
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.

TABLE OF CONTENTS

Specifications	7B-2	A/C Pressure Transducer	7B-24
A/C System Charging Capacity	7B-2	A/C Compressor Relay	7B-25
Fastener Tightening Specifications	7B-2	Air Filter	7B-25
Special Tools	7B-3	A/C Expansion Valve	7B-26
Special Tools Table	7B-3	Heater/Air Distributor Case Assembly	7B-28
Schematic and Routing Diagrams	7B-6	A/C High Pressure Pipe Line	7B-29
A/C System - Typical	7B-6	Heater Core	7B-31
Manual Control A/C Diagram, SOHC (IEFI-6 ECM)	7B-7	Evaporator Core	7B-31
Manual Control A/C Diagram, DOHC (ITMS-6F ECM)	7B-8	A/C Suction Hose Assembly	7B-33
Diagnosis	7B-9	A/C Discharge Hose - Compressor to Condenser	7B-34
General Diagnosis	7B-9	Receiver Dryer	7B-36
Testing the Refrigerant System	7B-9	Compressor	7B-37
Insufficient Cooling „Quick Check” Procedure	7B-9	Condenser	7B-38
A/C Performance Test	7B-10	Unit Repair	7B-41
Pressure Temperature Relationship of R 134a	7B-11	Component Locator	7B-41
Leak Testing the Refrigerant System	7B-12	V5 Compressor	7B-41
V5 System Air Conditioning Diagnosis - Insufficient Cooling	7B-13	V5 Air Conditioning Compressor Overhaul	7B-42
Insufficient Cooling Diagnosis	7B-13	Clutch Plate and Hub Assembly	7B-42
Symptom Diagnosis	7B-17	Clutch Rotor and Bearing	7B-44
Pressure Test Chart (R-134a System)	7B-17	Clutch Coil	7B-47
Low and High Side Pressure Relationship Chart	7B-19	Shaft Seal Replacement	7B-49
Maintenance and Repair	7B-20	Pressure Relief Valve	7B-51
On-Vehicle Service	7B-20	Control Valve Assembly	7B-52
General A/C System Service Procedures	7B-20	Rear Head, Gasket, Valve Plate, Reed Plate, and O-Ring	7B-53
O-Ring Replacement	7B-20	Cylinder to Front Head O-Ring	7B-55
Handling Refrigerant	7B-20	Leak Testing (External)	7B-57
Handling of Refrigerant Lines and Fittings	7B-20		
Maintaining Chemical Stability in the Refrigeration System	7B-21		
Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System	7B-21		
Serviceable Components	7B-23		

General Description and System

Operation **7B-58**
 General Information 7B-58
 The V5 A/C System 7B-58
 A/C System Differences 7B-58

System Components - Functional 7B-58
 System Components - Control 7B-59
 V5 Compressor - General Description 7B-60
 V5 Compressor - Description of Operation 7B-60

SPECIFICATIONS

A/C SYSTEM CHARGING CAPACITY

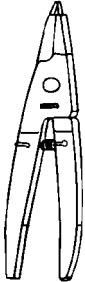
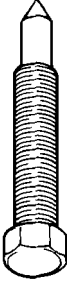
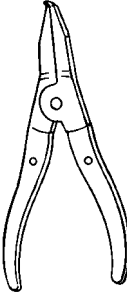
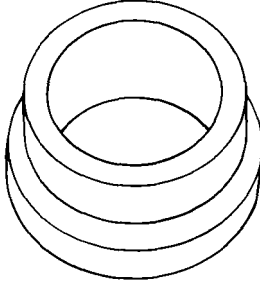

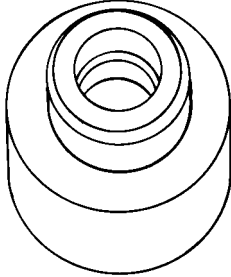

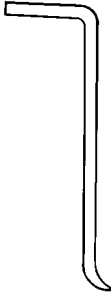
Application	Description
R134a System - Left Hand Drive - Right Hand Drive	750 - 20 g 850 - 20 g
Refrigerant Oil in A/C System	Synthetic PAG 265 ml

FASTENER TIGHTENING SPECIFICATIONS

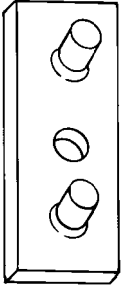
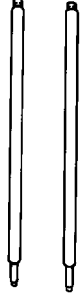
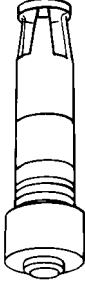
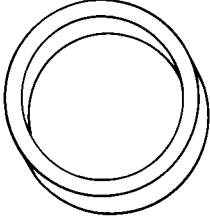
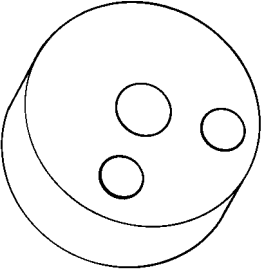
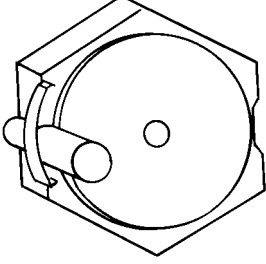
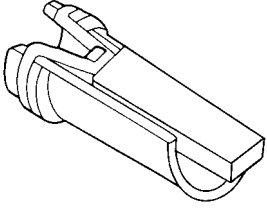
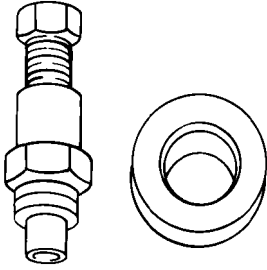
Application	N•m	Lb•Ft	Lb•In
Air Cleaner Housing Assembly Retaining Bolts	12	-	106
Band Clamp Bolt	5	-	44
Clamp Bolts	4	-	35
Clutch Plate and Hub Assembly Retaining Nut	17	13	-
Discharge Hose Connecting Block to Compressor Retaining Nut	33	24	-
Discharge Hose Connecting Block to Condenser Retaining Nut	16	12	-
Expansion Valve Bolts	10	-	89
Front Compressor to Bracket Mounting Bolts	35	26	-
High Pressure Pipe to Evaporator Flange Connecting Block Nut	10	-	89
HighPressure Pipe to Receiver Dryer Connecting Block Nut	10	-	89
Liquid Evaporator Pipe Clamp Bolt	4	-	35
Pressure Relief Valve	16	12	-
Pressure Transducer	10	-	89
Rear Compressor to Bracket Mounting Bolts	20	15	-
Receiver Dryer to Condenser Pipe Nut	10	-	89
Suction Hose Clamp Bolt	10	-	89
Suction Hose Connecting Block Retaining Nuts	10	-	89
Suction Hose Support Clamp Retaining Bolt	5	-	44
Suction Hose Support Clamp Retaining Nut	5	-	44
Through Bolts	10	-	89
Upper Condenser Mount Nuts	4	-	35
Vacuum Tank to Fire Wall Nuts	4	-	35

SPECIAL TOOLS

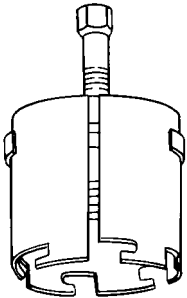
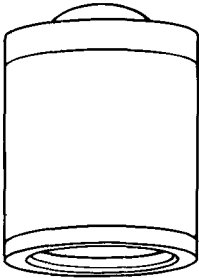
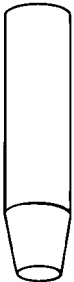
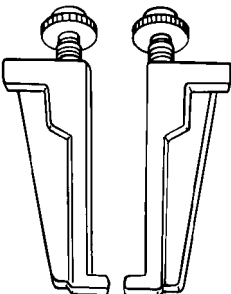
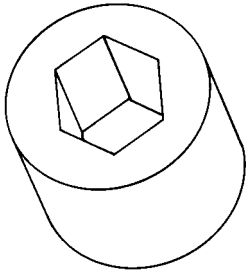
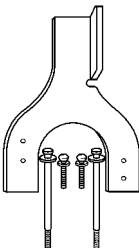
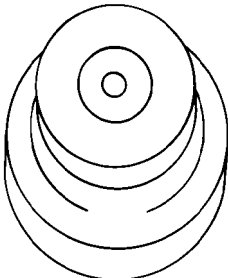
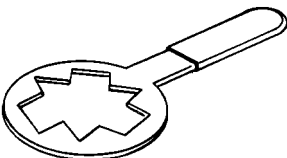
SPECIAL TOOLS TABLE

 <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)

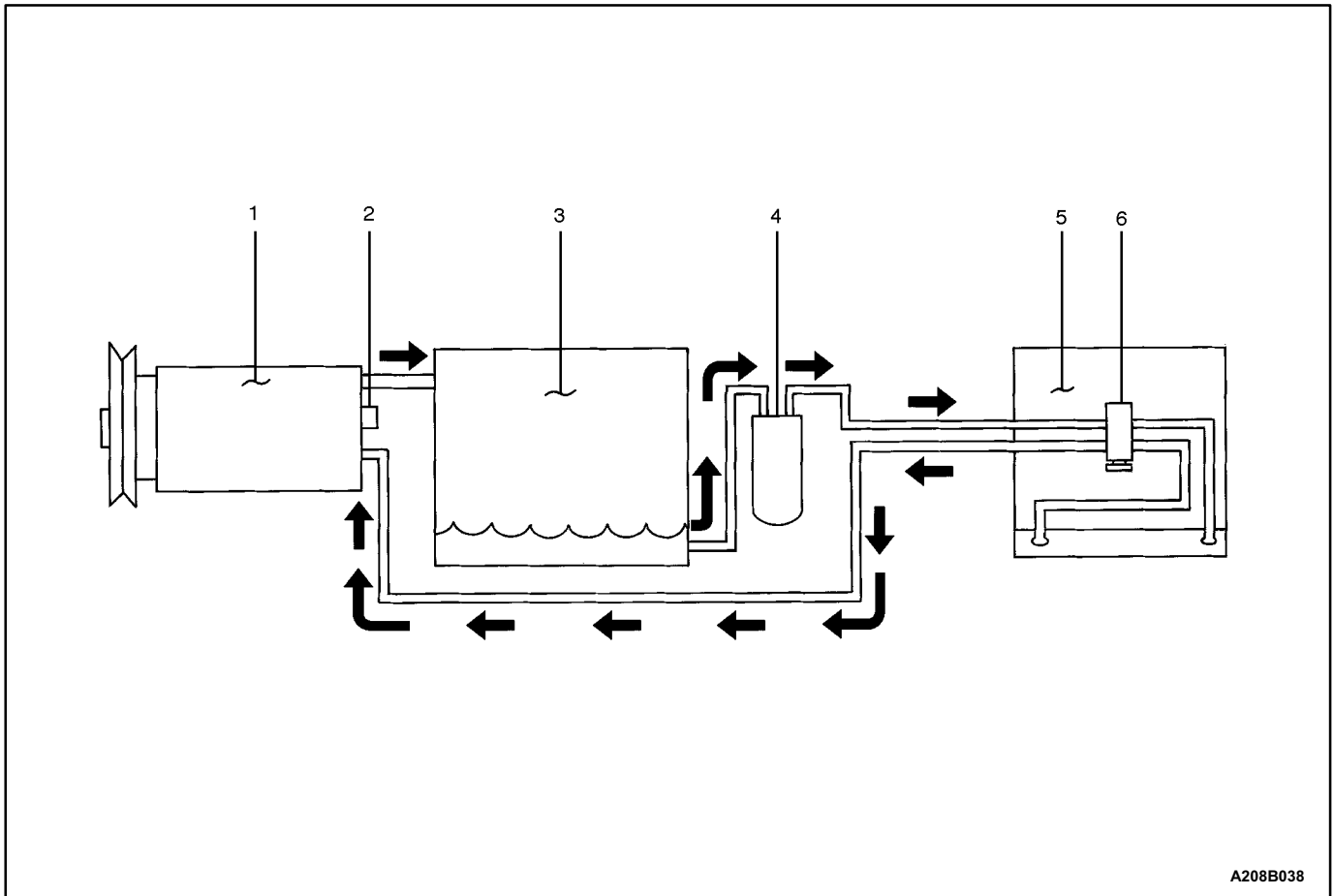
 <p>A108B087</p>	<p>J-9625-A Pressure Testing Connector</p>	 <p>A108B092</p>	<p>J-34993 Cylinder Alignment Rods</p>
 <p>A108B088</p>	<p>J-23128-A Seal Seat Remover and Installer</p>	 <p>A108B093</p>	<p>J-33017 Pulley Rotor and Bearing Installer</p>
 <p>A108B089</p>	<p>J-35372 Support Block</p>	 <p>A108B094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

SCHEMATIC AND ROUTING DIAGRAMS

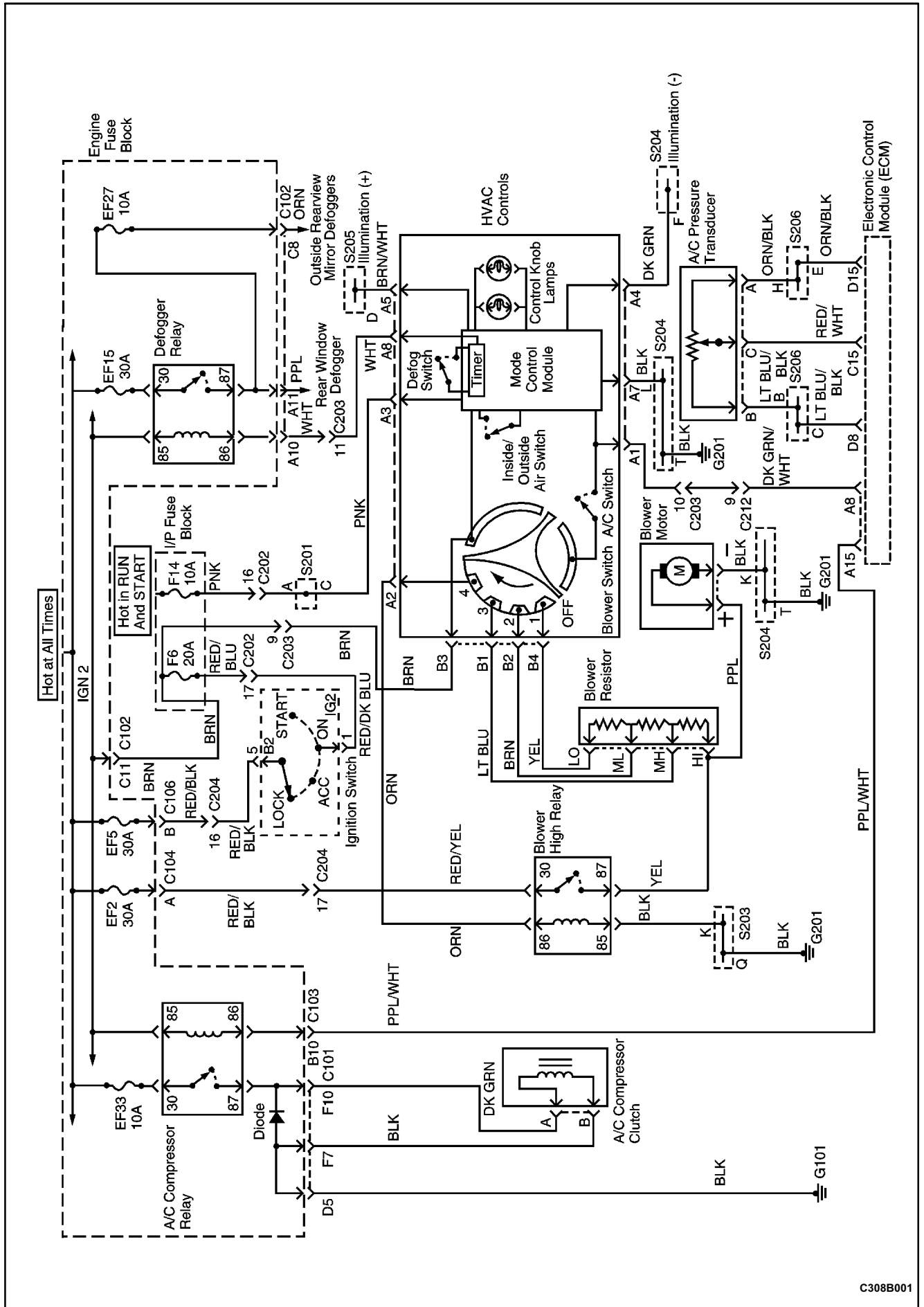
A/C SYSTEM - TYPICAL



- 1 Compressor
- 2 Pressure Relief Valve
- 3 Condenser

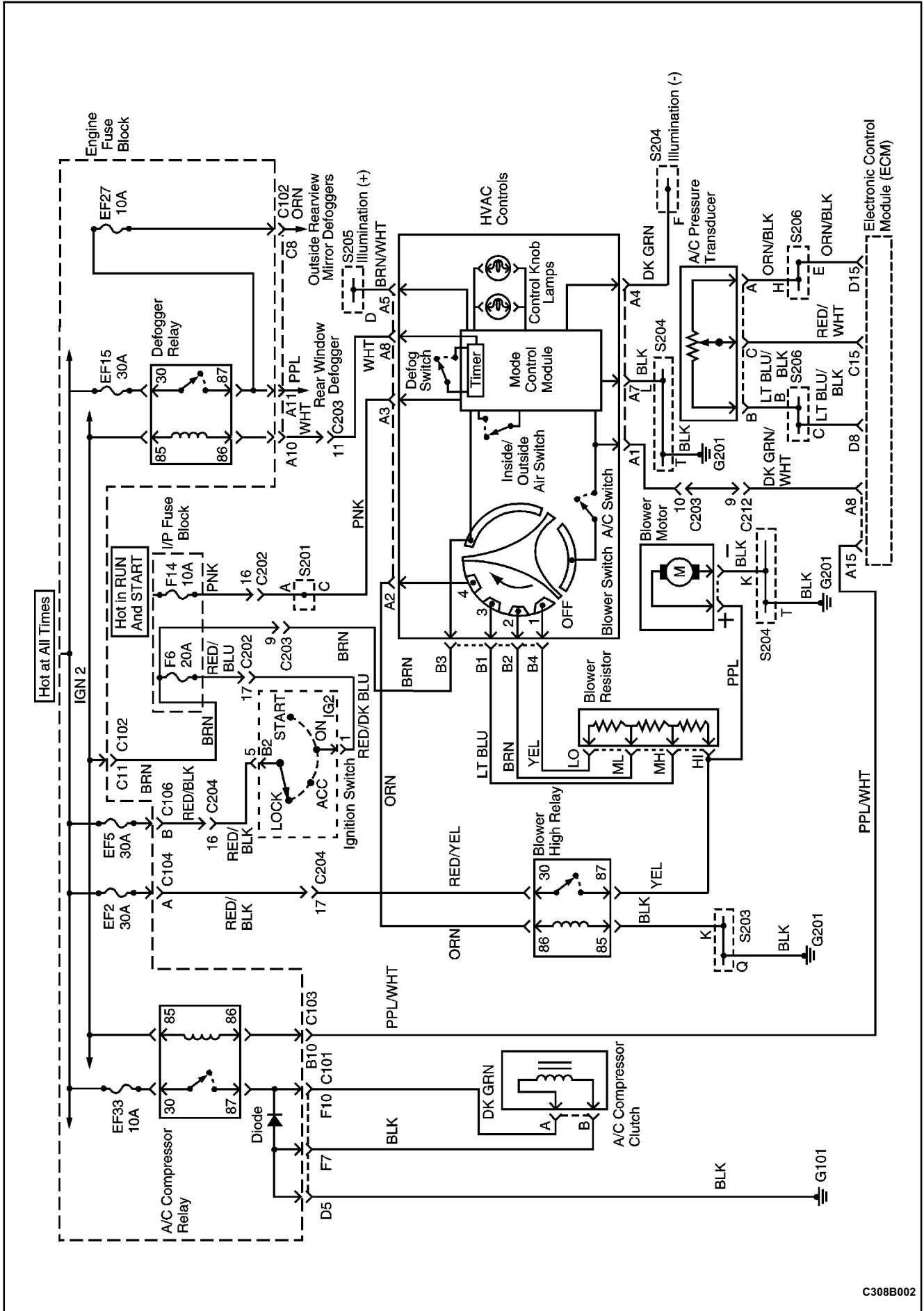
- 4 Receiver Dryer
- 5 Evaporator
- 6 Expansion Valve

MANUAL CONTROL A/C DIAGRAM, SOHC (IEFI6 ECM)



C308B001

MANUAL CONTROL A/C DIAGRAM, DOHC (ITMS6F ECM)



C308B002

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. Low airflow rate may indicate a restricted evaporator core.
5. Check for slippage of the compressor clutch.
6. Check the drive belt tension.

INSUFFICIENT COOLING „QUICK CHECK” PROCEDURE

Perform the following „hand feel” procedure to get a quick idea of whether the 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 the maximum speed setting.
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 the system and charge it.
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	2170	20029	2000	440	1034 150
	2780	20029		745	1310 190
	3290	20730		948	1689 245
	38100	21431		1457	2103 305
30	2170	20029	2000	642	1034 150
	2780	20730		847	1413 205
	3290	21431		1151	1827 265
	38100	22132		1661	2241 325
40	2170	20029	2000	745	1138 165
	2780	20730		948	1482 215
	3290	22132		1355	1931 280
	38100	26939		1865	2379 345
50	2170	20730	2000	847	1241 180
	2780	22132		1253	1620 235
	3290	23434		1559	2034 295
	38100	27640		2169	2413 350
60	2170	20730	2000	948	1241 180
	2780	22833		1356	1655 240
	3290	24836		1763	2068 300
	38100	29643		2373	2482 360
70	2170	20730	2000	1050	1276 185
	2780	23434		1458	1689 245
	3290	26238		1865	2103 305
	38100	30344		2475	2517 365
80	2170	20730	2000	1050	1310 190
	2780	23434		1559	1724 250
	3290	26939		1967	2137 310
90	2170	20730	2000	1050	1379 200
	2780	24836		1762	1827 265
	3290	29042		2271	2275 330

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 the 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 R134a before beginning the test.

Notice: 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

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

5. The audible tone changes from 1 to 2 clicks per second into a solid alarm if there is a leak. Adjust the balance control to maintain 1 to 2 clicks per second.
6. Test all of the following areas, even after one leak has been confirmed:
 - Evaporator inlet and outlet.
 - Receiverdrier 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 caps provide protection for the service ports. Make sure that these caps are not missing or loose. Always use the correct cap for each port.

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 the maximum speed setting for at least 15 minutes.
2. Turn the blower OFF.
3. Wait for 10 minutes.
4. Remove the blower motor resistor. Refer to *Section 7A, Heating and Ventilation System*.
5. Insert the leak detector probe as closely 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 on 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

Test Description

The numbers below refer to steps on the diagnostic table.

13. See the Important below.

Important: Perform this test under garage conditions with the air temperature at 21-32°C (70-90°F), and no sun load. Follow this test carefully for accurate results.

32. See the Important below.

Important: Perform this test exactly as described to obtain accurate results.

Insufficient Cooling Diagnosis

Step	Action	Value(s)	Yes	No
1	Record the customer's complaint. Can you verify the customer's 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 airflow. 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 (12°F) below ambient air temperature	System OK	Go to Step 3
3	1. Turn the ignition switch to LOCK. 2. Connect the high and the lowpressure 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. 4. Observe the two pressure gauges. 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. 5. Observe the two pressure gauges. 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 ON. ● 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

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
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	-
10	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. Does the A/C clutch engage?	-	Go to Step 11	Go to Step 12
11	Repair the electrical circuit to the A/C compressor clutch coil. Does the A/C clutch engage?	-	Go to Step 8	-
12	Replace the A/C compressor clutch coil. Does the A/C clutch engage?	-	Go to Step 8	-
13	1. Close all of the vehicle's windows and doors. 2. Set the A/C controls to the following positions: <ul style="list-style-type: none"> ● The A/C switch to ON. ● 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. Is there a noticeable difference in the temperature of the evaporator inlet and outlet pipes?	-	Go to Step 15	Go to Step 14
14	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 an obstruction or a malfunction. 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. Is the discharge temperature normal?	At least 7°C (12°F) below ambient air temperature	Go to Step 15	Go to Step 13

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
15	1. Record the low and the high side pressures after the A/C system has been operating for 5 minutes or more with the engine cooling fan 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. Do the low and the high side pressures intersect in the white area of the chart?	-	System OK	Go to Step 16
16	Check the high-and the low-side pressures. Do the low-and the high-side pressures intersect in the gray area of the chart?	-	Go to Step 17	Go to Step 20
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 airflow. 2. Check the cooling fans for proper operation. 3. Remove the restriction or repair the fans, as required. Is the pipe temperature normal now?	At least 7°C (12°F) below ambient air temperature	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 free from leaks?	-	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: <ul style="list-style-type: none"> ● The A/C switch to ON. ● The fresh air control switch to fresh air. ● The blower motor to 4. ● The temperature to full cold. 3. Close all of the vehicle's windows and doors. 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. Make sure 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

Insufficient Cooling Diagnosis (Cont'd)

Step	Action	Value(s)	Yes	No
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
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 oz)	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 free from leaks?	-	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. Check the A/C system for leaks. Is the system free from leaks?	-	Go to Step 13	-
32	1. Run the engine for 5 minutes at 2,000 rpm. 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 recirculate (indicator lamp ON). ● The blower motor to 1. ● The temperature to full cold. 3. Close all of the vehicle's windows and doors. 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 free from leaks?	-	Go to Step 13	-

SYMPTOM DIAGNOSIS

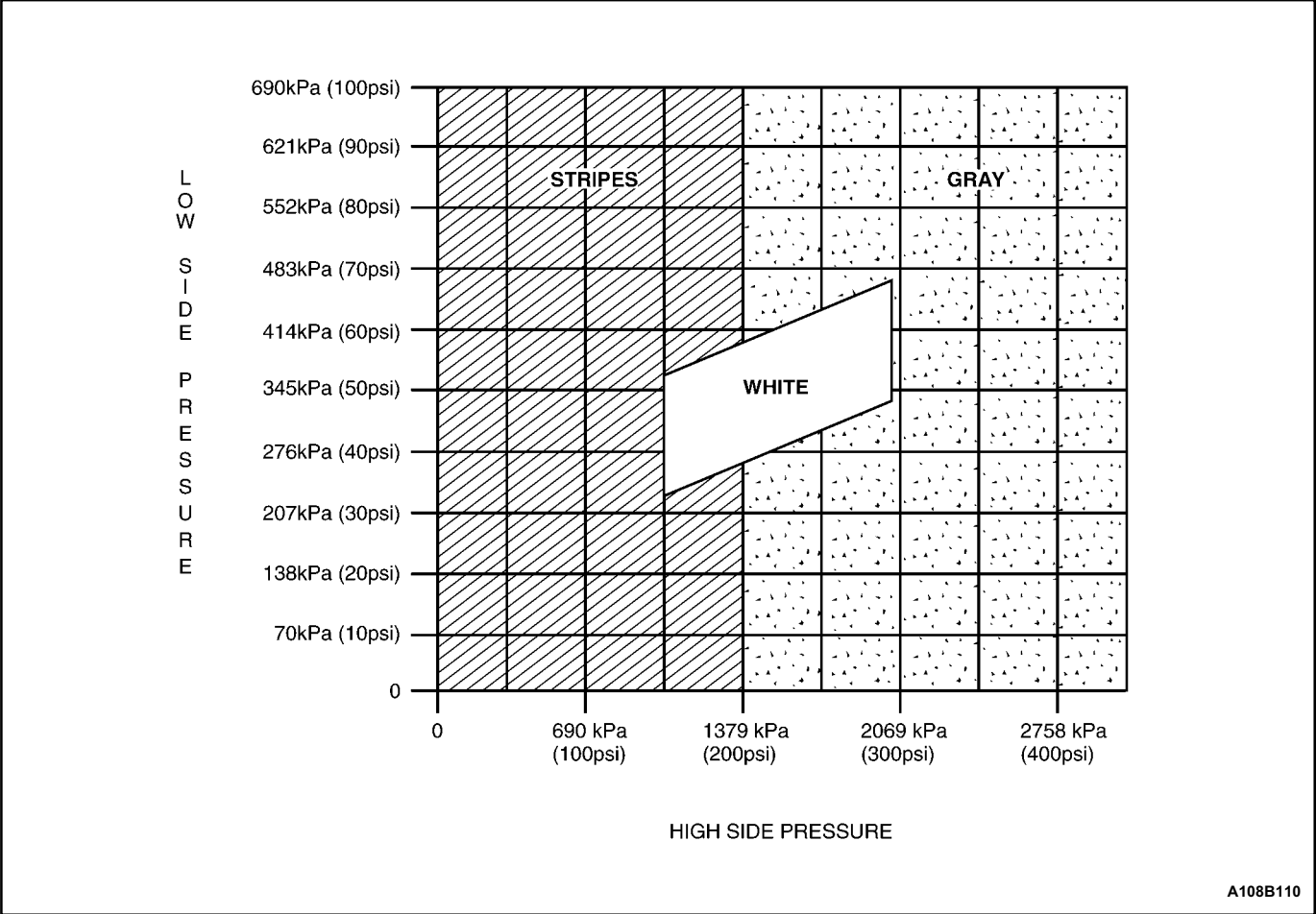
PRESSURE TEST CHART (R-134a SYSTEM)

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 (R134a 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.	
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

ORING 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 (A/C) 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 A/C 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.

Notice: 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 65 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.

Caution: 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.

- Open the fittings very slowly.
- 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 swagged 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 refrigerant oil before installation.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The efficient operation and the life of the air conditioning (A/C) 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 polyalkaline glycol 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.

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.

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 (A/C) system with one hookup. Filtering the refrigerant 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 from each system are not compatible with those from the other system and must never be mixed, even in the smallest amount. Mixing refrigerant residue will damage the equipment.
- Never use adapters which convert from one size fitting to another. Such use allows contamination, which may cause system failure.

Charging Station Setup and Maintenance

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 A/C system with a measured amount of refrigerant. Refer to the manufacturer's instructions for all initial setup procedures and all maintenance procedures.

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 the following:

1. Main Power Switch
 - Supplies electrical power to the control panel.
2. Display
 - Shows the time programmed for vacuum.
 - Shows the weight of the refrigerant programmed for recharging.
 - Refer to the manufacturer's instructions for detailed programming information.
3. Low-Side Manifold Gauge
 - Shows the system's low-side pressure.
4. High-Side Manifold Gauge
 - Shows the system's highside pressure.
5. Control Panel
 - Controls the various operating functions.
6. Low-Side Valve
 - Connects the low side of the A/C system to the unit.
7. Moisture Indicator
 - Shows whether the refrigerant is wet or dry.
8. High-Side 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 overflow limitation mechanism is calibrated specifically for use

with this tank. The tank's valves are also manufactured 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.
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.
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 which would, under this condition, 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 from such reuse. 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 polyalkaline glycol (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 provides a means of determining how much oil was removed. Replace the same amount of oil when recharging the system. Refer to the manufacturer's instructions for the charging station in use.

13. Wait 5 minutes, then check the control panel low-side gauge. If the A/C has maintained vacuum, the recovery is complete.
14. If the low-side gauge pressure rises above zero, there is more refrigerant in the system. Recover the additional refrigerant. Repeat this step until the system maintains vacuum for 2 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 vented from the tank automatically 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 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.
 - You must have an A/C system vacuum for this operation. Never open the oil injection valve while there is positive pressure in the A/C system. This will result in oil blowback through the bottle vent.
 - Never let the oil level drop below the pickup tube while charging or replenishing the system, as 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 A/C 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.
4. Enter the amount of refrigerant needed to charge the A/C, making sure to use the correct system of measurement, i.e. kilogram (kg) or pound (lb).
5. 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 gauge and the low-side gauge 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. The system will quickly draw in refrigerant from both hoses through the low-side hose.
10. Close the low-side coupler valve.
11. 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 then evacuate the A/C system and charge it again.
 - Refer to the manufacturer's instructions for the charging station in use.

SERVICEABLE COMPONENTS

COMPONENTS USED IN NON-A/C SYSTEMS

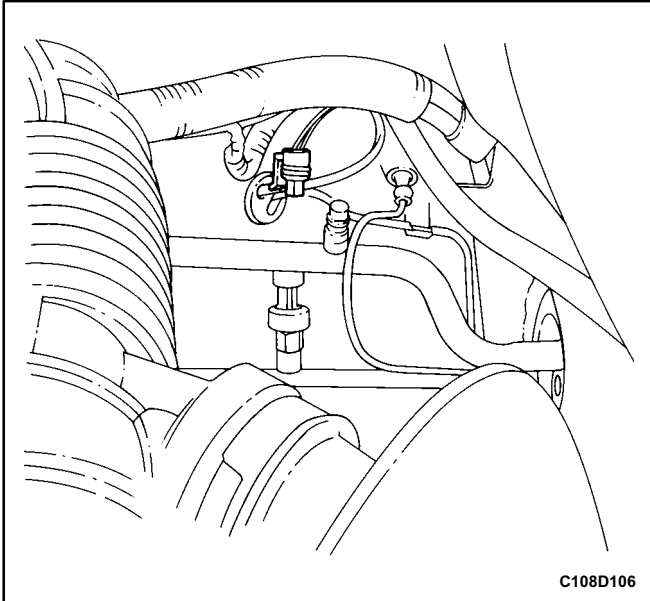
Refer to *Section 7A, Heating and Ventilation System* for on-vehicle service procedures for the following sections:

- Blower Motor.
- Blower Resistor.
- Control Assembly Knob Lighting.
- Control Assembly.
- Heater Hoses.
- High-Blower Relay.
- A/C Control Vacuum Tank.
- Temperature Control Cable.

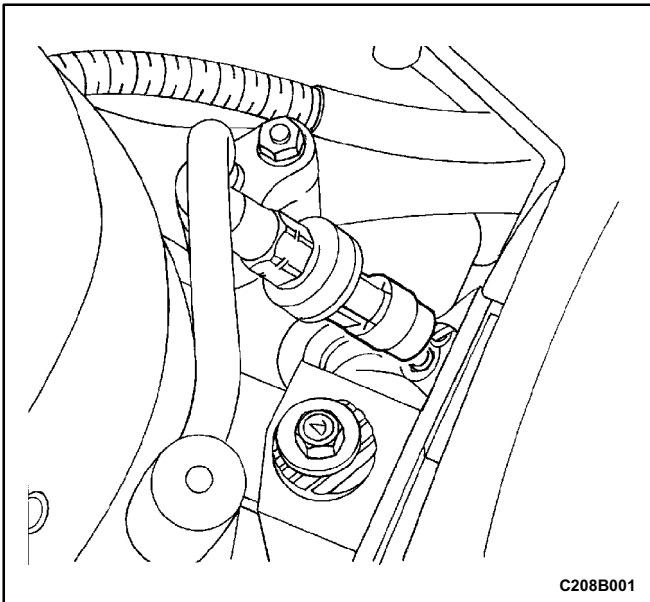
A/C PRESSURE TRANSDUCER

Removal Procedure

1. Disconnect the negative battery cable.
2. Release the connector lock and pull the transducer wire connector out.



3. Remove the transducer with a wrench.
4. Discard the O-ring seal.



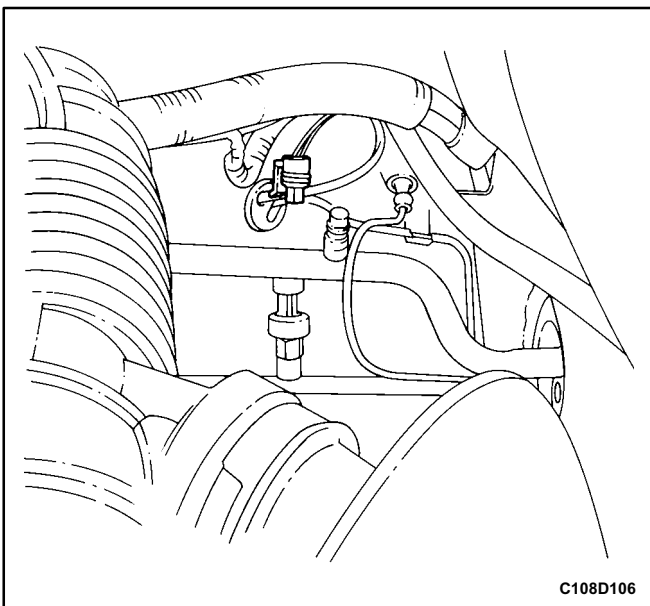
Installation Procedure

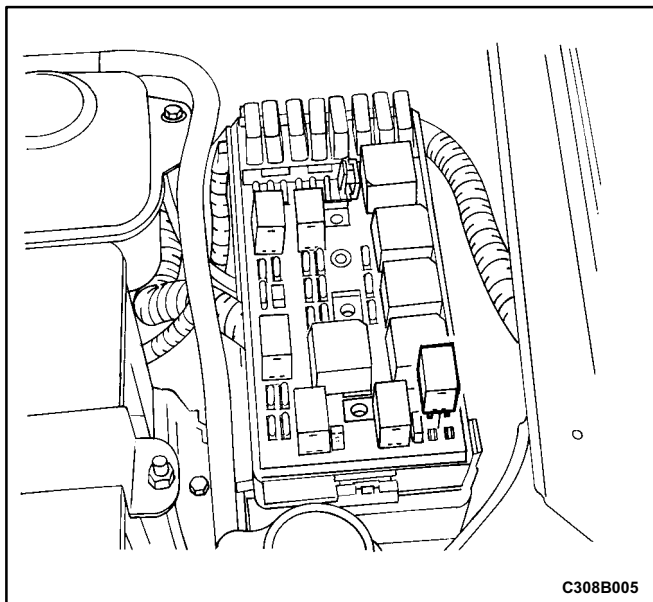
1. Install the new O-ring seal on the transducer.
2. Install the pressure transducer.

Tighten

Tighten the pressure transducer to 10 N•m (89 lb•in).

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



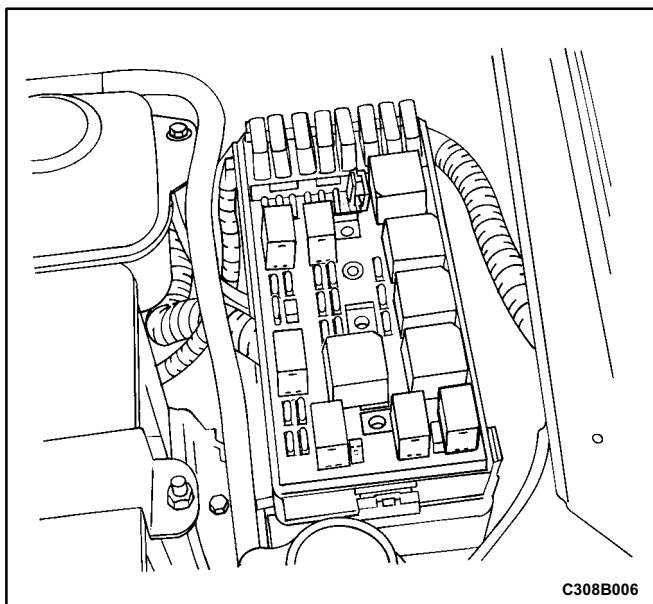


C308B005

A/C COMPRESSOR RELAY

Removal Procedure

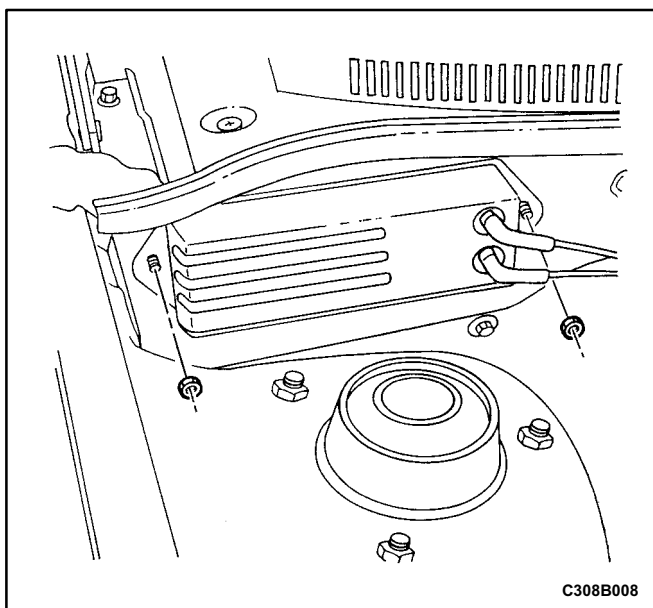
1. Disconnect the negative battery cable.
2. Pull the relay straight up and out from its location in the engine fuse block at the left front corner.



C308B006

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.



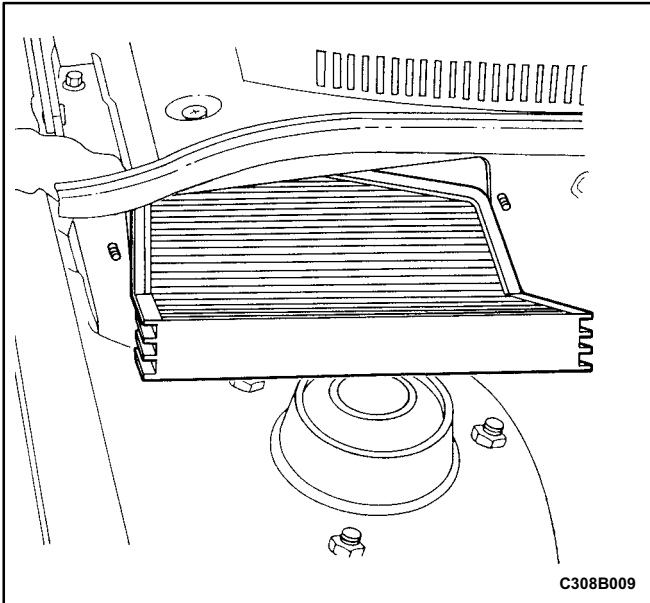
C308B008

AIR FILTER

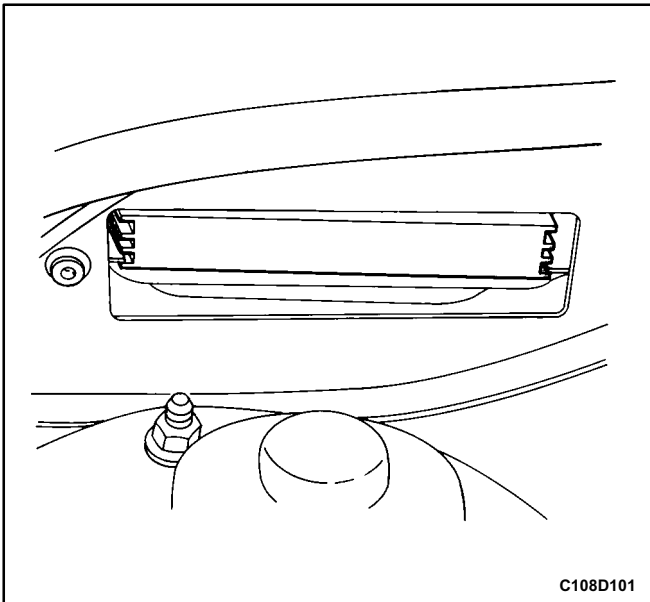
(Left-Hand Drive Shown, Right-Hand Drive Similar)

Removal

1. Remove the two nuts that secure the vacuum tank to the fire wall.



2. Set the vacuum tank aside.
3. Pull the filter out of the cavity in the fire wall.

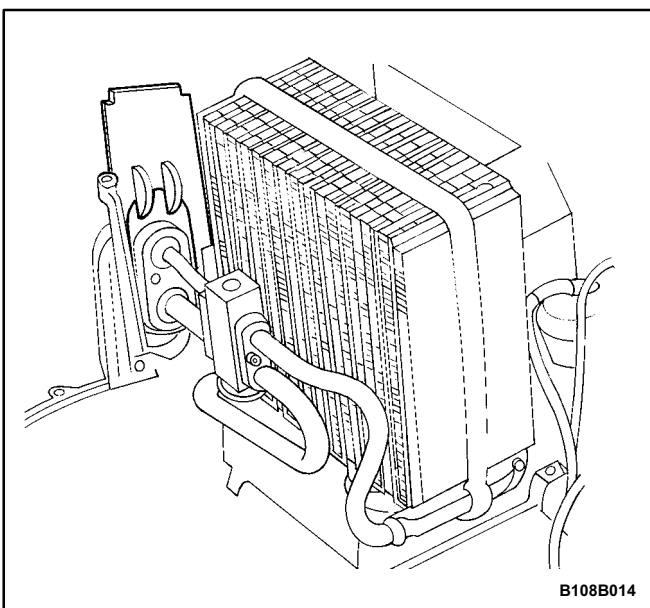


Installation

1. Install the filter into its cavity in the fire wall.
 - Align the fins on the plastic frame of the filter with the groove in the holder before attempting to insert the filter into place.
2. Hold the vacuum tank in place over its mounting studs on the fire wall.
3. Install the nuts to secure the vacuum tank to the fire wall.

Tighten

Tighten the vacuum tank-to-fire wall nuts to 4 N•m (35 lb•in).

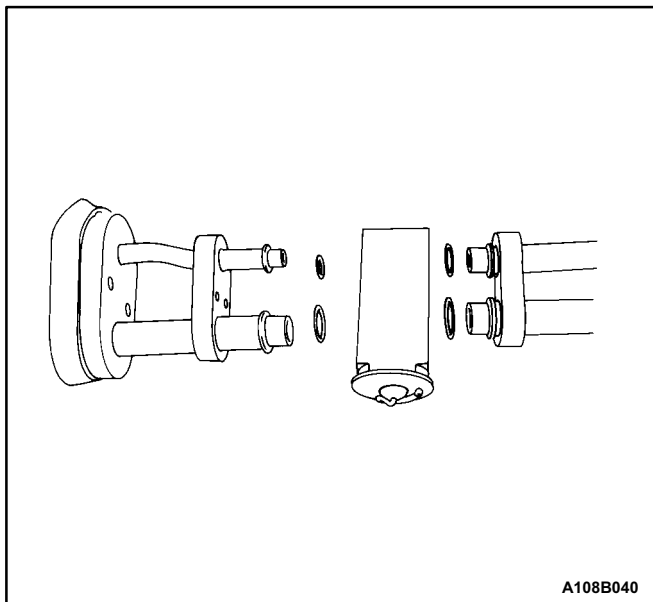


A/C EXPANSION VALVE

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

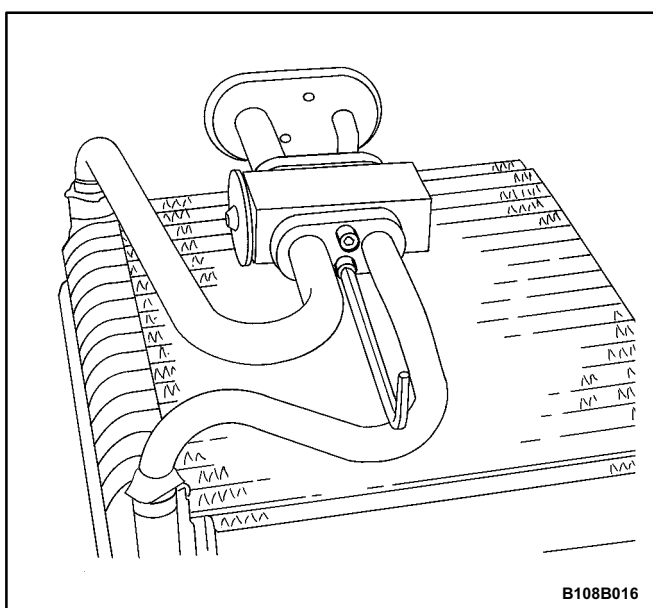
Removal Procedure

1. Remove the heater/air distributor case assembly. Refer to „Heater/Air Distributor Case Assembly” in this section.
2. Remove the screws that secure the evaporator case halves.
3. Remove the evaporator core case cover.
4. Slide the evaporator flange support plate upward to facilitate removal of the evaporator.



A108B040

5. Remove the evaporator from the case.
6. Remove the expansion valve bolts.
7. Remove the expansion valve.
8. Remove the Orings from the evaporator lines and the air conditioning (A/C) lines.



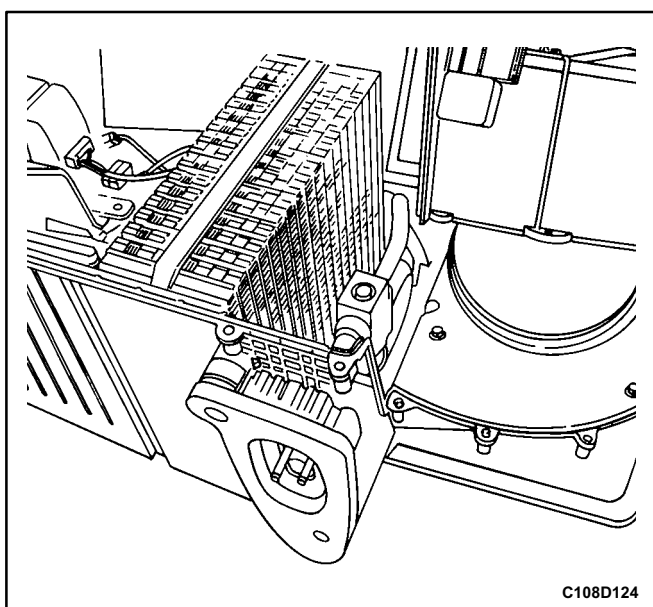
B108B016

Installation Procedure

1. Clean the O-ring surface areas of dirt or contamination.
2. Install new O-rings on the evaporator lines and the A/C lines.
3. Install a new expansion valve onto the evaporator lines.
4. Insert the expansion valve bolts through the expansion valve into the mounting surface of the evaporator flange.

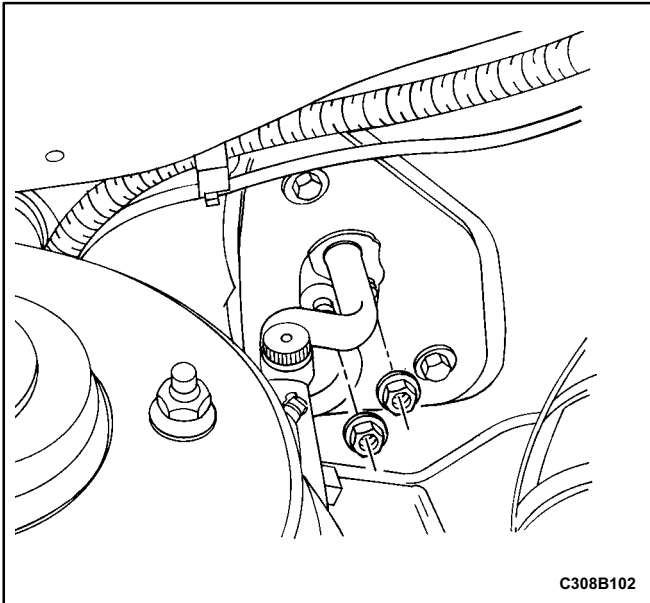
Tighten

Tighten the expansion valve bolts to 10 N•m (89 lb•in).



C108D124

5. Install the evaporator core into the case. Center the evaporator flange in the case opening.
6. Install the evaporator core case cover with the screws.
7. Install the heater/air distributor case. Refer to „Heater/Air Distributor Case” in this section.
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.

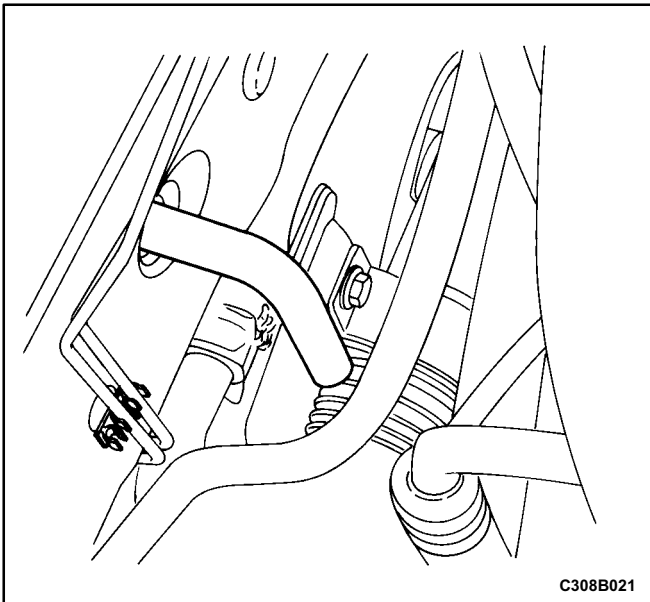


HEATER/AIR DISTRIBUTOR CASE ASSEMBLY

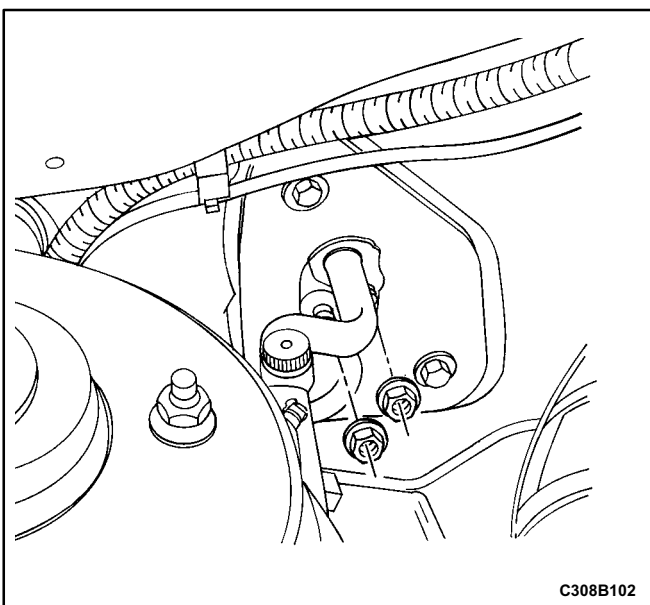
(Left-Hand Drive Shown, Right-Hand Drive Similar)

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 nuts that secure the air conditioning (A/C) suction hose and liquid evaporator pipe blocks at the fire wall.



4. Loosen the A/C suction hose clamp bolt. Loosen the liquid evaporator pipe clamp bolt.
5. Loosen the A/C suction hose and the liquid evaporator pipe clamps to allow movement of the tubes.
6. Pull the A/C suction hose and liquid evaporator pipe from the evaporator inlet.
7. Remove the evaporator drain hose.
8. Remove the heater/air distributor case from the vehicle. Refer to *Section 7A, Heating and Ventilation System*.



Installation Procedure

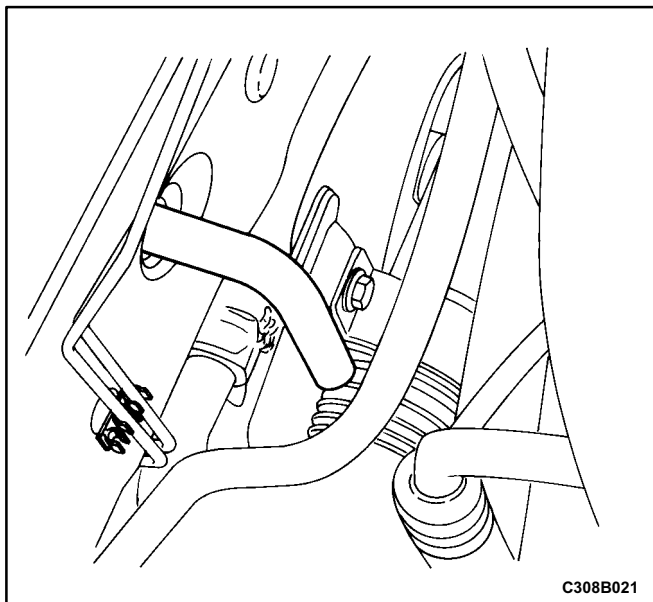
1. Install two new O-rings onto the A/C suction hose and the liquid evaporator pipe at the fire wall in the engine compartment.

Important: Do not try to verify the operation of the system until you have installed and recharged the A/C system.

2. Install the heater/air distributor case into the vehicle. Refer to *Section 7A, Heating and Ventilation System*.
3. Install the A/C suction hose and the liquid evaporator pipes onto the evaporator flange connecting block studs.
4. Secure the liquid evaporator pipe and the suction hose to the evaporator flange with the nuts.

Tighten

Tighten the suction hose connecting block retaining nuts to 10 N•m (89 lb•in).



5. Install the A/C suction hose clamp with the bolt.

Tighten

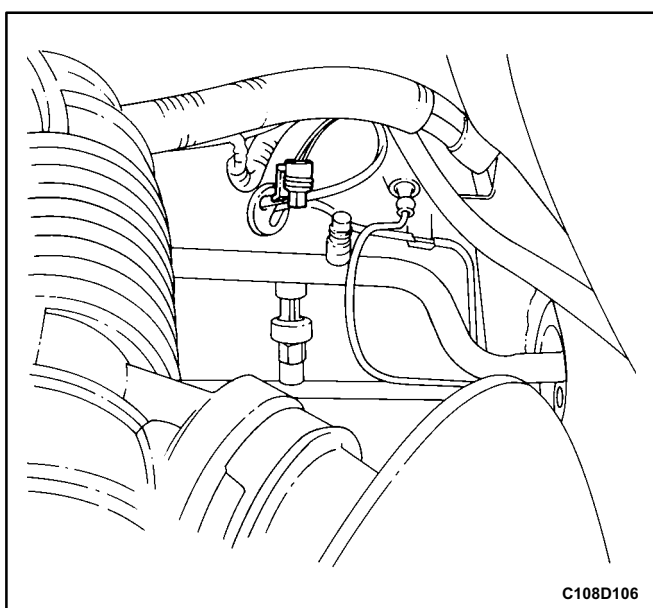
Tighten the suction hose clamp bolt to 10 N•m (89 lb•in).

6. Install the liquid evaporator pipe clamp with the bolt.

Tighten

Tighten the liquid evaporator pipe clamp bolt to 4 N•m (35 lb•in).

7. Install the evaporator drain hose.
8. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.
9. Operate the HVAC control to verify the proper function of the heating and the cooling systems.

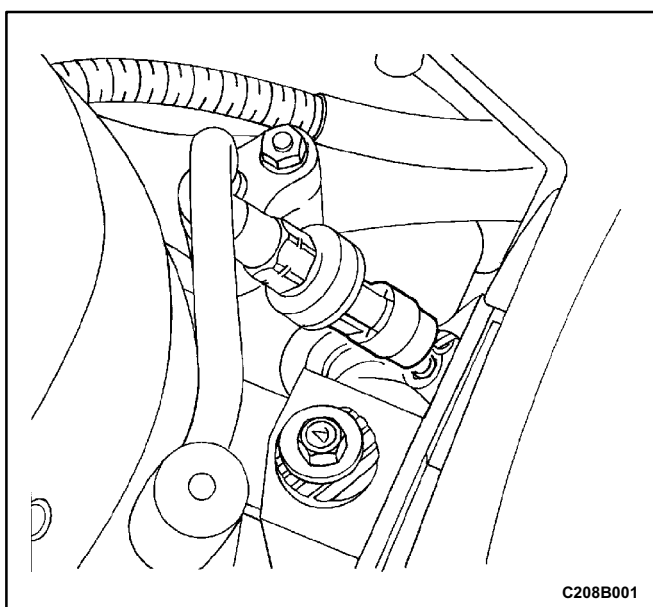


A/C HIGH-PRESSURE PIPE LINE

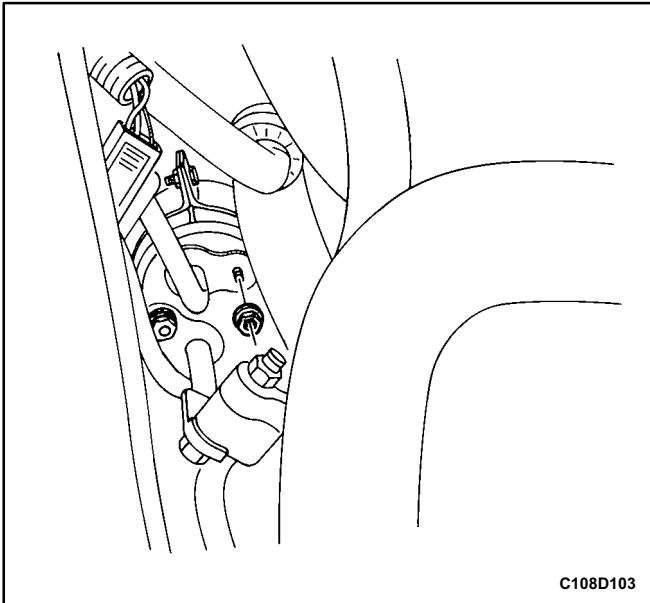
(Left-Hand Drive Shown, Right-Hand Drive Similar)

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 assembly mounting bolts and the air cleaner housing assembly.
4. Disconnect the electrical connector at the pressure transducer.

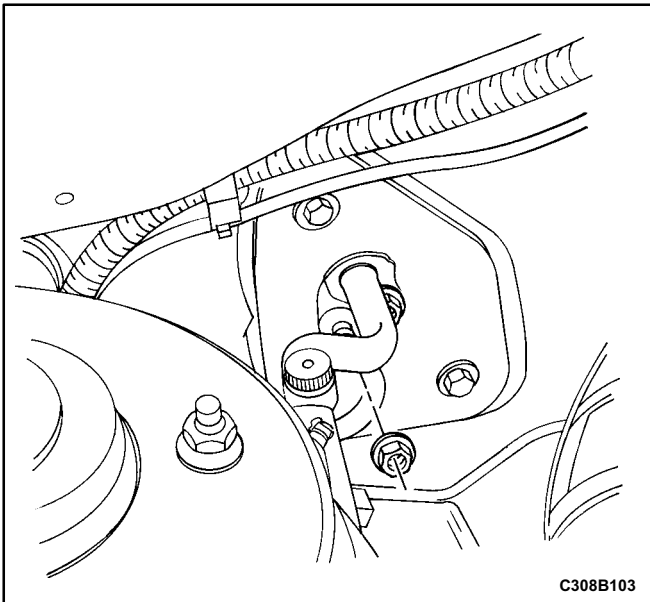


5. For right-hand drive vehicles, the transducer is located close to the right wheel shock tower.



C108D103

6. Remove the bolts which secure the clamps that hold the high-pressure pipe to the vehicle.
7. Remove the high-pressure pipe to evaporator flange connecting block retaining nut.
8. Cap the high-pressure pipe opening.
9. Remove the high-pressure pipe to receiver-dryer connecting block retaining nut.
10. Remove the high-pressure pipe from the vehicle.
11. Cap the opening at the receiver-dryer to prevent contamination.



C308B103

Installation Procedure

1. Position the high-pressure pipe into the vehicle.
2. Install a new O-ring on the pipe at the receiver-dryer.
3. Install the high-pressure pipe to receiver-dryer connecting block nut.

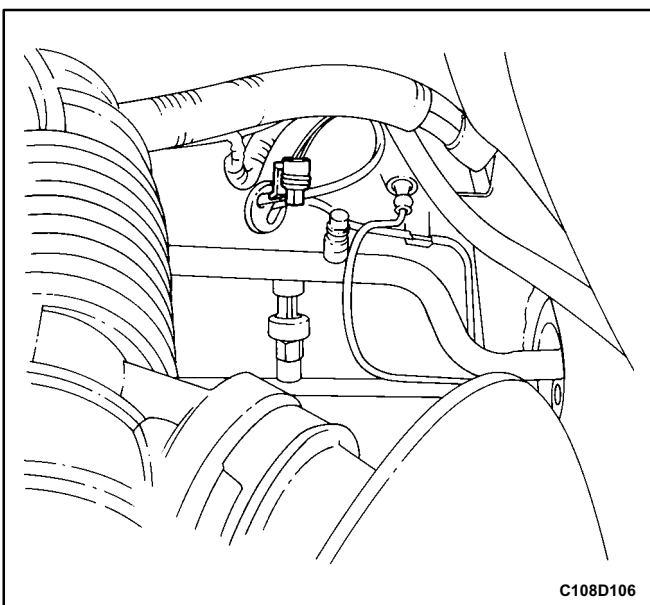
Tighten

Tighten the high-pressure pipe to receiver-dryer connecting block nut to 10 N•m (89 lb•in).

4. Install the the high pressure pipe to evaporator flange connecting block nut.

Tighten

Tighten the high-pressure pipe to evaporator flange connecting block nut to 10 N•m (89 lb•in).



C108D106

5. Install the bolts which secure the clamps that hold the high-pressure pipe to the vehicle.

Tighten

Tighten the clamp bolts to 4 N•m (35 lb•in).

6. Connect the electrical connector to the pressure transducer.
7. 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•).

8. Connect the negative battery cable.
9. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.

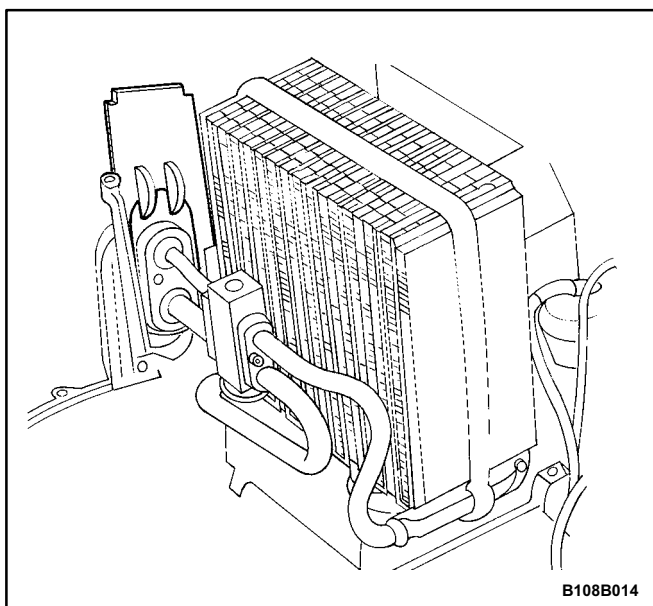
HEATER CORE

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the heater/air distributor case assembly. Refer to "Heater/Air Distributor Case Assembly" in this section.
3. Remove the heater core from the case. Refer to *Section 7A, Heating and Ventilation System*.

Installation Procedure

1. Install the heater core into the case. Refer to *Section 7A, Heating and Ventilation System*.
2. Install the heater/air distributor case assembly. Refer to „Heater/Air Distributor Case Assembly” in this section.
3. Fill the cooling system. Refer to *Section 1D, Engine Cooling*.
4. Connect the negative battery cable.
5. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.

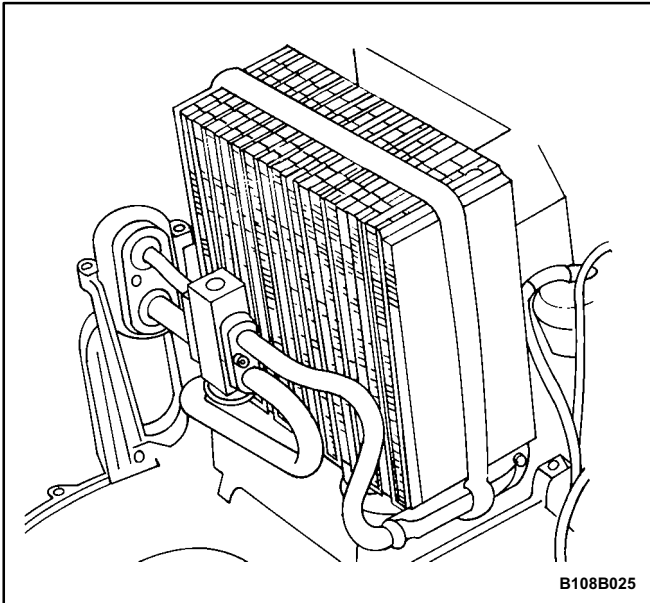


EVAPORATOR CORE

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

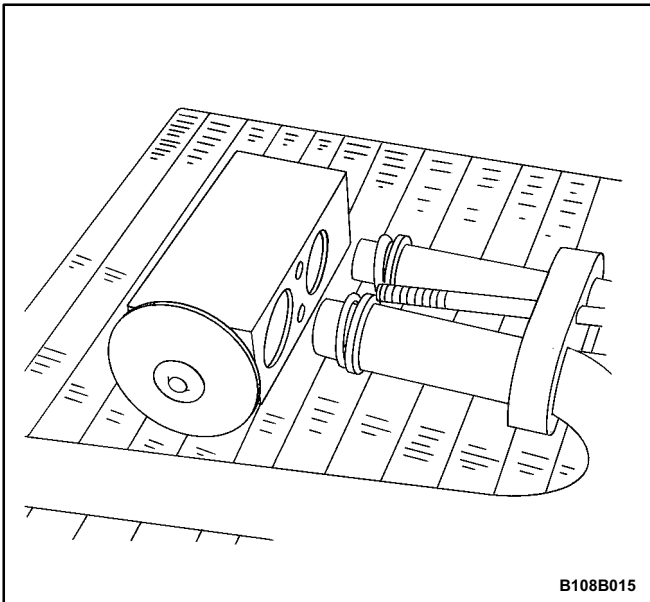
Removal Procedure

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 distributor case assembly. Refer to „Heater/Air Distributor Case” in this section.
4. Remove the screws that secure the evaporator case halves.
5. Remove the evaporator core case cover.
6. Slide the evaporator flange support plate upward to facilitate removal of the evaporator.



B108B025

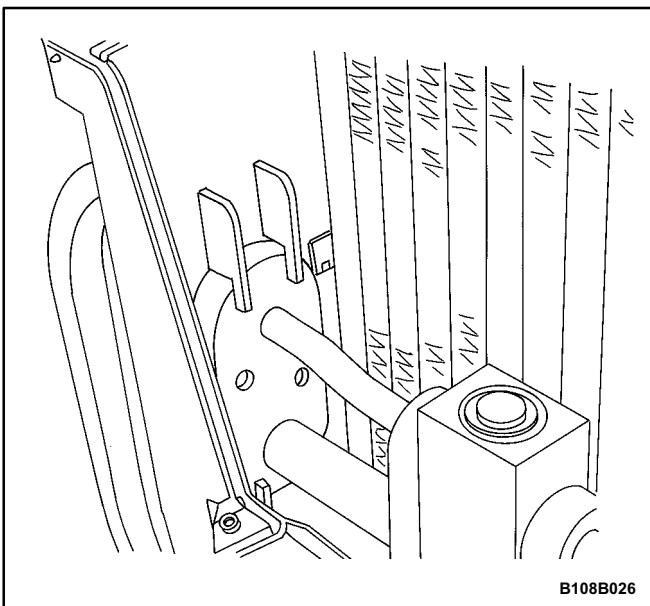
7. Remove the evaporator core from the case.
8. Remove the air conditioning (A/C) expansion valve. Refer to „A/C Expansion Valve” in this section.



B108B015

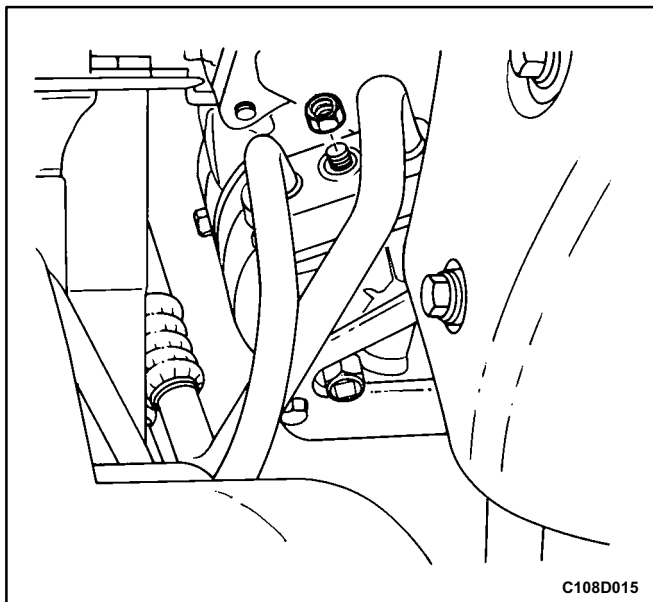
Installation Procedure

1. Install the Orings onto the evaporator tubes.
2. Install the A/C expansion valve. Refer to „A/C Expansion Valve” in this section.



B108B026

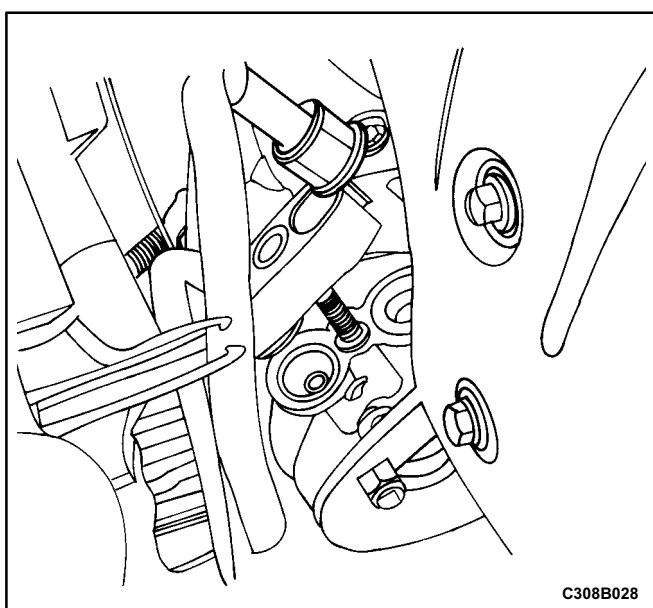
3. Install the evaporator core into the case. Center the evaporator flange in the case opening.
4. Assemble the evaporator case halves with the screws.
5. Install the heater/air distributor case. Refer to „Heater/Air Distributor Case” in this section.
6. Install the instrument panel carrier assembly. Refer to *Section 9E, Instrumentation/Driver Information*.
7. Connect the negative battery cable.
8. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.



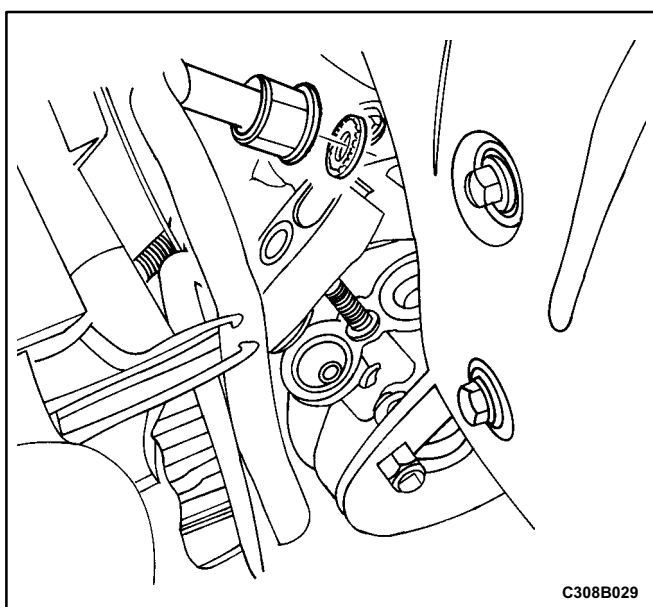
A/C SUCTION HOSE ASSEMBLY

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 air cleaner housing assembly mounting screws.
4. Remove the air cleaner housing.
5. Remove the retaining nut from the hose connecting block and disconnect the air conditioning (A/C) hose assembly connector block at the top rear of the compressor. Discard the sealing washers.
6. Cap all of the openings to prevent contamination.



7. Remove the suction hose support clamp bolt and the clamp along the left side of the engine compartment fender well.
8. Remove the suction hose support clamp nut and the clamp on the left side strut tower.
9. Remove the evaporator flange connecting block retaining nut and disconnect the A/C suction hose at the fire wall evaporator flange connecting block. Discard the O-ring seal.
10. Remove the A/C suction hose.
11. Cap the opening to the evaporator flange to prevent contamination.



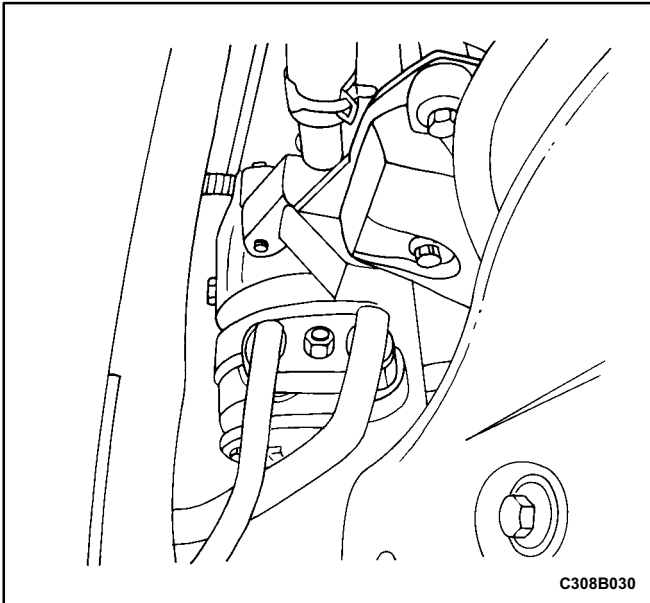
Installation Procedure

1. Install a new O-ring seal onto the suction hose end at the evaporator flange.
2. Position the hose assembly and the support clamp in place in the vehicle.
3. Insert the suction hose end into the evaporator flange.
4. Install the evaporator flange connecting block retaining nuts.

Tighten

Tighten the suction hose connecting block retaining nuts to 10 N•m (89 lb•in).

5. 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.



6. Mate the discharge hose connecting block to the compressor. Hold it in place while tightening the retaining nut.

Tighten

Tighten the discharge hose connecting block to compressor retaining nut to 33 N•m (24 lb•ft).

7. Install the suction hose support clamp on the left-side strut tower and tighten the support clamp retaining nut.

Tighten

Tighten the suction hose support clamp retaining nut to 5 N•m (44 lb•in).

8. Install the suction hose support clamp along the left side of the engine compartment fender well.

Tighten

Tighten the suction hose support clamp retaining bolt to 5 N•m (44 lb•in).

9. Install the air cleaner housing assembly.
 - Seat the housing in its place with the pickup tube in the hole provided.
 - Install the bolts that secure the housing.

Tighten

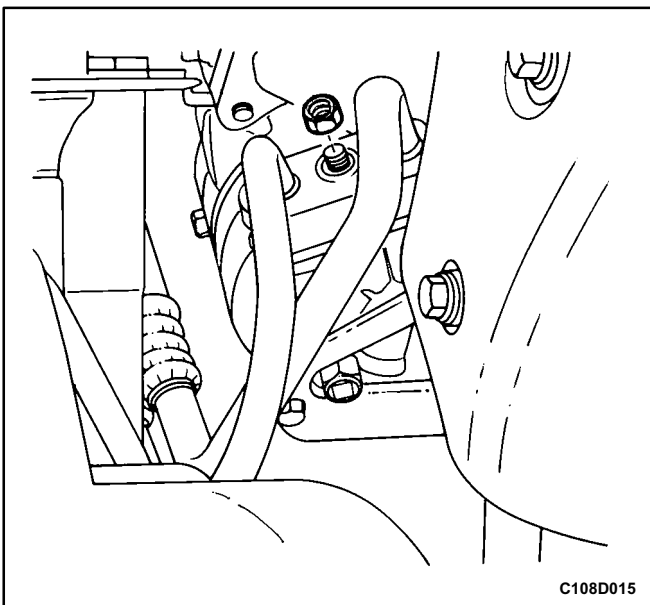
Tighten the air cleaner housing assembly retaining bolts to 12 N•m (106 lb•).

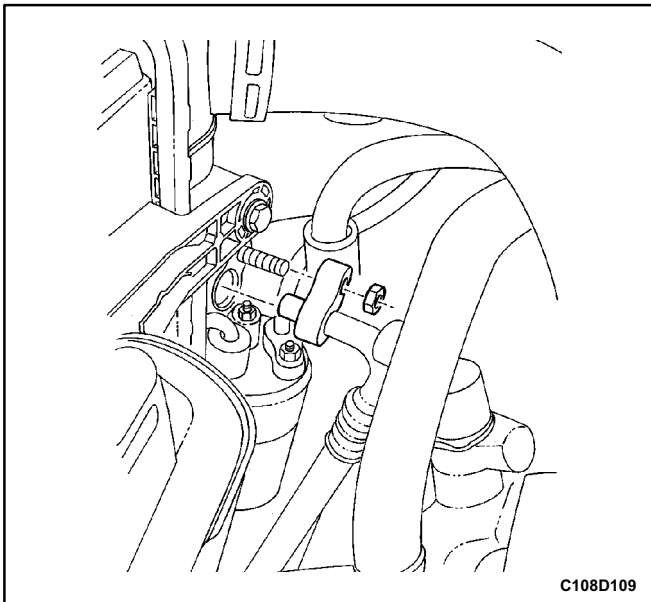
10. Connect the negative battery cable.
11. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.

A/C DISCHARGE HOSE - COMPRESSOR TO CONDENSER

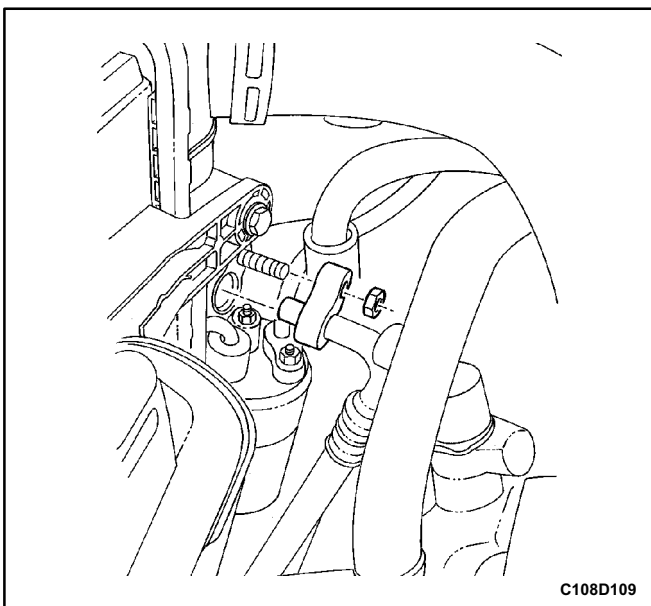
Removal Procedure

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 at the compressor hose connecting block.





4. Remove the nut at the condenser connecting block.
5. Remove the hose from the vehicle.

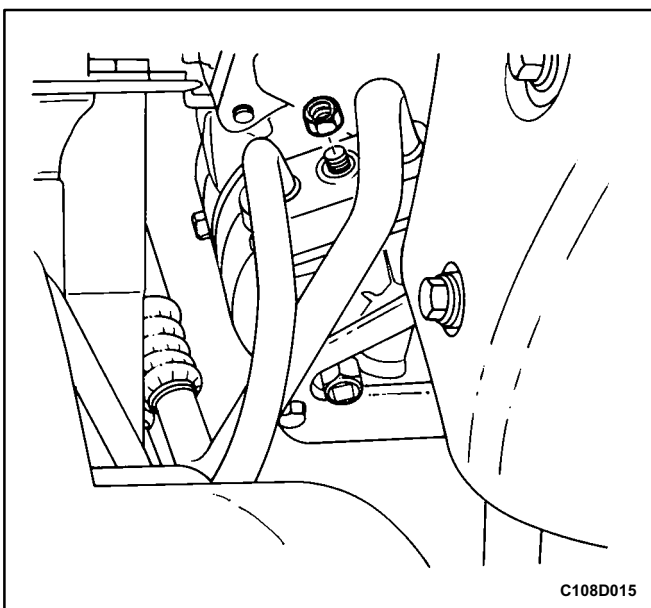


Installation Procedure

1. Install new sealing washers at the compressor connecting block end and a new O-ring at the condenser connecting block end.
2. Position the hose into the vehicle, and install the nut at the condenser connecting block.

Tighten

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

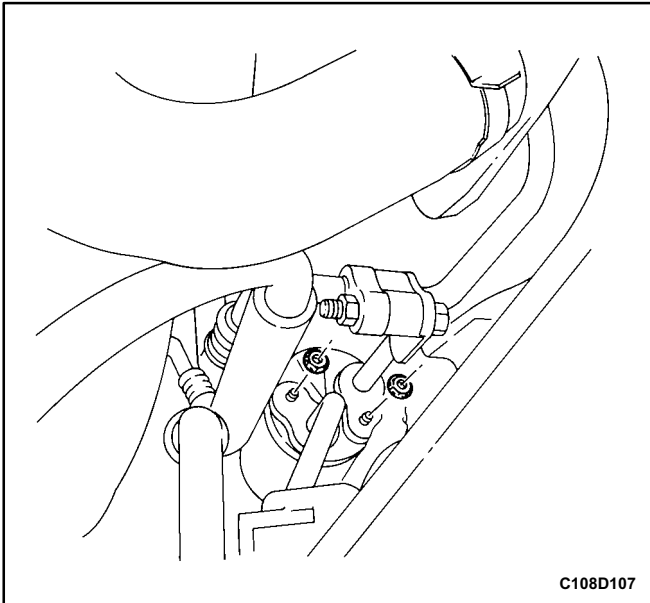


3. Mate the hose connecting the connecting block to the compressor, and install the retaining nut.

Tighten

Tighten the discharge hose connecting block to compressor retaining nut to 33 N•m (24 lb•ft).

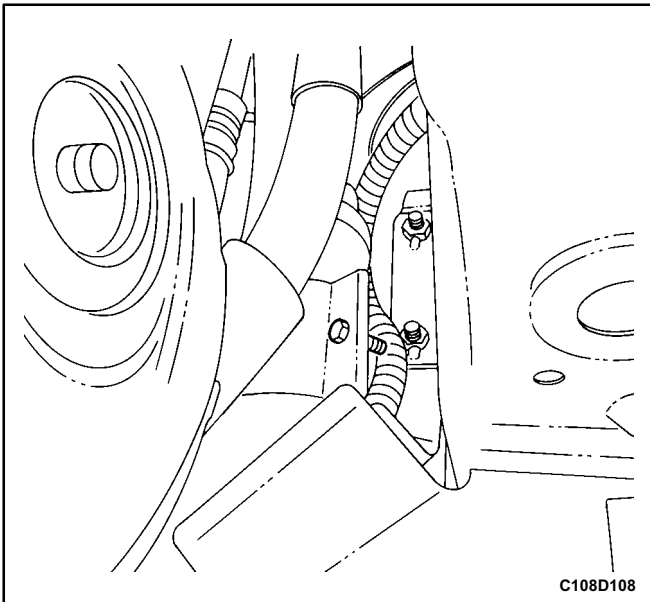
4. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section,
5. Connect the negative battery cable.



RECEIVER-DRYER

Removal Procedure

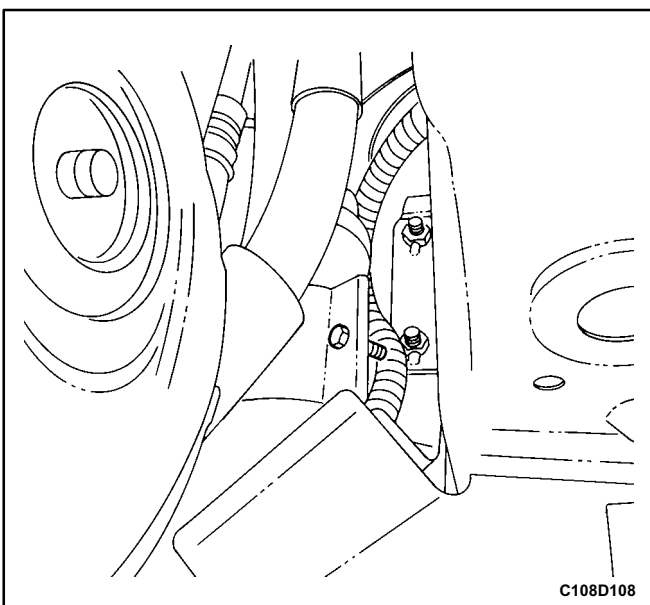
1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.
3. Remove the high-pressure pipe to receiver-dryer connecting block nut and remove the pipe from the receiver-dryer.
4. Remove the receiver-dryer to condenser pipe nut.



5. Loosen the bolt that secures the receiver-dryer band clamp.

Notice: Hold the receiver-dryer to condenser pipe to support it so that the pipe is not damaged while being removed from the receiver-dryer.

6. Remove the receiver-dryer by sliding it down and out of the band clamp.
7. Cap all open connections to prevent contamination.
8. Drain the oil from the receiver-dryer into a graduated container. Record the amount of oil drained.
9. Discard the used oil.



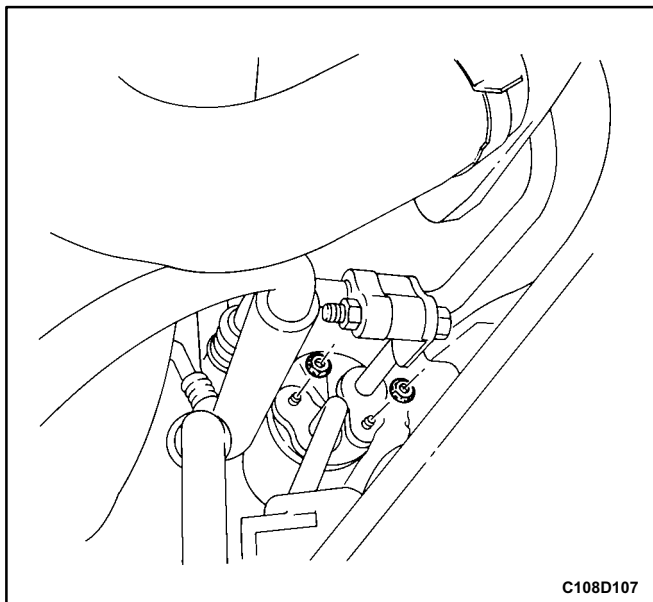
Installation Procedure

Important: Do not uncap the new receiver-dryer until just prior to installation.

1. Add the new oil to the new receiver-dryer. Use the exact amount of oil that you drained from the old receiver-dryer.
2. Install new O-rings onto the two pipes that connect to the receiver-dryer.
3. Install the receiver-dryer into the band clamp. Support the receiver-dryer to condenser pipe while pushing the receiver-dryer upward until the pipe is fully installed.
4. Tighten the bolt on the band clamp.

Tighten

Tighten the band clamp bolt to 5 N•m (44 lb•in).



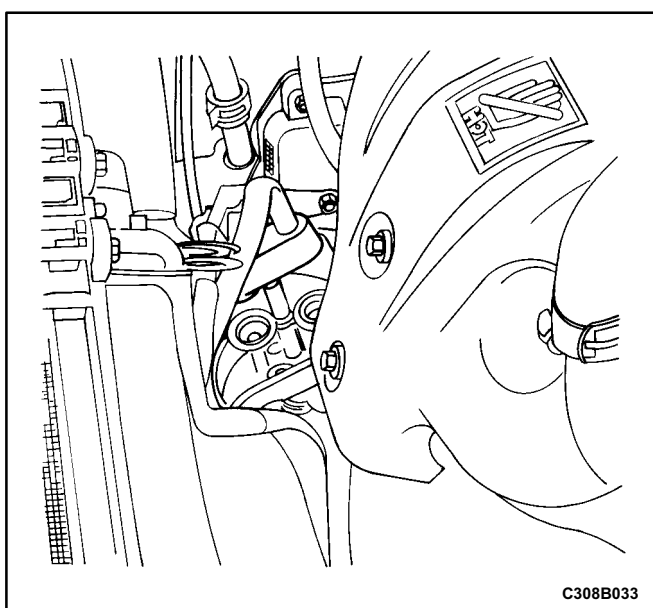
C108D107

5. Install the high-pressure pipe into the receiver-dryer.
6. Install the high-pressure pipe to receiver-dryer connecting block nut.

Tighten

Tighten the high-pressure pipe to receiver-dryer connecting block nut and the receiver-dryer to condenser pipe nut to 10 N•m (89 lb•in).

7. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.

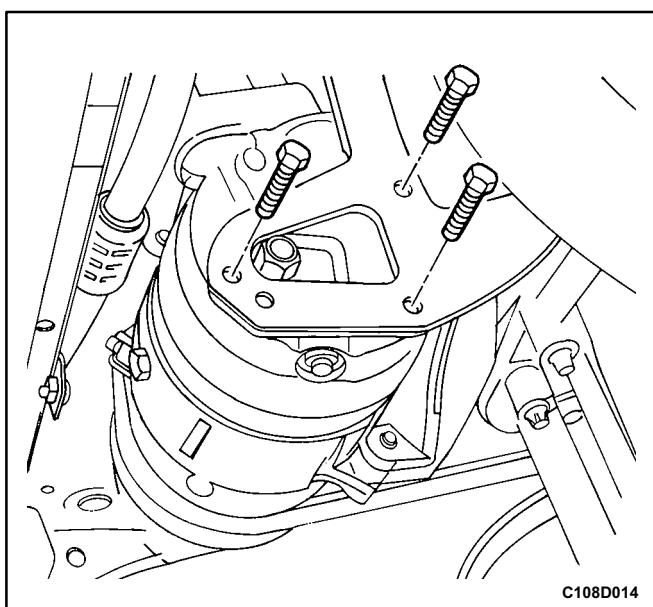


C308B033

COMPRESSOR

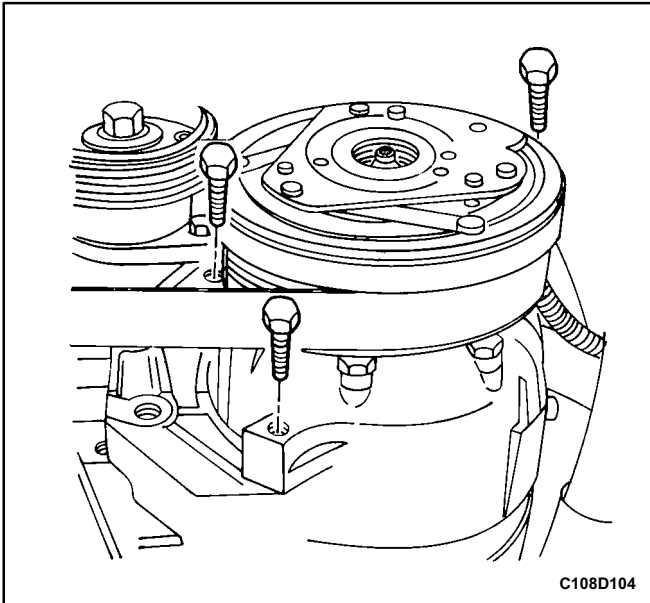
Removal Procedure

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 discharge hose mounting nut.
4. Lift the discharge hose mounting block and the suction hose from the compressor.



C108D014

5. Raise and suitably support the vehicle.
6. Disconnect the electrical connector at the compressor.
7. Remove the drive belt and the idler pulley. Refer to *Section 6B, Power Steering Pump*.
8. Remove the front and the rear compressor to bracket bolts.
9. Remove the compressor.
10. Drain the oil from the compressor into a container. Measure the amount of the oil that is drained. Then discard the used oil.



Installation Procedure

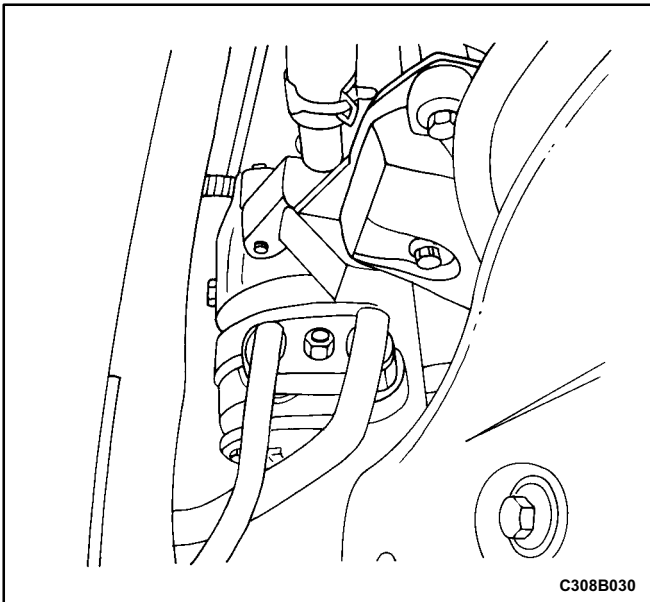
1. Add oil to the new compressor. Use the exact amount of oil that you drained from the old compressor.
2. Install the compressor.
3. Install the compressor to bracket mounting bolts.

Tighten

Tighten the front compressor to bracket mounting bolts to 35 N•m (26 lb•ft).

Tighten the rear compressor to bracket mounting bolts to 20 N•m (15 lb•ft).

4. Install the idler pulley and the serpentine accessory drive belt. Refer to *Section 6B, Power Steering Pump*.

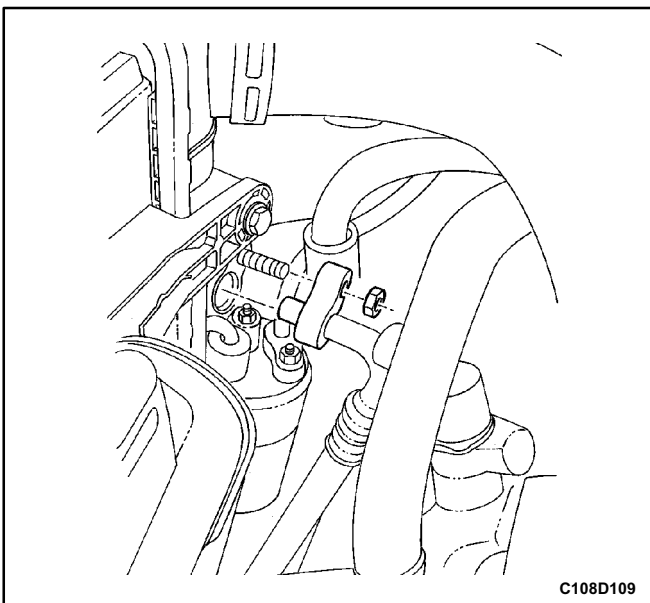


5. Install new sealing washers to the suction hose and the discharge hose mounting.
6. Connect the electrical connector at the compressor.
7. Lower the vehicle.
8. Place the suction hose into its cavity in the compressor and install the discharge hose mounting block to clamp it into place. Hold this all together while tightening the retaining nut.

Tighten

Tighten the discharge hose connecting block to compressor retaining nut to 33 N•m (24 lb•ft).

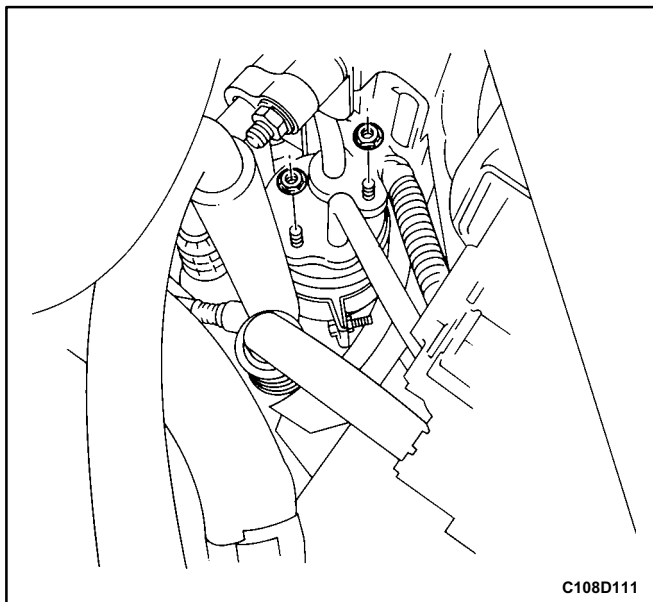
9. Connect the negative battery cable.
10. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.



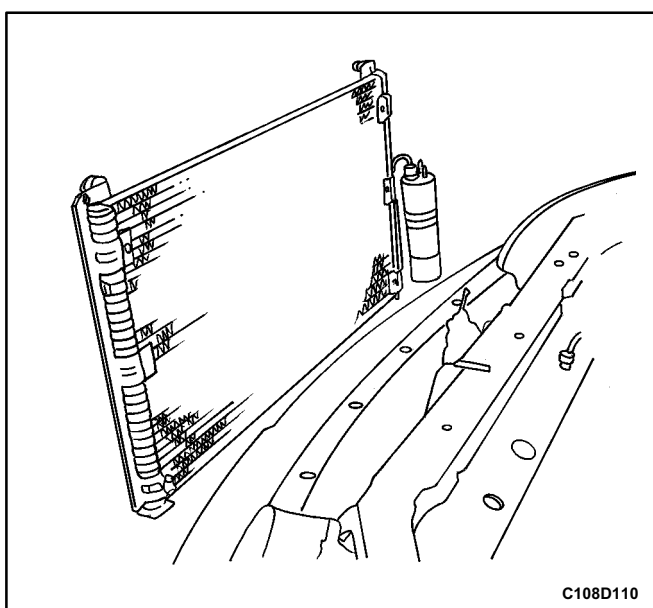
CONDENSER

Removal Procedure

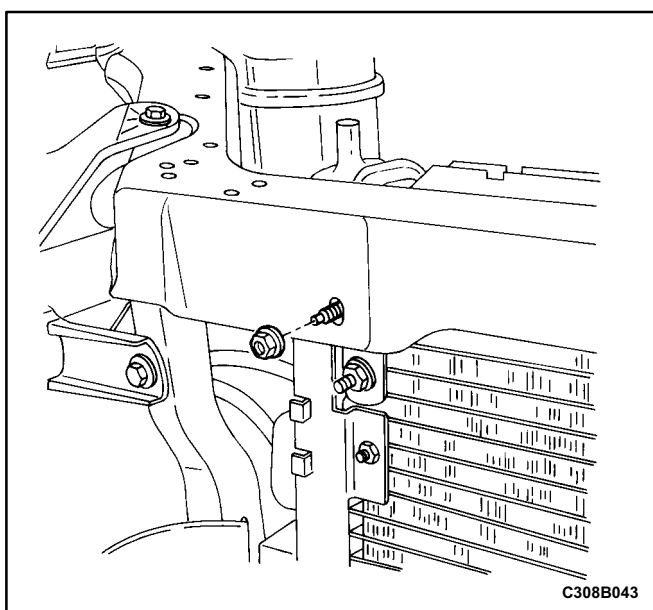
1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.
3. Remove the radiator. Refer to *Section 1D, Engine Cooling*.
4. Remove the discharge hose connecting block to condenser retaining nut.
5. Remove the hose from the condenser.



6. Remove the high pressure pipe to receiver-dryer connecting block nut.
7. Remove the pipe from the receiver-dryer.



8. Remove the upper condenser mount nuts.
9. Tilt the condenser to the rear, away from the radiator mount support.
10. Lift the condenser up and out of the engine compartment.
11. Cap all the open lines and the fittings to prevent contamination.

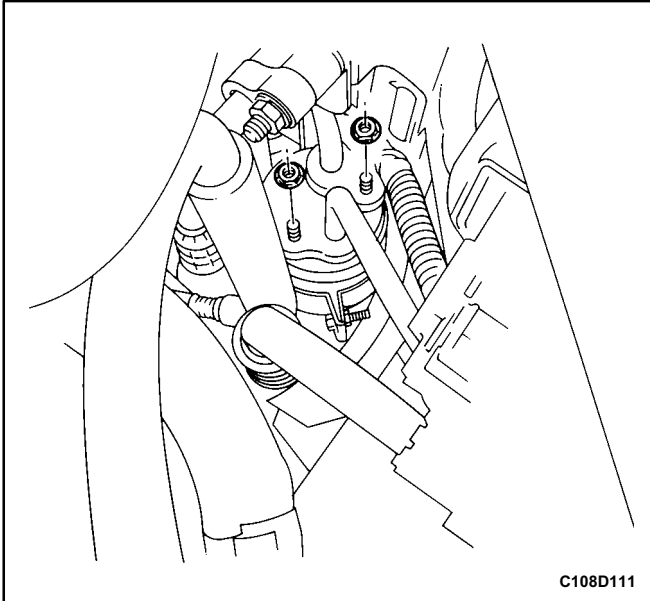


Installation Procedure

1. Make sure the condenser rubber mounts are in place.
2. Install the condenser into the vehicle. The lower mount shock protectors must fit into the holes provided.
3. Move the condenser forward into the radiator support mount holes.
4. Install the upper condenser mount nuts and the washers.

Tighten

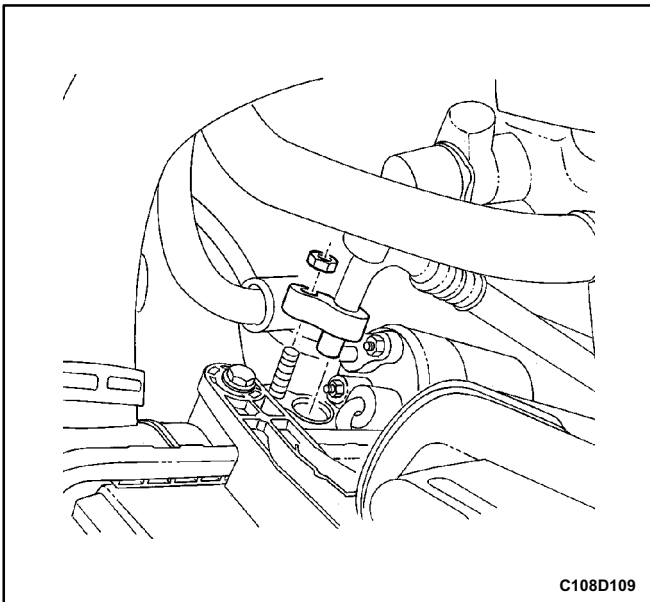
Tighten the upper condenser mount nuts to 4 N•m (35 lb•in).



5. Install a new O-ring onto the high-pressure pipe mounting block fitting on the receiver-dryer.
6. Install the high-pressure pipe into the receiver-dryer.
7. Install the high-pressure pipe to receiver-dryer connecting block nut.

Tighten

Tighten the high-pressure pipe to receiver-dryer connecting block nut to 10 N•m (89 lb•in).



8. Install a new O-ring onto the discharge hose connecting block fitting.
9. Install the discharge hose fitting into the condenser.
10. Install the discharge hose connecting block to condenser retaining nut at the condenser connecting block.

Tighten

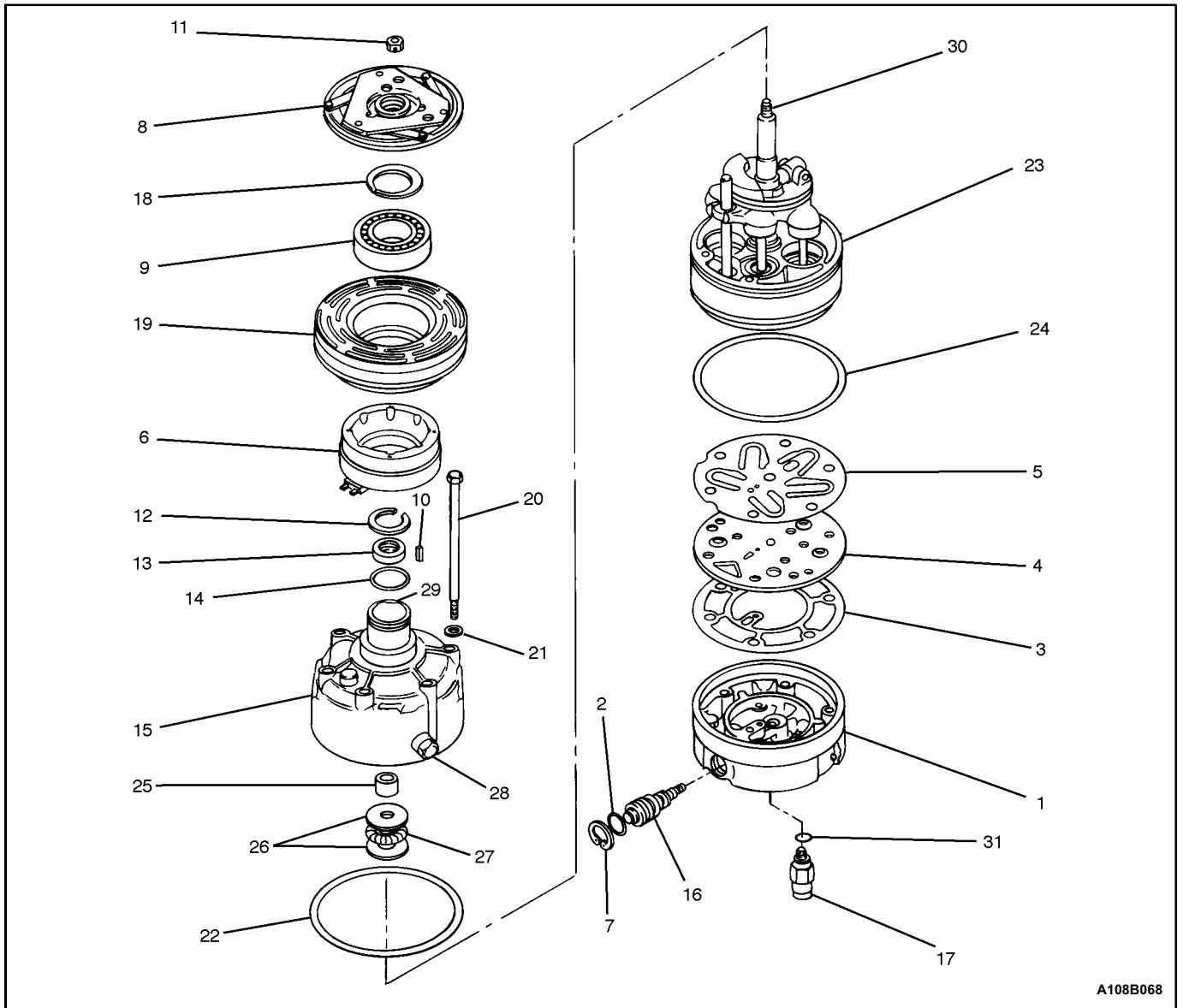
Tighten the discharge hose connecting block to condenser nut to 16 N•m (12 lb•ft).

11. Install the radiator. Refer to *Section 1D, Engine Cooling*.
12. Evacuate and recharge the A/C system. Refer to „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.
13. Connect the negative battery cable.
14. Operate the HVAC control to verify the proper function of the heating and cooling systems.

UNIT REPAIR

COMPONENT LOCATOR

V5 COMPRESSOR



A108B068

- | | |
|-----------------------------|--|
| 1 Rear Head Compressor | 17 Pressure Relief Valve |
| 2 Control Valve O-Ring | 18 Pulley Bearing to Head Retaining Ring |
| 3 Rear Head Gasket | 19 Rotor Pulley |
| 4 Valve Plate | 20 Through Bolt |
| 5 Suction Reed | 21 Through Gasket |
| 6 Clutch Coil | 22 Compressor Housing to Cylinder O-Ring |
| 7 Retaining Ring | 23 Shaft and Guide Pin Assembly Cylinder |
| 8 Drive Plate Clutch | 24 Rear Head O-Ring |
| 9 Pulley Bearing | 25 Thrust Washer |
| 10 Clutch Hub Key | 26 Race |
| 11 Shaft Nut | 27 Bearing |
| 12 Seal Retaining Ring | 28 Oil Drain Plug |
| 13 Shaft Lip Seal | 29 Clutch and Hub Keyway |
| 14 Shaft Seal O-Ring | 30 Compressor Shaft |
| 15 Compressor Housing | 31 Pressure Relief Valve O-Ring |
| 16 Compressor Control Valve | |

V5 AIR CONDITIONING COMPRESSOR OVERHAUL

CLUTCH PLATE AND HUB ASSEMBLY

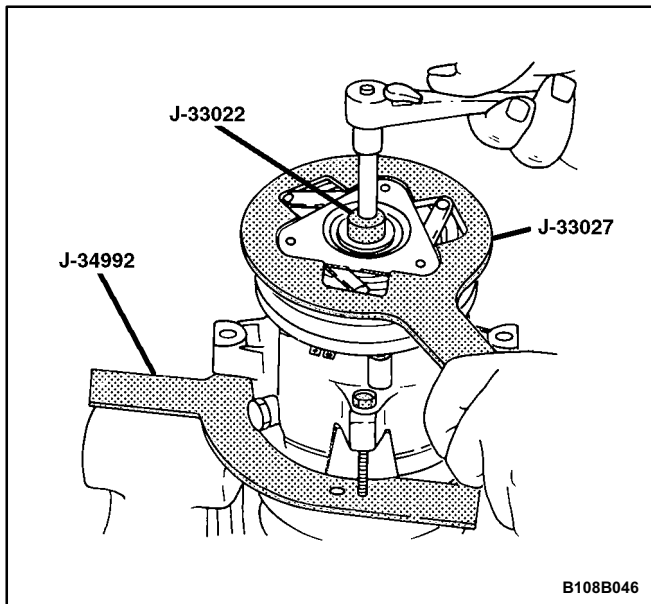
Tools Required

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

J-33022 Shaft Nut Socket

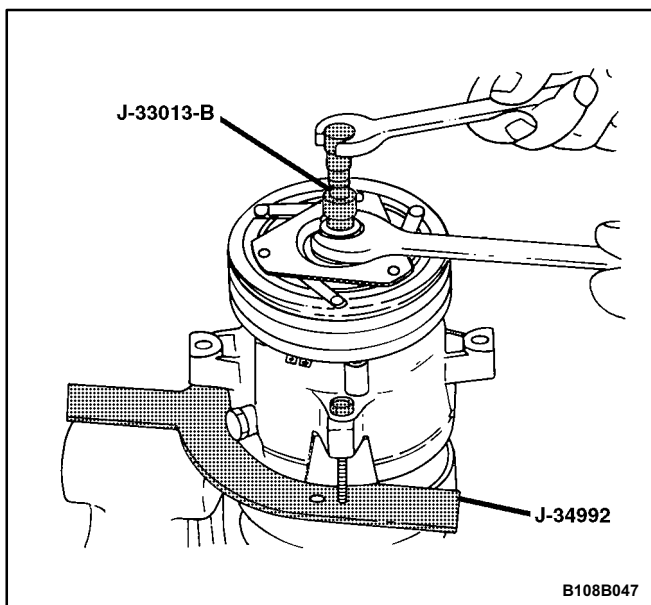
J-33027 Clutch Hub Holding Tool

J-34992 Compressor Holding Fixture

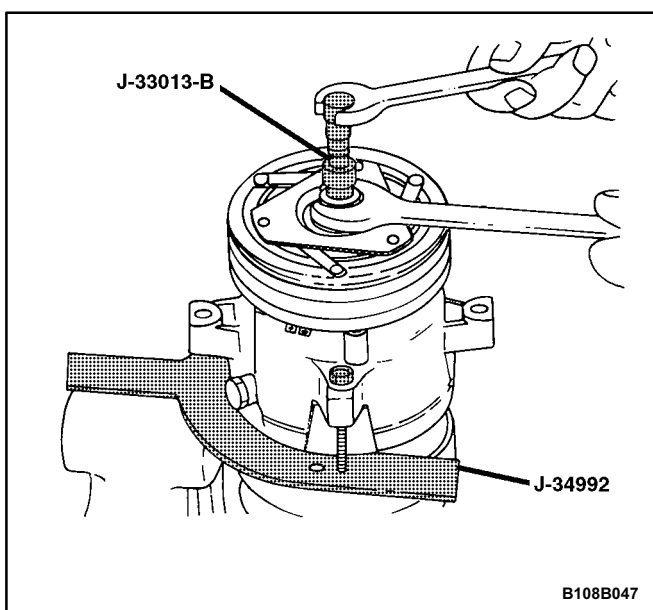
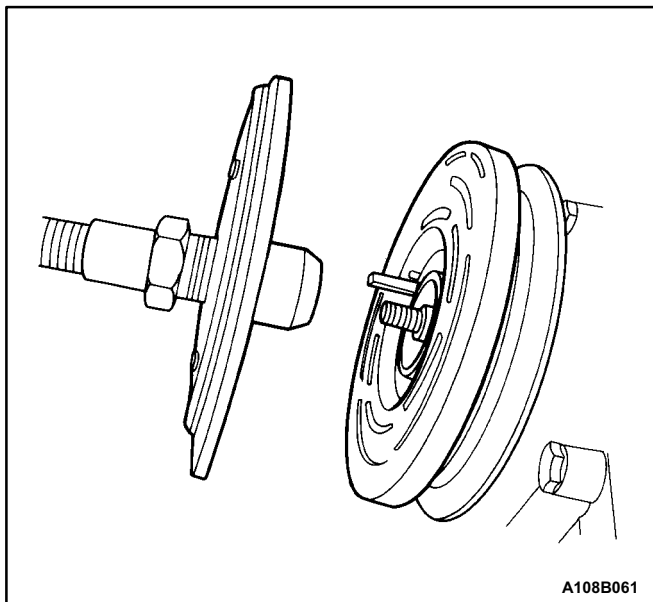


Disassembly Procedure

1. Remove the compressor. Refer to „Compressor” in this section.
2. Install the compressor holding fixture J-34992 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.
4. Remove the shaft nut using the shaft nut socket J-33022.



5. 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.
6. 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.

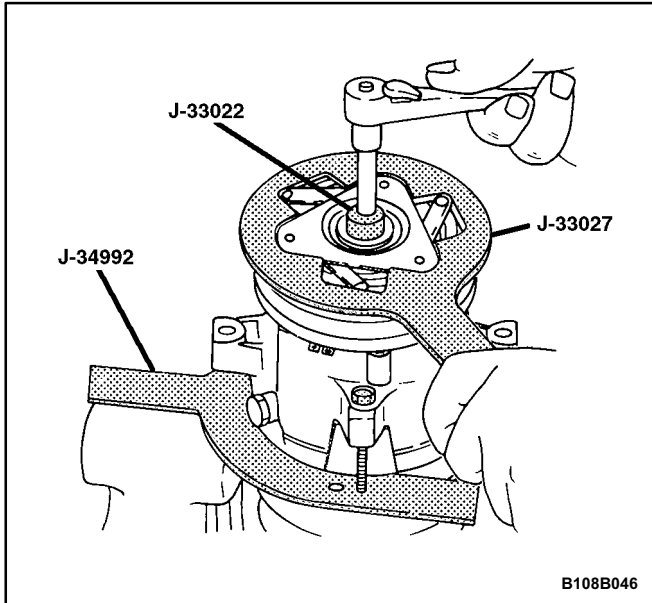
Notice: Do not drive or pound on the clutch hub or the shaft. Internal damage to the compressor may result.

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.

Notice: 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

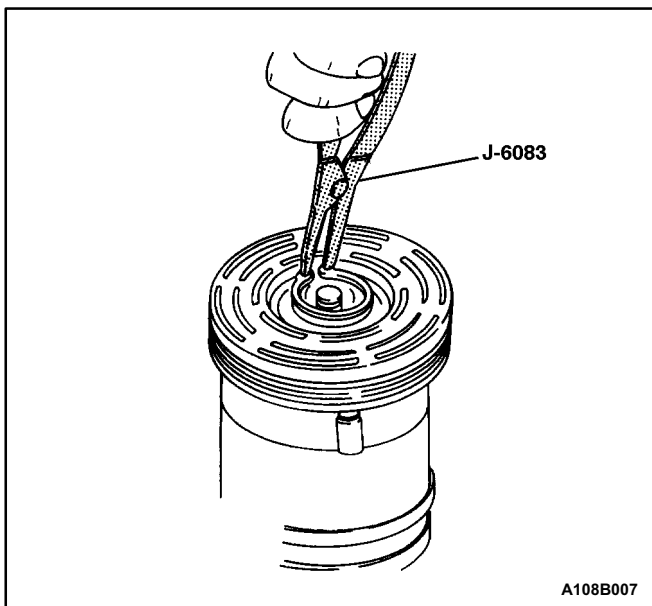
Tighten the clutch plate and hub assembly retaining nut to 17 N•m (13 lb•ft).

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 bench vise and remove the J-34992 compressor holding fixture from the compressor.
12. Install the compressor. Refer to „Compressor” in this section.

CLUTCH ROTOR AND BEARING

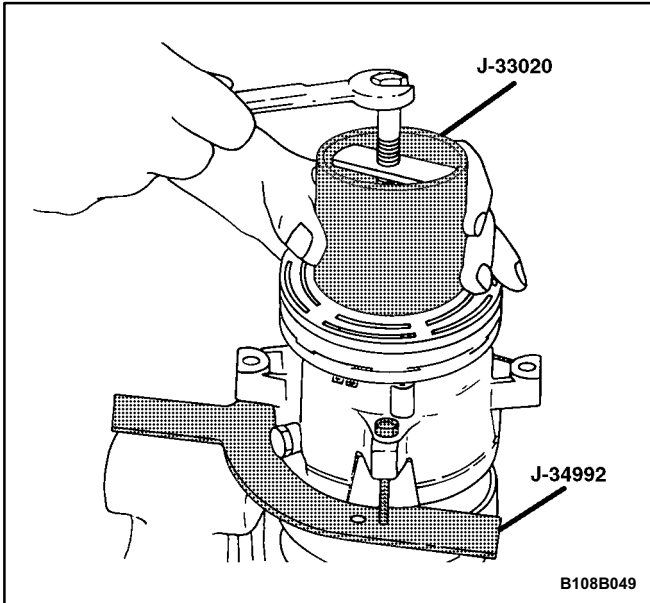
Tools Required

- 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 Installer
- J-8433-1 Puller Crossbar
- J-34992 Compressor Holding Fixture
- J-8092 Driver Handle
- J-8433-3 Forcing Screw

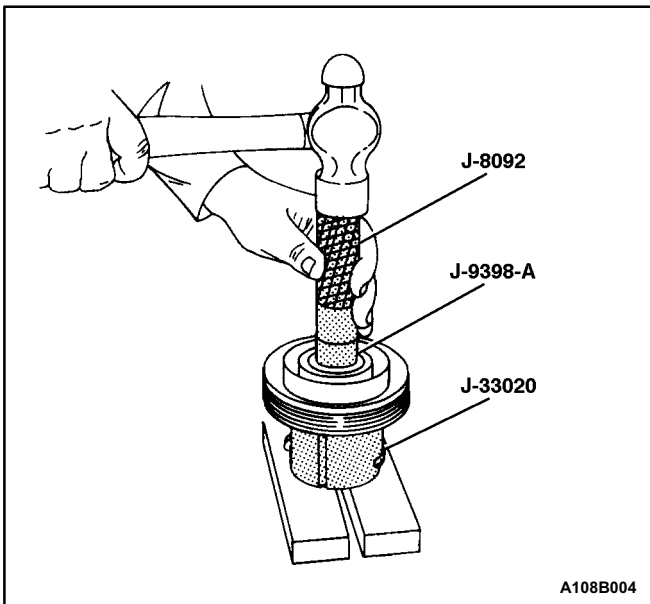


Disassembly Procedure

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 hub assembly. Refer to „Clutch Plate and Hub Assembly” in this section.
5. Remove the pulley rotor and bearing assembly retaining ring using the snap ring pliers J6083.



6. With the compressor mounted to the compressor holding fixture J-34992, 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 puller 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 bearing assembly.

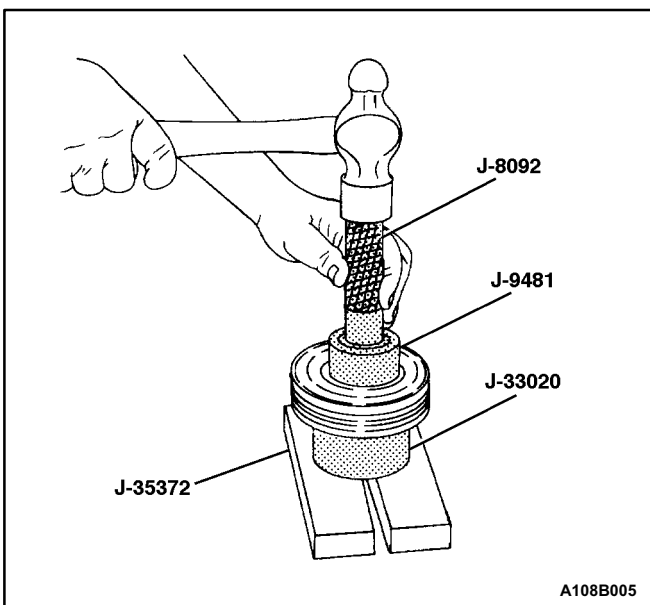


Notice: The rotor hub must be properly supported to prevent damage to the pulley rotor during bearing removal.

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.

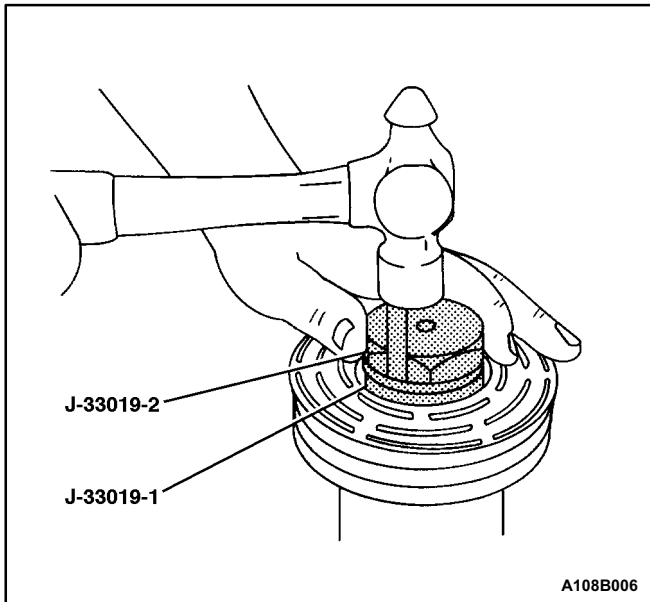
9. Drive the bearing out of the rotor hub with the bearing remover J-9398-A and the driver handle J-8092.



Installation Procedure

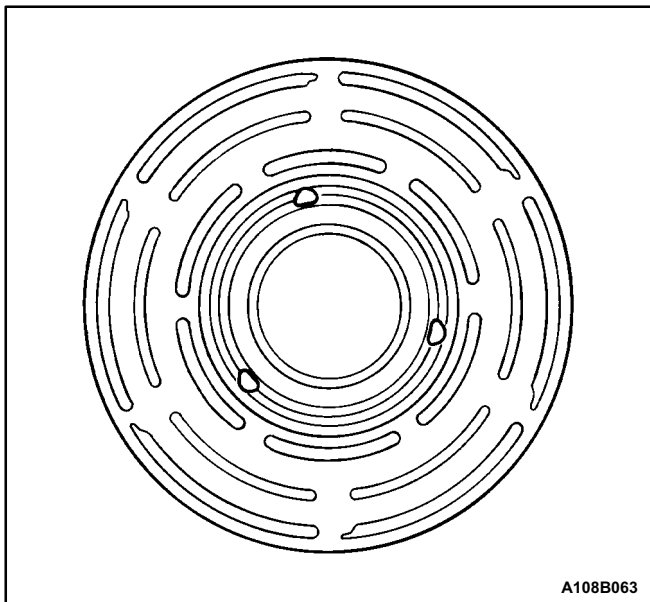
Notice: Do not support the rotor by resting the pulley rim on a flat surface during the bearing installation or the rotor face could be damaged.

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.

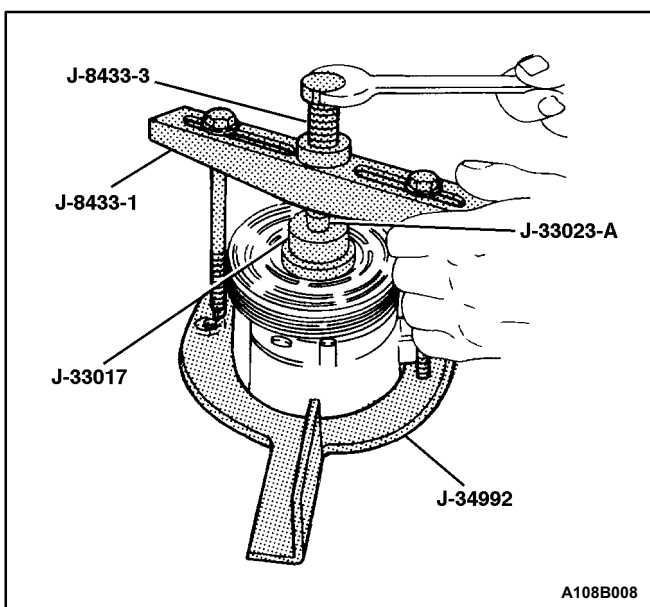


- Place the bearing staking guide J-33019-1 and the bearing staking pin J-33019-2 in the rotor hub core. Shift the rotor and bearing assembly on the block to give full support to the hub under the staking pin. A heavy duty rubber band may be used to hold the staking tool pin in the guide. The pin should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

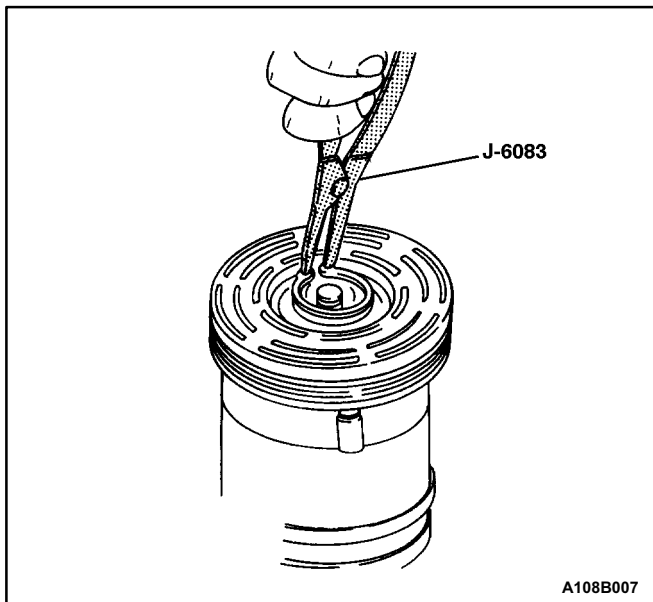
Caution: When striking the pin with a hammer, take care to avoid personal injury.



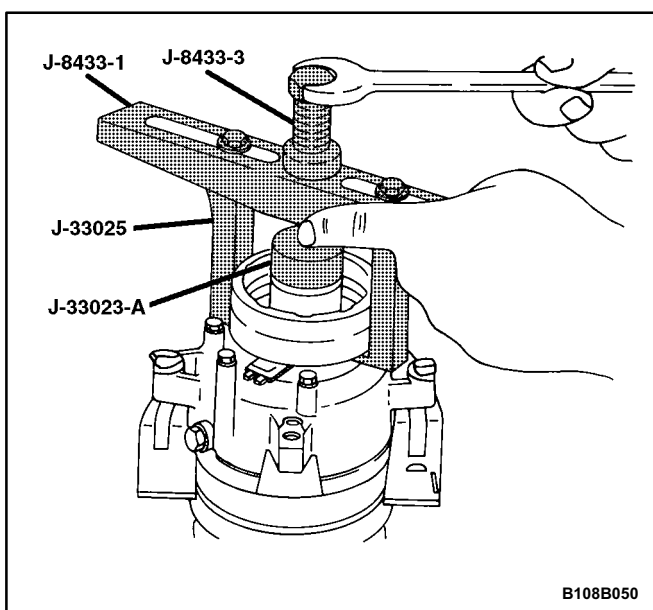
- Strike the pin with a hammer until a metal stake, similar to the original, is formed down to, but not touching, the bearing. The metal stake should not contact the outer race of the bearing to avoid the possibility of distorting the outer race. Stake in three places 120 degrees apart.



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



9. Install the rotor and bearing assembly retainer ring using the snap ring pliers J-6083.
10. Reinstall the clutch drive plate and hub assembly. Refer to „Clutch 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 Procedures for A/C System” in this section.



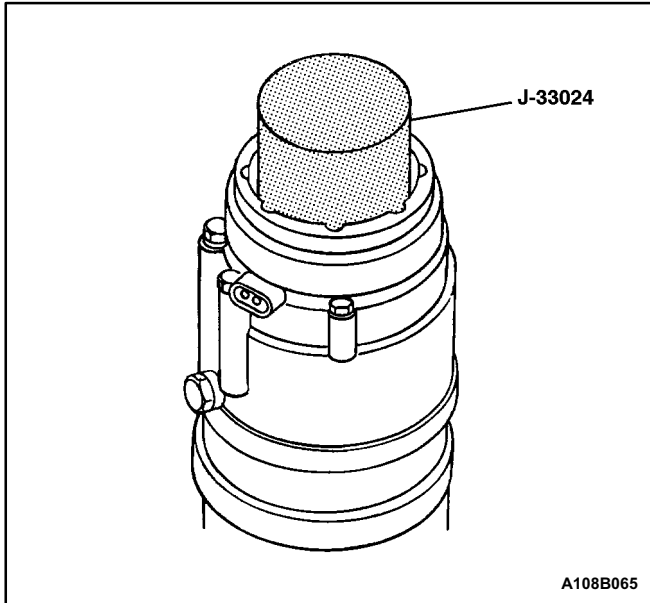
CLUTCH COIL

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

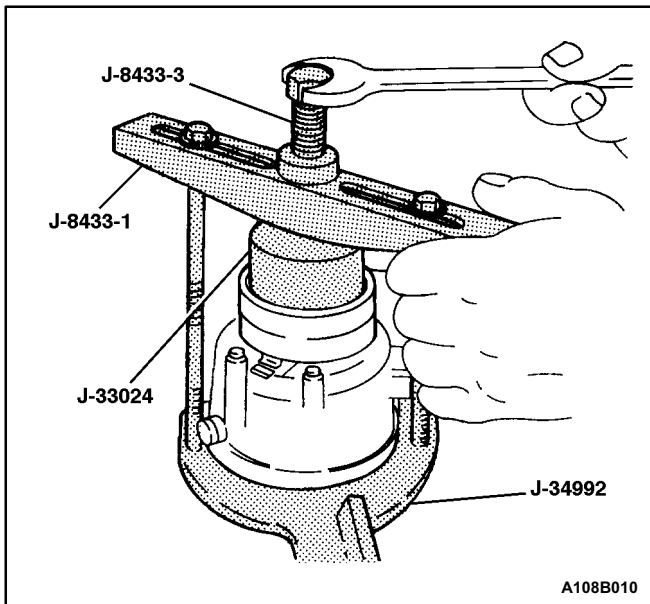
Removal Procedure

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 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 cross bar 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.



Installation Procedure

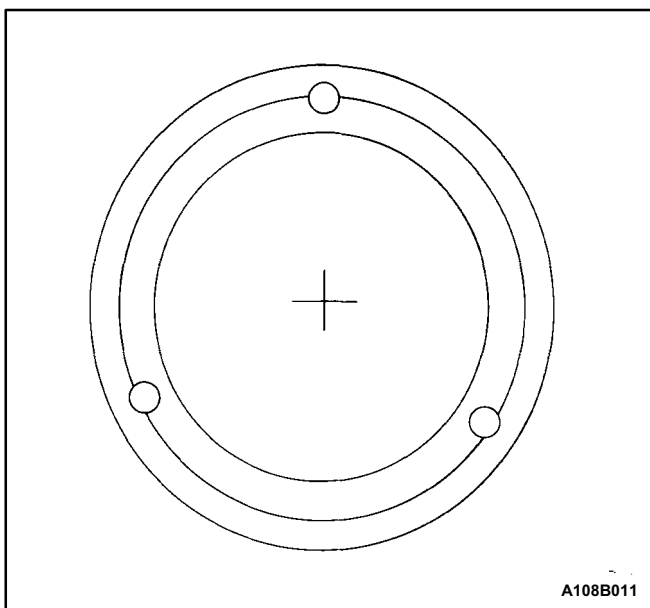
1. Place the clutch coil assembly on the compressor housing with the terminals positioned at the „marked” location.
2. Place the clutch coil installer adapter J-33024 over the internal opening of the clutch coil housing and align the clutch coil installer adapter J-33024 with the compressor housing.



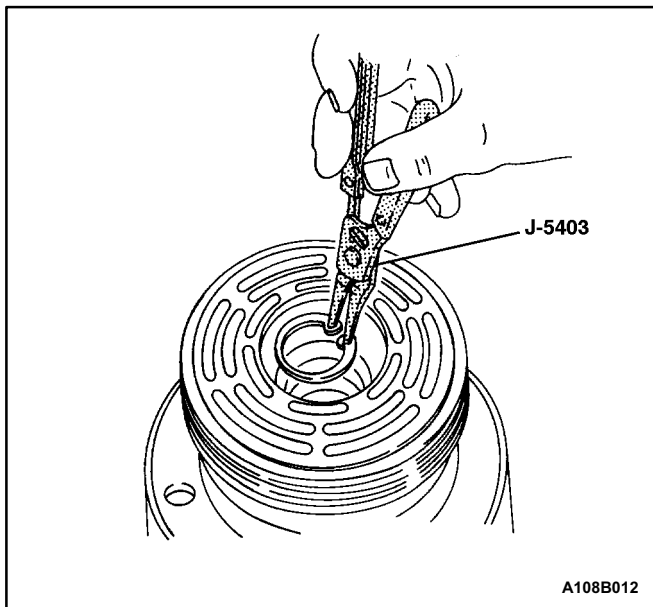
3. Center the puller crossbar J-8433-1 in the countersunk center hole of the clutch coil installer adapter J-33024. Install the throughbolts of the compressor holding fixture J-34992 and the washers in the crossbar slots. Thread them into the holding fixture to the full thickness of the holding fixture.

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

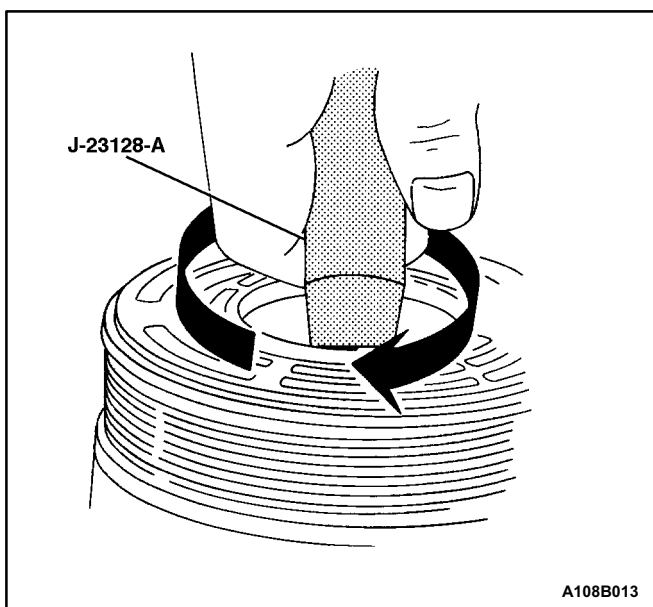
- J-5403 Snap Ring Pliers
- J-9553-1 O-Ring Remover
- J-23128-A Seal Seat Remover/Installer
- J-33011 O-Ring Installer
- J-34614 Shaft Seal Protector

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 receiverdryer 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 „Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System” in this section.

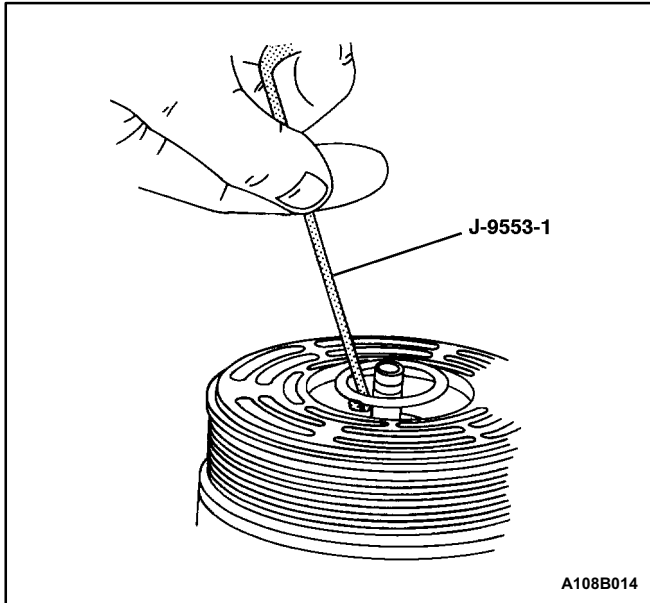
Removal Procedure

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. 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.

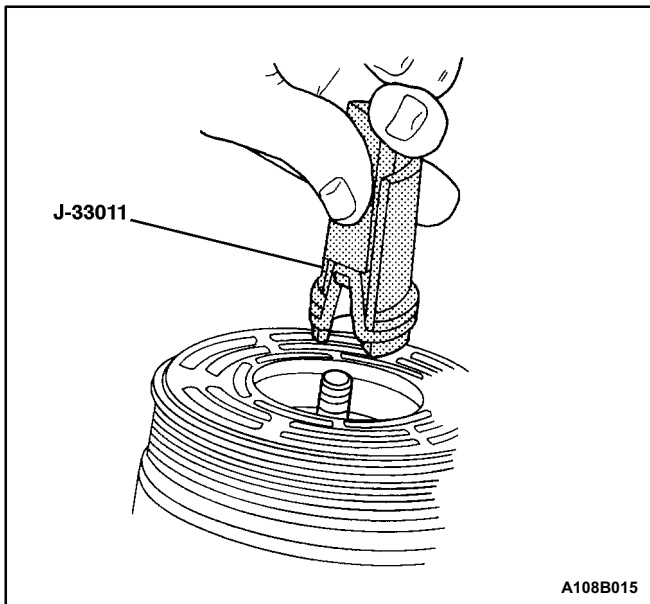


Notice: Any dirt or foreign material that enters the compressor may cause damage.

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 handtightened securely. Do not use a wrench or pliers to tighten the handle.



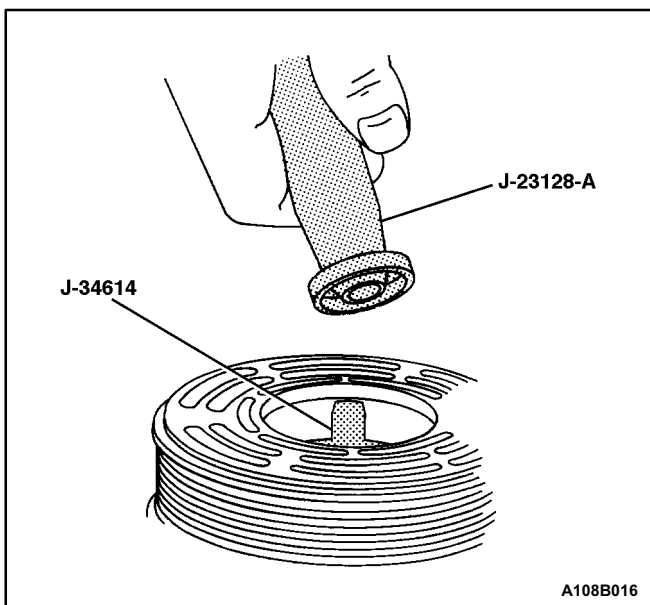
8. Remove and discard the O-ring from the compressor neck using the O-ring remover J-9553-1.
9. Thoroughly clean the seal O-ring groove in the compressor housing.
10. Inspect the shaft and the inside of the compressor housing neck for dirt or foreign material. These parts must be perfectly clean before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



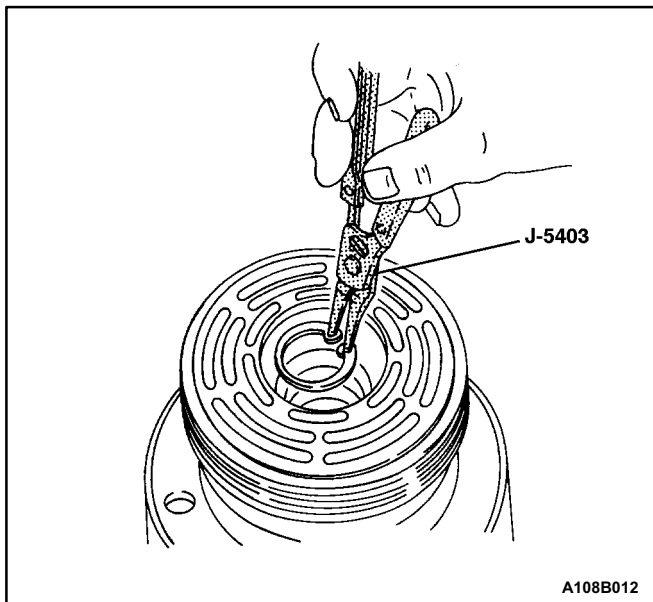
Installation Procedure

Notice: 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.

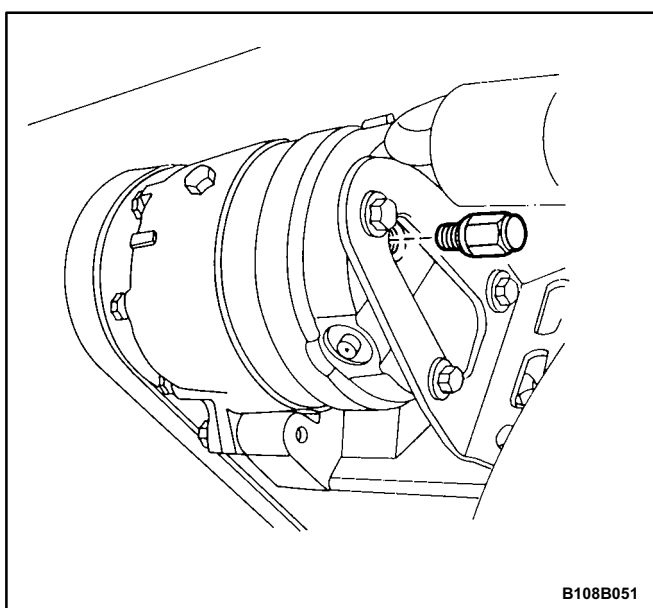
1. Dip the new seal O-ring in clean polyalkaline glycol (PAG) refrigerant oil and assemble the O-ring onto the O-ring installer J-33011.
2. Insert the O-ring installer J-33011 into the compressor neck until the installer „bottoms.” Lower the moveable slide of the O-ring installer J-33011 to release the 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.



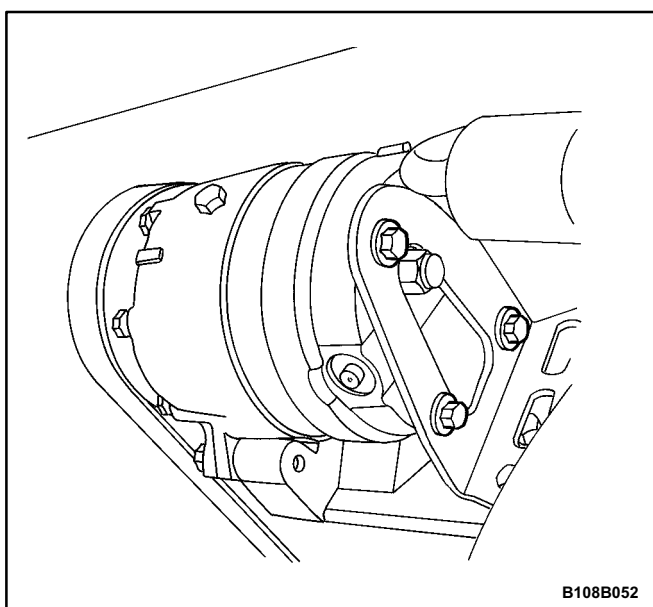
5. Use the snap ring pliers J-5403 to install the shaft seal retaining ring with its flat side against the seal.
6. Remove any excess oil around the shaft and the inside of the compressor housing neck.
7. Install the clutch plate and hub assembly. Refer to „Clutch Plate and Hub Assembly” in this section.
8. Reposition the compressor in its mounting.
9. Adjust the tension on the serpentine accessory 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

Removal 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.



Installation Procedure

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

Tighten

Tighten the pressure relief valve to 16 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.

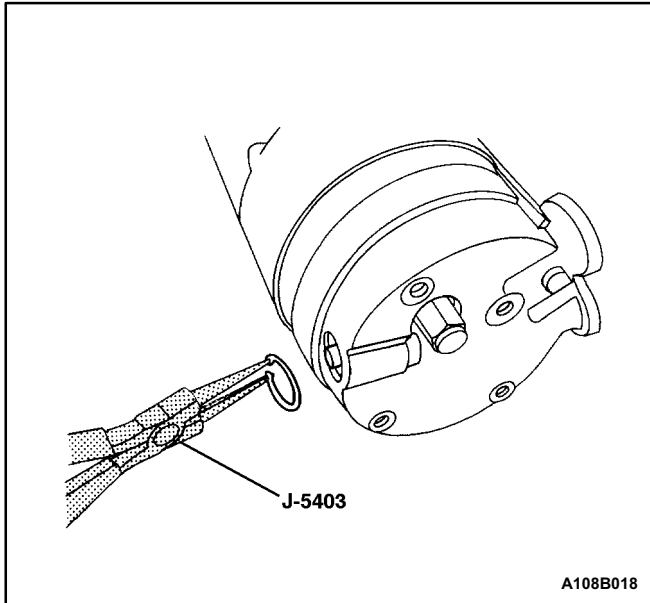
CONTROL VALVE ASSEMBLY

Tools Required

J-5403 Snap Ring Pliers

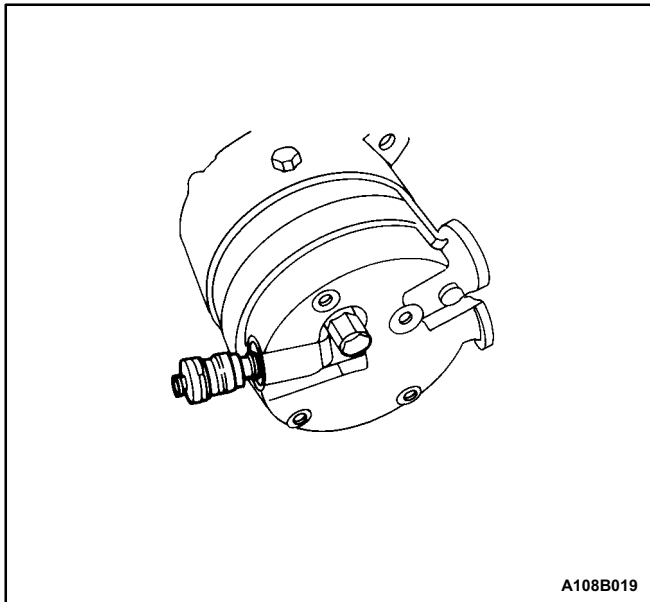
Removal Procedure

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.

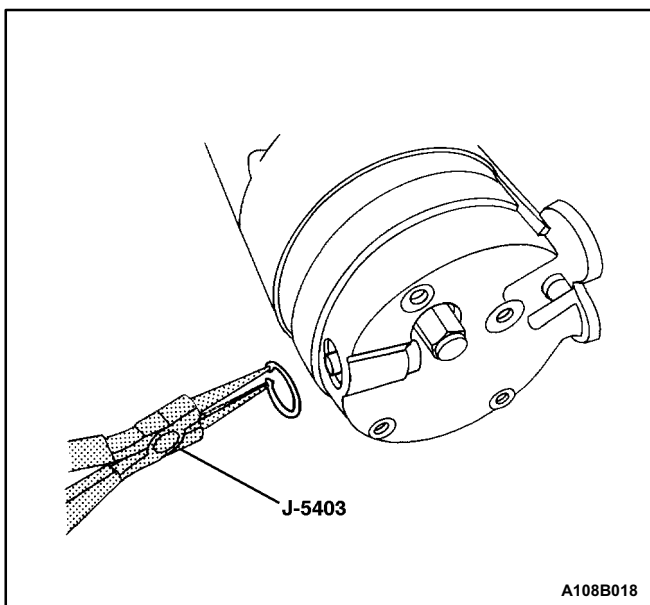


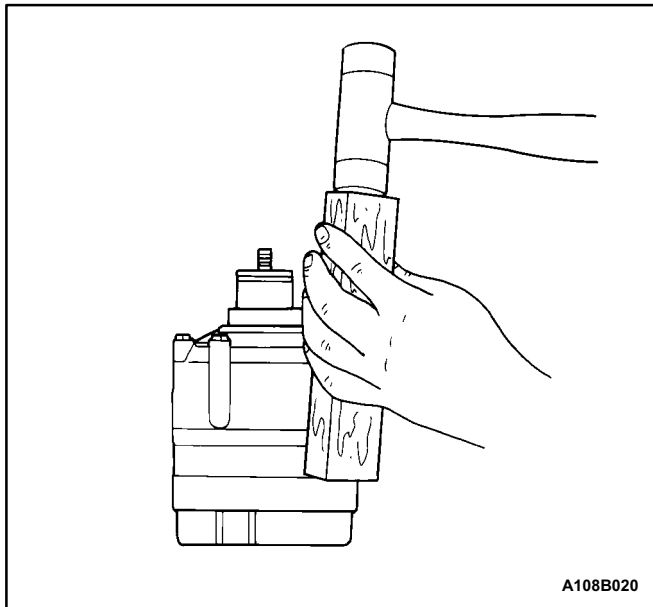
Installation Procedure

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.





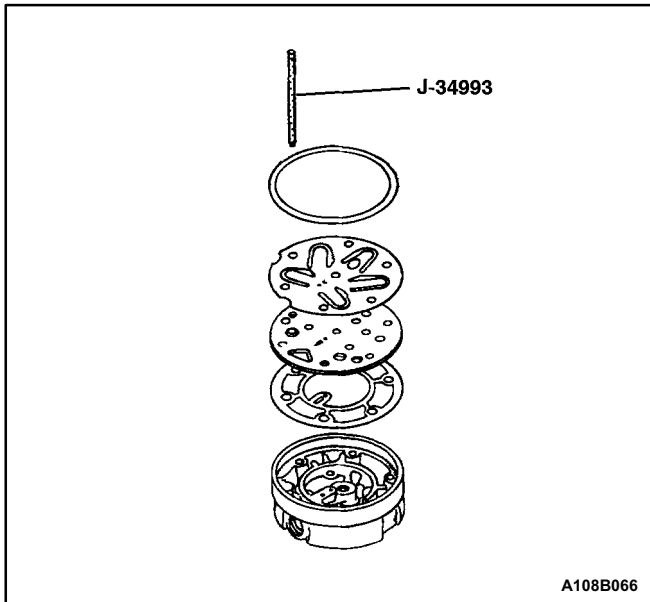
REAR HEAD, GASKET, VALVE PLATE, REED PLATE, AND ORING

Tools Required

J-34993 Cylinder Alignment Rods

Removal 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.



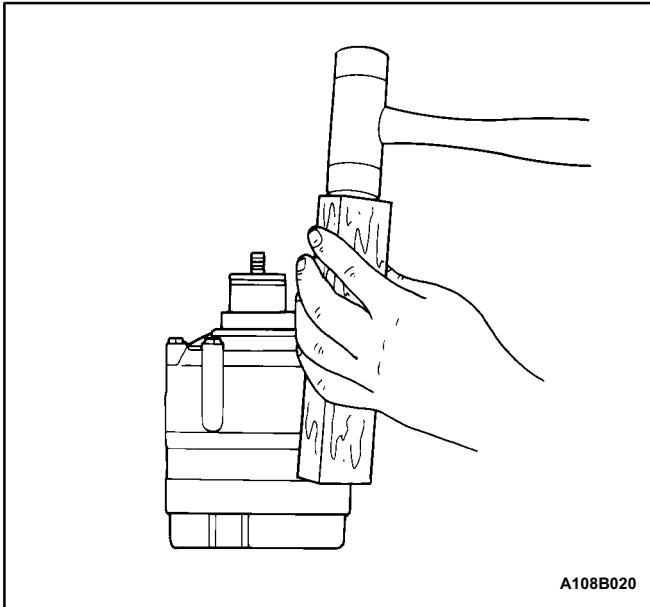
Installation Procedure

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 guide pins with the elongated hole at the upper left pin. 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 compressor guide pin 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 guide pin 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 throughbolts and install it into the compressor assembly. Four of the throughbolts must thread into the rear head before removing the alignment rod.

Tighten

Alternately tighten the through bolts in progressive torque sequence to 10 N•m (89 lb•in).

11. Add new PAG refrigerant oil as determined in Step 1 of Removal Procedure.
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

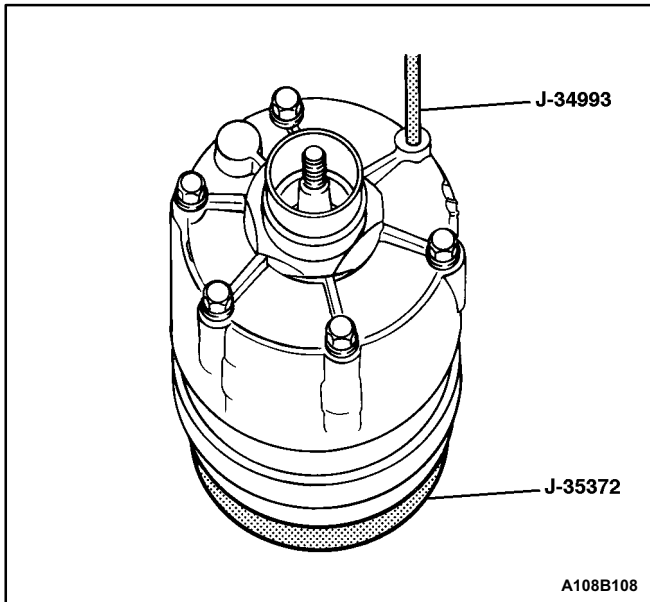
J-35372 Support Block

Removal 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 the bearing for ease of assembly.

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



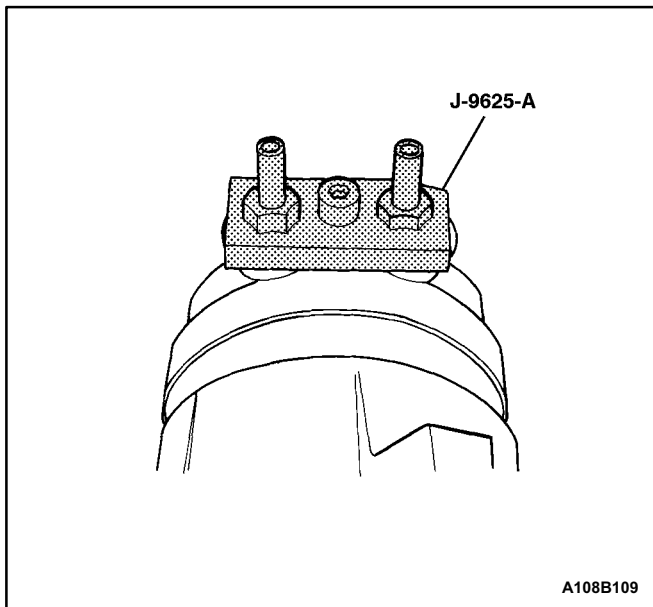
Installation Procedure

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 rod 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 guide pin recess in the compressor housing with the guide pin. 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 it into the compressor assembly. Four through bolts must thread into the rear head before removing the guide pins.

Tighten

Alternately tighten the 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 the 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 Testing Connector

1. Install the pressure testing connector 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 testing connector 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 testing connector 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 cut-off switch and no low-pressure cut-off 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 highpressure 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. These conditions include the following:

- 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 „V5 Air Conditioning Compressor Overhaul” in this section.

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 approximately 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 corrected. The refrigerant oil and the 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 located with the evaporator core, inside the heater/air distributor case under the instrument panel.

The expansion valve can fail in three different positions: open, closed, or restricted.

An expansion valve that fails in the open position will result in a noisy A/C compressor or no cooling. The cause can be a broken spring, a broken ball, or excessive moisture in the A/C system. If the spring or the ball 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 or 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 condenser outlet pipe. It acts as a refrigerant storing container, receiving liquid, 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 modes.

SYSTEM COMPONENTS - CONTROL

Controller

The operation of the A/C system is controlled by the switches on the control head. This console mounted heating and ventilation panel contains the following:

Three rotary control knobs

1. The rotary temperature control knob
 - Actuates by cable.
 - Varies the mix of the fresh air from outside the vehicle with the heated air from inside the vehicle to suit individual preference.
 - Raises the temperature of the air entering the vehicle by rotation toward the right, or the red portion of the knob.
2. The rotary mode control knob
 - Actuates by vacuum.
 - Regulates the air distribution between the windshield, the instrument panel, and the floor vents.
3. The rotary blower control knob
 - Turns on to operate the blower motor at four speeds.
 - Turns OFF to stop the blower.
 - Operates completely independently from both the mode control knob, that regulates the defroster door, and the temperature control knob.
 - Changes the fan speed in any mode and at any temperature setting. However, if the rotary blower control knob is OFF, the A/C system is OFF, regardless of the position of the A/C push knob.

Three push knobs

1. The A/C push knob
 - Controls the A/C.
 - Turns the A/C on when the push knob is pressed and the indicator lamp is illuminated. (The rotary blower control knob must be in one of its four positions for the A/C to function.)
2. The rear window defogger push knob
 - Controls the rear window defogger.
 - Turns on the rear window defogger when the push knob is pressed and the indicator lamp is illuminated.
3. The fresh air control push knob
 - Switches between recirculating passenger compartment air or bringing outside air into the passenger compartment.
 - Defaults to fresh air mode. The indicator lamp is illuminated when recirculation is selected.
 - Operates the inlet air door by vacuum.

The electric engine cooling fans are operational any time 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 electronic control module (ECM) through the cooling fan relays.

Vacuum Lines

Vacuum lines are molded to a connector, which is attached to a vacuum control switch on the control head assembly.

In case of leakage or hose collapse, it will not be necessary to replace the entire harness assembly. Replacement can be made by cutting the hose and inserting a plastic connector. If an entire hose must be replaced, cut all the hoses off at the connector and attach hoses directly to the control head vacuum switch.

Vacuum Tank

During heavy acceleration, the vacuum supply from the manifold drops. A check valve in the vacuum tank maintains vacuum so that under load conditions vacuum will be available for continuous use.

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 behind the right headlamp, between the right front inner fender and the air filter assembly. 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.

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 overhaul 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 undertaking any on-vehicle repairs and before the removal of the compressor. The parts must be kept clean at all times. 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 lintfree cloths to wipe the parts.

The operations described are based on bench overhaul 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 the oil from the compressor.

V5 COMPRESSOR - DESCRIPTION OF OPERATION

The V5 is a variable displacement compressor that can match the automotive 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 billows-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.