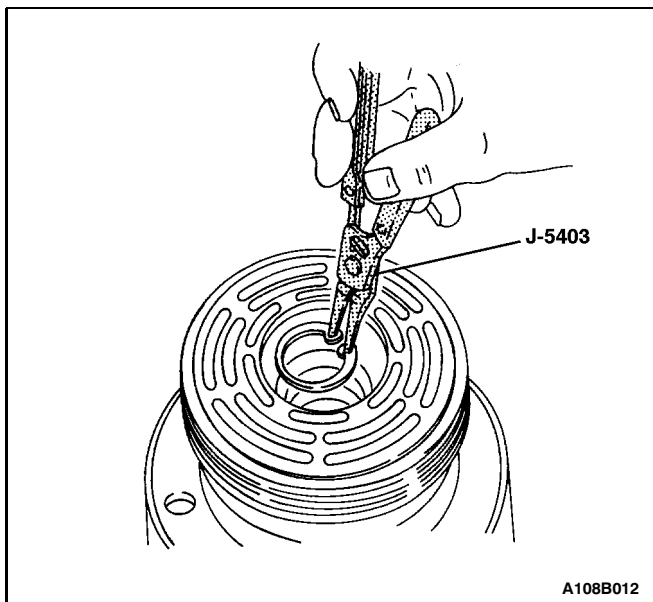
Important: Seals must not be reused. Always use a new specification service seal kit. Be sure that the seal to be installed is not scratched or damaged in any way. The seal must be free of lint and dirt that may damage the seal surface or prevent proper sealing.



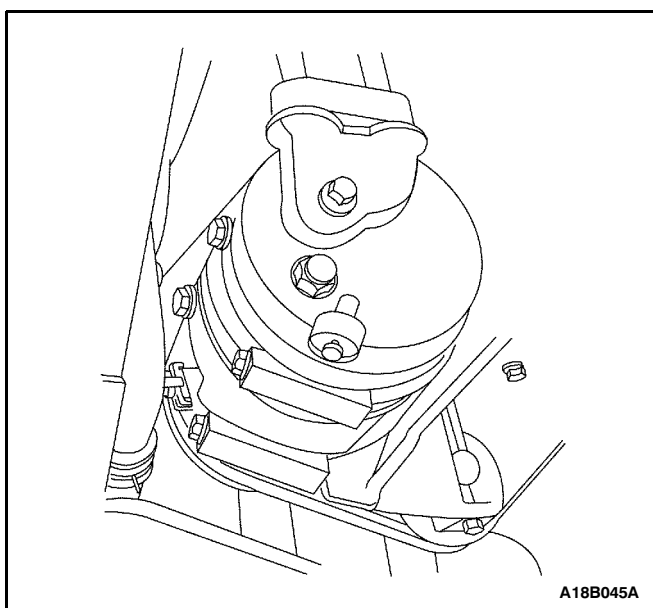
1. Dip the new seal O-ring in clean polyalkaline glycol (PAG) refrigerant oil and assemble the O-ring onto the O-ring installer J-33011.
2. Insert the O-ring installer J-33011 into the compressor neck until the installer "bottoms." Lower the moveable slide of the O-ring installer J-33011 to release the O-ring into the seal O-ring lower groove. (The top groove of the compressor neck is for the shaft seal retainer ring.) Rotate the installer to seat the O-ring and then remove the installer.



3. Attach the shaft lip seal to the seal seat remover/installer J-23128-A. Dip the seal in clean PAG oil.
4. Install the shaft seal protector J-34614 in the seal. Place it over the shaft and push the seal into place with a rotary motion.



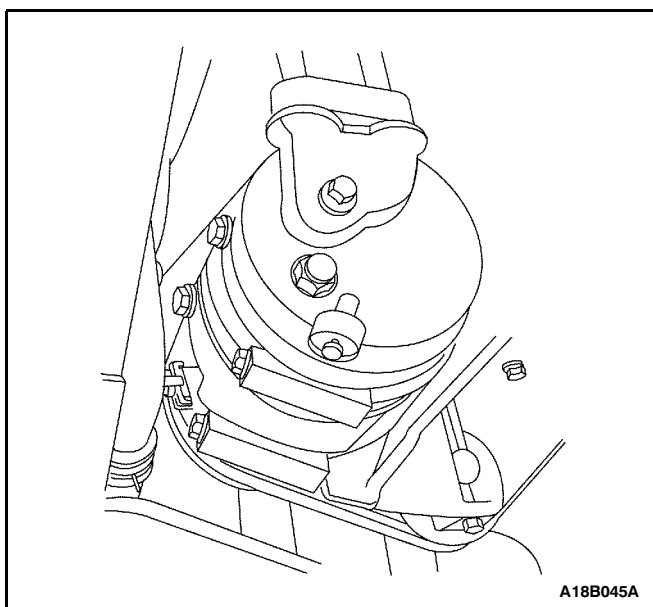
5. Use the snap ring pliers J-5403 to install the shaft seal retaining ring with its flat side against the seal.
6. Remove any excess oil around the shaft and the inside of the compressor housing neck.
7. Install the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
8. Reposition the compressor in its mounting.
9. Adjust the tension on the drive belt.
10. Connect the negative battery cable.
11. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
12. Perform a leak test of the system. Refer to "Leak Testing the Refrigerant System" in this section.



PRESSURE RELIEF VALVE

Disassembly Procedure

1. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
2. Raise the vehicle.
3. Remove the pressure relief valve.
4. Clean the valve seat area.



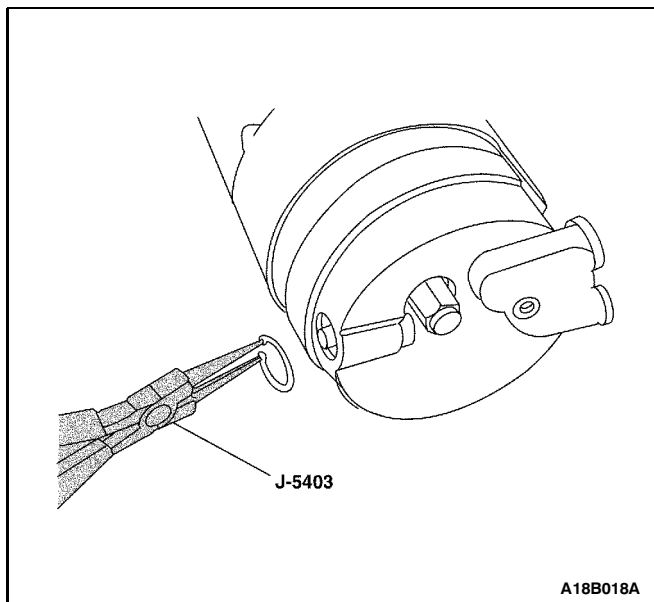
Assembly Procedure

1. Lubricate the O-ring of the new pressure relief valve with new polyalkylene glycol (PAG) oil.
2. Install the new valve.

Tighten

Tighten the pressure relief valve to 17 N•m (12 lb-ft).

3. Lower the vehicle.
4. Evacuate and recharge the system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



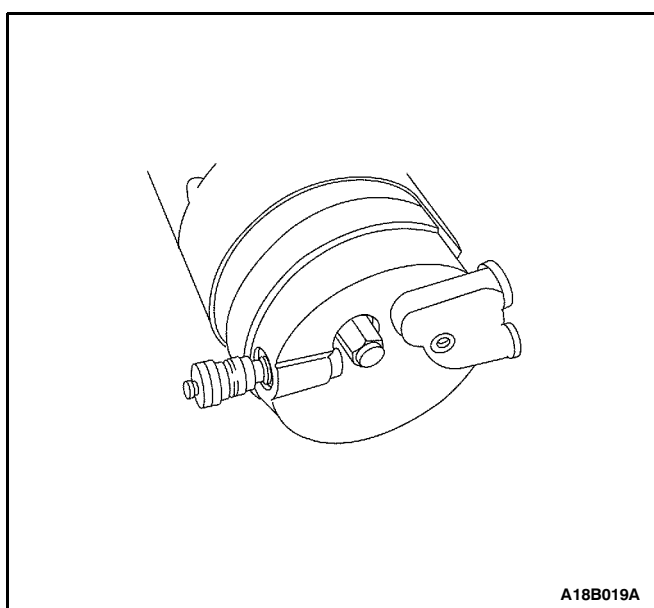
CONTROL VALVE ASSEMBLY

Tools Required

J-5403 Snap Ring Pliers

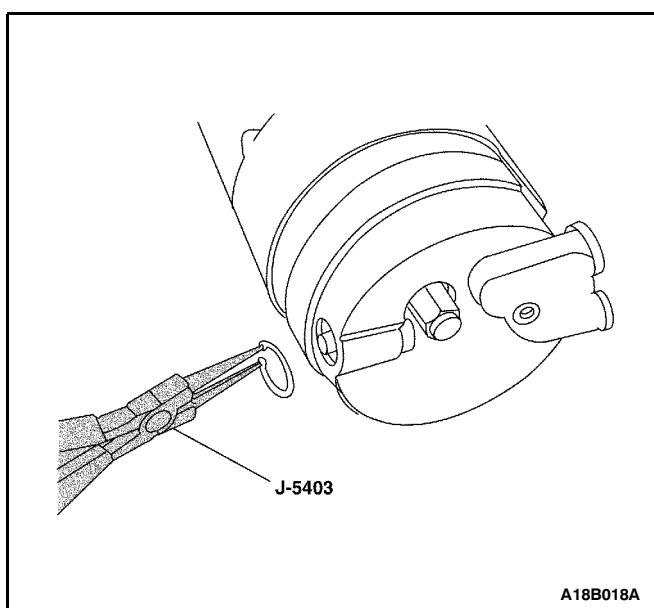
Disassembly Procedure

1. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
2. Remove the control valve retaining ring using the snap ring pliers J-5403.
3. Remove the control valve assembly.

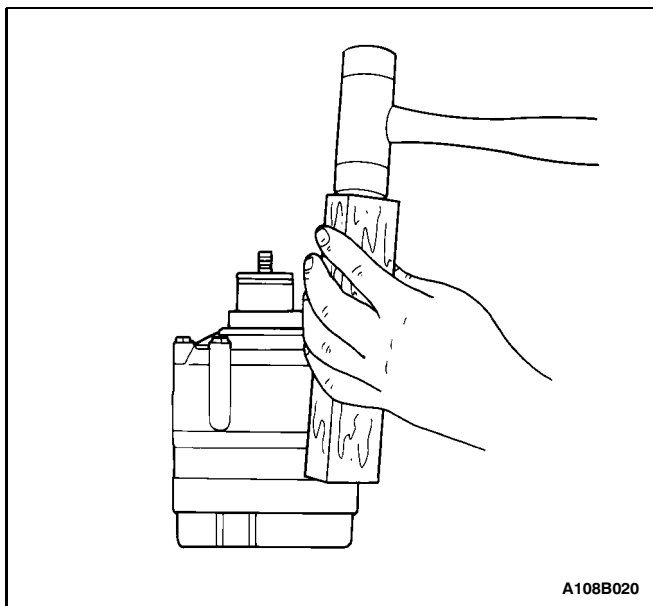


Assembly Procedure

1. Coat all the O-rings with clean polyalkaline glycol (PAG) oil.
2. Push the control valve in place using thumb pressure.



3. Use the snap ring pliers J-5403 to install the valve retaining ring. The high point of the curved sides must be against the valve housing. Be sure the retaining ring is properly seated in the ring groove.
4. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



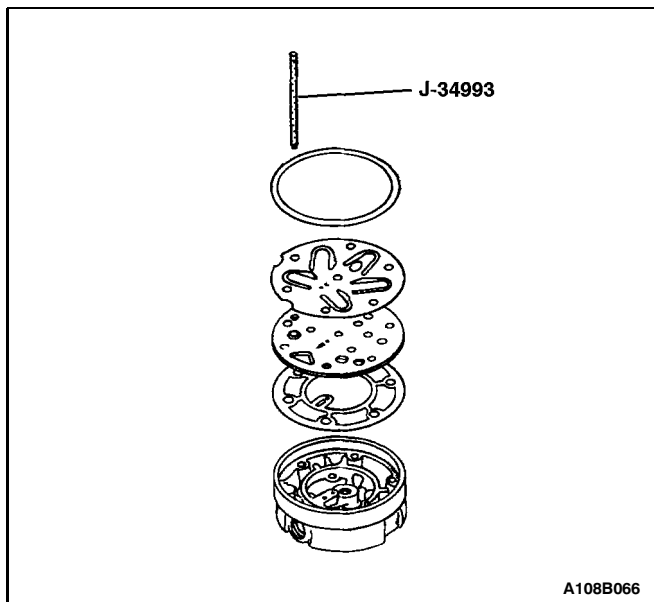
REAR HEAD, GASKET, VALVE PLATE, REED PLATE, AND O-RING

Tools Required

J-34993 Cylinder Alignment Rods

Disassembly Procedure

1. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
2. Discharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
3. Remove the compressor. Refer to "Compressor" in this section.
4. Drain the oil from compressor into a suitable container. Measure and record the amount of oil drained from the compressor. Discard the used oil.
5. Remove the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
6. Remove the clutch rotor and bearing. Refer to "Clutch Rotor and Bearing" in this section.
7. Remove the clutch coil. Refer to "Clutch Coil" in this section.
8. Remove the compressor through-bolts. Remove and discard the gaskets.
9. Using a wooden block and a plastic-headed hammer, tap around the edge of the rear head to disengage the head from the compressor cylinder. Separate the rear head, the head gasket, the rear valve plate, the suction reed plate, and the cylinder to rear head O-ring. Discard the head gasket and the O-ring.



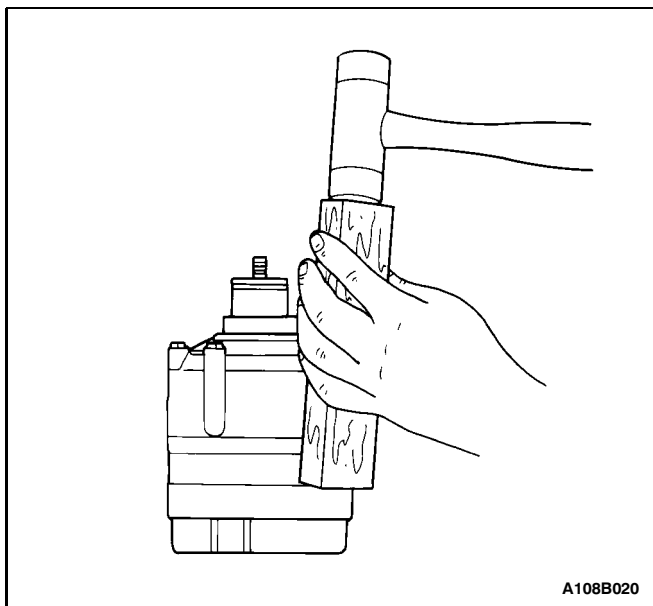
Assembly Procedure

1. Place the rear head on a clean, flat surface. Position the head with the control valve at the 6 o'clock position.
2. Install the cylinder alignment rods J-34993 in the mounting holes at the 11 o'clock and the 5 o'clock positions.
3. Install the head gasket over the cylinder alignment rods J-34993 with the elongated hole at the upper left pin (the 11 o'clock position).
4. Install the rear head valve plate over the cylinder alignment rods J-34993 with the elongated hole at the upper left alignment rod. Lower the rear head valve plate into place.
5. Install the suction reed plate over the cylinder alignment rods J-34993. Remove the alignment rod at the 5 o'clock position.
6. Lubricate the cylinder to the new rear head O-ring with clean polyalkaline glycol (PAG) refrigerant oil.
7. Install the O-ring in the cylinder O-ring groove. The O-ring seal surface of the head may be lubricated to ease assembly.
8. With the O-ring in place on the rear of the cylinder assembly, locate the relief boss for the alignment rod at the 6 o'clock position, directly above the hole in the side of the rear head. Carefully lower the cylinder and the front head assembly over the cylinder alignment rods to the rear head.
9. Press the cylinder and the compressor housing assembly down onto the rear head using both hands.
10. Add the new through-bolt gasket to the through-bolts and install it into the compressor assembly. Four of the through-bolts must thread into the rear head before removing the alignment rods.

Tighten

Alternately tighten the compressor front head-to-rear head through-bolts in progressive torque sequence to 10 N•m (89 lb-in).

11. Add new PAG refrigerant oil as determined in step 1.
12. Place the shaft nut on the shaft and rotate the compressor shaft several times.
13. Perform a leak test on the compressor. Refer to "Leak Testing (External)" in this section.
14. Install the clutch coil. Refer to "Clutch Coil" in this section.
15. Install the clutch rotor and bearing. Refer to "Clutch Rotor and Bearing" in this section.
16. Install the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
17. Install the compressor. Refer to "Compressor" in this section.
18. Evacuate and recharge the A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



CYLINDER TO FRONT HEAD O-RING

Tools Required

J-34993 Cylinder Alignment Rods

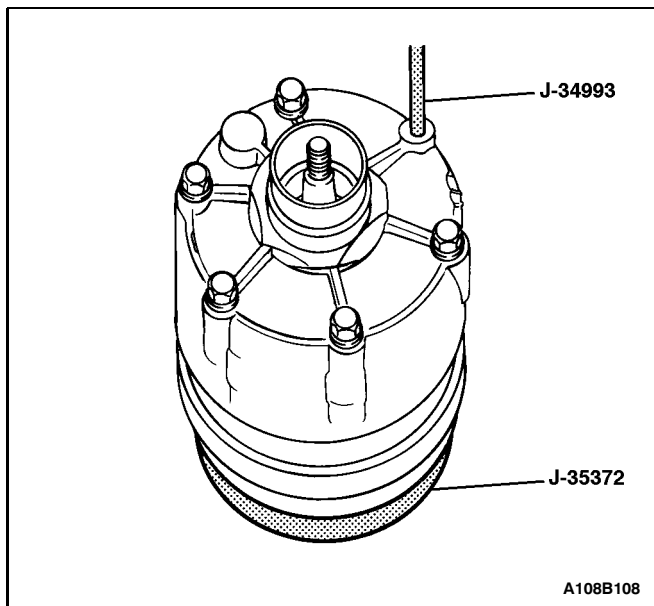
J-35372 Support Block

Disassembly Procedure

1. Recover the refrigerant. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.
2. Remove the compressor. Refer to "Compressor" in this section.
3. Drain the oil from compressor into a suitable container. Measure and record the amount of oil drained from the compressor. Discard all used oil.
4. Remove the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
5. Remove the clutch rotor and bearing. Refer to "Clutch Rotor and Bearing" in this section.
6. Remove the clutch coil. Refer to "Clutch Coil" in this section.
7. Remove and discard the shaft seal parts. Refer to "Shaft Seal Replacement" in this section.
8. Remove the compressor through-bolts. Remove and discard the gaskets.
9. Using a wooden block and a plastic-headed hammer, tap the compressor housing at the mounting locations to disengage the housing from the compressor cylinder.

Important: Note the assembly sequence of the thrust washer and bearing for ease of assembly.

10. Remove the thrust washer and the bearing.
11. Remove and discard the compressor housing-to-cylinder O-ring.



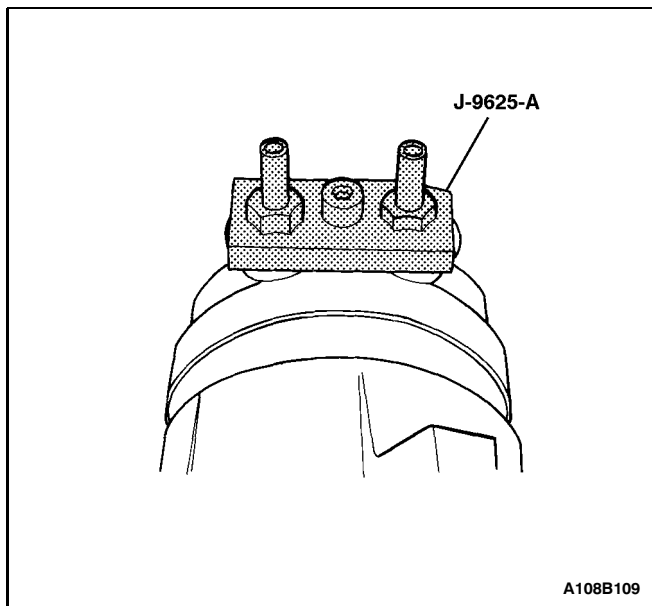
Assembly Procedure

1. Rest the rear head on the support block J-35372. Locate the control valve at the 6 o'clock position.
2. Install cylinder alignment rods J-34993 through the 11 o'clock and the 5 o'clock bolt holes.
3. Lubricate the new cylinder-to-compressor housing O-ring with clean polyalkaline glycol (PAG) oil.
4. Install the new O-ring in the cylinder O-ring groove.
5. Install the thrust washer and bearing in the same order as they were removed.
6. Align the cylinder alignment rod recess in the compressor housing with the cylinder alignment rod. Press down on the compressor housing with both hands to force it over the O-ring on the cylinder assembly.
7. Add a new through-bolt gasket to the through-bolts and install them into the compressor assembly. Four through bolts must thread into the rear head before removing the cylinder alignment rods.

Tighten

Alternately tighten the compressor front head-to-rear head through-bolts in progressive torque sequence to 10 N•m (89 lb-in).

8. Install a new shaft seal. Refer to "Shaft Seal Replacement" in this section.
9. Add new PAG oil equal to the amount drained in Step 3.
10. Install the clutch coil. Refer to "Clutch Coil" in this section.
11. Install the clutch rotor and bearing. Refer to "Clutch Rotor and Bearing" in this section.
12. Install the clutch plate and hub assembly. Refer to "Clutch Plate and Hub Assembly" in this section.
13. Perform a leak test on the compressor. Refer to "Leak Testing (External)" in this section.
14. Install the compressor. Refer to "Compressor" in this section.
15. Evacuate and recharge A/C system. Refer to "Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System" in this section.



LEAK TESTING (EXTERNAL)

Tools Required

J-9625-A Pressure Test Set Connectors

1. Install the pressure test set connectors J-9625-A to the suction/discharge ports on the compressor.
2. Attach the center hose of the manifold gauge set on the charging station to a refrigerant drum standing in an upright position. Open the valve on the drum.
3. Connect the charging station high and low pressure lines to the corresponding fittings on the pressure test set connectors J-9625-A (or hoses equipped with valve depressors). The suction port (low-side) of the compressor has a large internal opening. The discharge port (high-side) has a smaller internal opening into the compressor.
4. Open the low pressure control, the high pressure control and the refrigerant control on the charging station to allow the refrigerant vapor to flow into the compressor.
5. Using a leak detector, check for leaks at the high pressure relief valve seal, the housing seal, the rear head seal, the center cylinder seal, the through-bolt gaskets, and the compressor shaft seal. After checking for leaks, shut off the low pressure control, the high pressure control and the refrigerant control lines on the charging station.
6. If an external leak is present, perform the necessary corrective measures and recheck for leaks to verify that the leak has been corrected.
7. Loosen the manifold gauge hose connections to the gauge adapters connected to the low and high sides. Allow the vapor pressure to release from the compressor. If valve depressor-type hoses are used, loosen the hose connections at the gauge manifold to release vapor pressure from the compressor.
8. Disconnect both gauge hoses. Remove the pressure test set connectors J-9625-A.

GENERAL DESCRIPTION AND SYSTEM OPERATION

GENERAL INFORMATION

THE V5 A/C SYSTEM

The V5 variable displacement compressor along with the thermal expansion valve on the evaporator, constitutes a largely self-regulating system. There is no pressure cycling switch, no high-pressure cutoff switch, and no low-pressure cutoff switch. The compressor clutch is controlled by the electronic control module (ECM), which receives data from various engine systems and from a pressure transducer located in the high-pressure refrigerant pipe. In normal operation, the clutch is engaged continuously. Should one of the monitored conditions become abnormal, the ECM will disengage the compressor clutch until normal operation is restored. The following conditions are monitored:

- Wide open throttle.
- High engine coolant temperature.
- High engine RPM.
- Refrigerant low pressure.
- Refrigerant high pressure.

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 an electromagnetic clutch coil is energized. When voltage is applied to energize the clutch coil, the clutch plate and hub assembly is drawn rearward toward the pulley. The magnetic force locks the clutch plate and pulley together as one unit to drive the compressor shaft.

As the compressor shaft is driven, it compresses the low-pressure refrigerant vapor from the evaporator into a high-pressure, high temperature vapor. The refrigerant oil which is used to lubricate the compressor is carried with the refrigerant. Refer to "Minor V5 Compressor Repair" and "Major V5 Compressor Repair" in this section for complete overhaul procedures.

Pressure Relief Valve

The compressor is equipped with a pressure relief valve which is placed in the system as a safety factor. Under certain conditions, the refrigerant on the discharge side may exceed the designed operating pressure. In order to prevent system damage, the valve is designed to open automatically at 3 171 to 4 137 kPa (460 to 600 psi) in an R-134a system. Conditions that might cause this valve to open, such as a defective pressure transducer, an inoperative cooling fan, etc., should be cor-

rected and the refrigerant oil and refrigerant should be replaced as necessary.

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 causes it to condense into a liquid.

Expansion Valve

The expansion valve is attached to the evaporator core inside the heater/air distribution case.

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 are found to be defective, 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 dome 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 the cause, recycle the refrigerant, replace the expansion valve, and replace the receiver/dryer.

Evaporator Core

The evaporator is a 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 of the receiver-dryer is the desiccant, which acts as a drying agent for the moisture that may have entered the system. An oil bleed hole is located near the bottom of the receiver-dryer outlet pipe to provide an oil return path to the compressor. The receiver-dryer is serviceable only as an assembly.

Heater Core

The heater core heats the air before it enters the vehicle. Engine coolant is circulated through the core to heat the outside air passing over the fins of the core. The core is functional at all times and may be used to temper conditioned air in the A/C mode as well as in the heat or the vent mode.

SYSTEM COMPONENTS - CONTROL

Controller

The operation of the A/C system is controlled by the switches and the lever on the control head. This connects electrically to the blower and the electronic control module (ECM) through wiring harnesses. It also connects mechanically to the various doors in the heater/air distribution case by cables. Refer to Section 7A, Heating and Ventilating System for operating details.

The electric engine cooling fans are operational anytime the A/C control is on. This added feature is part of the A/C controller function and is aimed at preventing excessive compressor head temperatures. It also allows the A/C system to function more efficiently. The operation of the cooling fans is controlled by the ECM through the cooling fan relays.

Pressure Transducer

Pressure transducer switching incorporates the functions of the high-pressure and the low-pressure cutout switches along with the fan cycling switch. The pressure transducer is located in the high-side liquid refrigerant line on a connecting block near the right front strut tower. The output from this pressure transducer goes to the ECM which controls the compressor function based on the pressure signal.

Wide-Open Throttle (WOT) Compressor Cutoff

During full throttle acceleration, the throttle position sensor (TPS) sends a signal to the ECM, which then controls the compressor clutch.

A/C Time Delay Relay

This relay on some vehicles controls the current to the entire A/C system and provides a short delay of A/C operation upon start-up.

V5 COMPRESSOR - GENERAL DESCRIPTION

Vehicles using the V5 compressor may have differences between installations in the mounting brackets, the drive systems, the pulleys, the connections, and the system capacities. Basic unit repair procedures are similar between the compressors used on different vehicles.

When servicing the compressor, keep dirt and foreign material from getting on or into the compressor parts and the system. Clean tools and a clean work area are

important for proper service. The compressor connections and the outside of the compressor should be cleaned before any on-vehicle repairs and before the removal of the compressor. The parts must be kept

clean at all times and any parts that are to be reassembled should be cleaned with trichloroethane, naphtha, stoddard solvent, kerosene or equivalent solvents and dried with dry air. Use only lint-free cloths to wipe the parts.

The operations described are based on bench unit repair with the compressor removed from the vehicle, except as noted. They have been prepared in the order of accessibility of the components. When a compressor is removed from the vehicle for servicing, the amount of oil remaining in the compressor should be drained, measured and recorded. This oil should then be discarded and new polyalkaline glycol (PAG) refrigerant oil added to the compressor.

Important: The oil drain plug must be removed and the oil drained through the plug opening to insure complete draining of oil from the compressor.

V5 COMPRESSOR - DESCRIPTION OF OPERATION

The V5 is a variable displacement compressor that can match the automotive air conditioning (A/C) demand under all conditions without cycling. The basic compressor mechanism is a variable angle wobble-plate with five axially oriented cylinders. The center of control of the compressor displacement is a bellows-actuated control valve located in the rear head of the compressor that senses compressor suction pressure.

The wobble-plate angle and the compressor displacement are controlled by the crankcase suction pressure differential. When the A/C capacity demand is high, the suction pressure will be above the control point. The valve will maintain a bleed from crankcase to suction. With no crankcase suction pressure differential, the compressor will have maximum displacement.

When the A/C capacity demand is lower and the suction pressure reaches the control point, the valve will bleed discharge gas into the crankcase and close off a passage from the crankcase to the suction plenum. The angle of the wobble-plate is controlled by a force balance on the five pistons. A slight elevation of the crankcase suction pressure differential creates total force on the pistons resulting in a movement about the wobble-plate pivot pin that reduces the plate angle.

The compressor has a unique lubrication system. The crankcase suction bleed is routed through the rotating wobble-plate for lubrication of the wobble-plate bearing. The rotation acts as an oil separator which removes some of the oil from the crankcase suction bleed, re-routing it to the crankcase where it can lubricate the compressor mechanism.