HEATING AND AIR CONDITIONING

CONTENTS

GENERAL INFORMATION

HEATER AND AIR CONDITIONER

All vehicles are equipped with a common heater-A/C housing assembly (Fig. 1). The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted under the instrument panel. On heater-only systems, the evaporator coil and recirculating air door are omitted from the housing.

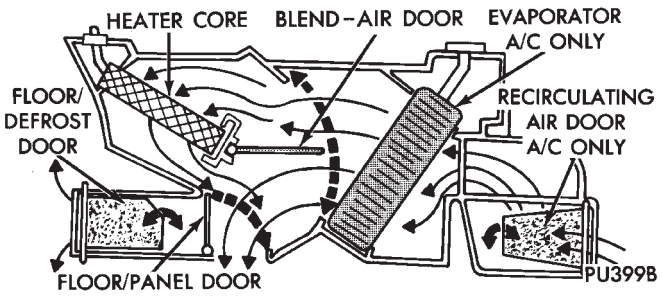

Fig. 1 Common Blend-Air Heater-Air Conditioner System - Typical

Outside fresh air enters the vehicle through the cowl top opening at the base of the windshield, and passes through a plenum chamber to the heater-A/C system blower housing. Air flow velocity can then be adjusted with the blower motor speed selector switch on the heater-A/C control panel. The air intake openings must be kept free of snow, ice, leaves, and other obstructions for the heater-A/C system to receive a sufficient volume of outside air.

The heater and optional air conditioner are blend-air type systems. In a blend-air system, a blend-air door controls the amount of unconditioned air (or cooled air from the evaporator on models with air conditioning) is allowed to flow through, or around, the heater core. A temperature control lever on the heater-A/C control panel determines the discharge air temperature by moving a cable, which operates the blend-air door. This allows an almost immediate manual control of the output air temperature of the system.

The mode control knob on the heater-A/C control panel is used to direct the conditioned air to the selected system outlets. Both mode control switches use engine vacuum to control the mode doors through vacuum actuator motors.

On air conditioned vehicles, the outside air intake can be shut off by selecting the Recirculation Mode with the mode control knob. This will open a vacuum actuated recirculating air door and recirculate the air that is already inside the vehicle.

The optional air conditioner for all models is designed for the use of non-CFC, R-134a refrigerant. The air conditioning system has an evaporator to cool and dehumidify the incoming air prior to blending it with the heated air. This system uses a fixed orifice tube in the liquid line near the condenser outlet tube to meter refrigerant flow to the evaporator coil. To maintain minimum evaporator temperature, a fixed pressure setting switch on the accumulator cycles the compressor clutch.

NOTE: This group covers both Left-Hand Drive (LHD) and Right-Hand Drive (RHD) versions of this model. Whenever required and feasible, the RHD versions of affected vehicle components have been constructed as mirror-image of the LHD versions. While most of the illustrations used in this group represent only the LHD version, the diagnostic and service procedures outlined can generally be applied to either version. Exceptions to this rule have been clearly identified as LHD or RHD, if a special illustration or procedure is required.

HEATER AND AIR CONDITIONER CONTROL

Both the heater-only and heater-A/C systems use a combination of mechanical, electrical, and vacuum controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual for more information on the suggested operation and use of these controls.

The heater-only or heater-A/C control panel is located to the right of the instrument cluster on the instrument panel. The control panel contains a rotating-type temperature control knob, a rotating-type mode control switch knob, and a rotating-type blower motor switch knob.

The heater-only or heater-A/C control panel cannot be repaired. If faulty or damaged, the entire unit must be replaced.

GENERAL INFORMATION (Continued)

SERVICE WARNINGS AND PRECAUTIONS

WARNING:

- **THE AIR CONDITIONING SYSTEM CONTAINS REFRIGERANT UNDER HIGH PRESSURE. SEVERE PERSONAL INJURY MAY RESULT FROM IMPROPER SERVICE PROCEDURES. REPAIRS SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.**
- **AVOID BREATHING THE REFRIGERANT AND REFRIGERANT OIL VAPOR OR MIST. EXPOSURE MAY IRRITATE THE EYES, NOSE, AND/OR THROAT. WEAR EYE PROTECTION WHEN SERVICING THE AIR CONDITIONING REFRIGERANT SYSTEM. SERIOUS EYE INJURY CAN RESULT FROM DIRECT CONTACT WITH THE REFRIGERANT. IF EYE CONTACT OCCURS, SEEK MEDICAL ATTENTION IMMEDIATELY.**
- **DO NOT EXPOSE THE REFRIGERANT TO OPEN FLAME. POISONOUS GAS IS CREATED WHEN REFRIGERANT IS BURNED. AN ELECTRONIC LEAK DETECTOR IS RECOMMENDED.**
- **IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE THE WORK AREA BEFORE RESUMING SERVICE. LARGE AMOUNTS OF REFRIGERANT RELEASED IN A CLOSED WORK AREA WILL DISPLACE THE OXYGEN AND CAUSE SUFFOCATION.**
- **THE EVAPORATION RATE OF R-134a REFRIGERANT AT AVERAGE TEMPERATURE AND ALTITUDE IS EXTREMELY HIGH. AS A RESULT, ANYTHING THAT COMES IN CONTACT WITH THE REFRIGERANT WILL FREEZE. ALWAYS PROTECT THE SKIN OR DELICATE OBJECTS FROM DIRECT CONTACT WITH THE REFRIGERANT.**
- **THE R-134a SERVICE EQUIPMENT OR THE VEHICLE REFRIGERANT SYSTEM SHOULD NOT BE PRESSURE TESTED OR LEAK TESTED WITH COMPRESSED AIR. SOME MIXTURES OF AIR AND R-134a HAVE BEEN SHOWN TO BE COMBUSTIBLE AT ELEVATED PRESSURES. THESE MIXTURES ARE POTENTIALLY DANGEROUS, AND MAY RESULT IN FIRE OR EXPLOSION CAUSING INJURY OR PROPERTY DAMAGE.**

CAUTION:

- **Liquid refrigerant is corrosive to metal surfaces. Follow the operating instructions supplied with the service equipment being used.**
- **Never add R-12 to a refrigerant system designed to use R-134a. Damage to the system will result.**
- **R-12 refrigerant oil must not be mixed with R-134a refrigerant oil. They are not compatible.**
- **Do not use R-12 equipment or parts on the R-134a system. Damage to the system will result.**
- **Do not overcharge the refrigerant system. This will cause excessive compressor head pressure and can cause noise and system failure.**

In addition to the warnings and cautions listed above, the following precautions must also be observed whenever servicing the air conditioning system:

- Recover the refrigerant before opening any fitting or connection. Open the fittings with caution, even after the system has been discharged. Never open or loosen a connection before recovering the refrigerant.
- The refrigerant system must always be evacuated before charging.
- Do not open the refrigerant system or uncap a replacement component until you are ready to service the system. This will prevent contamination in the system.
- Before disconnecting a component, clean the outside of the fittings thoroughly to prevent contamination from entering the refrigerant system.
- Immediately after disconnecting a component from the refrigerant system, seal the open fittings with a cap or plug.
- Before connecting an open refrigerant fitting, always install a new seal or gasket. Coat the fitting and seal with clean refrigerant oil before connecting.
- Do not remove the sealing caps from a replacement component until it is to be installed.
- When installing a refrigerant line, avoid sharp bends that may restrict refrigerant flow. Position the refrigerant lines away from exhaust system components or any sharp edges, which may damage the line.
- Tighten refrigerant fittings only to the specified torque. The aluminum fittings used in the refrigerant system will not tolerate overtightening.
- When disconnecting a refrigerant fitting, use a wrench on both halves of the fitting. This will prevent twisting of the refrigerant lines or tubes.
- Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open a container of refrigerant oil until you are ready to use it. Replace the cap on the oil container immediately after using. Store refrigerant oil only in a clean, airtight, and moisture-free container.
- Keep service tools and the work area clean. Contamination of the refrigerant system through careless work habits must be avoided.

COOLING SYSTEM REQUIREMENTS

To maintain the performance level of the heating-air conditioning system, the engine cooling system must be properly maintained.

The use of a bug screen is not recommended. Any obstructions in front of the radiator or condenser will reduce the performance of the air conditioning and engine cooling systems.

GENERAL INFORMATION (Continued)

COOLANT PRECAUTIONS

WARNING:

- **ANTIFREEZE IS AN ETHYLENE GLYCOL BASED COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO A FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY.**
- **WASH THE SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE GLYCOL.**
- **KEEP OUT OF THE REACH OF CHILDREN AND PETS.**
- **DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE. PERSONAL INJURY MAY RESULT.**
- **DO NOT STORE ENGINE COOLANT IN OPEN OR UNMARKED CONTAINERS.**
- **HOT ENGINE COOLANT CAN CAUSE SEVERE BURNS. DO NOT OPEN THE RADIATOR DRAIN COCK WHEN THE COOLING SYSTEM IS HOT AND PRESSURIZED. ALLOW THE COOLANT TO REACH TO ROOM TEMPERATURE BEFORE STARTING REPAIR OPERATIONS.**

The engine cooling system is designed to develop internal pressures of 97 to 124 kPa (14 to 18 psi). Allow the vehicle 15 minutes to cool down, or wait until a safe temperature and pressure are attained, before opening the cooling system. Refer to Group 7 - Cooling System for more information.

REFRIGERANT HOSES/LINES/TUBES PRECAUTIONS

Kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 mm (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

There are two types of refrigerant fittings:

- All fittings with O-rings need to be coated with refrigerant oil before installation. Use only O-rings approved for use with R-134a refrigerant. Failure to do so may result in a leak.
- Unified plumbing connections with aluminum gaskets cannot be serviced with O-rings. The gaskets are not reusable and new gaskets do not require lubrication before installing.

Using the proper tools when making a refrigerant plumbing connection is very important. Improper tools or improper use of the tools can damage the refrigerant fittings. Always use two wrenches when loosening or tightening tube fittings. Use one wrench to hold one side of the connection stationary, while loosening or tightening the other side of the connection with a second wrench.

The refrigerant must be recovered completely from the system before opening any fitting or connection. Open the fittings with caution, even after the refrigerant has been recovered. If any pressure is noticed as a fitting is loosened, tighten the fitting and recover the refrigerant from the system again.

Do not discharge refrigerant into the atmosphere. Use an R-134a refrigerant recovery/recycling device that meets SAE Standard J2210.

The refrigerant system will remain chemically stable as long as pure, moisture-free R-134a refrigerant and refrigerant oil is used. Dirt, moisture, or air can upset this chemical stability. Operational troubles or serious damage can occur if foreign material is present in the refrigerant system.

When it is necessary to open the refrigerant system, have everything needed to service the system ready. The refrigerant system should not be left open to the atmosphere any longer than necessary. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture. All lines and components in parts stock should be capped or sealed until they are to be installed.

All tools, including the refrigerant recycling equipment, the manifold gauge set, and test hoses should be kept clean and dry. All tools and equipment must be designed for R-134a refrigerant.

DESCRIPTION AND OPERATION

ACCUMULATOR

The accumulator is mounted in the engine compartment between the evaporator coil outlet tube and the compressor inlet. Refrigerant enters the accumulator canister as a low pressure vapor through the inlet tube.

Any liquid, oil-laden refrigerant falls to the bottom of the canister, which acts as a separator. A desiccant bag is mounted inside the accumulator canister to absorb any moisture which may have entered and become trapped in the refrigerant system (Fig. 2).

BLOWER MOTOR

The blower motor and blower wheel are located in the passenger side end of the heater-A/C housing, below the glove box. The blower motor controls the

DESCRIPTION AND OPERATION (Continued)

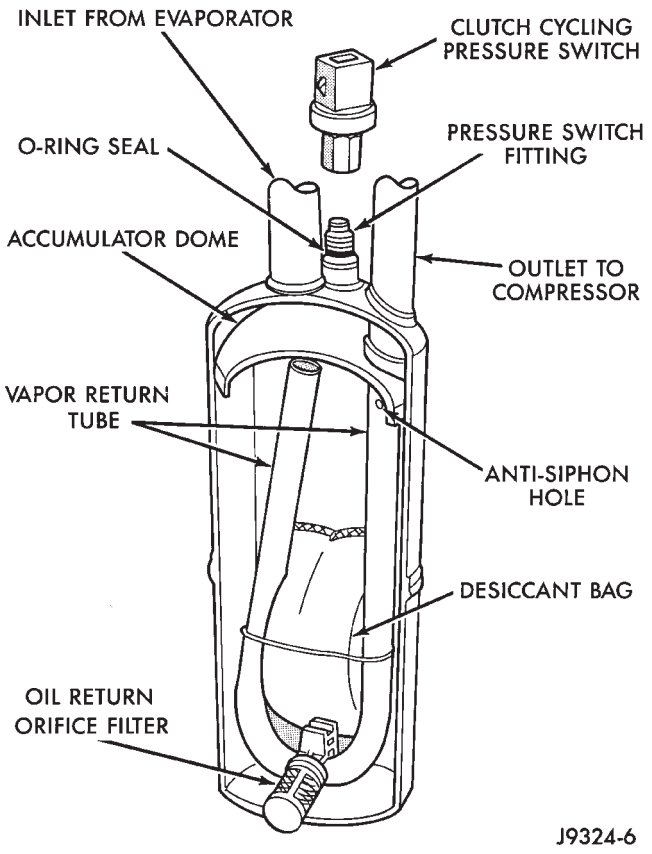

Fig. 2 Accumulator - Typical

velocity of air flowing through the heater-A/C housing by spinning a squirrel cage-type blower wheel within the housing at the selected speed. The blower motor and wheel can be removed from the engine compartment side of the housing without heater-A/C housing removal.

The blower motor will only operate when the ignition switch is in the On position, and the heater-A/C mode control switch knob is in any position, except Off. The blower motor receives a fused battery feed through the blower motor relay whenever the ignition switch is in the On position. The blower motor battery feed circuit is protected by a fuse in the Power Distribution Center (PDC). Blower motor speed is controlled by regulating the ground path through the heater-A/C control blower motor switch and the blower motor resistor.

The blower motor and blower motor wheel cannot be repaired and, if faulty, they must be replaced. The blower motor and blower wheel are serviced only as a unit.

BLOWER MOTOR RELAY

The blower motor relay is a International Standards Organization (ISO)-type relay. The relay is a electromechanical device that switches battery current from a fuse in the Power Distribution Center (PDC) directly to the blower motor. The relay is energized when the relay coil is provided a voltage signal by the ignition switch. See the Diagnosis and Testing section of this group for more information on the operation of the blower motor relay.

The blower motor relay is located in a wire harness connector that is secured to the heater-A/C housing behind the glove box on the passenger side of the vehicle, next to the heater-A/C wire harness connector in the passenger compartment.

The blower motor relay cannot be repaired and, if faulty or damaged, it must be replaced.

BLOWER MOTOR RESISTOR

The blower motor resistor is mounted to the bottom of the heater-A/C housing on the passenger side of the vehicle under the instrument panel. It can be accessed for service by removing the heater-A/C housing kick cover.

The resistor has multiple resistor wires, each of which reduce the current flow to the blower motor by changing the resistance in the blower motor ground path. The blower motor switch directs the ground path through the correct resistor wire to obtain the selected speed. When the highest blower speed is selected, the blower motor switch connects the blower motor directly to ground, bypassing the blower motor resistor.

The blower motor resistor cannot be repaired and, if faulty, it must be replaced.

BLOWER MOTOR SWITCH

The heater or heater-A/C blower motor is controlled by a four position rotary-type blower motor switch, mounted in the heater-A/C control panel. The switch allows the selection of one of four blower motor speeds, but can only be turned off by selecting the Off position with the heater-A/C mode control switch knob.

The blower motor switch directs the blower motor ground path through the mode control switch to the blower motor resistor, or directly to ground, as required to achieve the selected blower motor speed.

The blower motor switch cannot be repaired and, if faulty or damaged, the entire heater-A/C control panel must be replaced.

COMPRESSOR

The air conditioning system uses a Sanden SD7H15 fixed displacement compressor on all models. A label identifying the use of R-134a refrigerant is located on the compressor. The purpose of the compressor is to compress the low-pressure refrigerant vapor from the evaporator into a high-pressure, high-temperature vapor. The compressor is serviced only as an assembly.

DESCRIPTION AND OPERATION (Continued)

COMPRESSOR CLUTCH

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 3). The electromagnetic coil and pulley are retained on the compressor with snap rings. The clutch plate is mounted on the compressor shaft and secured with a nut.

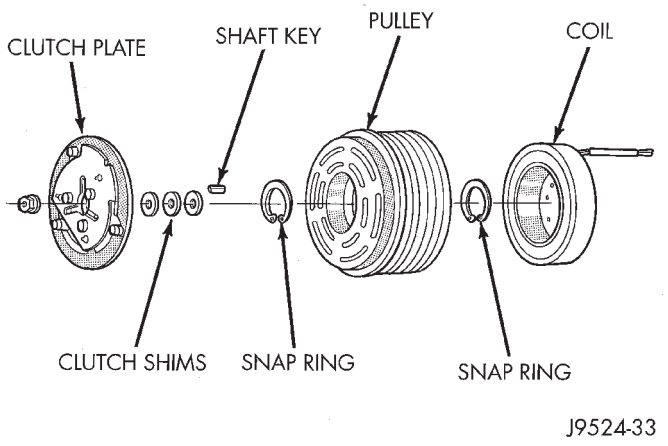

Fig. 3 Compressor Clutch

These components provide the means to engage and disengage the compressor from the engine serpentine accessory drive belt. When the clutch coil is energized, it magnetically draws the clutch into contact with the pulley and drives the compressor shaft. When the coil is not energized, the pulley freewheels on the clutch hub bearing, which is part of the pulley. The compressor clutch and coil are the only serviced parts on the compressor.

The compressor clutch is controlled by several components: the heater-A/C mode control switch, the low pressure cycling clutch switch, the high pressure cut-off switch, the compressor clutch relay, and the Powertrain Control Module (PCM). The PCM may delay compressor clutch engagement for up to 30 seconds. Refer to Group 14 - Fuel System for more information on the PCM controls.

COMPRESSOR CLUTCH RELAY

The compressor clutch relay is a International Standards Organization (ISO) micro-relay. The terminal designations and functions are the same as a conventional ISO relay. However, the micro-relay terminal orientation (footprint) is different, current capacity is lower, and the relay case dimensions are smaller than those of the conventional ISO relay.

The compressor clutch relay is a electromechanical device that switches battery current to the compressor clutch coil when the Powertrain Control Module (PCM) grounds the coil side of the relay. The PCM responds to inputs from the heater-A/C mode control switch, the low pressure cycling clutch switch, and the high pressure cut-off switch. See the Diagnosis and Testing section of this group for more information on the operation of the compressor clutch relay.

The compressor clutch relay is located in the Power Distribution Center (PDC) in the engine compartment. Refer to the PDC label for relay identification and location.

The compressor clutch relay cannot be repaired and, if faulty or damaged, it must be replaced.

CONDENSER

The condenser is located in front of the engine cooling radiator. It is a heat exchanger that allows the high-pressure refrigerant gas to give up its heat to the air passing over the condenser fins. This causes the refrigerant gas to condense into a high-pressure liquid refrigerant.

The condenser cannot be repaired and, if faulty or damaged, it must be replaced.

EVAPORATOR COIL

The evaporator coil is located in the heater-A/C housing, under the instrument panel. Refrigerant enters the evaporator as a low-temperature, low-pressure liquid. As air passes over the fins of the evaporator, the humidity in the air condenses on the fins, and the heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to become a low-pressure gas before it leaves the evaporator.

The evaporator coil cannot be repaired and, if faulty or damaged, it must be replaced.

FIXED ORIFICE TUBE

The fixed orifice tube is installed in the liquid line between the outlet tube of the condenser and the inlet tube of the evaporator. The fixed orifice tube is located in the end of the liquid line or liquid line jumper that connects to the condenser outlet tube.

The inlet and outlet ends of the tube have a screen to filter the refrigerant. O-rings on the tube body prevent the refrigerant from bypassing the fixed orifice. The fixed orifice tube is used to meter the flow of liquid refrigerant into the evaporator coil.

The fixed orifice tube cannot be repaired and, if faulty or plugged, the liquid line or liquid line jumper containing the fixed orifice tube must be replaced.

HEATER CORE

The heater core is located in the heater-A/C housing, under the instrument panel. It is a heat exchanger made of rows of tubes and fins. Engine coolant is circulated through heater hoses to the heater core at all times. As the coolant flows through

DESCRIPTION AND OPERATION (Continued)

the heater core, heat removed from the engine is transferred to the heater core fins and tubes.

Air directed through the heater core picks up the heat from the heater core fins. The blend air door allows control of the heater output air temperature by controlling how much of the air flowing through the heater-A/C housing is directed through the heater core. The blower motor speed controls the amount of air flowing through the heater-A/C housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced.

HIGH PRESSURE CUT-OFF SWITCH

The high pressure cut-off switch is located on the discharge line between the compressor and the condenser inlet. This switch is connected in series with the low pressure cycling clutch switch between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the compressor clutch on and off. This prevents compressor operation when the discharge line pressure approaches high levels.

The high pressure cut-off switch contacts are open when the discharge line pressure rises above 3100 to 3375 kPa (450 to 490 psi). The switch contacts will close when the discharge line pressure drops to 1860 to 2275 kPa (270 to 330 psi).

The high pressure cut-off switch is a factory-calibrated unit. The switch cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

HIGH PRESSURE RELIEF VALVE

The high pressure relief valve is located on the compressor. The valve is used to prevent excessive refrigerant system pressure. The valve vents the system when a pressure of 3445 to 4135 kPa (500 to 600 psi), and above, is reached. This prevents damage to the compressor and other system components due to condenser air flow being restricted or an overcharge of refrigerant. The valve closes with a minimum pressure of 2756 kPa (400 psi).

The high pressure relief valve vents only enough refrigerant to reduce system pressure, and then re-seats itself. The majority of the refrigerant is conserved in the system. If the valve vents refrigerant, it does not mean the valve is faulty. The valve is part of the compressor assembly and must not be removed or otherwise disturbed.

LOW PRESSURE CYCLING CLUTCH SWITCH

The low pressure cycling clutch switch is mounted on top of the accumulator. The switch is connected in series with the high pressure cut-off switch, between ground and the Powertrain Control Module (PCM). The switch contacts open and close causing the PCM to turn the compressor clutch on and off. This regulates the system pressure and controls evaporator temperature. Controlling evaporator temperature prevents condensate water on the evaporator fins from freezing and obstructing air conditioning system air flow.

The low pressure cycling clutch switch contacts are open when the suction pressure is approximately 141 kPa (20.5 psi) or lower. The switch contacts will close when the suction pressure rises to approximately 234 to 262 kPa (34 to 38 psi) or above. Lower ambient temperatures, below approximately -1°C (30°F) during cold weather will also open the switch contacts. This is due to the pressure/temperature relationship of the refrigerant in the system.

The low pressure cycling clutch switch is a factory-calibrated unit. It cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

REFRIGERANT

The R-134a refrigerant used in this air conditioning system is a non-toxic, non-flammable, clear, and colorless liquefied gas. R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system.

Even a small amount of R-12 added to a R-134a refrigerant system, will cause compressor failure, refrigerant oil sludge, or poor air conditioning system performance. The refrigerant system service ports have been designed to ensure that the system is not accidentally filled with the wrong refrigerant (R-12).

REFRIGERANT LINE

The refrigerant lines are used to carry the refrigerant between the various air conditioning system components. A barrier hose design is used for the air conditioning system on this vehicle. The ends of the refrigerant hoses are made from lightweight aluminum, and use braze-less fittings.

Kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 mm (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

DESCRIPTION AND OPERATION (Continued)

The refrigerant lines and hoses cannot be repaired and, if faulty or damaged, they must be replaced.

REFRIGERANT LINE COUPLER

Spring-locking refrigerant line couplers are used to connect refrigerant lines and other components to the refrigerant system. The coupling is held together by a garter spring inside a circular cage.

When the coupling halves are connected, the flared end of the female fitting slips behind the garter spring inside the cage of the male fitting. The garter spring and cage prevent the flared end of the female fitting from pulling out of the cage. Secondary clips are installed over the coupling at the factory for added blowoff protection.

O-rings are used to seal the coupling. These O-rings are compatible with R-134a refrigerant and must be replaced with O-rings made of the same material.

REFRIGERANT OIL

The oil used in the SD7H15 compressor is a poly-alkylene glycol, synthetic (SP-20 PAG), wax-free refrigerant oil. Use only refrigerant oil of the same type to service the system.

Refrigerant oil will absorb any moisture it comes in contact with, even moisture in the air. The oil container should be kept tightly capped until it is ready to be used. Then, cap the oil immediately after using, to prevent contamination.

REFRIGERANT SYSTEM SERVICE EQUIPMENT

WARNING: EYE PROTECTION MUST BE WORN WHEN SERVICING AN AIR CONDITIONING REFRIGERANT SYSTEM. TURN OFF (ROTATE CLOCKWISE) ALL VALVES ON THE EQUIPMENT BEING USED, BEFORE CONNECTING TO OR DISCONNECTING FROM THE REFRIGERANT SYSTEM. FAILURE TO OBSERVE THESE WARNINGS MAY RESULT IN PERSONAL INJURY.

When servicing the air conditioning system, a refrigerant charging station and a recovery/recycling device for R-134a must be used. This device must meet SAE Standard J2210. Contact an automotive service equipment supplier for refrigerant charging and recycling/recovering equipment. Refer to the operating instructions provided with the equipment for proper operation.

A manifold gauge set may be needed with some charging and/or recovery/recycling devices (Fig. 4). The service hoses on the gauge set being used should have manual (turn wheel), or automatic back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

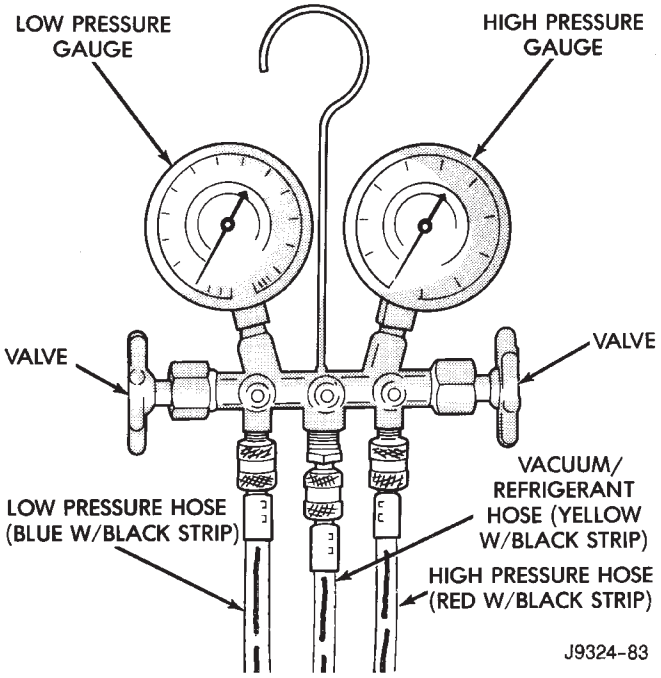

Fig. 4 Manifold Gauge Set

MANIFOLD GAUGE SET CONNECTIONS

CAUTION: Do not use an R-12 manifold gauge set on an R-134a system. The refrigerants are not compatible and system damage will result.

LOW PRESSURE GAUGE HOSE

The low pressure hose (Blue with Black stripe) attaches to the suction service port. This port is located on the suction line between the accumulator outlet and the compressor.

HIGH PRESSURE GAUGE HOSE

The high pressure hose (Red with Black stripe) attaches to the discharge service port. This port is located on the discharge line between the compressor and the condenser inlet.

RECOVERY/RECYCLING/EVACUATION/CHARGING HOSE

The center manifold hose (Yellow, or White, with Black stripe) is used to recover, evacuate, and charge the refrigerant system. When the low or high pressure valves on the manifold gauge set are opened, the refrigerant in the system will escape through this hose.

REFRIGERANT SYSTEM SERVICE PORT

The two refrigerant system service ports are used to charge, recover/recycle, evacuate, and test the air conditioning refrigerant system. Unique service port coupler sizes are used on the R-134a system, to ensure that the refrigerant system is not accidentally contaminated by the use of the wrong refrigerant (R-12), or refrigerant system service equipment.

DESCRIPTION AND OPERATION (Continued)

The high pressure service port is located on the discharge line, between the compressor and the condenser inlet. The low pressure service port is located on the suction line, between the accumulator outlet and the compressor. After servicing the refrigerant system, always reinstall the service port caps.

VACUUM CHECK VALVE

A one-way vacuum check valve is installed in the accessory vacuum supply line near the vacuum tap on the engine intake manifold in the engine compartment. This check valve helps to maintain the system vacuum needed to retain the selected heater-A/C mode settings by preventing the engine from bleeding down system vacuum through the intake manifold during extended heavy engine load (low engine vacuum) operation.

The vacuum check valve cannot be repaired and, if faulty or damaged, it must be replaced.

VACUUM RESERVOIR

The vacuum reservoir is mounted to the front bumper bar behind the passenger side bumper end cap. Vacuum stored in the reservoir is used to operate the vacuum-controlled vehicle accessories during periods of low engine vacuum, such as when the vehicle is climbing a steep grade or under other high engine load operating conditions.

The vacuum reservoir cannot be repaired and, if faulty or damaged, it must be replaced.

DIAGNOSIS AND TESTING

A/C PERFORMANCE

The air conditioning system is designed to provide the passenger compartment with low temperature and low humidity air. The evaporator, located in the heater-A/C housing on the dash panel below the instrument panel, is cooled to temperatures near the freezing point. As warm damp air passes over the fins in the evaporator, the air is cooled and the moisture is removed as it condenses on the fins. During periods of high heat and humidity, an air conditioning system will be more effective in the Recirculation Mode. With the system in the Recirculation Mode, only air from the passenger compartment passes through the evaporator. As the passenger compartment air dehumidifies, the air conditioning system performance levels improve.

Humidity has an important bearing on the temperature of the air delivered to the interior of the vehicle. It is important to understand the effect that humidity has on the performance of the air conditioning system. When humidity is high, the evaporator has to perform a double duty. It must lower the air temperature, and it must lower the temperature of the moisture in the air that condenses on the evaporator fins. Condensing the moisture in the air transfers heat energy into the evaporator fins and tubing. This reduces the amount of heat the evaporator can absorb from the air. High humidity greatly reduces the ability of the evaporator to lower the temperature of the air.

However, evaporator capacity used to reduce the amount of moisture in the air is not wasted. Wringing some of the moisture out of the air entering the vehicle adds to the comfort of the passengers. Although, an owner may expect too much from their air conditioning system on humid days. A performance test is the best way to determine whether the system is performing up to standard. This test also provides valuable clues as to the possible cause of trouble with the air conditioning system.

Review the Service Warnings and Precautions in the front of this group before performing this procedure. The air temperature in the test room and in the vehicle must be a minimum of 21°C (70°F) for this test.

(1) Connect a tachometer and a manifold gauge set.

(2) Set the heater-A/C mode control switch knob in the Recirculation Mode position, the temperature control knob in the full cool position, and the blower motor switch knob in the highest speed position.

(3) Start the engine and hold the idle at 1,000 rpm with the compressor clutch engaged.

(4) The engine should be at operating temperature. The doors and windows must be open.

(5) Insert a thermometer in the driver side center A/C (panel) outlet. Operate the engine for five minutes.

(6) The compressor clutch may cycle, depending upon the ambient temperature and humidity. If the clutch cycles, unplug the low pressure cycling clutch switch wire harness connector from the switch located on the accumulator (Fig. 5). Place a jumper wire across the terminals of the low pressure cycling clutch switch wire harness connector.

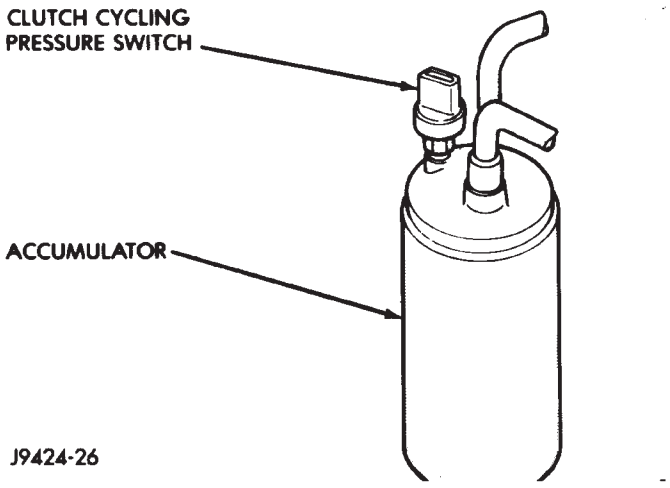

Fig. 5 Low Pressure Cycling Clutch Switch

DIAGNOSIS AND TESTING (Continued)

(7) With the compressor clutch engaged, record the discharge air temperature and the compressor discharge pressure.

(8) Compare the discharge air temperature to the Performance Temperature and Pressure chart (Fig. 6). If the discharge air temperature is high, see Refrigerant System Leaks and Refrigerant System Charge in this group.

(9) Compare the compressor discharge pressure to the Performance Temperature and Pressure chart. If the compressor discharge pressure is high, see the Pressure Diagnosis chart

Ambient Temperature	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
Air Temperature at Center Panel Outlet	-3 to 3°C (27-38°F)	1 to 7°C (33-44°F)	3 to 9°C (37-48°F)	6 to 13°C (43-55°F)	10 to 18°C (50-64°F)
Evaporator Inlet Pressure at Charge Port	179-241 kPa (26-35 psi)	221-283 kPa (32-41 psi)	262-324 kPa (38-47 psi)	303-365 kPa (44-53 psi)	345-414 kPa (50-60 psi)
Compressor Discharge Pressure	1240-1655 kPa (180-240 psi)	1380-1790 kPa (200-260 psi)	1720-2070 kPa (250-300 psi)	1860-2345 kPa (270-340 psi)	2070-2690 kPa (300-390 psi)

Fig. 6 Performance Temperature and Pressure

DIAGNOSIS AND TESTING (Continued)

Pressure Diagnosis		
Condition	**Possible Causes**	**Correction**
Rapid compressor clutch cycling (ten or more cycles per minute).	1. Low refrigerant system charge.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required.
Equal pressures, but the compressor clutch does not engage.	1. No refrigerant in the refrigerant system. 2. Faulty fuse. 3. Faulty compressor clutch coil. 4. Faulty compressor clutch relay. 5. Improperly installed or faulty low pressure cycling clutch switch. 6. Faulty high pressure cut-off switch. 7. Faulty Powertrain Control Module (PCM).	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. 2. Check the fuses in the Power Distribution Center and the junction block. Repair the shorted circuit or component and replace the fuses, if required. 3. See Compressor Clutch Coil in this group. Test the compressor clutch coil and replace, if required. 4. See Compressor Clutch Relay in this group. Test the compressor clutch relay and relay circuits. Repair the circuits or replace the relay, if required. 5. See Low Pressure Cycling Clutch Switch in this group. Test the low pressure cycling clutch switch and tighten or replace, if required. 6. See High Pressure Cut-Off Switch in this group. Test the high pressure cut-off switch and replace, if required. 7. Refer to the proper Diagnostic Procedures manual for testing of the PCM. Test the PCM and replace, if required.
Normal pressures, but A/C Performance Test air temperatures at center panel outlet are too high.	1. Excessive refrigerant oil in system. 2. Temperature control cable improperly installed or faulty. 3. Blend-air door inoperative or sealing improperly.	1. See Refrigerant Oil Level in this group. Recover the refrigerant from the refrigerant system and inspect the refrigerant oil content. Restore the refrigerant oil to the proper level, if required. 2. See Temperature Control Cable in this group. Inspect the temperature control cable for proper routing and operation and correct, if required. 3. See Blend-Air Door under Heater-A/C Housing Door in this group. Inspect the blend-air door for proper operation and sealing and correct, if required.

DIAGNOSIS AND TESTING (Continued)

Pressure Diagnosis		
Condition	**Possible Causes**	**Correction**
The low side pressure is normal or slightly low, and the high side pressure is too low.	1. Low refrigerant system charge. 2. Refrigerant flow through the accumulator is restricted. 3. Refrigerant flow through the evaporator coil is restricted. 4. Faulty compressor.	1. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. 2. See Accumulator in this group. Replace the restricted accumulator, if required. 3. See Evaporator Coil in this group. Replace the restricted evaporator coil, if required. 4. See Compressor in this group. Replace the compressor, if required.
The low side pressure is normal or slightly high, and the high side pressure is too high.	1. Condenser air flow restricted. 2. Inoperative cooling fan. 3. Refrigerant system overcharged. 4. Air in the refrigerant system. 5. Engine overheating.	1. Check the condenser for damaged fins, foreign objects obstructing air flow through the condenser fins, and missing or improperly installed air seals. Refer to Group 7 - Cooling System for more information on air seals. Clean, repair, or replace components as required. 2. Refer to Group 7 - Cooling System for more information. Test the cooling fan and replace, if required. 3. See Refrigerant System Charge in this group. Recover the refrigerant from the refrigerant system. Charge the refrigerant system to the proper level, if required. 4. See Refrigerant System Leaks in this group. Test the refrigerant system for leaks. Repair, evacuate and charge the refrigerant system, if required. 5. Refer to Group 7 - Cooling System for more information. Test the cooling system and repair, if required.
The low side pressure is too high, and the high side pressure is too low.	1. Accessory drive belt slipping. 2. Fixed orifice tube not installed. 3. Faulty compressor.	1. Refer to Group 7 - Cooling System for more information. Inspect the accessory drive belt condition and tension. Tighten or replace the accessory drive belt, if required. 2. See Fixed Orifice Tube in this group. Install the missing fixed orifice tube, if required. 3. See Compressor in this group. Replace the compressor, if required.

DIAGNOSIS AND TESTING (Continued)

Pressure Diagnosis		
Condition	**Possible Causes**	**Correction**
The low side pressure is too low, and the high side pressure is too high.	1. Restricted refrigerant flow through the refrigerant lines. 2. Restricted refrigerant flow through the fixed orifice tube. 3. Restricted refrigerant flow through the condenser.	1. See Liquid Line and Suction and Discharge Line in this group. Inspect the refrigerant lines for kinks, tight bends or improper routing. Correct the routing or replace the refrigerant line, if required. 2. See Fixed Orifice Tube in this group. Replace the restricted fixed orifice tube, if required. 3. See Condenser in this group. Replace the restricted condenser, if required.

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HEATER PERFORMANCE

PREPARATIONS

Review the Service Warnings and Precautions in the front of this group before performing the following procedures.

Check the radiator coolant level, serpentine drive belt tension, and engine vacuum line connections. Also check the radiator air flow and the radiator fan operation. Start the engine and allow it to warm up to normal operating temperature.

WARNING: DO NOT REMOVE THE RADIATOR PRESSURE CAP WHEN THE ENGINE IS AT OPERATING TEMPERATURE, PERSONAL INJURY MAY RESULT.

If the vehicle has been operated recently, wait fifteen minutes or longer before removing the radiator pressure cap. Place a rag over the cap and turn it to the first safety stop. Allow any pressure to escape through the overflow tube. When the system stabilizes, remove the cap completely.

MAXIMUM HEATER OUTPUT

Engine coolant is delivered to the heater core through two heater hoses. With the engine idling at normal operating temperature, set the temperature control knob in the full hot position, the mode control switch knob in the Floor position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the air temperature coming from the floor outlets, refer to the Temperature Reference chart (Fig. 7).

If the floor outlet air temperature is low, refer to Group 7 - Cooling System for the coolant temperature specifications. Both of the heater hoses should be hot to the touch. The coolant return hose should be slightly cooler than the supply hose. If the coolant return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the heater system.

Ambient Temperature		Minimum Heater System Floor Outlet Temperature	
Celsius	**Fahrenheit**	**Celsius**	**Fahrenheit**
15.5°	60°	62.2°	144°
21.1°	70°	63.8°	147°
26.6°	80°	65.5°	150°
32.2°	90°	67.2°	153°

Fig. 7 Temperature Reference

OBSTRUCTED COOLANT FLOW

Possible locations or causes of obstructed coolant flow:

- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections (refer to Group 7 - Cooling System).
- A plugged heater core.

If proper coolant flow through the heater system is verified, and outlet air temperature is still low, a mechanical problem may exist.

MECHANICAL PROBLEMS

Possible locations or causes of insufficient heat:

- An obstructed cowl air intake.
- Obstructed heater system outlets.
- A blend-air door not functioning properly.

TEMPERATURE CONTROL

If the heater discharge air temperature cannot be adjusted with the temperature control knob on the

DIAGNOSIS AND TESTING (Continued)

heater-A/C control panel, the following could require service:

- The heater-A/C control.
- The temperature control cable.
- The blend-air door.
- Improper engine coolant temperature.

VACUUM SYSTEM

Vacuum control is used to operate the mode doors in the heater-A/C housing. Testing of the heater-A/C mode control switch operation will determine if the vacuum, and mechanical controls are functioning. However, it is possible that a vacuum control system that operates perfectly at engine idle (high engine vacuum) may not function properly at high engine speeds or loads (low engine vacuum). This can be caused by leaks in the vacuum system, or a faulty vacuum check valve.

A vacuum system test will help to identify the source of poor vacuum system performance, or locate vacuum system leaks. Before starting this test, stop the engine and make certain that the problem isn't a disconnected vacuum supply tube at the engine intake manifold vacuum tap or the vacuum reservoir.

Use an adjustable vacuum test set (Special Tool C-3707) and a suitable vacuum pump to test the heater-A/C vacuum control system. With a finger placed over the end of the vacuum test hose probe (Fig. 8), adjust the bleed valve on the test set gauge to obtain a vacuum of exactly 27 kPa (8 in. Hg.). Release and block the end of the probe several times to verify that the vacuum reading returns to the exact 27 kPa (8 in. Hg.) setting. Otherwise, a false reading will be obtained during testing.

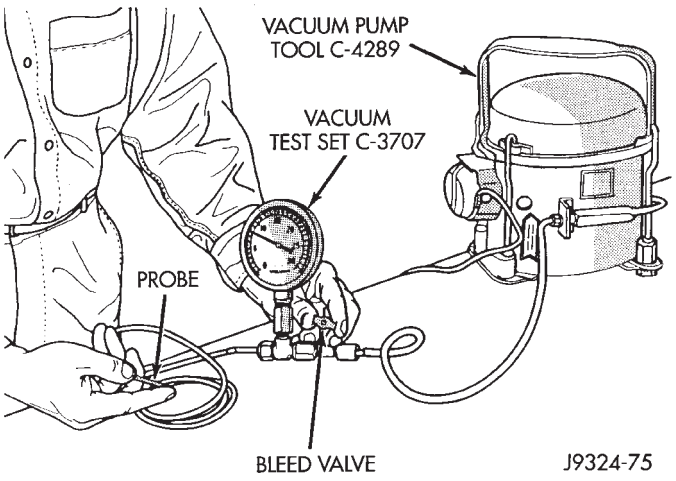


Fig. 8 Adjust Vacuum Test Bleed Valve

VACUUM CHECK VALVE

(1) Remove the vacuum check valve. The valve is located in the (black) vacuum supply tube at the heat-A/C system vacuum tap.

(2) Connect the test set vacuum supply hose to the heat-A/C system side of the valve. When connected to this side of the check valve, no vacuum should pass and the test set gauge should return to the 27 kPa (8 in. Hg.) setting. If OK, go to Step 3. If not OK, replace the faulty valve.

(3) Connect the test set vacuum supply hose to the engine vacuum side of the valve. When connected to this side of the check valve, vacuum should flow through the valve without restriction. If not OK, replace the faulty valve.

HEATER-A/C CONTROLS

(1) Connect the test set vacuum probe to the heat-A/C system vacuum supply (black) tube at the tee in the engine compartment. Position the test set gauge so that it can be viewed from the passenger compartment.

(2) Place the heater-A/C mode control switch knob in each mode position, one at a time, and pause after each selection. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each selection is made. If not OK, a component or vacuum line in the vacuum circuit of the selected mode has a leak. See the procedure in Locating Vacuum Leaks.

CAUTION: Do not use lubricant on the switch ports or in the holes in the plug, as lubricant will ruin the vacuum valve in the switch. A drop of clean water in the connector plug holes will help the connector slide onto the switch ports.

LOCATING VACUUM LEAKS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect the vacuum harness connector behind the glove box and inboard of the glove box opening on the heater-A/C housing.

(2) Connect the test set vacuum hose probe to each port in the heater-A/C housing half of the vacuum harness connector, one at a time, and pause after each connection (Fig. 9). The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty heater-A/C control. If not OK, go to Step 3.

(3) Determine the vacuum line color of the vacuum circuit that is leaking. To determine the vacuum line

DIAGNOSIS AND TESTING (Continued)

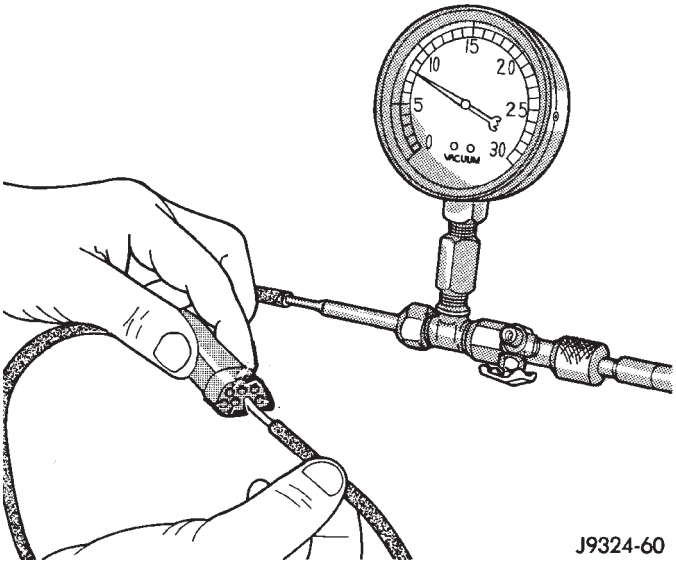


Fig. 9 Vacuum Circuit Test

colors, refer to the Vacuum Circuits chart (Fig. 10) or (Fig. 11).

(4) Disconnect and plug the vacuum line from the component (fitting, actuator, valve, switch, or reservoir) on the other end of the leaking circuit. Instrument panel disassembly or removal may be necessary to gain access to some components. See the service procedures in this group.

(5) Connect the test set hose or probe to the open end of the leaking circuit. The test set gauge should return to the 27 kPa (8 in. Hg.) setting shortly after each connection is made. If OK, replace the faulty disconnected component. If not OK, go to Step 6.

(6) To locate a leak in a vacuum line, leave one end of the line plugged and connect the test set hose or probe to the other end. Run your fingers slowly along the line while watching the test set gauge. The vacuum reading will fluctuate when your fingers contact the source of the leak. To repair the vacuum line, cut out the leaking section of the line. Then, insert the loose ends of the line into a suitable length of 3 mm (1/8-inch) inside diameter rubber hose.

BLOWER MOTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. Possible causes of an inoperative blower motor include:

- Faulty fuse
- Faulty blower motor circuit wiring or wire harness connectors
- Faulty blower motor resistor
- Faulty blower motor relay
- Faulty blower motor switch
- Faulty heater-A/C mode control switch
- Faulty blower motor.

Possible causes of the blower motor not operating in all speeds include:

- Faulty fuse
- Faulty blower motor switch
- Faulty blower motor resistor
- Faulty blower motor circuit wiring or wire harness connectors.

VIBRATION

Possible causes of blower motor vibration include:

- Improper blower motor mounting
- Improper blower wheel mounting
- Blower wheel out of balance or bent
- Blower motor faulty.

NOISE

To verify that the blower is the source of the noise, unplug the blower motor wire harness connector and operate the heater-A/C system. If the noise goes away, possible causes include:

- Foreign material in the heater-A/C housing
- Improper blower motor mounting
- Improper blower wheel mounting
- Blower motor faulty.

BLOWER MOTOR RELAY

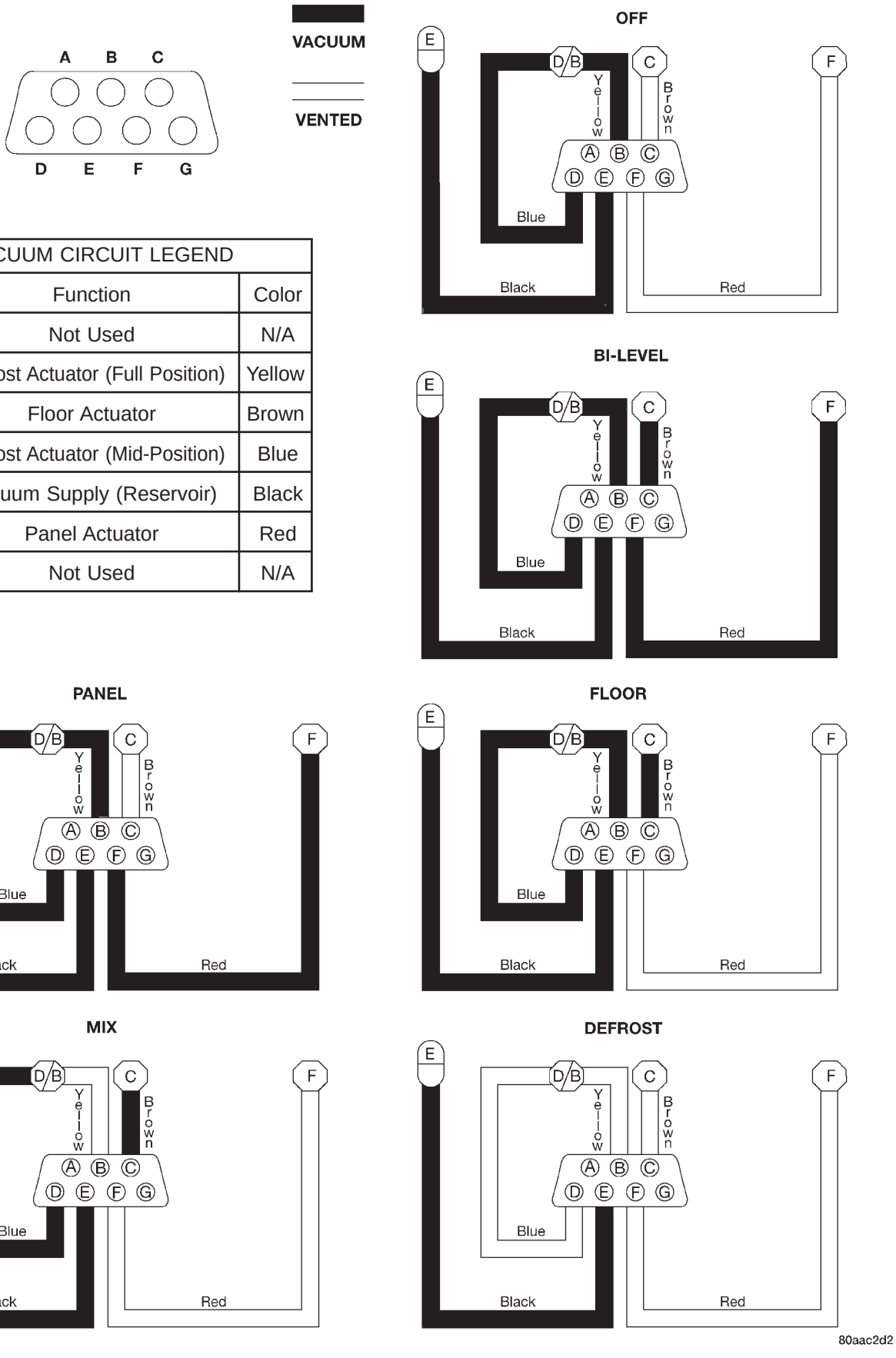
WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

RELAY TEST

The blower motor relay is located in a wire harness connector that is secured to the heater-A/C housing behind the glove box on the passenger side of the vehicle, next to the heater-A/C wire harness connector in the passenger compartment. Remove the relay from its connector to perform the following tests:

(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and

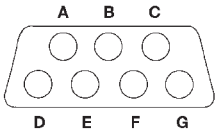
DIAGNOSIS AND TESTING (Continued)



VACUUM CIRCUIT LEGEND		
I.D.	Function	Color
A	Not Used	N/A
B	Defrost Actuator (Full Position)	Yellow
C	Floor Actuator	Brown
D	Defrost Actuator (Mid-Position)	Blue
E	Vacuum Supply (Reservoir)	Black
F	Panel Actuator	Red
G	Not Used	N/A

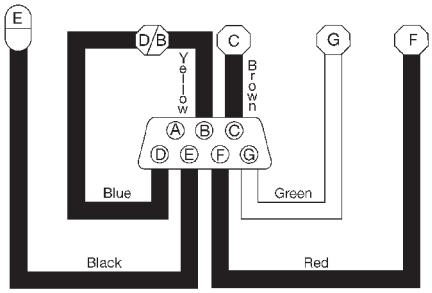
Fig. 10 Vacuum Circuits - Heater Only

DIAGNOSIS AND TESTING (Continued)

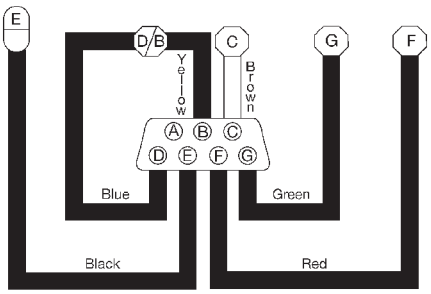


VACUUM CIRCUIT LEGEND		
I.D.	Function	Color
A	Not Used	N/A
B	Defrost Actuator (Full Position)	Yellow
C	Floor Actuator	Brown
D	Defrost Actuator (Mid-Position)	Blue
E	Vacuum Supply (Reservoir)	Black
F	Panel Actuator	Red
G	Recirculation Actuator	Green

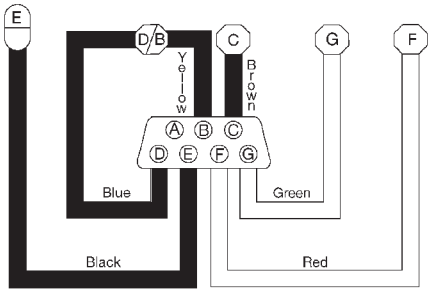
A/C-BI LEVEL



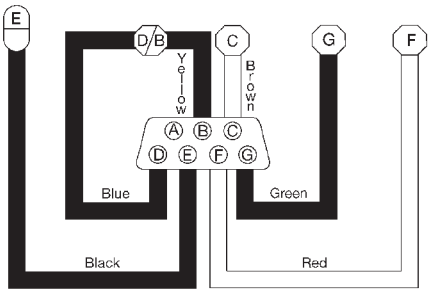
A/C-RECIRCULATION



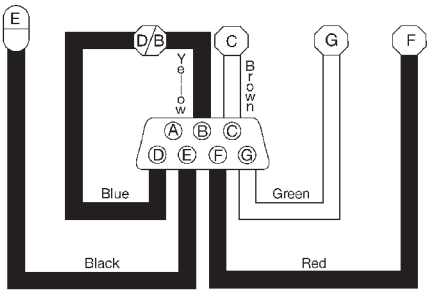
FLOOR



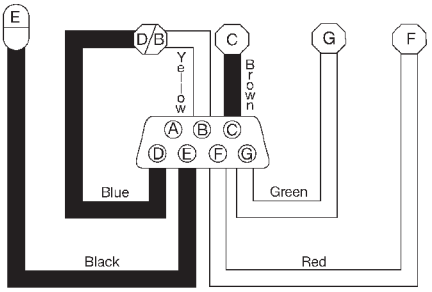
OFF



A/C-OUTSIDE OR PANEL



MIX



DEFROST

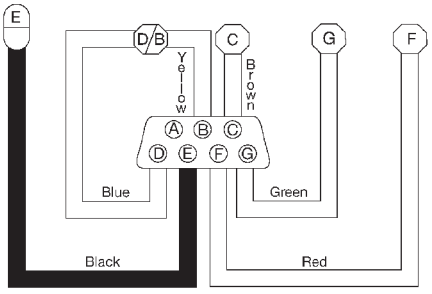


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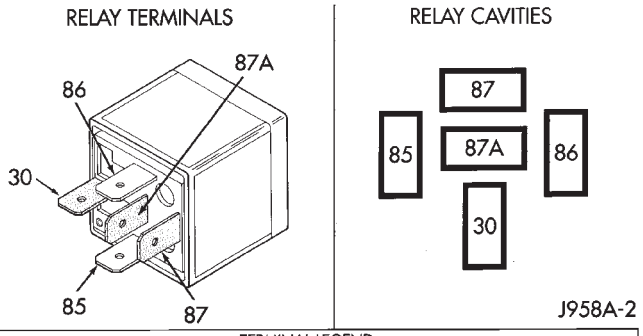
Fig. 11 Vacuum Circuits - Heater-A/C

DIAGNOSIS AND TESTING (Continued)

no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A and 30. If OK, see the Circuit Test in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

Blower Motor Relay

CIRCUIT TEST

(1) The relay common feed terminal cavity (30) is connected to fused battery feed directly from a fuse in the Power Distribution Center (PDC), and should be hot at all times. Check for battery voltage at the connector cavity for relay terminal 30. If OK, go to Step 2. If not OK, repair the open circuit to the PDC as required.

(2) The relay normally closed terminal cavity (87A) is not used for this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the blower motor. When the relay is energized, terminal 87 is connected to terminal 30 and provides full battery current to the blower motor feed circuit. There should be continuity between the connector cavity for terminal 87 and the blower motor relay output circuit cavity of the blower motor wire harness connector at all times. If OK, go to Step 4. If not OK, repair the open circuit to the blower motor as required.

(4) The coil battery terminal cavity (86) is connected to the ignition switch. When the ignition switch is placed in the On position, fused ignition switch output is directed from a fuse in the junction block to the relay electromagnetic coil to energize the relay. There should be battery voltage at the connector cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the junction block fuse as required.

(5) The coil ground terminal cavity (85) is connected to ground. This terminal supplies the ground for the relay electromagnet coil. There should be continuity between the cavity for relay terminal 85 and a good ground at all times. If not OK, repair the open circuit as required.

BLOWER MOTOR RESISTOR

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

To test the blower motor resistor, unplug the resistor wire harness connector. Each blower motor switch input terminal on the resistor must have continuity to the resistor output terminal, which is connected to the circuit going to the blower motor. If the blower motor resistor continuity does not check OK, replace the faulty resistor.

BLOWER MOTOR SWITCH

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. The blower motor switch is only serviced as a part of the heater-only or heater-A/C control assembly.

(1) Turn the ignition switch to the Off position. Remove the heater-A/C control from the instrument panel. Check for continuity between the ground circuit cavity of the control wire harness connector and a good ground. There should be continuity. If OK, go to Step 2. If not OK, repair the open circuit to ground as required.

(2) With the heater-A/C control wire harness connector unplugged, place the mode control switch knob in any position except the Off position. Check for continuity between the ground circuit terminal and each of the blower motor driver circuit terminals of the control as you move the blower switch to each of the four speed positions. There should be continuity at each driver circuit terminal in only one blower motor switch speed position. If OK, test and repair the blower driver circuits between the control connector and the blower motor resistor as required. If not OK, replace the faulty heater-A/C control unit.

DIAGNOSIS AND TESTING (Continued)

COMPRESSOR

When investigating an air conditioning related noise, you must first know the conditions under which the noise occurs. These conditions include: weather, vehicle speed, transmission in gear or neutral, engine temperature, and any other special conditions.

Noises that develop during air conditioning operation can often be misleading. For example: What sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify serpentine drive belt tension. Improper belt tension can cause a misleading noise when the compressor is engaged. The noise may not occur when the compressor is disengaged.

Drive belts are speed sensitive. At different engine speeds and depending upon belt tension, belts can develop noises that are mistaken for a compressor noise.

(1) Select a quiet area for testing. Duplicate the complaint conditions as much as possible. Switch the compressor on and off several times to clearly identify the compressor noise. Listen to the compressor clutch while engaged and disengaged.

(2) To duplicate a high-ambient temperature condition (high head pressure), restrict the air flow through the condenser. Install a manifold gauge set to make sure that the discharge pressure does not exceed 2070 kPa (300 psi).

(3) Tighten all compressor mounting bolts, the clutch mounting nut, the clutch coil mounting screw or nut, and the serpentine drive belt to the correct specifications.

(4) Check the refrigerant system plumbing for rubbing or interference, which can cause unusual noises.

(5) Check the refrigerant system charge. See the Charging Refrigerant System procedure in this group.

(6) Check the compressor noise as in Step 1.

(7) If the noise still exists, loosen the compressor mounting bolts and tighten again. Repeat Step 1.

(8) If the noise continues, replace the compressor and repeat Step 1.

COMPRESSOR CLUTCH COIL

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams. The battery must be fully-charged before performing the following tests. Refer to Group 8A - Battery for more information.

(1) Connect an ammeter (0 to 10 ampere scale) in series with the clutch coil terminal. Use a voltmeter (0 to 20 volt scale) with clip-type leads for measuring the voltage across the battery and the compressor clutch coil.

(2) With the heater-A/C mode control switch in any A/C mode, and the blower motor switch in the lowest speed position, start the engine and run it at normal idle.

(3) The compressor clutch coil voltage should read within two volts of the battery voltage. If there is voltage at the clutch coil, but the reading is not within two volts of the battery voltage, test the clutch coil feed circuit for excessive voltage drop and repair as required. If there is no voltage reading at the clutch coil, use a DRB scan tool and the proper Diagnostic Procedures manual for testing of the compressor clutch circuit. The following components must be checked and repaired as required before you can complete testing of the clutch coil:

- Fuses in the junction block and the Power Distribution Center (PDC)
- Heater-A/C mode control switch
- Compressor clutch relay
- High pressure cut-off switch
- Low pressure cycling clutch switch
- Powertrain Control Module (PCM).

(4) The compressor clutch coil is acceptable if the current draw measured at the clutch coil is 2.0 to 3.9 amperes with electrical system voltage at 11.5 to 12.5 volts. This should only be checked with the work area temperature at 21° C (70° F). If system voltage is more than 12.5 volts, add electrical loads by turning on electrical accessories until the system voltage drops below 12.5 volts.

(a) If the clutch coil current reading is 4 amperes or more, the coil is shorted and should be replaced.

(b) If the clutch coil current reading is zero, the coil is open and should be replaced.

COMPRESSOR CLUTCH RELAY

RELAY TEST

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

The compressor clutch relay is located in the Power Distribution Center (PDC). Refer to the PDC label for relay identification and location. Remove the relay from the PDC to perform the following tests:

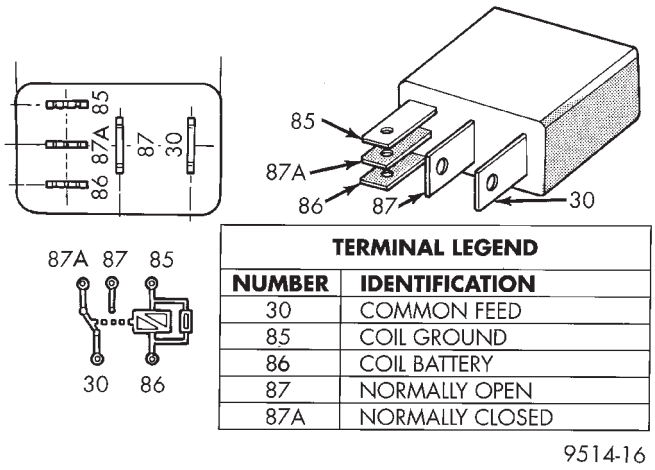
(1) A relay in the de-energized position should have continuity between terminals 87A and 30, and no continuity between terminals 87 and 30. If OK, go to Step 2. If not OK, replace the faulty relay.

(2) Resistance between terminals 85 and 86 (electromagnet) should be 75 ± 5 ohms. If OK, go to Step 3. If not OK, replace the faulty relay.

(3) Connect a battery to terminals 85 and 86. There should now be continuity between terminals 30 and 87, and no continuity between terminals 87A

DIAGNOSIS AND TESTING (Continued)

and 30. If OK, see the Relay Circuit Test procedure in this group. If not OK, replace the faulty relay.



TERMINAL LEGEND	
NUMBER	IDENTIFICATION
30	COMMON FEED
85	COIL GROUND
86	COIL BATTERY
87	NORMALLY OPEN
87A	NORMALLY CLOSED

9514-16

Compressor Clutch Relay

RELAY CIRCUIT TEST

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) The relay common feed terminal cavity (30) is connected to fused battery feed. There should be battery voltage at the cavity for relay terminal 30 at all times. If OK, go to Step 2. If not OK, repair the open circuit to the fuse in the PDC as required.

(2) The relay normally closed terminal (87A) is not used in this application. Go to Step 3.

(3) The relay normally open terminal cavity (87) is connected to the compressor clutch coil. There should be continuity between this cavity and the A/C compressor clutch relay output circuit cavity of the compressor clutch coil wire harness connector. If OK, go to Step 4. If not OK, repair the open circuit as required.

(4) The relay coil battery terminal (86) is connected to the fused ignition switch output (run/start) circuit. There should be battery voltage at the cavity for relay terminal 86 with the ignition switch in the On position. If OK, go to Step 5. If not OK, repair the open circuit to the fuse in the junction block as required.

(5) The coil ground terminal cavity (85) is switched to ground through the Powertrain Control Module (PCM). There should be continuity between this cavity and the A/C compressor clutch relay control circuit cavity of the PCM wire harness connector C (gray) at all times. If not OK, repair the open circuit as required.

HIGH PRESSURE CUT-OFF SWITCH

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) Verify that the refrigerant system is properly charged.

(2) Unplug the high pressure switch wire harness connector and test for continuity between the switch terminals. There should be continuity. If OK, refer to the wiring diagrams and repair the A/C request signal circuit as required. If not OK, replace the faulty switch.

LOW PRESSURE CYCLING CLUTCH SWITCH

Before performing diagnosis of the low pressure cycling clutch switch, be certain that the switch is properly installed on the accumulator fitting. The low pressure cycling clutch switch should be hand-tightened onto the fitting. If the switch is too loose it may not open the Schrader-type valve in the accumulator fitting, which will prevent the switch from correctly monitoring the refrigerant system pressure.

Also verify that the refrigerant system has the correct refrigerant charge. See Refrigerant System Charge in this group for more information.

For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

(1) Unplug the low pressure cycling clutch switch wire harness connector from the switch on the accumulator, and install a jumper wire between the two connector cavities.

(2) Connect a manifold gauge set to the refrigerant system service ports.

(3) Place the heater-A/C mode control switch knob in any A/C position and start the engine.

(4) Check the continuity between the two terminals of the low pressure switch. There should be continuity with a suction pressure reading of 296 kPa (43 psi) or above, and no continuity with a suction pressure reading of 172 kPa (25 psi) or below. If OK, test and repair the A/C request signal circuit as required. If not OK, replace the faulty switch.

REFRIGERANT SYSTEM LEAKS

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE LEAK TESTING THE SYSTEM.

If the air conditioning system is not cooling properly, determine if the refrigerant system is fully-charged. See A/C Performance in this group. If the refrigerant system is low or empty, a leak at a line, fitting, or component seal is likely. Fittings, lines, or components that appear to be oily indicate a possible refrigerant leak. To detect a leak in the refrigerant system, perform one of the following procedures:

DIAGNOSIS AND TESTING (Continued)

SYSTEM EMPTY

(1) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group.

(2) Connect and dispense 0.283 kPa (0.6 lbs. or 10 oz.) of R-134a refrigerant into the evacuated refrigerant system. See Refrigerant System Charge in this group.

(3) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(4) With the engine not running, use a electronic R-134a leak detector and search for leaks. Move the leak detector probe slowly along the bottom side of all lines and fittings, because R-134a is heavier than air.

(5) To inspect the evaporator coil for leaks, insert the leak detector probe into the center panel outlet. Set the blower motor switch to the lowest speed position, and the mode control switch in the Recirculation Mode.

SYSTEM LOW

(1) Position the vehicle in a wind-free work area. This will aid in detecting small leaks.

(2) Bring the refrigerant system up to operating temperature and pressure. This is done by allowing the engine to run with the air conditioning system on for five minutes.

(3) With the engine not running, use a electronic R-134a leak detector and search for leaks. Move the leak detector probe slowly along the bottom side of all lines and fittings, because R-134a is heavier than air.

(4) To inspect the evaporator coil for leaks, insert the leak detector probe into the center panel outlet. Set the blower motor switch to the lowest speed position, and the mode control switch in the Recirculation Mode.

SERVICE PROCEDURES

REFRIGERANT RECOVERY

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE RECOVERING REFRIGERANT.

R-134a refrigerant is a hydrofluorocarbon (HFC) that does not contain chlorine. A R-134a refrigerant recovery/recycling station that meets SAE Standard J2210 must be used to recover the refrigerant. Refer to the operating instructions provided with the equipment for proper operation.

REFRIGERANT SYSTEM EVACUATE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE EVACUATING THE SYSTEM.

If the refrigerant system has been open to the atmosphere, it must be evacuated before the system can be charged. Moisture and air mixed with the refrigerant will raise the compressor head pressure above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Evacuating will boil the moisture out of the refrigerant system at near room temperature. To evacuate the refrigerant system, use the following procedure:

(1) Connect a suitable charging station and manifold gauge set to the vehicle.

(2) Open the low and high side valves and start the vacuum pump. When the suction gauge reads 88 kPa (26 in. Hg.) vacuum or greater, close all of the valves and turn off the vacuum pump. If the system fails to reach the specified vacuum, the system has a leak that must be corrected. If the system maintains the specified vacuum for five minutes, restart the vacuum pump. Then open the suction and discharge valves and evacuate an additional ten minutes.

(3) Close all of the valves. Turn off and disconnect the vacuum pump.

(4) The refrigerant system is now ready to be charged with refrigerant.

REFRIGERANT SYSTEM CHARGE

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE CHARGING THE REFRIGERANT SYSTEM.

After the system has been tested for leaks and evacuated, a refrigerant charge can be injected into the system. See Refrigerant Charge Capacity for the proper amount of the refrigerant charge. Charge the system using a recovery/recycling/charging station approved for R-134a refrigerant. This device must meet SAE Standard J2210. Refer to the instructions provided with the equipment for proper operation.

REFRIGERANT CHARGE CAPACITY

The R-134a system charge capacity is 0.567 kg (1.25 lbs.).

REFRIGERANT OIL LEVEL

When an air conditioning system is assembled at the factory, all components (except the compressor) are refrigerant oil free. After the system has been charged and operated, the oil in the compressor is dispersed through the refrigerant system. The accu-

SERVICE PROCEDURES (Continued)

mulator, evaporator, condenser, and compressor will retain a significant amount of oil.

It is important to have the correct amount of oil in the refrigerant system. This will ensure proper lubrication of the compressor. Too little oil will result in damage to the compressor. Too much oil will reduce the cooling capacity of the system.

It will not be necessary to check the oil level in the compressor or to add oil, unless there has been an oil loss. This may be due to a rupture or leak from a refrigerant line, a compressor shaft seal, an evaporator, or a condenser. If a rupture occurs, add 30 milliliters (1 fluid ounce) of oil to the system after the repair has been made. Oil loss at a leak point will be evident by the presence of a wet, shiny surface around the leak.

Refrigerant oil must be added when a accumulator, evaporator, or condenser are replaced. Refer to the Refrigerant Oil Capacities chart. When a compressor is replaced, the oil must be drained from the old compressor and measured. Drain all the oil from the new compressor, then fill the new compressor with the same amount of oil that was drained out of the old compressor.

Refrigerant Oil Capacities		
Component	**ml**	**oz**
A/C System	240	8.1
Accumulator	120	4
Condenser	30	1
Evaporator	60	2
Compressor	drain and measure the oil from the old compressor - see text.	

REMOVAL AND INSTALLATION

REFRIGERANT LINE COUPLER

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Recover the refrigerant from the refrigerant system as described in this group.

(2) Remove the secondary clip from the coupler. Fit the appropriate spring lock refrigerant line coupler tool (Special Tool 7193) to the coupler (Fig. 12).

(3) Close the tool and push it into the open side of the cage to expand the garter spring and release the female fitting.

NOTE: The garter spring may not release if the tool is cocked while pushing it into the cage opening.

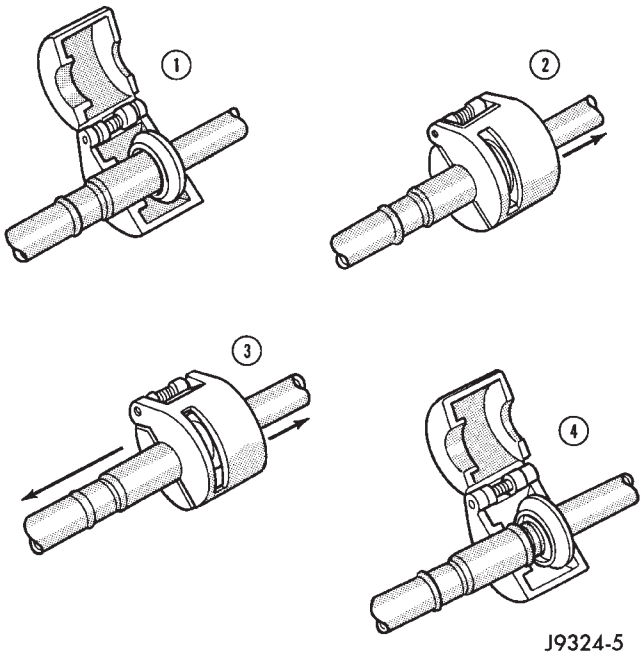


Fig. 12 Spring Lock Coupler Disconnect

(4) After the garter spring is expanded, pull the fittings apart within the tool.

(5) Remove the tool from the disconnected coupler.

(6) Separate the two ends of the coupler.

INSTALLATION

(1) Check to ensure that the garter spring is in the cage of the male coupler fitting. If the garter spring is missing, install a new spring by pushing it into the cage opening. If the garter spring is damaged, remove it from the cage with a small wire hook (DO NOT use a screwdriver) and install a new garter spring.

(2) Clean any dirt or foreign material from both halves of the coupling.

(3) Install new O-rings on the male fitting.

CAUTION: Use only the specified O-rings as they are made of a special material for the R-134a system. The use of any other O-ring may allow the connection to leak intermittently during vehicle operation.

(4) Lubricate the male fitting and O-ring, and the inside of the female fitting with clean R-134a refrigerant oil. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(5) Fit the female fitting to the male fitting and push together until the garter spring snaps over the flared end of the female fitting.

(6) Ensure the coupler is fully engaged by pulling back on the lines on either side of the coupler.

(7) Install the secondary clip on the coupler.

REMOVAL AND INSTALLATION (Continued)

HIGH PRESSURE CUT-OFF SWITCH

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the high pressure cut-off switch, which is located in a fitting on the discharge line between the compressor and the condenser inlet (Fig. 13).

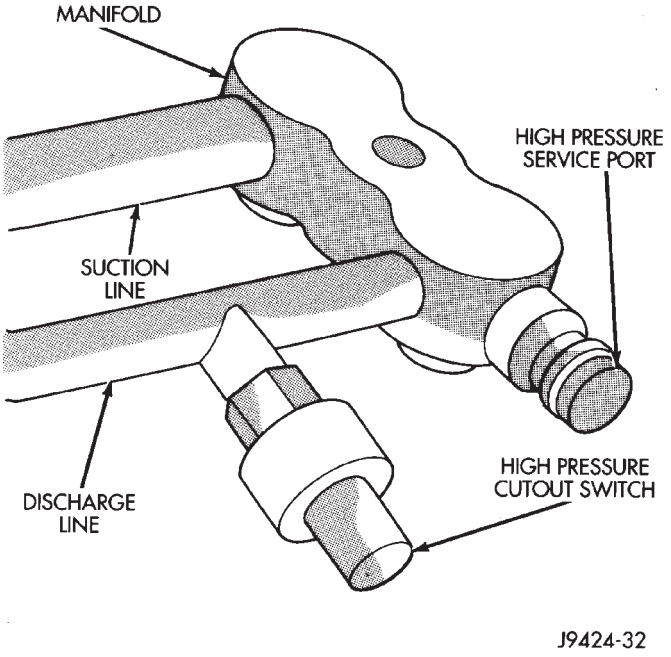


Fig. 13 High Pressure Cut-Off Switch - Typical

(3) Unscrew the high pressure cut-off switch from the discharge line fitting.

(4) Remove the high pressure cut-off switch from the vehicle.

INSTALLATION

(1) Install and tighten the high pressure cut-off switch on the discharge line fitting.

(2) Plug the wire harness connector into the high pressure cut-off switch.

(3) Connect the battery negative cable.

SUCTION AND DISCHARGE LINE

Kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 mm (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

2.5L ENGINE

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system as described in this group.

(3) Unplug the wire harness connector from the high pressure cut-off switch.

(4) Remove the radiator grille panel. Refer to Group 23 - Body for the procedures.

(5) Reach through the grille opening to remove the screw that secures the discharge line block fitting at the condenser inlet (Fig. 14) or (Fig. 15). Install plugs in, or tape over all of the open refrigerant fittings.

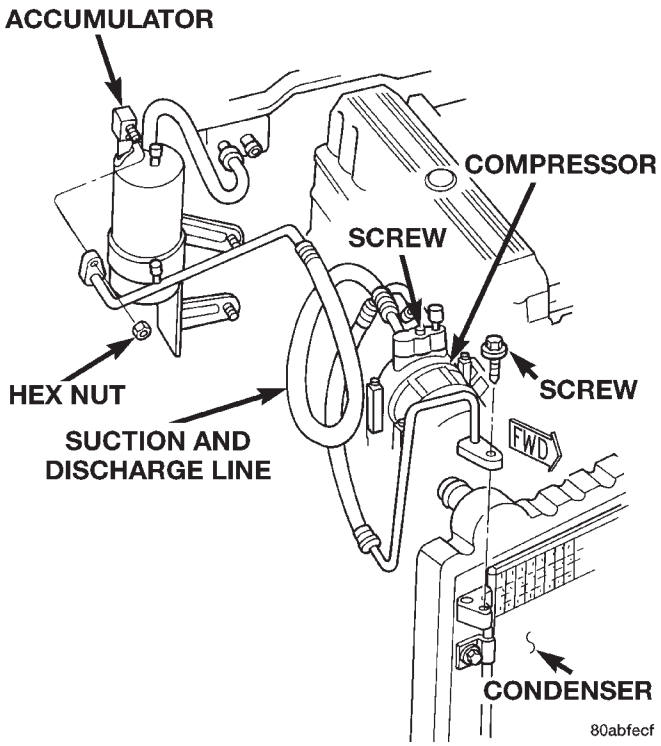


Fig. 14 Suction and Discharge Line Remove/Install - Left-Hand Drive 2.5L Engine

(6) Remove the nut that secures the suction line block fitting to the accumulator outlet. Install plugs in, or tape over all of the open refrigerant fittings.

REMOVAL AND INSTALLATION (Continued)

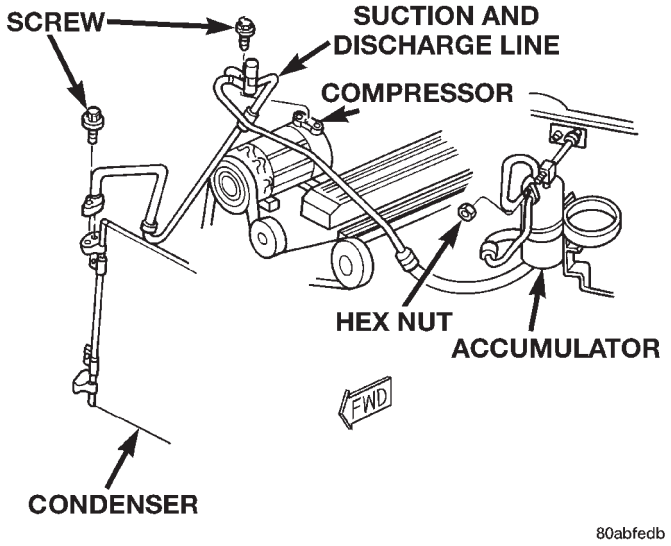


Fig. 15 Suction and Discharge Line Remove/Install - Right-Hand Drive 2.5L Engine

(7) Remove the screw that secures the suction and discharge line manifold to the compressor. Install plugs in, or tape over all of the open refrigerant fittings.

(8) Remove the suction and discharge line unit from the vehicle.

INSTALLATION

(1) Remove the tape or plugs from the suction and discharge line manifold and the compressor. Install the suction and discharge line manifold to the compressor. Tighten the mounting screw to 28 N·m (250 in. lbs.).

(2) Remove the tape or plugs from the suction line and the accumulator outlet block fittings. Install the suction line to the accumulator outlet and tighten the mounting nut to 9 N·m (80 in. lbs.).

(3) Remove the tape or plugs from the discharge line and the condenser inlet block fittings. Install the discharge line to the condenser inlet and tighten the mounting screw to 12 N·m (105 in. lbs.).

(4) Install the radiator grille panel. Refer to Group 23 - Body for the procedures.

(5) Plug in the wire harness connector to the high pressure cut-off switch.

(6) Connect the battery negative cable.

(7) Evacuate and charge the refrigerant system as described in this group.

LEFT-HAND DRIVE 4.0L ENGINE

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system as described in this group.

(3) Unplug the wire harness connector from the high pressure cut-off switch.

(4) Disconnect the discharge line refrigerant line coupler at the condenser inlet (Fig. 16). See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the open refrigerant fittings.

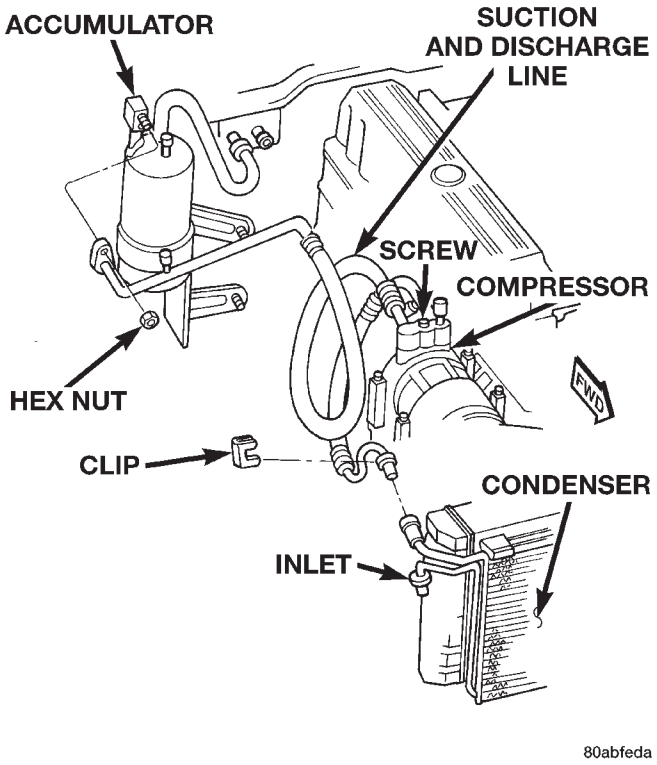


Fig. 16 Suction and Discharge Line Remove/Install - Left-Hand Drive 4.0L Engine

(5) Remove the nut that secures the suction line block fitting to the accumulator outlet. Install plugs in, or tape over all of the open refrigerant fittings.

(6) Remove the screw that secures the suction and discharge line manifold to the compressor. Install plugs in, or tape over all of the open refrigerant fittings.

(7) Remove the suction and discharge line unit from the vehicle.

INSTALLATION

(1) Remove the tape or plugs from the suction and discharge line manifold and the compressor. Install the suction and discharge line manifold to the compressor. Tighten the mounting screw to 28 N·m (250 in. lbs.).

(2) Remove the tape or plugs from the suction line and the accumulator outlet block fittings. Install the suction line to the accumulator outlet and tighten the mounting nut to 9 N·m (80 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

(3) Remove the tape or plugs from the refrigerant line couplers on the discharge line and the condenser inlet. Install the discharge line to the condenser inlet. See Refrigerant Line Coupler in this group for the procedures.

(4) Plug in the wire harness connector to the high pressure cut-off switch.

(5) Connect the battery negative cable.

(6) Evacuate and charge the refrigerant system as described in this group.

RIGHT-HAND DRIVE 4.0L ENGINE

The suction and discharge lines for this model are individual components and are secured to a manifold block on the compressor with block fittings (Fig. 17). There is also a jumper line installed between the discharge line and the condenser inlet that is secured with refrigerant line couplers at each end. Each of these components is available as a separate service part.

The suction and discharge line components can be removed from or installed on the vehicle individually, or as a unit. Otherwise, the service procedures are the same as those for the Left-Hand Drive 4.0L Engine application. Tighten the additional mounting hardware as follows:

- Suction line to manifold block nut - 9 N·m (80 in. lbs.)
- Discharge line to manifold block nut - 9 N·m (80 in. lbs.)
- Manifold block to compressor screw - 28 N·m (250 in. lbs.).

COMPRESSOR

The compressor may be removed and repositioned without disconnecting the refrigerant lines or discharging the refrigerant system. Discharging is not necessary if servicing the compressor clutch or clutch coil, the engine, the cylinder head, or the generator.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Recover the refrigerant from the refrigerant system as described in this group.

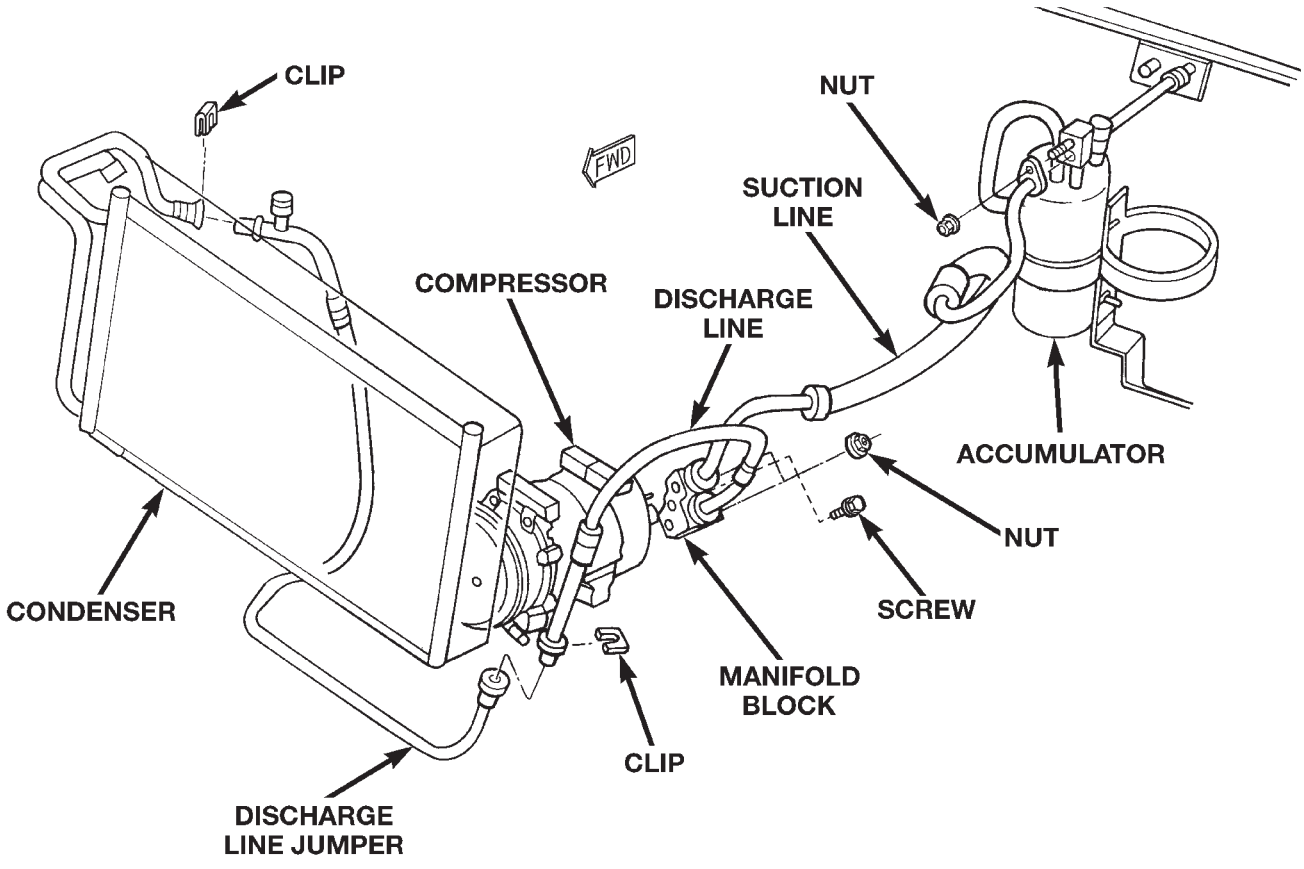


Fig. 17 Suction and Discharge Line Remove/Install - Right-Hand Drive 4.0L Engine

REMOVAL AND INSTALLATION (Continued)

(2) Disconnect and isolate the battery negative cable.

(3) Loosen and remove the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(4) If the vehicle is equipped with Right-Hand Drive (RHD) and the 4.0L engine, raise and support the vehicle.

(5) Unplug the compressor clutch coil wire harness connector.

(6) Remove the suction and discharge refrigerant lines from the compressor as described in this group. Install plugs in, or tape over all of the open refrigerant fittings.

(7) Remove the four bolts that secure the compressor to the mounting bracket (Fig. 18) or (Fig. 19).

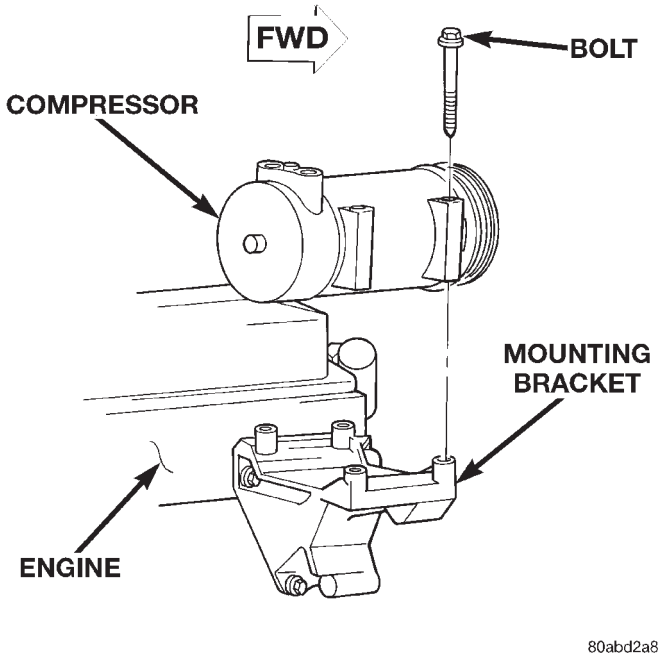


Fig. 18 Compressor Remove/Install - All 2.5L Engines and LHD 4.0L Engines

(8) Remove the compressor from the mounting bracket.

INSTALLATION

NOTE: If a replacement compressor is being installed, be certain to check the oil level. See Refrigerant Oil Level in this group.

(1) Install the compressor to the mounting bracket. Tighten the four mounting bolts as follows:

- All 2.5L engines and LHD 4.0L engines - 27 N·m (20 ft. lbs.)
- RHD 4.0L engines - 57 N·m (42 ft. lbs.).

(2) Remove the tape or plugs from all of the open refrigerant fittings, and install the suction and discharge lines to the compressor as described in this group.

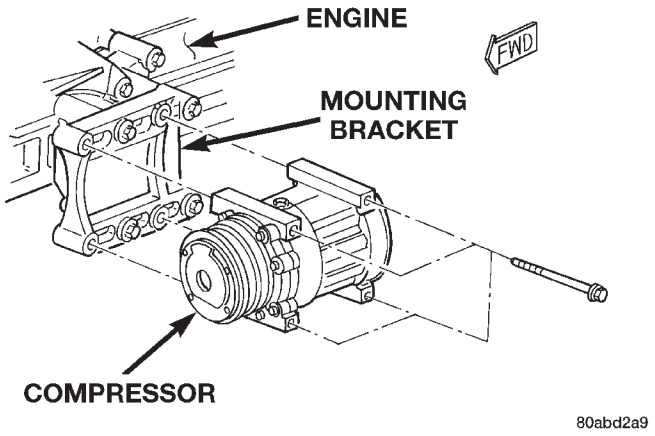


Fig. 19 Compressor Remove/Install - RHD 4.0L Engines

(3) Install the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(4) Plug in the compressor clutch coil wire harness connector.

(5) Connect the battery negative cable.

(6) Evacuate and charge the refrigerant system as described in this group.

COMPRESSOR CLUTCH

The refrigerant system can remain fully-charged during compressor clutch, pulley, or coil replacement. The compressor clutch can be serviced in the vehicle.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the serpentine drive belt. Refer to Group 7 - Cooling System for the procedures.

(3) Remove the compressor mounting bolts and lift the compressor from the mounting bracket. Support the compressor to work on the clutch.

(4) Insert the two pins of the spanner wrench (Special Tool C-4489) into the holes of the clutch plate. Hold the clutch plate stationary and remove the hex nut (Fig. 20).

(5) Remove the clutch plate with a puller (Special Tool C-6461) (Fig. 21).

(6) Remove the compressor shaft key and the clutch shims.

(7) Remove the external front housing snap ring with snap ring pliers (Fig. 22).

(8) Install the lip of the rotor puller (Special Tool C-6141-1) into the snap ring groove exposed in the previous step, and install the shaft protector (Special Tool C-6141-2) (Fig. 23).

REMOVAL AND INSTALLATION (Continued)

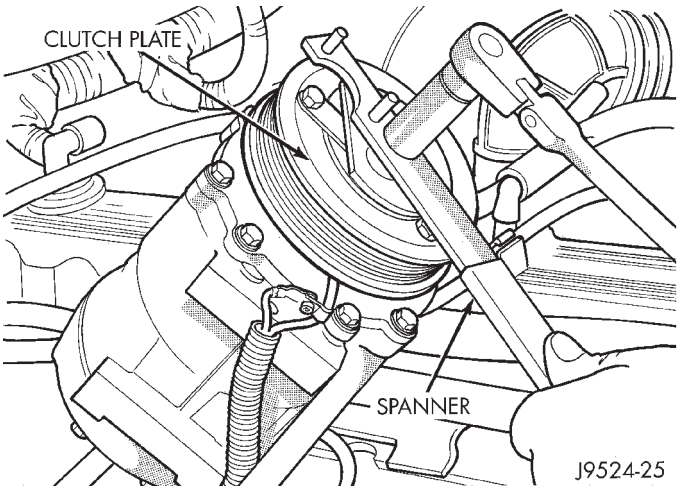


Fig. 20 Clutch Nut Remove

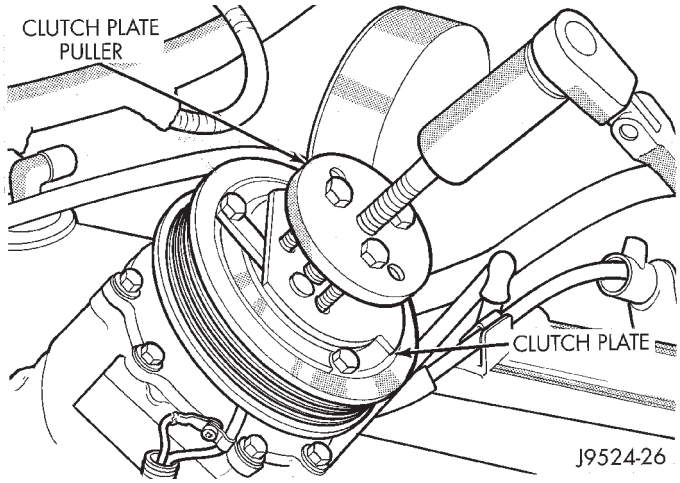


Fig. 21 Clutch Plate Remove

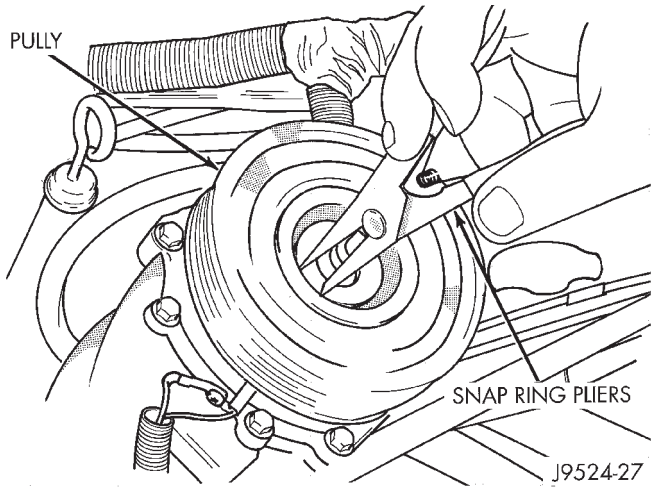


Fig. 22 External Snap Ring Remove

(9) Install the puller through-bolts (Special Tool C-6461) through the puller flange and into the jaws of the rotor puller and tighten (Fig. 24). Turn the puller center bolt clockwise until the rotor pulley is free.

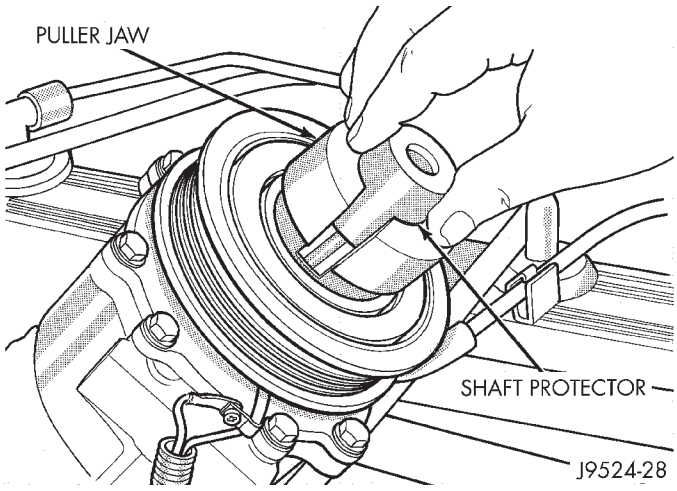


Fig. 23 Shaft Protector and Puller

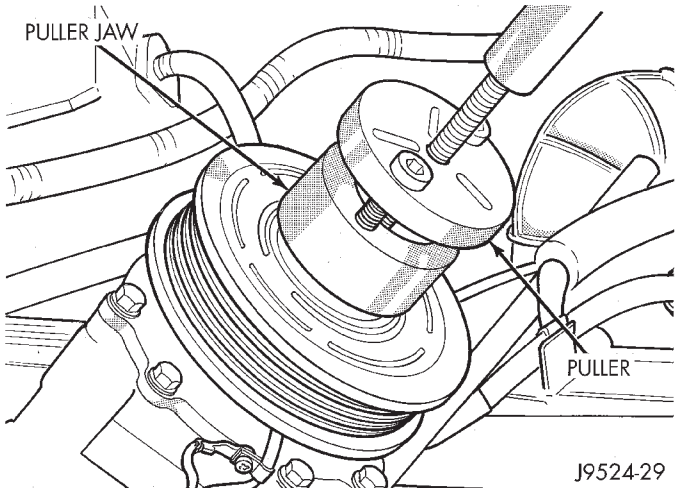


Fig. 24 Install Puller Plate

(10) Remove the screw and retainer from the clutch coil lead wire harness on the compressor front housing (Fig. 25).

(11) Remove the snap ring from the compressor hub and remove the clutch field coil (Fig. 26). Slide the clutch field coil off of the compressor hub.

INSPECTION

Examine the friction surfaces of the clutch pulley and the front plate for wear. The pulley and front plate should be replaced if there is excessive wear or scoring.

If the friction surfaces are oily, inspect the shaft and nose area of the compressor for oil. Remove the felt from the front cover. If the felt is saturated with oil, the shaft seal is leaking and the compressor must be replaced.

REMOVAL AND INSTALLATION (Continued)

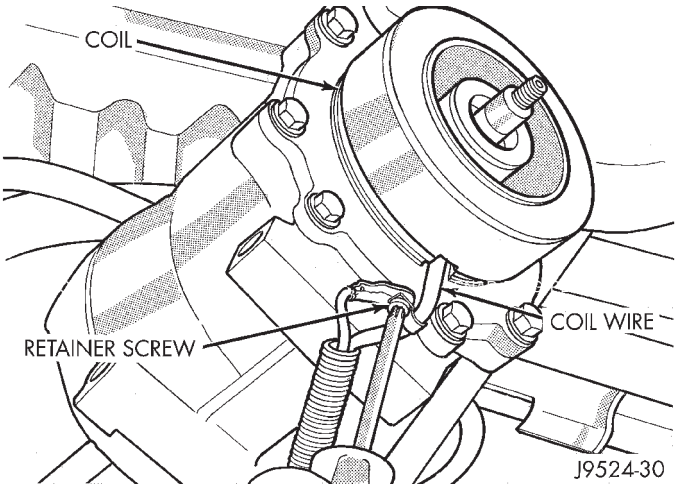


Fig. 25 Clutch Coil Lead Wire Harness

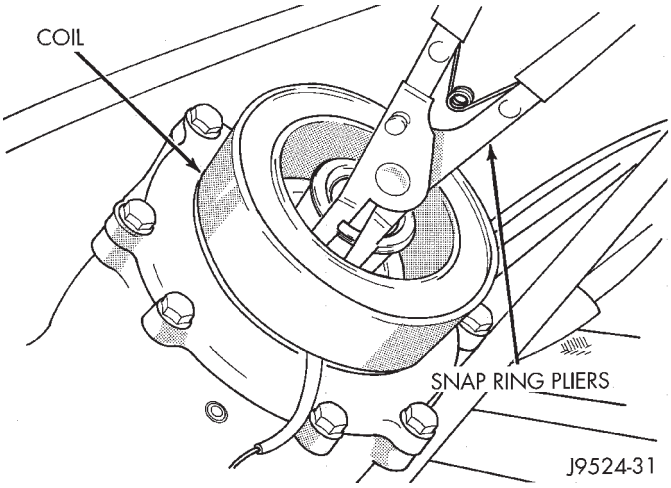


Fig. 26 Clutch Field Coil Snap Ring Remove

Check the clutch pulley bearing for roughness or excessive leakage of grease. Replace the bearing, if required.

INSTALLATION

(1) Install the clutch field coil and snap ring.

(2) Install the clutch coil lead wire harness retaining clip on the compressor front housing and tighten the retaining screw.

(3) Align the rotor assembly squarely on the front compressor housing hub.

(4) Install the pulley bearing assembly with the installer (Special Tool C-6871) (Fig. 27). Thread the installer on the shaft, then turn the nut until the pulley assembly is seated.

(5) Install the external front snap ring with snap ring pliers. The bevel side of the snap ring must be facing outward. Press the snap ring to make sure it is properly seated in the groove.

CAUTION: If the snap ring is not fully seated in the groove it will vibrate out, resulting in a clutch failure and severe damage to the front housing of the compressor.

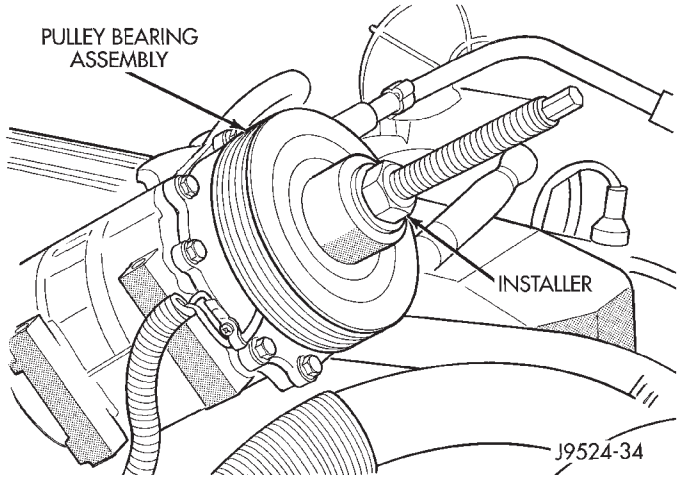


Fig. 27 Clutch Pulley Install

(6) Install the compressor shaft key and the original clutch shims on the compressor shaft.

(7) Install the clutch plate with the driver (Special Tool C-6463) (Fig. 28). Install the shaft hex nut and tighten to 14.4 N·m (10.5 ft. lbs.).

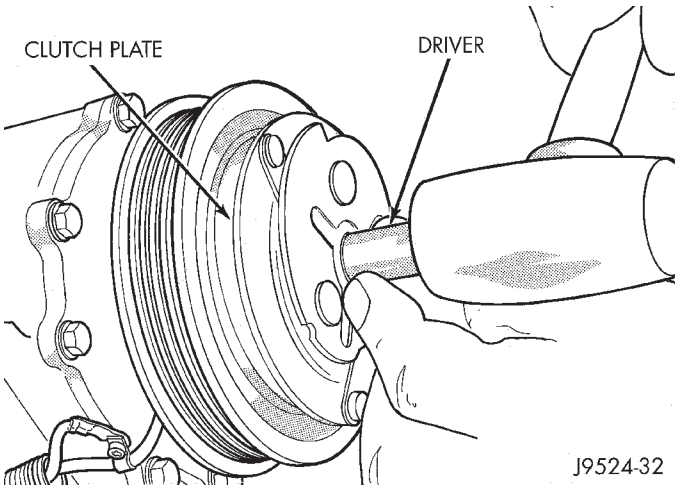


Fig. 28 Clutch Plate Driver

(8) Check the clutch air gap with a feeler gauge (Fig. 29). If the air gap does not meet the specification, add or subtract shims as required. The air gap specification is 0.41 to 0.79 mm (0.016 to 0.031 inch). If the air gap is not consistent around the circumference of the clutch, lightly pry up at the minimum variations. Lightly tap down at the points of maximum variation.

REMOVAL AND INSTALLATION (Continued)

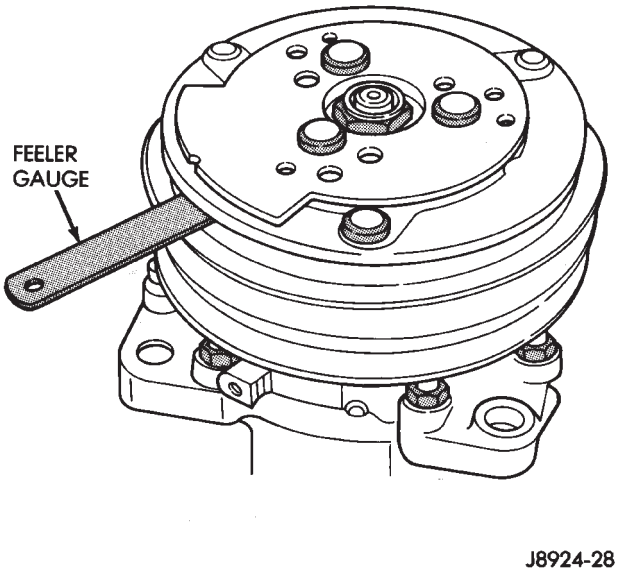


Fig. 29 Check Clutch Air Gap

NOTE: The air gap is determined by the spacer shims. When installing an original, or a new clutch assembly, try the original shims first. When installing a new clutch onto a compressor that previously did not have a clutch, use 0.040, 0.020, and 0.005 shims from the clutch hardware package that is provided with the new clutch.

(9) Reverse the remaining removal procedures to complete the installation.

CLUTCH BREAK-IN

After a new compressor clutch has been installed, cycle the compressor clutch approximately twenty times (five seconds on, then five seconds off). During this procedure, set the heater-A/C control to the Recirculation Mode, the blower motor switch in the highest speed position, and the engine speed at 1500 to 2000 rpm. This procedure (burnishing) will seat the opposing friction surfaces and provide a higher compressor clutch torque capability.

COMPRESSOR CLUTCH RELAY

(1) Disconnect and isolate the battery negative cable.

(2) Remove the cover from the Power Distribution Center (PDC) (Fig. 30).

(3) Refer to the label on the PDC for compressor clutch relay identification and location.

(4) Unplug the compressor clutch relay from the PDC.

(5) Install the compressor clutch relay by aligning the relay terminals with the cavities in the PDC and pushing the relay firmly into place.

(6) Install the PDC cover.

(7) Connect the battery negative cable.

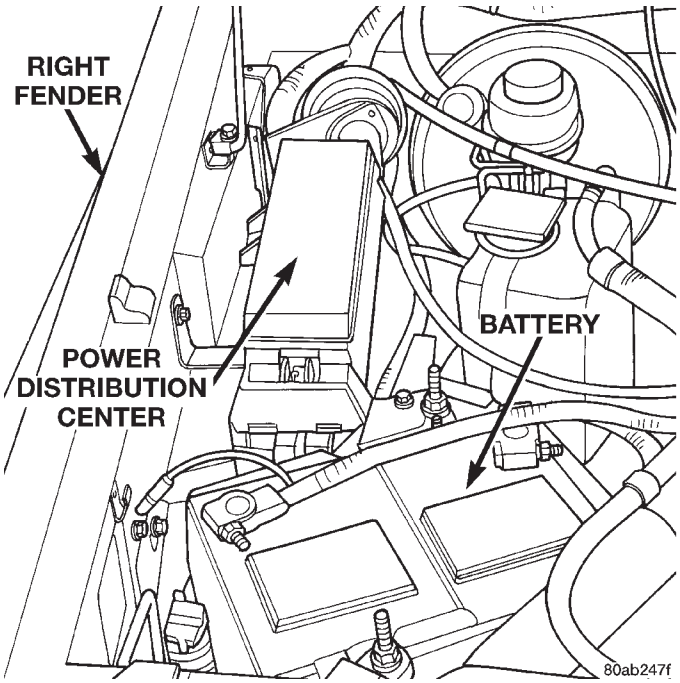


Fig. 30 Power Distribution Center

(8) Test the relay operation.

LIQUID LINE

Kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all refrigerant system connections are pressure tight.

A good rule for the flexible hose refrigerant lines is to keep the radius of all bends at least ten times the diameter of the hose. Sharp bends will reduce the flow of refrigerant. The flexible hose lines should be routed so they are at least 80 mm (3 inches) from the exhaust manifold. It is a good practice to inspect all flexible refrigerant system hose lines at least once a year to make sure they are in good condition and properly routed.

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

2.5L ENGINE

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system as described in this group.

(3) Disconnect the liquid line refrigerant line couplers at the evaporator inlet and, on Right-Hand

REMOVAL AND INSTALLATION (Continued)

Drive models only, the liquid line jumper (Fig. 31) or (Fig. 32). See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the open refrigerant fittings.

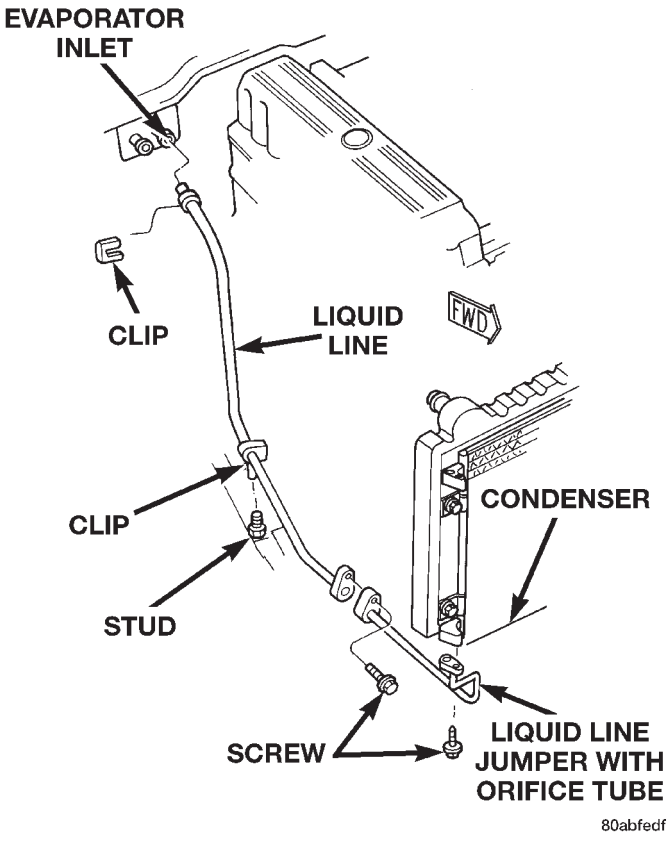


Fig. 31 Liquid Line Remove/Install - Left-Hand Drive 2.5L Engine

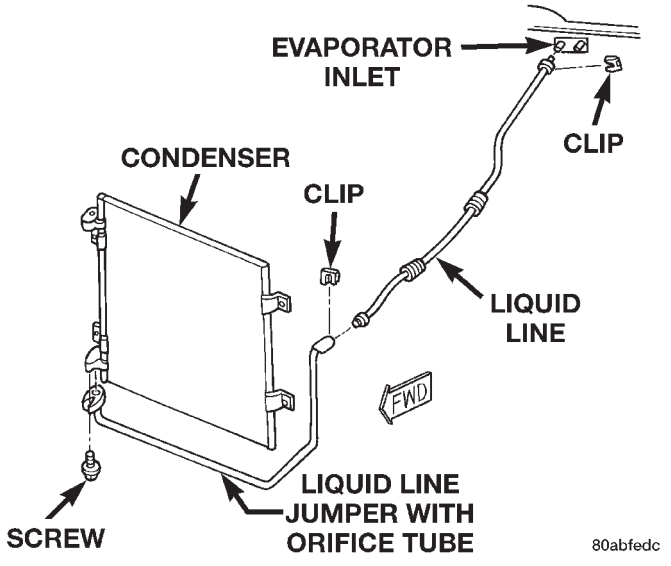


Fig. 32 Liquid Line Remove/Install - Right-Hand Drive 2.5L Engine

(4) On Left-Hand Drive models only, remove the screw that secures the liquid line block fitting to the liquid line jumper. Install plugs in, or tape over all of the open refrigerant fittings.

(5) Remove the liquid line from the vehicle.

(6) Remove the radiator grille panel. Refer to Group 23 - Body for the procedures.

(7) Reach through the grille opening to remove the screw that secures the liquid line jumper block fitting at the condenser outlet. Install plugs in, or tape over all of the open refrigerant fittings.

(8) Remove the liquid line jumper from the vehicle.

INSTALLATION

(1) Remove the tape or plugs from the liquid line jumper and condenser outlet block fittings. Install the liquid line jumper to the condenser outlet. Tighten the mounting screw to 12 N·m (105 in. lbs.).

(2) Install the radiator grille panel. Refer to Group 23 - Body for the procedures.

(3) Remove the tape or plugs from the refrigerant line couplers on the liquid line, the liquid line jumper, and the evaporator inlet. Install the liquid line to the liquid line jumper and the evaporator inlet refrigerant line couplers. See Refrigerant Line Coupler in this group for the procedures.

(4) On Left-Hand Drive models only, install the screw that secures the liquid line block fitting to the liquid line jumper. Tighten the mounting screw to 9 N·m (80 in. lbs.).

(5) Connect the battery negative cable.

(6) Evacuate and charge the refrigerant system as described in this group.

4.0L ENGINE

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system as described in this group.

(3) Disconnect the liquid line refrigerant line couplers at the evaporator inlet and the condenser outlet (Left-Hand Drive) (Fig. 33), or at the evaporator inlet and the liquid line jumper (Right-Hand Drive) (Fig. 34). See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the open refrigerant fittings.

(4) Remove the liquid line from the vehicle.

(5) On Right-Hand Drive models only, disconnect the liquid line jumper refrigerant line coupler at the condenser outlet. Install plugs in, or tape over all of the open refrigerant fittings.

(6) On Right-Hand Drive models only, remove the liquid line jumper from the vehicle.

REMOVAL AND INSTALLATION (Continued)

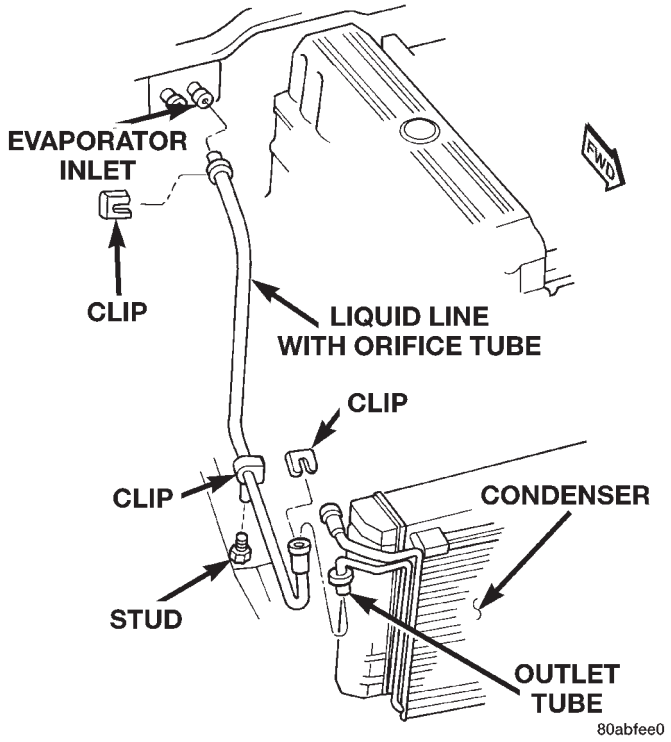


Fig. 33 Liquid Line Remove/Install - Left-Hand Drive 4.0L Engine

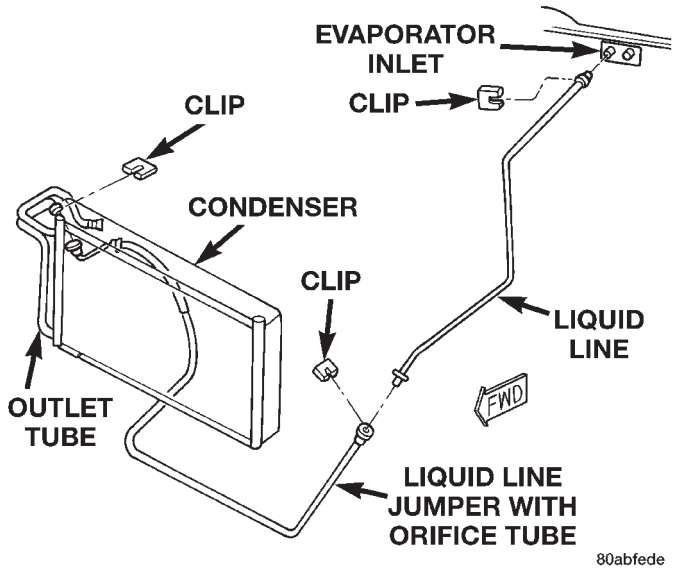


Fig. 34 Liquid Line Remove/Install - Right-Hand Drive 4.0L Engine

INSTALLATION

(1) On Right-Hand Drive models only, remove the tape or plugs from the refrigerant line couplers on the liquid line jumper and the condenser outlet. Install the liquid line jumper to the condenser outlet. See Refrigerant Line Coupler in this group for the procedures.

(2) Remove the tape or plugs from the refrigerant line couplers on the condenser outlet (Left-Hand Drive); or, on the liquid line, the evaporator inlet, and the liquid line jumper (Right-Hand Drive). Install the liquid line to the evaporator inlet and the condenser outlet or the liquid line jumper. See Refrigerant Line Coupler in this group for the procedures.

(3) Connect the battery negative cable.

(4) Evacuate and charge the refrigerant system as described in this group.

FIXED ORIFICE TUBE

The fixed orifice tube is located in the liquid line (Left-Hand Drive 4.0L engine) or the liquid line jumper (all except Left-Hand Drive 4.0L engine) near the condenser. The orifice has filter screens on the inlet and outlet ends of the tube body. If the fixed orifice tube is faulty or plugged, the liquid line unit must be replaced. See the service procedures for the liquid line in this group.

LOW PRESSURE CYCLING CLUTCH SWITCH

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the low pressure cycling clutch switch on the top of the accumulator (Fig. 35).

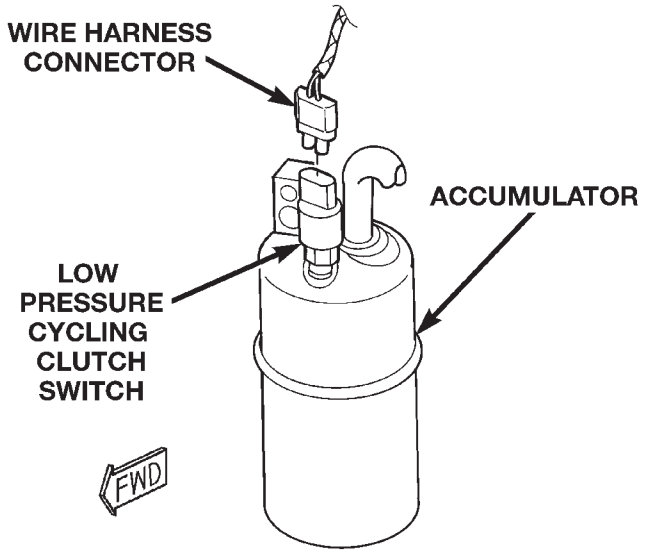


Fig. 35 Low Pressure Cycling Clutch Switch Remove/Install

(3) Unscrew the low pressure cycling clutch switch from the fitting on the top of the accumulator.

REMOVAL AND INSTALLATION (Continued)

(4) Reverse the removal procedures to install. The switch should be hand-tightened onto the accumulator fitting.

ACCUMULATOR

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system as described in this group.

(3) Unplug the wire harness connector from the low pressure cycling clutch switch.

(4) Loosen the screw that secures the accumulator retaining band to the support bracket (Fig. 36) or (Fig. 37).

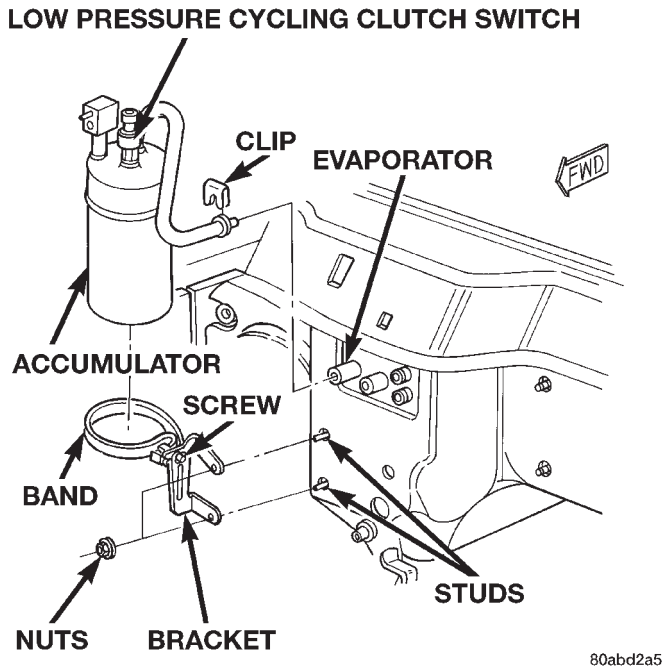


Fig. 36 Accumulator Remove/Install - Left-Hand Drive

(5) Disconnect the suction line from the accumulator as described in this group.

(6) Disconnect the accumulator inlet tube refrigerant line coupler from the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the open refrigerant fittings.

(7) Slide the accumulator out of the retaining band and remove the accumulator from the vehicle.

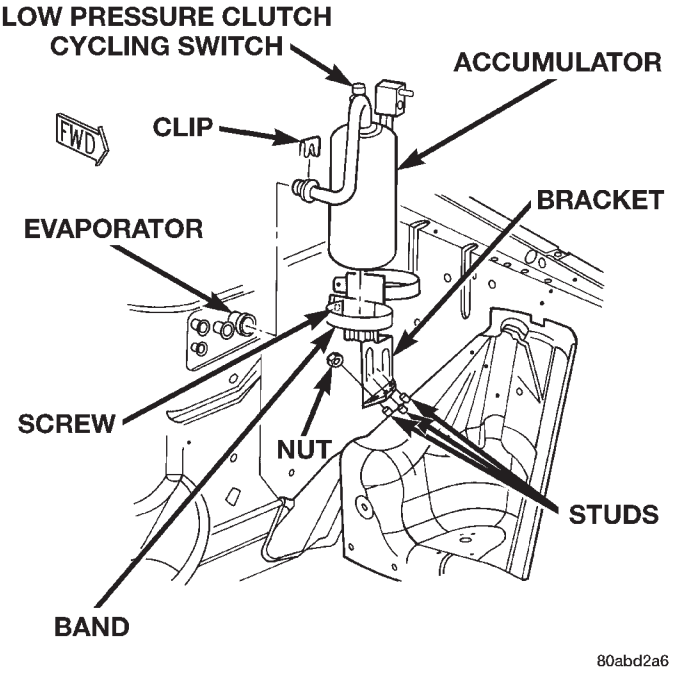


Fig. 37 Accumulator Remove/Install - Right-Hand Drive

INSTALLATION

(1) Install the accumulator into the retaining band.

(2) Remove the tape or plugs from accumulator inlet and evaporator outlet tube fittings, and install the accumulator refrigerant line coupler to the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures.

(3) Install the suction line to the accumulator as described in this group.

(4) Tighten the accumulator retaining band screw to 5 N·m (45 in. lbs.).

(5) Plug the wire harness connector into the low pressure cycling clutch switch.

(6) Connect the battery negative cable.

(7) Evacuate and charge the refrigerant system as described in this group.

NOTE: If the accumulator is replaced, add 120 ml (4 oz.) of refrigerant oil to the refrigerant system.

CONDENSER

2.5L ENGINE

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

REMOVAL AND INSTALLATION (Continued)

CAUTION: Before removing the condenser, note the location of each of the radiator and condenser air seals. These seals are used to direct air through the condenser and radiator. The air seals must be reinstalled in their proper locations in order for the air conditioning and engine cooling systems to perform as designed.

(1) Disconnect and isolate the battery negative cable.
(2) Recover the refrigerant from the refrigerant system as described in this group.
(3) Remove the radiator grille panel. Refer to Group 23 - Body for the procedures.
(4) Reach through the grille opening to remove the screw from the discharge line block fitting at the condenser inlet and remove the discharge line from the condenser. Install plugs in, or tape over, all of the open refrigerant fittings.
(5) Reach through the grille opening to remove the screw from the liquid line jumper block fitting at the condenser outlet and remove the liquid line jumper from the condenser. Install plugs in, or tape over, all of the open refrigerant fittings.
(6) Remove the radiator and the condenser from the vehicle as a unit. Refer to Group 7 - Cooling System for the procedures.
(7) Remove the four screws that secure the condenser to the radiator (Fig. 38).

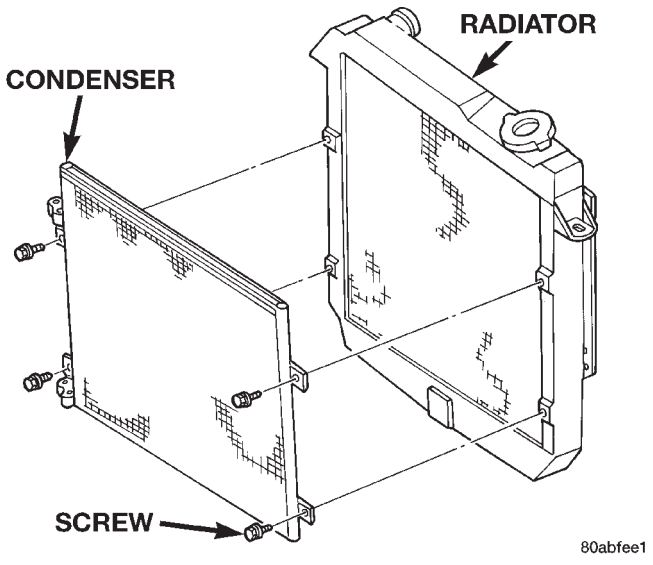


Fig. 38 Condenser Remove/Install - 2.5L Engine

(8) Remove the condenser from the radiator.

INSTALLATION

(1) Install the condenser to the radiator. Tighten the mounting screws to 28 N·m (250 in. lbs.).
(2) Install the radiator and condenser to the vehicle as a unit. Refer to Group 7 - Cooling System for the procedures.
(3) Remove the tape or plugs from the liquid line jumper and condenser outlet block fittings. Install the liquid line jumper to the condenser outlet. Tighten the mounting screw to 12 N·m (105 in. lbs.).
(4) Remove the tape or plugs from the discharge line and condenser inlet block fittings. Install the discharge line to the condenser inlet. Tighten the mounting screw to 12 N·m (105 in. lbs.).
(5) Install the radiator grille panel. Refer to Group 23 - Body for the procedures.
(6) Connect the battery negative cable.
(7) Evacuate and charge the refrigerant system as described in this group.

NOTE: If the condenser is replaced, add 30 ml (1 oz.) of refrigerant oil to the refrigerant system.

4.0L ENGINE

REMOVAL

WARNING: REVIEW THE WARNINGS AND CAUTIONS IN THE FRONT OF THIS GROUP BEFORE PERFORMING THE FOLLOWING OPERATION.

CAUTION: Before removing the condenser, note the location of each of the radiator and condenser air seals. These seals are used to direct air through the condenser and radiator. The air seals must be reinstalled in their proper locations in order for the air conditioning and engine cooling systems to perform as designed.

(1) Disconnect and isolate the battery negative cable.
(2) Recover the refrigerant from the refrigerant system as described in this group.
(3) Disconnect the discharge line (Left-Hand Drive) or discharge line jumper (Right-Hand Drive) refrigerant line coupler at the condenser inlet. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the open refrigerant fittings.
(4) Disconnect the liquid line (Left-Hand Drive) or liquid line jumper (Right-Hand Drive) refrigerant line coupler at the condenser outlet. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the open refrigerant fittings.
(5) Remove the radiator and the condenser from the vehicle as a unit. Refer to Group 7 - Cooling System for the procedures.

REMOVAL AND INSTALLATION (Continued)

(6) Remove the four nuts that secure the upper brackets to the radiator and the condenser (Fig. 39).

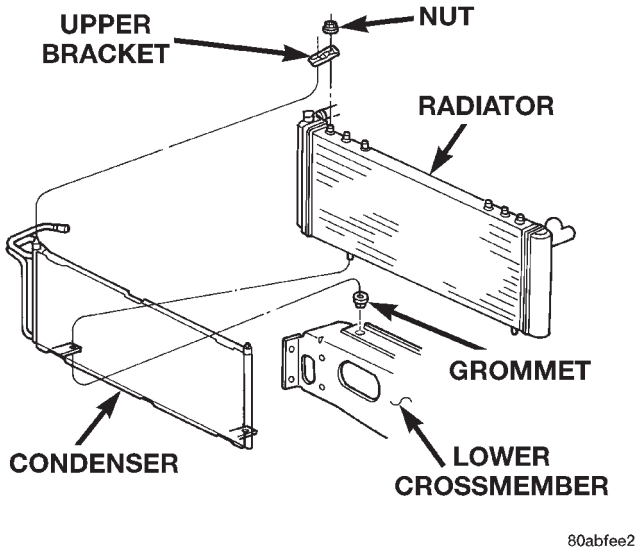


Fig. 39 Condenser Remove/Install - 4.0L Engine

(7) Remove the upper brackets from the radiator and the condenser.

(8) Slide the condenser lower brackets off of the dowel pins on the bottom of the radiator.

(9) Remove the condenser from the radiator.

INSTALLATION

(1) Install the holes of the condenser lower brackets over the dowel pins on the bottom of the radiator.

(2) Install the upper brackets over the studs on the top of the radiator and the condenser. Tighten the mounting nuts to 5.3 N·m (47 in. lbs.).

(3) Install the radiator and condenser to the vehicle as a unit. Refer to Group 7 - Cooling System for the procedures.

(4) Remove the tape or plugs from the refrigerant line couplers on the condenser outlet and the liquid line (Left-Hand Drive) or the liquid line jumper (Right-Hand Drive). Install the liquid line or the liquid line jumper to the condenser outlet. See Refrigerant Line Coupler in this group for the procedures.

(5) Remove the tape or plugs from the refrigerant line couplers on the condenser inlet and the discharge line (Left-Hand Drive) or the discharge line jumper (Right-Hand Drive). Install the discharge line or the discharge line jumper to the condenser inlet. See Refrigerant Line Coupler in this group for the procedures.

(6) Connect the battery negative cable.

(7) Evacuate and charge the refrigerant system as described in this group.

NOTE: If the condenser is replaced, add 30 ml (1 oz.) of refrigerant oil to the refrigerant system.

VACUUM CHECK VALVE

(1) Unplug the heater-A/C vacuum supply line at the vacuum check valve (Fig. 40).

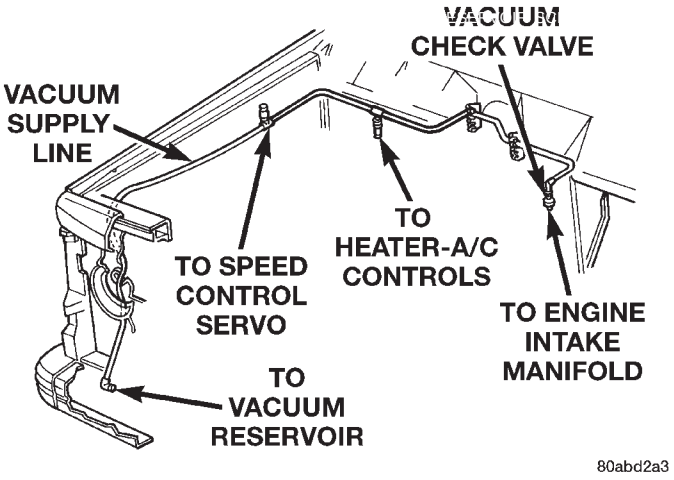


Fig. 40 Vacuum Supply

(2) Note the orientation of the check valve in the vacuum supply line for correct reinstallation.

(3) Unplug the vacuum check valve from the vacuum supply line fittings.

(4) Reverse the removal procedures to install.

VACUUM RESERVOIR

(1) Remove the passenger side bumper end cap from the front bumper. Refer to Group 23 - Body for the procedures.

(2) Unplug the vacuum supply line connector from the reservoir (Fig. 41).

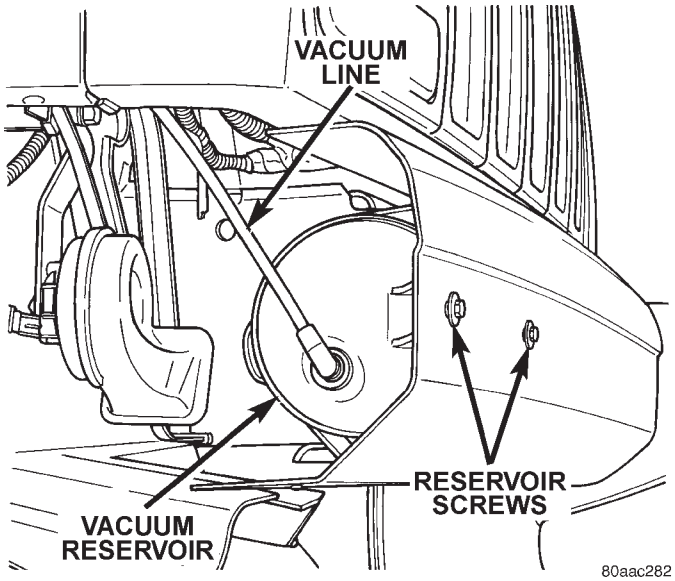


Fig. 41 Vacuum Reservoir Remove/Install

(3) Remove the two screws that secure the reservoir to the front bumper.

REMOVAL AND INSTALLATION (Continued)

(4) Remove the vacuum reservoir from behind the front bumper.

(5) Reverse the removal procedures to install.

BLOWER MOTOR

REMOVAL

(1) If the vehicle is equipped with air conditioning, recover the refrigerant from the refrigerant system as described in this group.

(2) Disconnect and isolate the battery negative cable.

(3) If the vehicle is equipped with air conditioning, loosen the accumulator retaining band screw, disconnect the accumulator inlet tube from the evaporator outlet tube and move the accumulator far enough to access and remove the blower motor.

(4) Unplug the blower motor wire harness connector (Fig. 42).

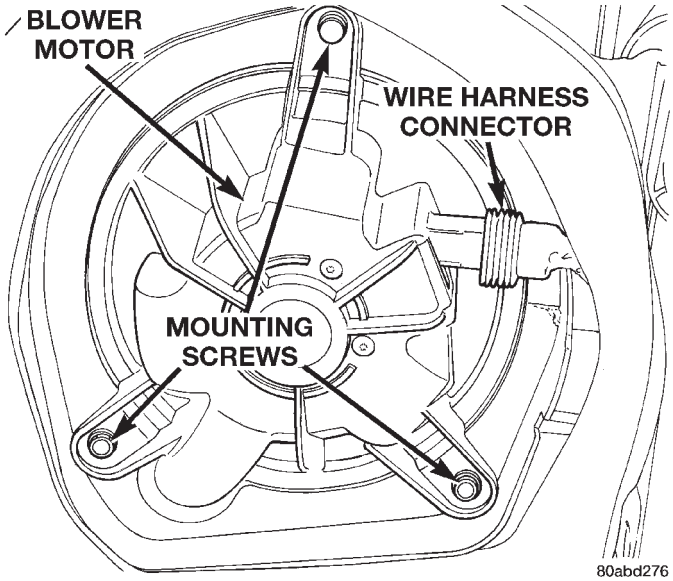


Fig. 42 Blower Motor Remove/Install

(5) Remove the three screws that secure the blower motor and wheel assembly to the heater-A/C housing.

(6) Rotate and tilt the blower motor unit as needed for clearance to remove the blower motor and wheel from the heater-A/C housing.

INSTALLATION

(1) Align and install the blower motor and wheel assembly into the heater-A/C housing.

(2) Install and tighten the three screws that secure the blower motor to the heater A/C housing. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Plug in the blower motor wire harness connector.

(4) If the vehicle is equipped with air conditioning, connect the accumulator inlet tube to the evaporator outlet tube and tighten the accumulator retaining band screw.

(5) Connect the battery negative cable.

(6) If the vehicle is equipped with air conditioning, evacuate and charge the refrigerant system as described in this group.

HEATER-A/C CONTROL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Open the glove box and remove the glove box stop bumpers to roll down the glove box as described in Group 8E - Instrument Panel Systems.

(3) Reach through the glove box opening and unplug the vacuum harness connector.

(4) Using a trim stick or another suitable wide-bladed flat tool, gently pry the instrument panel center bezel away from the instrument panel to release the six snap clip retainers (Fig. 43).

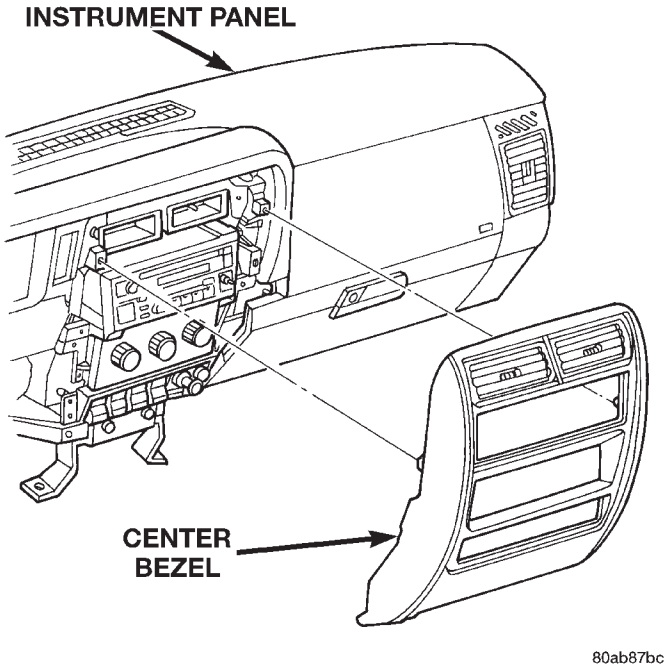


Fig. 43 Center Bezel Remove/Install

(5) Remove the center bezel from the vehicle.

REMOVAL AND INSTALLATION (Continued)

(6) Release the vacuum harness push-in retainer from the instrument panel directly beneath the heater-A/C control.

(7) Remove the four screws that secure the heater-A/C control to the instrument panel (Fig. 44).

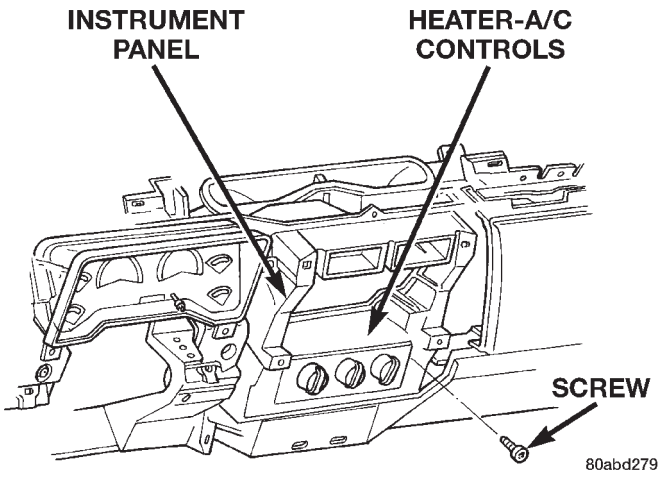


Fig. 44 Heater-A/C Controls Remove/Install

(8) Pull the heater-A/C control assembly away from the instrument panel far enough to access the connections.

(9) Unplug the wire harness connector from the back of the heater-A/C control assembly (Fig. 45).

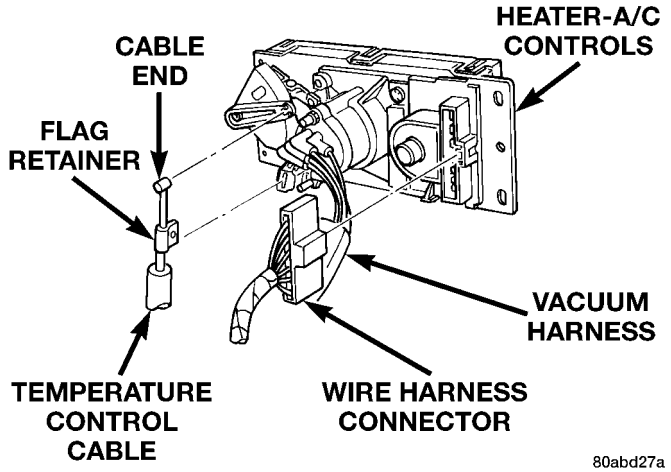


Fig. 45 Heater-A/C Control Connections

(10) Release the temperature control cable housing flag retainer latch on the receptacle on the back of the heater-A/C control and disengage the flag retainer from the receptacle.

(11) Rotate the heater-A/C control assembly to align the cable core with the slot on the end of the temperature control lever and remove the cable end from the lever.

(12) Reaching through the glove box opening, carefully guide the heater-A/C control half of the vacuum harness around any obstacles while removing the heater-A/C control from the front of the instrument panel.

INSTALLATION

(1) Connect the temperature control cable core end to the temperature control lever on the back of the heater-A/C controls.

(2) Snap the temperature control cable housing flag retainer into the receptacle on the back of the heater-A/C controls.

(3) Plug in the wire harness connector to the back of the heater-A/C control.

(4) Route the vacuum harness through the instrument panel opening and reinstall the vacuum harness push-in retainer.

(5) Reach through the glove box opening and plug in the vacuum harness connector.

(6) Roll up the glove box and reinstall the glove box stop bumpers.

(7) Install the heater-A/C controls to the instrument panel and secure with four screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(8) Install the instrument panel center bezel.

(9) Connect the battery negative cable.

TEMPERATURE CONTROL CABLE

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the temperature control cable from the heater-A/C controls. See Heater-A/C Controls in this group for the procedures.

(3) Locate the temperature control cable housing flag retainer receptacle on the bottom of the heater-A/C housing towards the passenger side of the floor pan transmission tunnel (Fig. 46). Locate the flag retainer latch release window on the side of the receptacle. While depressing the latch through the latch release window, use a trim stick or another suitable wide flat-bladed tool to gently pry the flag retainer out of the receptacle.

(4) Remove the screw that secures the blend-air door crank arm to the blend-air door pivot shaft.

REMOVAL AND INSTALLATION (Continued)

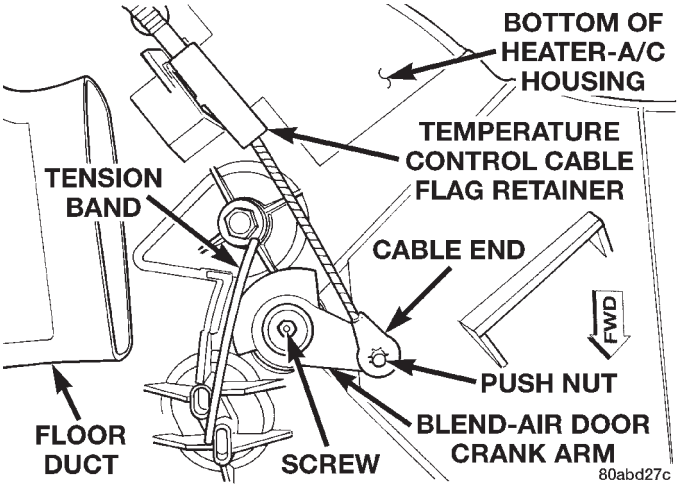


Fig. 46 Temperature Control Cable Remove/Install

(5) Pull the blend-air door crank arm down from the heater-A/C housing to remove it from the blend-air door pivot shaft.

(6) Remove the blend-air door crank arm and temperature control cable from the vehicle as a unit.

(7) Remove the push nut that secures the temperature control cable end to the pin on the end of the blend-air door crank arm.

(8) Remove the temperature control cable from the blend-air door crank arm.

INSTALLATION

(1) Install the blend-air door crank arm onto the blend-air door pivot shaft. Be certain that the tension band on the bottom of the heater-A/C housing is properly positioned against the cam formation on the blend-air door crank arm.

(2) Install and tighten the screw that secures the blend-air door crank arm to the blend-air door pivot shaft. Tighten the mounting screw to 1 N·m (10 in. lbs.).

(3) Install the temperature control cable end over the pin on the end of the blend-air door crank arm and secure it with a push nut.

(4) Snap the temperature control cable housing flag retainer into the receptacle on the bottom of the heater-A/C housing.

(5) Connect the temperature control cable to the heater-A/C controls and reinstall the heater-A/C controls to the instrument panel. See Heater-A/C Controls in this group for the procedures.

(6) Connect the battery negative cable.

BLOWER MOTOR RELAY

(1) Disconnect and isolate the battery negative cable.

(2) Open the glove box and remove the glove box stop bumpers to roll down the glove box as described in Group 8E - Instrument Panel Systems.

(3) Reach through the glove box opening to locate the blower motor relay (Fig. 47).

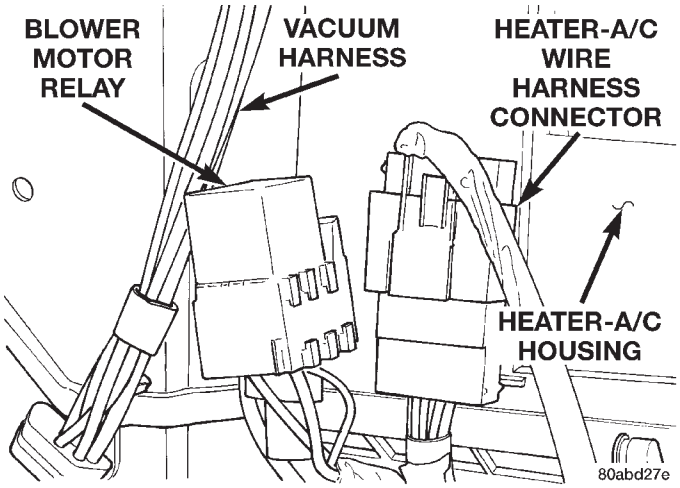


Fig. 47 Blower Motor Relay Remove/Install

(4) Unplug the blower motor relay from its wire harness connector.

(5) Install the blower motor relay by aligning the relay terminals with the cavities in the wire harness connector and pushing the relay firmly into place.

(6) Roll up the glove box and reinstall the glove box stop bumpers.

(7) Connect the battery negative cable.

(8) Test the relay operation.

KICK COVER

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Loosen the two upper screws that secure the kick cover to the heater-A/C housing under the passenger side of the instrument panel on the passenger side of the instrument panel (Fig. 48).

(3) Remove the two lower screws that secure the kick cover to the heater-A/C housing.

(4) Pull the kick cover down towards the floor to disengage the slotted upper mounting tabs from under the upper screws.

(5) Remove the kick cover from the vehicle.

REMOVAL AND INSTALLATION (Continued)

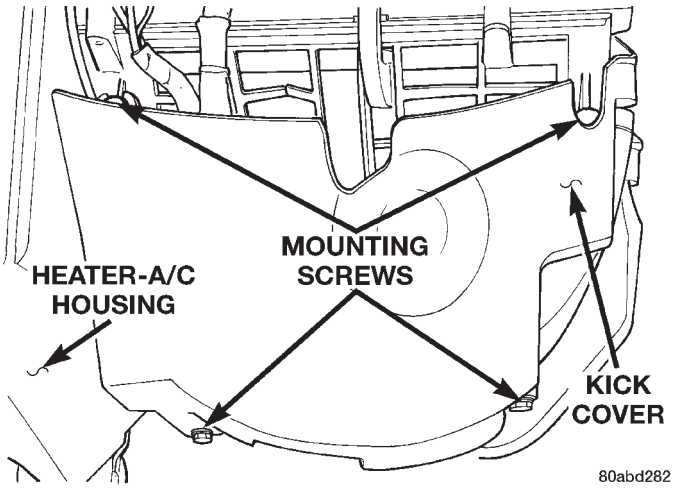


Fig. 48 Kick Cover Remove/Install

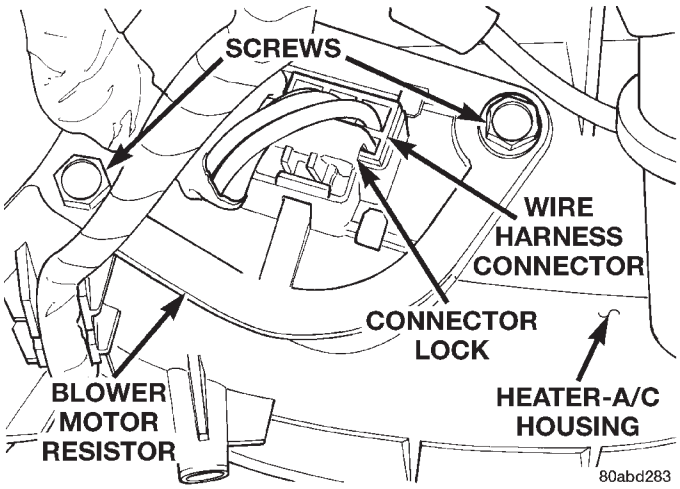


Fig. 49 Blower Motor Resistor Remove/Install

INSTALLATION

(1) Position the slotted upper mounting tabs of the kick cover under the upper mounting screws on the heater-A/C housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

(2) Install the two lower kick cover mounting screws to the heater-A/C housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Connect the battery negative cable.

BLOWER MOTOR RESISTOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the kick cover from the heater-A/C housing as described in this group.

(3) Pull out on the blower motor resistor wire harness connector lock to release the connector latch (Fig. 49).

(4) Depress the latch on the blower motor resistor wire harness connector and unplug it from the resistor.

(5) Remove the two screws that secure the resistor to the heater-A/C housing.

(6) Remove the resistor from the housing.

(7) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in lbs.).

MODE DOOR VACUUM ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

DEFROST DOOR ACTUATOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(3) Unplug the two vacuum harness connectors from the defrost door actuator (Fig. 50).

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount to release the actuator latch and pull firmly outwards on the actuator to remove the actuator from the mount (Fig. 51).

(5) Move the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the defrost door crank arm.

(6) Remove the defrost door vacuum actuator from the vehicle.

(7) Reverse the removal procedures to install.

FLOOR DOOR ACTUATOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

REMOVAL AND INSTALLATION (Continued)

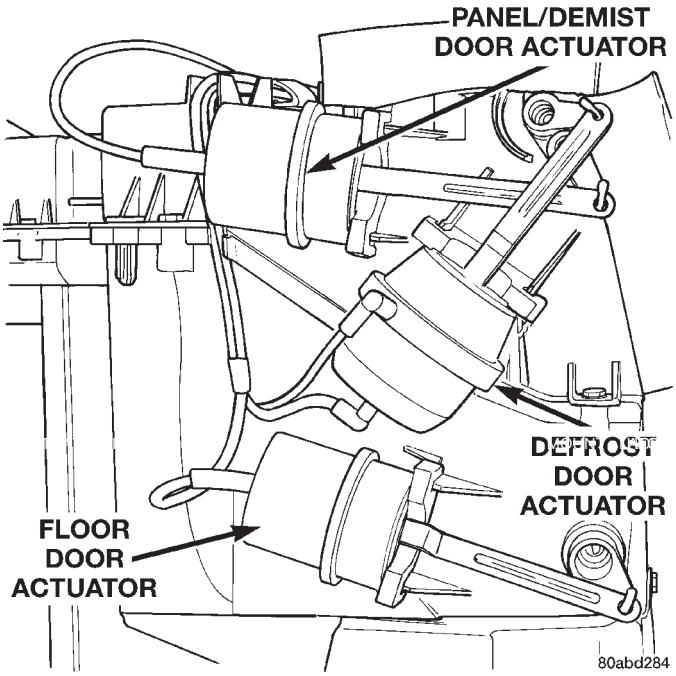


Fig. 50 Defrost, Floor, and Panel/Demist Door Vacuum Actuators

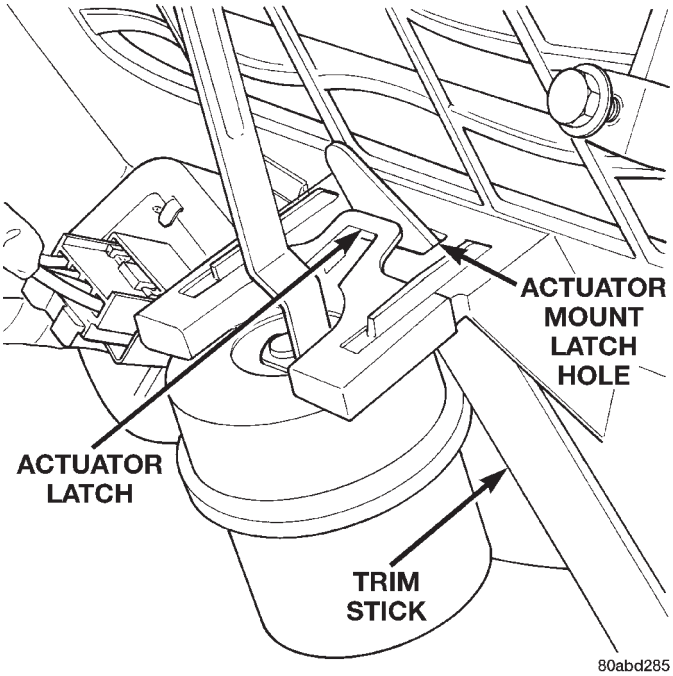


Fig. 51 Vacuum Actuator Remove/Install - Typical

(3) Unplug the vacuum harness connector from the floor door actuator (Fig. 50).

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount to release the actuator latch and pull firmly outwards on the actuator to remove the actuator from the mount (Fig. 51).

(5) Move the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the floor door crank arm.

(6) Remove the floor door vacuum actuator from the vehicle.

(7) Reverse the removal procedures to install.

PANEL/DEMIST DOOR ACTUATOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(3) Remove the defrost door actuator as described in this group.

(4) Unplug the vacuum harness connector from the panel/demist door actuator (Fig. 50).

(5) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount to release the actuator latch and pull firmly outwards on the actuator to remove the actuator from the mount (Fig. 51).

(6) Move the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the panel/demist door crank arm.

(7) Remove the panel/demist door vacuum actuator from the vehicle.

(8) Reverse the removal procedures to install.

RECIRCULATION AIR DOOR ACTUATOR

A recirculation air door and vacuum actuator are used only on models with the optional air conditioning system.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the kick cover from the heater-A/C housing as described in this group.

(3) Unplug the vacuum harness connector from the recirculation air door actuator (Fig. 52).

(4) Insert a trim stick or another suitable wide flat-bladed tool into the latch hole on the heater-A/C housing actuator mount to release the actuator latch and pull firmly outwards on the actuator to remove the actuator from the mount (Fig. 51).

(5) Move the vacuum actuator as required to disengage the hole on the end of the actuator link from the hooked pin on the end of the recirculation air door lever.

(6) Remove the recirculation air door vacuum actuator from the vehicle.

(7) Reverse the removal procedures to install.

HEATER-A/C HOUSING

The heater-A/C housing assembly must be removed from the vehicle and the two halves of the housing separated for service access of the heater core, evaporator coil, blend-air door, and each of the various mode control doors.

REMOVAL AND INSTALLATION (Continued)

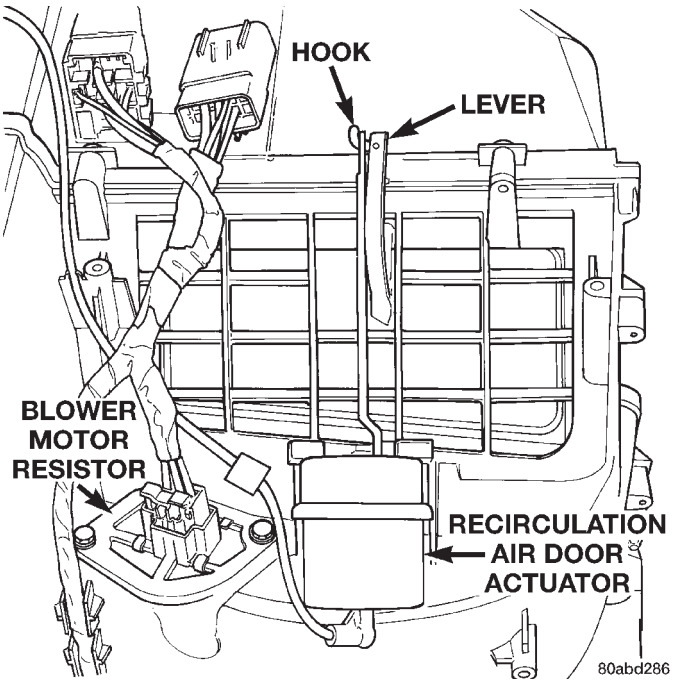


Fig. 52 Recirculation Air Door Vacuum Actuator

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(3) Unplug the heater-A/C unit wire harness connector, which is fastened to the heater-A/C housing next to the blower motor relay (Fig. 53).

(4) If the vehicle is not equipped with air conditioning, go to Step 6. If the vehicle is equipped with air conditioning, recover the refrigerant from the refrigerant system as described in this group.

(5) Disconnect the refrigerant lines from the evaporator tubes. Install plugs in, or tape over all of the open refrigerant fittings.

(6) Drain the cooling system. Refer to Group 7 - Cooling System for the procedures.

(7) Disconnect the heater hoses from the heater core tubes.

(8) Unplug the heater-A/C system vacuum supply line from the tee fitting near the heater core tubes.

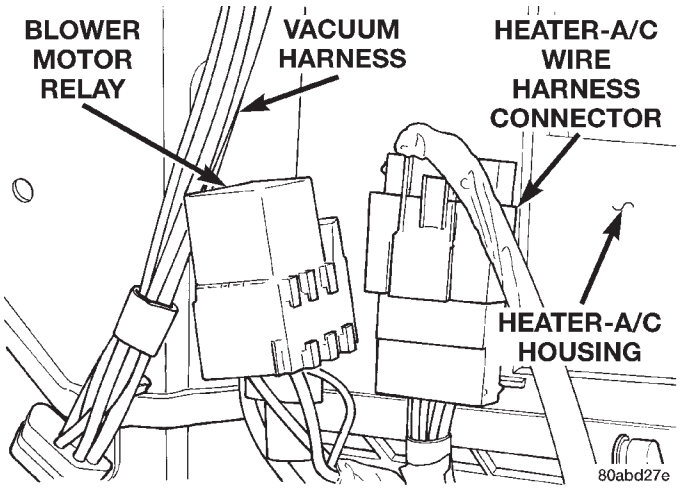


Fig. 53 Heater-A/C Unit Connector

(9) If the vehicle is equipped with air conditioning, remove and relocate the accumulator and its mounting bracket.

(10) Remove the five heater-A/C housing mounting nuts from the studs on the engine compartment side of the dash panel (Fig. 54). Remove or reposition the evaporation canister for access, if required.

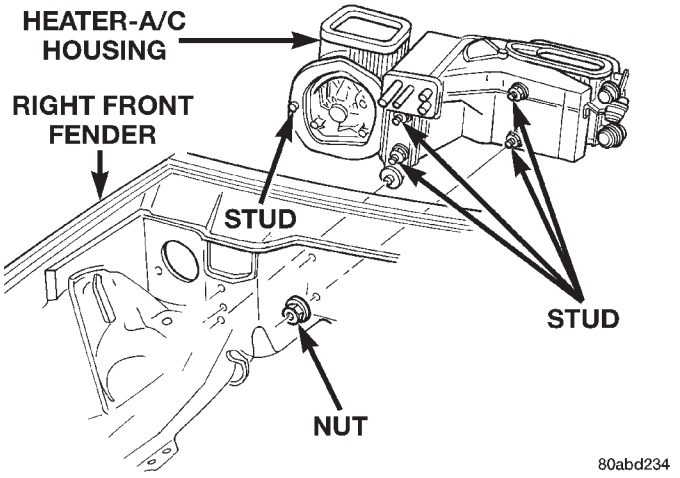


Fig. 54 Heater-A/C Housing Remove/Install

(11) Pull the heater-A/C housing rearward far enough for the mounting studs and the evaporator drain tube to clear the dash panel holes.

(12) Remove the heater-A/C housing from the vehicle.

DISASSEMBLY

(1) Remove the heater-A/C housing from the vehicle and place it on a work bench.

(2) Unplug the vacuum harness connectors from the floor door actuator and, if the unit is so equipped, the recirculation air door actuator.

REMOVAL AND INSTALLATION (Continued)

(3) Disengage the vacuum harness from any routing clips located on the lower half of the heater-A/C housing.

(4) Disengage the heater-A/C unit wire harness and blower motor relay wire harness connector push-in retainers from their mounting holes on the heater-A/C housing.

(5) Remove the blower motor and blower wheel unit from the heater-A/C housing as described in this group.

(6) Pull the vacuum supply line and connector through the foam gasket on the heater-A/C housing heater core and evaporator coil tube mounting flange (Fig. 55).

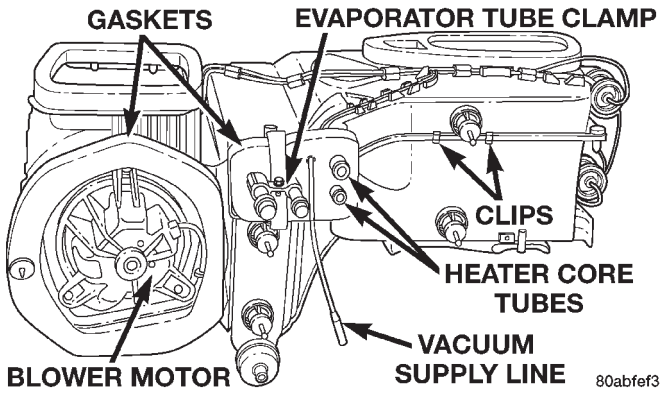


Fig. 55 Heater-A/C Housing Disassembly

(7) Carefully remove the blower motor housing foam flange gasket from around the blower motor opening in the heater-A/C housing. If the gasket is deformed or damaged, it must be replaced.

(8) If the unit is equipped with air conditioning, remove the screw that secures the clamp to the evaporator coil tubes and remove the clamp.

(9) Carefully remove the foam gasket from the heater-A/C housing heater core and evaporator coil tube mounting flange. If the gasket is deformed or damaged, it must be replaced.

(10) Use a screwdriver to pry off the two snap clips that help secure the upper and lower heater-A/C housing halves together.

(11) Remove the 14 screws that help secure the upper and lower heater-A/C housing halves together.

(12) Carefully separate the upper heater-A/C housing half from the lower half.

ASSEMBLY

(1) Assemble the upper heater-A/C housing half to the lower half. Be certain that each of the door pivot shaft ends is properly engaged in its pivot hole, that the blower motor ring is properly installed and, if the unit is so equipped, that the evaporator coil tube rubber seal is properly positioned (Fig. 56).

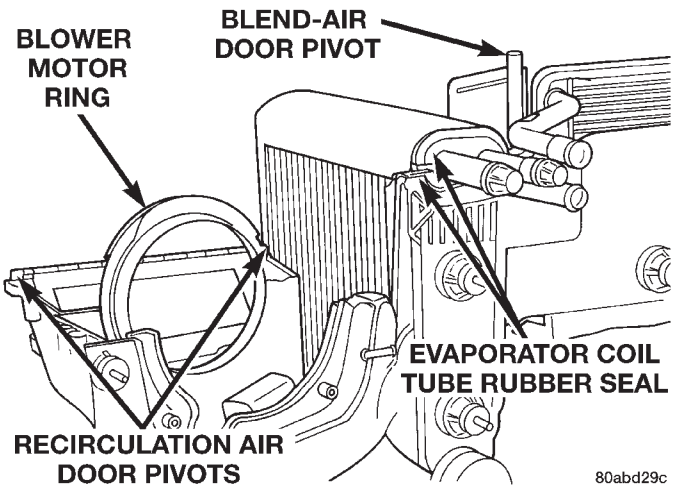


Fig. 56 Heater-A/C Housing Assembly

(2) Install the 14 screws and two snap clips that secure the upper and lower heater-A/C housing halves together.

(3) Install the blower motor and wheel unit to the heater-A/C housing.

(4) Install the blower motor housing flange and heater core and evaporator coil tube mounting flange foam gaskets.

(5) Insert the vacuum supply line and connector through the foam gasket on the heater-A/C housing heater core and evaporator coil tube mounting flange.

(6) If the unit is equipped with air conditioning, reinstall the evaporator coil tube clamp.

(7) Engage the heater-A/C unit wire harness and blower motor relay wire harness connector push-in retainers to their mounting holes on the heater-A/C housing.

(8) Reinstall the vacuum harness to the routing clips and plug in the vacuum harness connector at the floor door actuator and, if the unit is so equipped, the recirculation air door actuator.

(9) Install the heater-A/C housing in the vehicle.

INSTALLATION

(1) Position the heater-A/C housing to the dash panel. Be certain that the evaporator drain tube and the housing mounting studs are inserted into their correct mounting holes.

(2) Install the five nuts to the mounting studs on the engine compartment side of the dash panel. Tighten the mounting nuts to 6.2 N·m (55 in. lbs.).

(3) Reinstall the evaporation canister if it was repositioned during the removal procedure.

(4) If the vehicle is equipped with air conditioning, reinstall the accumulator and its mounting bracket.

(5) Connect the heater-A/C system vacuum supply line to the tee fitting near the heater core tubes.

(6) Connect the heater hoses to the heater core tubes.

REMOVAL AND INSTALLATION (Continued)

(7) If the vehicle is equipped with air conditioning, unplug or remove the tape from the refrigerant fittings, and connect the refrigerant lines to the evaporator tubes.

(8) Install the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(9) Connect the battery negative cable.

(10) Fill the cooling system. Refer to Group 7 - Cooling System for the procedures.

(11) If the vehicle is equipped with air conditioning, evacuate and charge the refrigerant system as described in this group.

(12) Start the vehicle and check for proper operation of the heating and air conditioning systems.

HEATER-A/C HOUSING DOOR

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

BLEND-AIR DOOR

(1) Remove and disassemble the heater-A/C housing as described in this group.

NOTE: If the temperature control cable was not removed with the blend-air door crank arm as a unit during the instrument panel assembly removal procedures, the crank arm must be removed from the blend-air door pivot shaft before the blend-air door can be removed from the heater-A/C housing. See Temperature Control Cable in this group for the procedures.

(2) Lift the blend-air door pivot shaft out of the pivot hole in the bottom of the lower half of the heater-A/C housing (Fig. 57).

(3) Reverse the removal procedures to install.

PANEL/DEMIST DOOR AND CRANK ARM

(1) Remove and disassemble the heater-A/C housing as described in this group.

(2) Remove the defrost and panel/demist door vacuum actuators as described in this group.

(3) Insert a screwdriver into the latch hole (Fig. 58) of the panel/demist door pivot shaft to release the latch of the panel/demist door crank arm, and pull the crank arm out of the pivot shaft from the outside of the upper half of the heater-A/C housing.

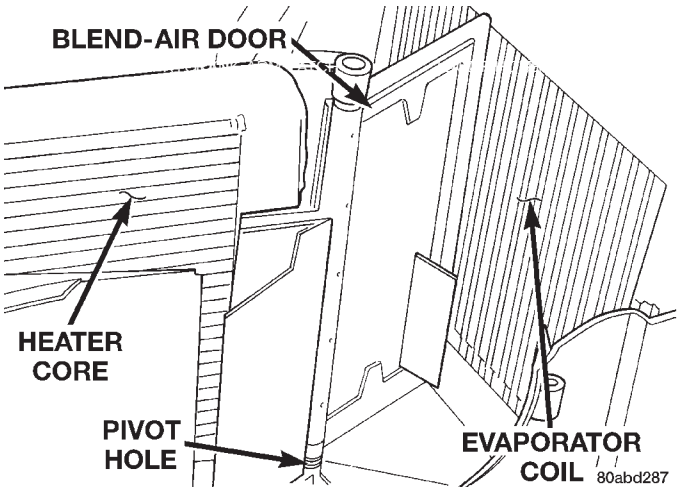


Fig. 57 Blend-Air Door

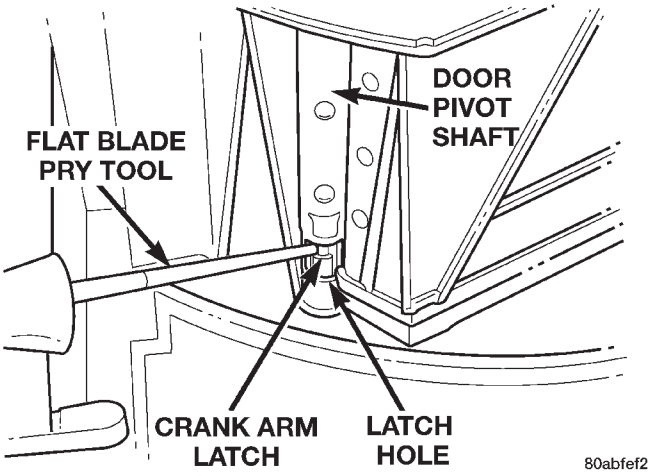


Fig. 58 Mode Door Crank Arm Remove/Install - Typical

(4) Reach inside the upper half of the heater-A/C housing and carefully flex the panel/defrost door (Fig. 59) enough so that the door pivot clears the pivot hole in the housing.

(5) Remove the panel/demist door from the heater-A/C housing.

(6) Reverse the removal procedures to install.

DEFROST DOOR AND CRANK ARM

(1) Remove and disassemble the heater-A/C housing as described in this group.

(2) Remove the panel/demist door and crank arm as described in this group.

(3) Insert a screwdriver into the latch hole (Fig. 58) of the defrost door pivot shaft to release the latch of the defrost door crank arm, and pull the crank arm out of the pivot shaft from the outside of the upper half of the heater-A/C housing.

(4) Reach inside the upper half of the heater-A/C housing and carefully flex the defrost door (Fig. 59)

REMOVAL AND INSTALLATION (Continued)

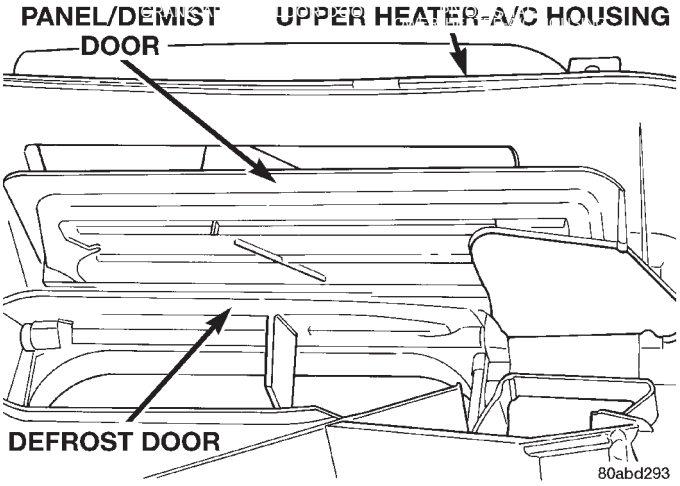


Fig. 59 Panel/Demist and Defrost Doors

enough so that the door pivot clears the pivot hole in the housing.

(5) Remove the defrost door from the heater-A/C housing.

(6) Reverse the removal procedures to install.

FLOOR DOOR AND CRANK ARM

(1) Remove and disassemble the heater-A/C housing as described in this group.

(2) Remove the floor door vacuum actuator as described in this group.

(3) Insert a screwdriver into the latch hole (Fig. 58) of the floor door pivot shaft to release the latch of the floor door crank arm, and pull the crank arm out of the pivot shaft from the outside of the lower half of the heater-A/C housing.

(4) Reach inside the lower half of the heater-A/C housing and carefully flex the floor door (Fig. 60) enough so that the door pivot clears the pivot hole in the housing.

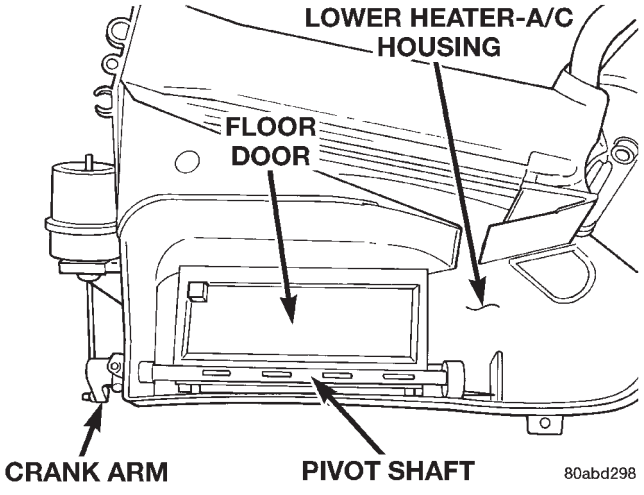


Fig. 60 Floor Door

(5) Remove the floor door from the heater-A/C housing.

(6) Reverse the removal procedures to install.

RECIRCULATION AIR DOOR

A recirculation air door and vacuum actuator are used only on models with the optional air conditioning system.

(1) Remove and disassemble the heater-A/C housing as described in this group.

(2) Remove the recirculation air door vacuum actuator as described in this group.

(3) Reach inside the lower half of the heater-A/C housing and lift the bottom edge of the recirculation air door upwards (Fig. 61).

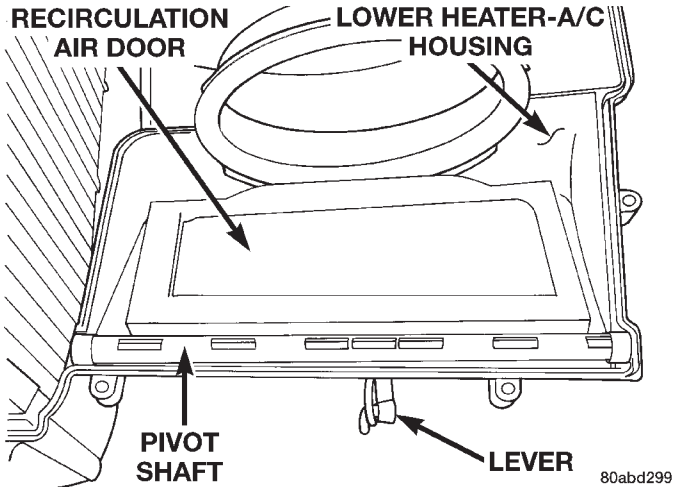


Fig. 61 Recirculation Air Door

(4) Guide the recirculation air door lever through the air intake grille of the heater-A/C housing while removing the door from the housing.

(5) Reverse the removal procedures to install.

EVAPORATOR COIL

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the heater-A/C housing as described in this group.

(2) Lift the evaporator coil unit out of the lower half of the heater-A/C housing (Fig. 62).

(3) Reverse the removal procedures to install. Be certain that the evaporator foam insulator wrap and rubber tube seal are reinstalled.

REMOVAL AND INSTALLATION (Continued)

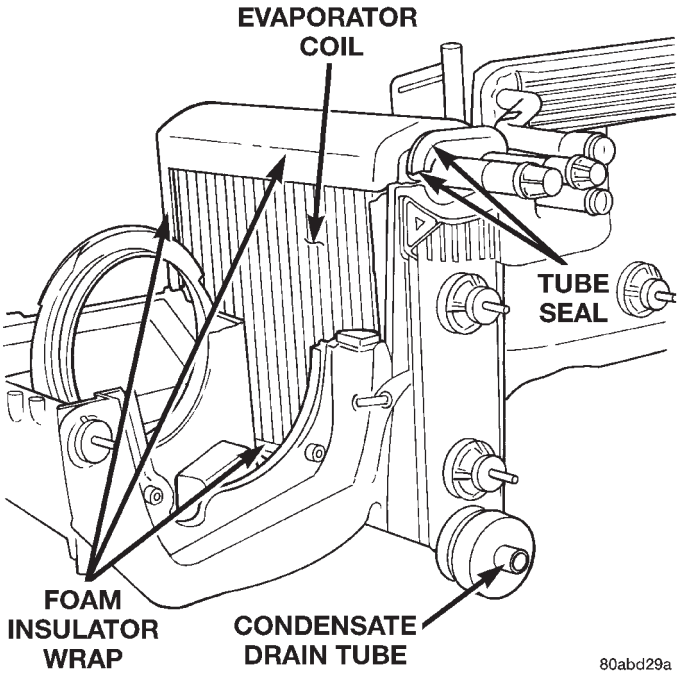


Fig. 62 Evaporator Coil

NOTE: If the evaporator is replaced, add 60 ml (2 oz.) of refrigerant oil to the refrigerant system.

HEATER CORE

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

(1) Remove and disassemble the heater-A/C housing as described in this group.

(2) Lift the heater core out of the lower half of the heater-A/C housing (Fig. 63).

(3) Reverse the removal procedures to install. Be certain that the heater core foam insulator is reinstalled.

DUCTS AND OUTLETS

WARNING: ON VEHICLES EQUIPPED WITH AIRBAGS, REFER TO GROUP 8M - PASSIVE RESTRAINT SYSTEMS BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

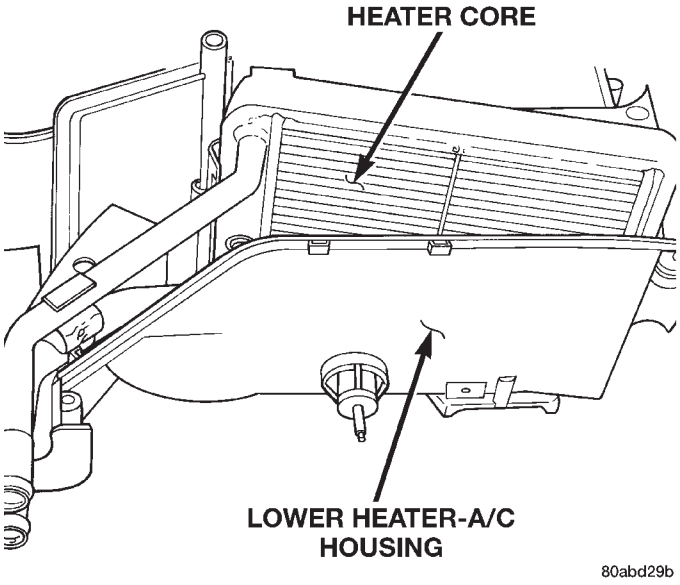


Fig. 63 Heater Core

PANEL OUTLET DUCTS

The panel outlet ducts are integral to the instrument panel assembly. Refer to Group 8E - Instrument Panel Systems for the instrument panel assembly service procedures.

PANEL OUTLET BARRELS

(1) Use a trim stick or another suitable wide-bladed flat tool to gently pry the panel outlet barrel out of the panel outlet housing (Fig. 64). The barrel is retained by a light snap fit.

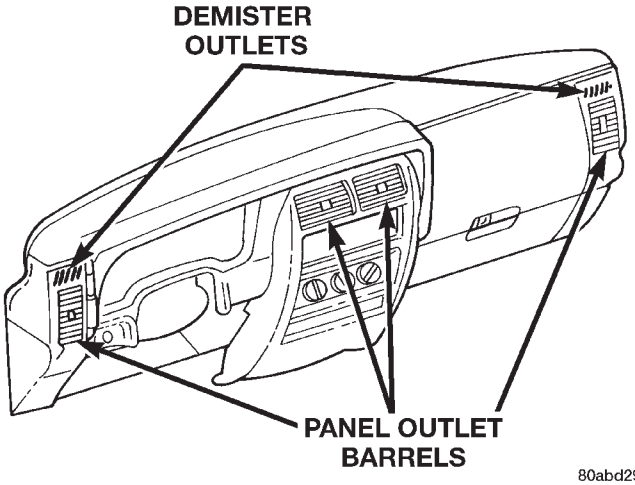


Fig. 64 Panel Outlet Barrels

(2) To install, position the barrel in the panel outlet housing and press firmly until the barrel snaps into place.

REMOVAL AND INSTALLATION (Continued)

DEMISTER OUTLETS

The side window demister outlets are integral to the instrument panel end caps. Refer to Group 8E - Instrument Panel Systems for the instrument panel end cap service procedures.

DEFROST DUCT/DEMISTER ADAPTER

(1) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(2) Disconnect the demister hoses from the defrost duct/demister adapter (Fig. 65).

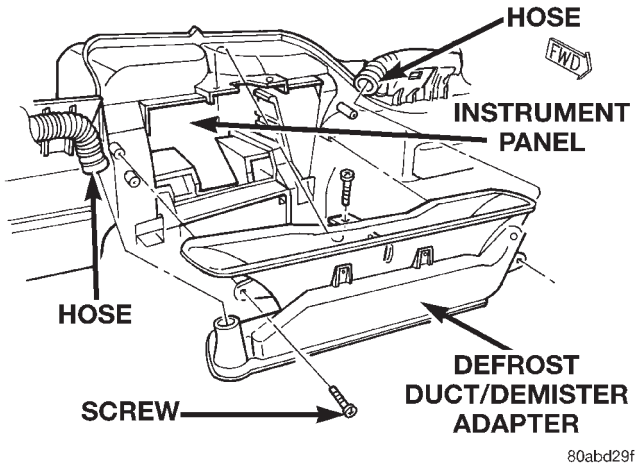


Fig. 65 Defrost Duct/Demister Adapter

(3) Remove the three screws that secure the defrost duct/demister adapter to the instrument panel.

(4) Remove the defrost duct/demister adapter from the instrument panel.

(5) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

DEMISTER HOSES

(1) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(2) Disconnect the ends of the demister hose from the demister duct (Fig. 66) and the defrost duct/demister adapter (Fig. 65).

(3) Reverse the removal procedures to install.

DEMISTER DUCTS

(1) Remove the instrument panel assembly as described in Group 8E - Instrument Panel Systems.

(2) Remove the instrument panel end cap as described in Group 8E - Instrument Panel Systems.

(3) Disconnect the demister hoses from the demister duct (Fig. 66).

(4) Remove the two screws that secure the demister duct to the top of the instrument panel.

(5) Remove the demister duct from the instrument panel.

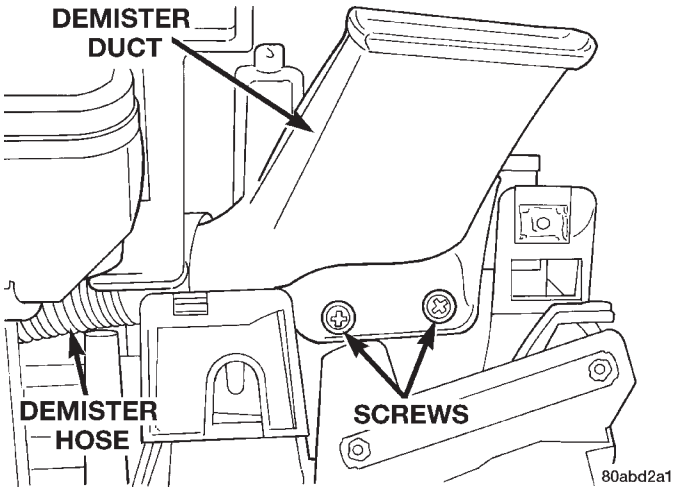


Fig. 66 Demister Duct Remove/Install

(6) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

CONSOLE REAR DUCT

(1) Disconnect and isolate the battery negative cable.

(2) Remove the floor console from the floor pan transmission tunnel (Fig. 67). Refer to Group 23 - Body for the procedures.

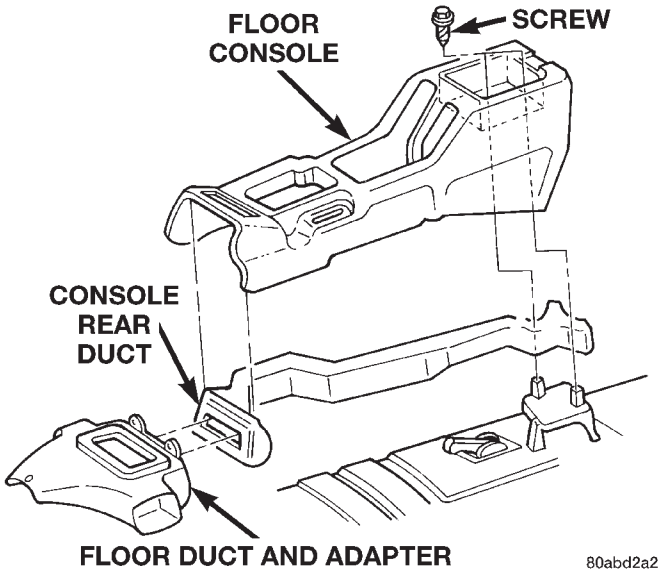


Fig. 67 Floor Duct and Console Rear Duct Remove/ Install

(3) Lift the rear of the console rear duct out of the console rear mounting bracket on the floor pan transmission tunnel and slide the duct rearward to disengage it from the floor duct and adapter.

(4) Remove the console rear duct from the vehicle.

(5) Reverse the removal procedures to install.

REMOVAL AND INSTALLATION (Continued)

FLOOR DUCT AND ADAPTER

(1) Remove the instrument panel as described in Group 8E - Instrument Panel Systems.

(2) Remove the heater-A/C housing as described in this group.

(3) Remove the three screws that secure the floor duct and adapter to the heater-A/C housing (Fig. 67).

(4) Remove the floor duct and adapter from the heater-A/C housing.

(5) Reverse the removal procedures to install. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).