HEATING AND AIR CONDITIONING

CONTENTS

GENERAL INFORMATION

HEATER AND AIR CONDITIONER

A manual temperature control type heating-air conditioning system is standard factory-installed equipment on this model. An electronically controlled Automatic Temperature Control (ATC) type heating-air conditioning system is an available factory-installed option.

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.

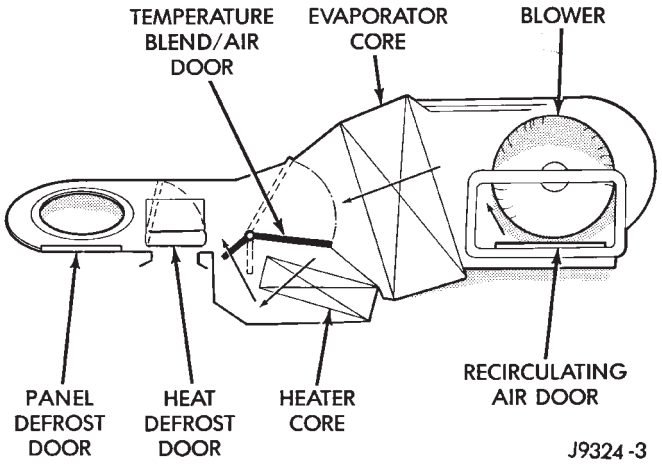


Fig. 1 Common Blend-Air Heater-Air Conditioner System

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.

It is also important to keep the air intake openings clear of debris because leaf particles and other debris that is small enough to pass through the cowl plenum screen can accumulate within the heater-A/C housing. The closed, warm, damp and dark environment created within the heater-A/C housing is ideal for the growth of certain molds, mildews and other fungi. Any accumulation of decaying plant matter provides an additional food source for fungal spores, which enter the housing with the fresh air. Excess debris, as well as objectionable odors created by decaying plant matter and growing fungi can be discharged into the passenger compartment during heater-A/C system operation.

Both the manual and ATC heater and 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) that is allowed to flow through, or around, the heater core. A temperature control knob on the heater-A/C control panel determines the discharge air temperature by energizing the blend-air door motor, which operates the blend-air door. This allows an almost immediate 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. On manual temperature control systems, the mode control knob switches engine vacuum to control the mode doors, which are operated by vacuum actuator motors. On ATC systems, the mode control knob switches electrical current to control the mode doors, which are operated by electronic actuator motors.

The outside air intake can be shut off by selecting the Recirculation Mode with the mode control knob. This will operate the recirculating air door that closes off the outside fresh air intake and recirculates the air that is already inside the vehicle.

The 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 air conditioning 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 and prevent evaporator freezing, a fixed pressure setting switch on the accumulator cycles the compressor clutch.

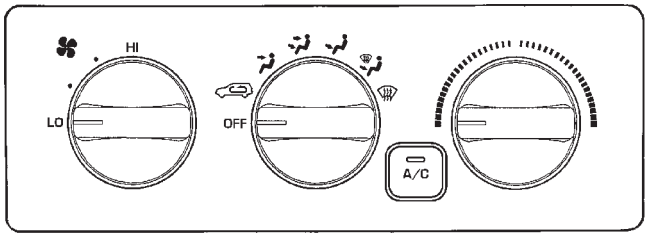
HEATER AND AIR CONDITIONER CONTROL

The manual temperature control heater-A/C system uses a combination of electrical, and vacuum controls. The Automatic Temperature Control (ATC) heater-A/C system uses only electrical controls. These controls provide the vehicle operator with a number of setting options to help control the climate and comfort within the vehicle. Refer to the owner's manual in the vehicle glove box for more information on the suggested operation and use of these controls.

Both heater-A/C control panels are located on the instrument panel inboard of the steering column and below the radio (Fig. 2). Both control panels contain a rotary-type temperature control knob, a rotary-type mode control switch knob, a rotary-type blower motor speed switch knob and an air conditioning compressor push button switch. The ATC control panel also features a Recirc push button switch and a vacuum fluorescent display area.

GENERAL INFORMATION (Continued)

MANUAL AIR CONDITIONING SYSTEM



AUTOMATIC TEMPERATURE CONTROL SYSTEM

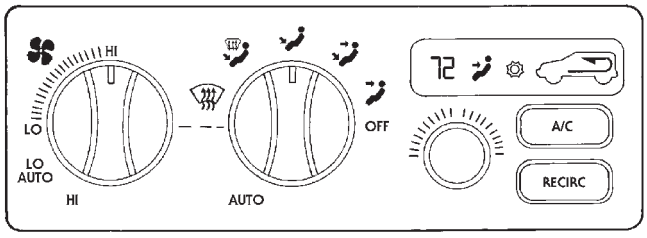


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Fig. 2 Heater-Air Conditioner Control Panels

The ATC control panel includes the ATC control module. The ATC control module contains a microprocessor and uses internal programming along with hard-wired sensor inputs and messages received on the Chrysler Collision Detection (CCD) data bus network to control the many functions and features of the ATC system.

Both the manual heater-A/C control panel and the ATC control panel are serviced only as complete units and cannot be repaired. If faulty or damaged, the entire control panel unit must be replaced.

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.

GENERAL INFORMATION (Continued)

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.**
- **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.

The engine cooling system includes the heater core and the heater hoses. Refer to Group 7 - Cooling System for more information before the opening of, or attempting any service to the engine cooling system.

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 millimeters (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

GENERAL INFORMATION (Continued)

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 within the refrigerant system (Fig. 3).

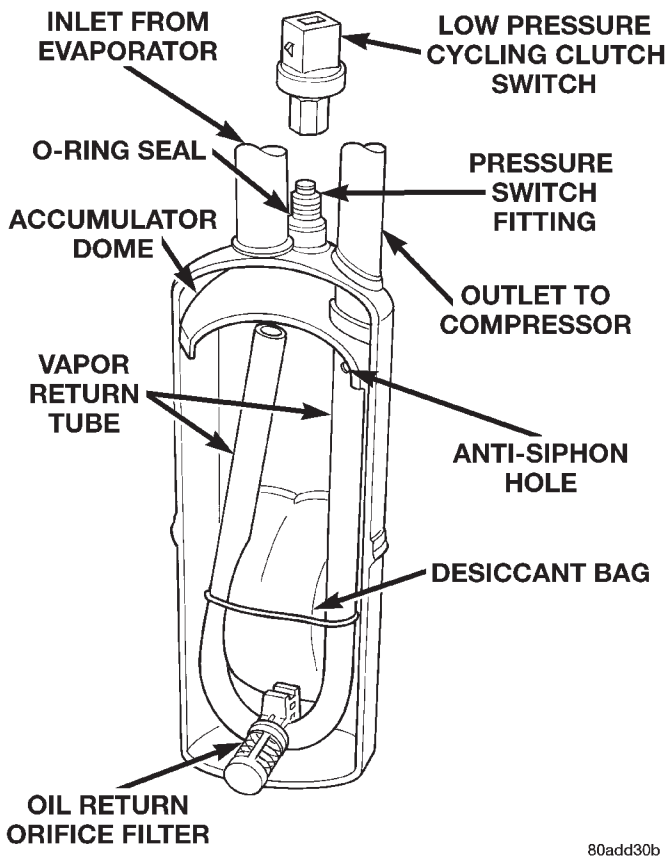

Fig. 3 Accumulator - Typical

AMBIENT TEMPERATURE SENSOR

Models with the optional Automatic Temperature Control (ATC) system use an input from the ambient temperature sensor. The sensor is located in front of the condenser and behind the radiator grille on the center radiator support.

The ambient temperature sensor is hard-wired to the Body Control Module (BCM). The BCM places an ambient temperature message on the CCD data bus for use by the overhead console for the thermometer function, and for use by the ATC control module.

The ambient temperature sensor is a Negative Temperature Coefficient (NTC) thermistor or temperature sensitive resistor. The ATC control module uses this sensor input to monitor the outside air temperature. However, because heat from the radiator and condenser can affect the accuracy of the input from this sensor when the vehicle is not moving, this input is only used by the ATC system when the vehicle is in motion.

The ambient temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

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 module. The blower motor controls the velocity of the 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 blower wheel can be serviced from the passenger compartment side of the housing.

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 circuit is protected by a fuse in the junction block. On models with the standard manual temperature control system, the blower motor speed is controlled by regulating the battery feed through the blower motor switch and the blower motor resistor. On models with the optional Automatic Temperature Control (ATC) system, the blower

DESCRIPTION AND OPERATION (Continued)

motor speed is controlled by the blower motor power module, which adjusts the battery feed voltage to the blower motor based upon an input from the blower motor switch through the ATC control module.

The blower motor and blower motor wheel cannot be repaired and, if faulty or damaged, they must be replaced. The blower motor and blower wheel are each serviced separately.

BLOWER MOTOR POWER MODULE

Models equipped with the optional Automatic Temperature Control (ATC) system have a blower motor power module. The power module allows the selection of almost infinitely variable blower motor speeds. The power module is mounted to the heater-A/C housing, under the instrument panel and just inboard of the blower motor, in the same location used for the blower motor resistor on manual temperature control systems. It can be accessed without removing any other components.

The blower motor power module output to the blower motor can be controlled by adjusting the blower motor speed switch knob on the ATC heater-A/C control panel, or it can be adjusted automatically by the logic circuitry and programming of the ATC control module. In either case, the ATC control module sends the correct pulse-width modulated signal to the power module to obtain the selected or programmed blower motor speed.

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

BLOWER MOTOR RESISTOR

Models with the standard manual temperature control system have a blower motor resistor. The blower motor resistor is mounted to the bottom of the heater-A/C housing, under the instrument panel and just inboard of the blower motor. It can be accessed for service without removing any other components.

The resistor has multiple resistor wires, each of which will reduce the current flow to the blower motor to change the blower motor speed 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.

With the blower motor switch in the lowest speed position, the ground path for the motor is applied through all of the resistor wires. Each higher speed selected with the blower motor switch applies the blower motor ground path through fewer of the resistor wires, increasing the blower motor speed. When the blower motor switch is in the highest speed position, the blower motor resistor is bypassed and the blower motor receives a direct path to ground.

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

BLOWER MOTOR SWITCH

The heater-A/C blower motor is controlled by a rotary-type blower motor switch, mounted in the heater-A/C control panel. On vehicles with manual temperature control systems, the switch allows the selection of four blower motor speeds, but will only operate with the ignition switch in the On position and the heater-A/C mode control switch in any position, except Off. On vehicles with the Automatic Temperature Control (ATC) systems, the switch allows the selection of Lo Auto, Hi Auto, and an infinite number of manual speed settings between Lo and Hi.

On manual temperature control systems, the blower motor switch is connected in series with the blower motor ground path through the heater-A/C mode control switch. The blower motor switch directs this ground path to the blower motor through the blower motor resistor wires, or directly to the blower motor, as required to achieve the selected blower motor speed.

On ATC systems, the blower motor switch is just one of many inputs to the ATC control module. In the manual blower modes, the ATC control module adjusts the blower motor speed through the blower motor power module as required to achieve the selected blower switch position. In the auto blower modes, the ATC controller is programmed to select and adjust the blower motor speed through the blower motor power module as required to achieve and maintain the selected comfort level.

The blower motor switch cannot be repaired and, if faulty or damaged, it must be replaced. The switch is serviced only as a part of the heater-A/C control assembly.

COMPRESSOR

The air conditioning system uses a Nippon Denso 10PA17 ten cylinder, double-acting swash plate-type compressor on all models. This compressor has a fixed displacement of 170 cubic centimeters (10.374 cubic inches), and has both the suction and discharge ports located on the cylinder head. A label identifying the use of R-134a refrigerant is located on the compressor.

The compressor is driven by the engine through an electric clutch, drive pulley and belt arrangement. The compressor is lubricated by refrigerant oil that is circulated throughout the refrigerant system with the refrigerant.

The compressor draws in low-pressure refrigerant vapor from the evaporator through its suction port. It then compresses the refrigerant into a high-pressure, high-temperature refrigerant vapor, which is then pumped to the condenser through the compressor discharge port.

DESCRIPTION AND OPERATION (Continued)

The compressor cannot be repaired. If faulty or damaged, the entire compressor assembly must be replaced. The compressor clutch, pulley and clutch coil are available for service.

COMPRESSOR CLUTCH

The compressor clutch assembly consists of a stationary electromagnetic coil, a hub bearing and pulley assembly, and a clutch plate (Fig. 4). The electromagnetic coil unit and the hub bearing and pulley assembly are each retained on the nose of the compressor front housing with snap rings. The clutch plate is keyed to the compressor shaft and secured with a screw.

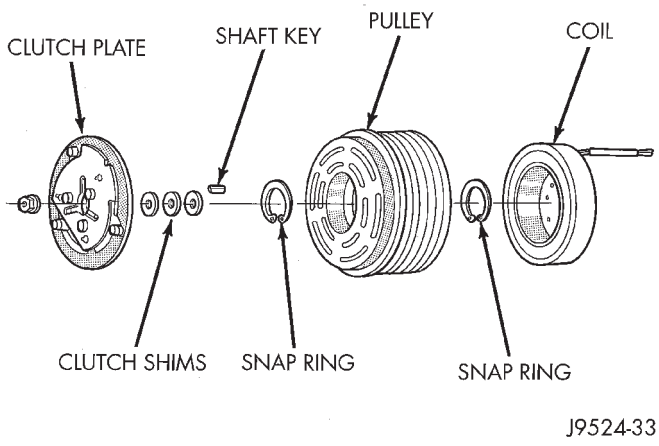

Fig. 4 Compressor Clutch - Typical

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 engagement is controlled by several components: the A/C switch on the heater-A/C control panel, the Automatic Temperature Control (ATC) control module (if the vehicle is so equipped), 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 thirty 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, the 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 A/C compressor switch on the heater-A/C control panel, the Automatic Temperature Control (ATC) control module (if the vehicle is so equipped), 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 the air flow in front of the engine cooling radiator. The condenser is a heat exchanger that allows the high-pressure refrigerant gas being discharged by the compressor to give up its heat to the air passing over the condenser fins. When the refrigerant gas gives up its heat, it condenses. When the refrigerant leaves the condenser, it has become a high-pressure liquid refrigerant.

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

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. The evaporator coil is positioned in the heater-A/C housing so that all air that enters the housing must pass over the fins of the evaporator before it is distributed through the system ducts and outlets. However, air passing over the evaporator coil fins will only be conditioned when the compressor is engaged and circulating refrigerant through the evaporator coil tubes.

Refrigerant enters the evaporator from the fixed orifice tube as a low-temperature, low-pressure liquid. As air flows over the fins of the evaporator, the humidity in the air condenses on the fins, and the

DESCRIPTION AND OPERATION (Continued)

heat from the air is absorbed by the refrigerant. Heat absorption causes the refrigerant to boil and vaporize. The refrigerant becomes a low-pressure gas before it leaves the evaporator.

The evaporator 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 of the condenser and the inlet of the evaporator. The fixed orifice tube is only serviced as an integral part of the liquid line.

The inlet end of the fixed orifice tube has a nylon mesh filter screen, which filters the refrigerant and helps to reduce the potential for blockage of the metering orifice by refrigerant system contaminants (Fig. 5). The outlet end of the tube has a nylon mesh diffuser screen. The O-rings on the plastic body of the fixed orifice tube seal the tube to the inside of the liquid line and prevent the refrigerant from bypassing the fixed metering orifice.

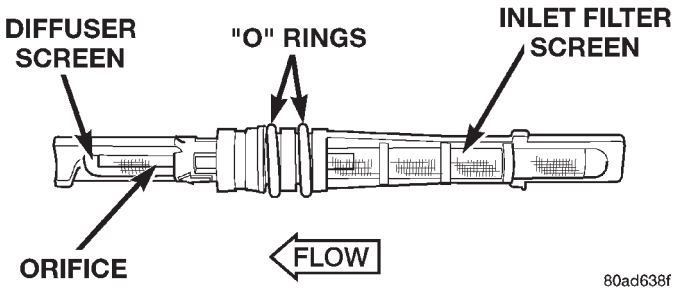

Fig. 5 Fixed Orifice Tube - Typical

The fixed orifice tube is used to meter the flow of liquid refrigerant into the evaporator coil. The high-pressure liquid refrigerant from the condenser expands into a low-pressure liquid as it passes through the metering orifice and diffuser screen of the fixed orifice tube.

The fixed orifice tube cannot be repaired and, if faulty or plugged, the liquid line assembly 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 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 volume of air flowing through the heater-A/C housing.

The heater core cannot be repaired and, if faulty or damaged, it must be replaced. Refer to Group 7 - Cooling System for more information on the engine cooling system, the engine coolant and the heater hoses.

HIGH PRESSURE CUT-OFF SWITCH

The high pressure cut-off switch is located on the discharge line or discharge line block fitting near the compressor. The switch is screwed onto a fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The discharge line fitting is equipped with an O-ring to seal the switch connection.

The high pressure cut-off switch is connected in series electrically 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

A high pressure relief valve is located on the compressor manifold, which is on the side of the compressor. This mechanical valve is designed to vent refrigerant from the system to protect against damage to the compressor and other system components, caused by condenser air flow restriction or an overcharge of refrigerant.

The high pressure relief valve vents the system when a discharge pressure of 3445 to 4135 kPa (500 to 600 psi) or above is reached. The valve closes when a minimum discharge pressure of 2756 kPa (400 psi) is reached.

The high pressure relief valve vents only enough refrigerant to reduce the 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 that the valve is faulty.

The high pressure relief valve is a factory-calibrated unit. The valve cannot be adjusted or repaired, and must not be removed or otherwise disturbed. The valve is only serviced as a part of the compressor assembly.

DESCRIPTION AND OPERATION (Continued)

IN-VEHICLE TEMPERATURE SENSOR

Models equipped with the optional Automatic Temperature Control (ATC) system have an in-vehicle temperature sensor. The in-vehicle temperature sensor is located in the instrument panel, just inboard of the glove box and below the passenger side center panel outlet. The ATC control module uses the in-vehicle temperature sensor signal input to adjust the blower speed, blend-air door position, and mode door selection in order to maintain the selected comfort level.

The in-vehicle temperature sensor is a Negative Temperature Coefficient (NTC) thermistor, which is a temperature sensitive resistor. Air passing over a venturi in the heater-A/C housing creates a vacuum, which draws air from inside the vehicle through a grille opening in the instrument panel past the sensor and through an aspirator hose and tube into the heater-A/C housing. The sensor provides a signal to the ATC control module with a value that represents the temperature of the air inside the vehicle.

The in-vehicle temperature sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

LOW PRESSURE CYCLING CLUTCH SWITCH

The low pressure cycling clutch switch is located on the top of the accumulator. The switch is screwed onto an accumulator fitting that contains a Schrader-type valve, which allows the switch to be serviced without discharging the refrigerant system. The accumulator fitting is equipped with an O-ring to seal the switch connection.

The low pressure cycling clutch switch is connected in series electrically 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 refrigerant system pressure and controls evaporator temperature. Controlling the 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), will also cause the switch contacts to open. 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 refrigerant used in this air conditioning system is a HydroFluoroCarbon (HFC), type R-134a. Unlike R-12, which is a ChloroFluoroCarbon (CFC), R-134a refrigerant does not contain ozone-depleting chlorine. R-134a refrigerant is a non-toxic, non-flammable, clear, and colorless liquefied gas.

Even though R-134a does not contain chlorine, it must be reclaimed and recycled just like CFC-type refrigerants. This is because R-134a is a greenhouse gas and can contribute to global warming.

R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. Even a small amount of R-12 added to an R-134a refrigerant system will cause compressor failure, refrigerant oil sludge or poor air conditioning system performance. In addition, the PolyAlkylene Glycol (PAG) synthetic refrigerant oils used in an R-134a refrigerant system are not compatible with the mineral-based refrigerant oils used in an R-12 refrigerant system.

R-134a refrigerant system service ports, service tool couplers and refrigerant dispensing bottles have all been designed with unique fittings to ensure that an R-134a system is not accidentally contaminated with the wrong refrigerant (R-12). There are also labels posted in the engine compartment of the vehicle and on the compressor identifying to service technicians that the air conditioning system is equipped with R-134a.

REFRIGERANT LINE

The refrigerant lines and hoses are used to carry the refrigerant between the various air conditioning system components. A barrier hose design with a nylon tube inner hose liner is used for the R-134a air conditioning system on this vehicle. This nylon liner helps to further contain the R-134a refrigerant, which has a smaller molecular structure than R-12 refrigerant. The ends of the refrigerant hoses are made from lightweight aluminum, and use braze-less fittings.

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. 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. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once

DESCRIPTION AND OPERATION (Continued)

a year to make sure they are in good condition and properly routed.

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

REFRIGERANT LINE COUPLER

Spring-lock type refrigerant line couplers are used to connect many of the refrigerant lines and other components to the refrigerant system. These couplers require a special tool for disengaging the two coupler halves.

The spring-lock coupler is held together by a garter spring inside a circular cage on the male half of the fitting (Fig. 6). When the two coupler halves are connected, the flared end of the female fitting slips behind the garter spring inside the cage on the male fitting. The garter spring and cage prevent the flared end of the female fitting from pulling out of the cage.

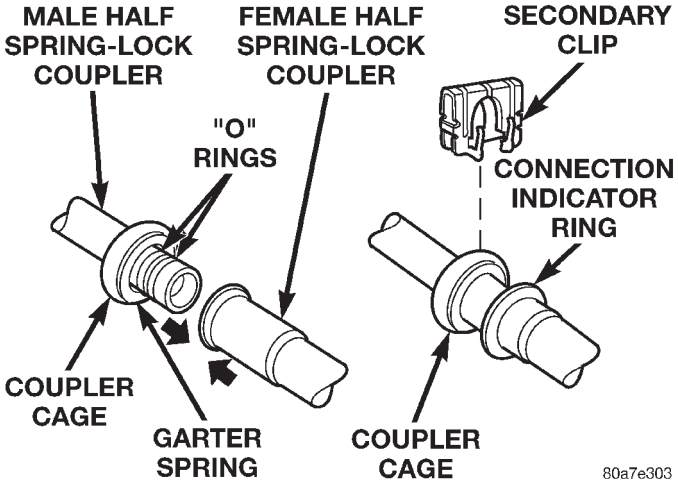

Fig. 6 Spring-Lock Coupler - Typical

Two O-rings on the male half of the fitting are used to seal the connection. These O-rings are compatible with R-134a refrigerant and must be replaced with O-rings made of the same material.

Secondary clips are installed over the two connected coupler halves at the factory for added blowoff protection. In addition, a plastic ring is used at the factory as a visual indicator to confirm that these couplers are connected. After the coupler is connected, the plastic indicator ring is no longer needed; however, it will remain on the refrigerant line near the coupler cage.

REFRIGERANT OIL

The refrigerant oil used in R-134a refrigerant systems is a synthetic-based, PolyAlkylene Glycol (PAG), wax-free lubricant. Mineral-based R-12 refrigerant oils are not compatible with PAG oils, and should never be introduced to an R-134a refrigerant system.

There are different PAG oils available, and each contains a different additive package. The 10PA17 compressor used in this vehicle is designed to use an ND8 PAG refrigerant oil. Use only refrigerant oil of this same type to service the refrigerant system.

After performing any refrigerant recovery or recycling operation, always replenish the refrigerant system with the same amount of the recommended refrigerant oil as was removed. Too little refrigerant oil can cause compressor damage, and too much can reduce air conditioning system performance.

PAG refrigerant oil is much more hygroscopic than mineral oil, and will absorb any moisture it comes into contact with, even moisture in the air. The PAG oil container should always be kept tightly capped until it is ready to be used. After use, recap the oil container immediately to prevent moisture 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 R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used. Contact an automotive service equipment supplier for refrigerant recovery/recycling/charging equipment. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

A manifold gauge set may be needed with some recovery/recycling/charging equipment (Fig. 7). 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.

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 liquid line, near the evaporator at the rear of the engine compartment.

DESCRIPTION AND OPERATION (Continued)

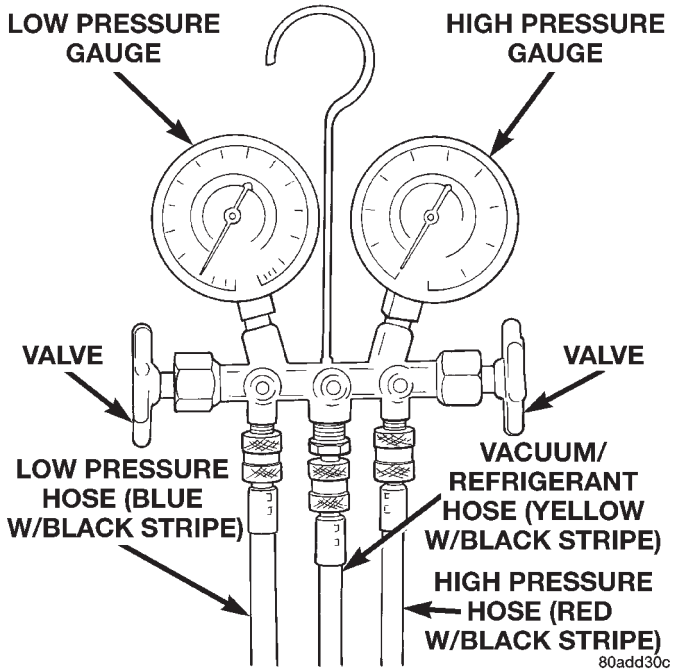

Fig. 7 Manifold Gauge Set - Typical

HIGH PRESSURE GAUGE HOSE

The high pressure hose (Red with Black stripe) attaches to the discharge service port. This port is located on the compressor manifold on the side of the compressor.

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.

The high pressure service port is located on the compressor manifold on the side of the compressor. The low pressure service port is located on the liquid line near the evaporator at the rear of the engine compartment.

Each of the service ports has a threaded plastic protective cap installed over it from the factory. After servicing the refrigerant system, always reinstall both of the service port caps.

SOLAR SENSOR

Models equipped with the optional Automatic Temperature Control (ATC) system have a solar sensor. The solar sensor is mounted in the cowl top trim panel, on the top of the instrument panel near the passenger side defroster outlet. The sensor is a photo diode which responds to sunlight intensity, not to temperature.

The ATC control module uses the solar sensor input to calculate and compensate for the potential effects of heat gain in bright sunlight, and heat loss with an overcast sky or at night. It then adjusts the blower motor speed, blend air door position, and mode door position as needed to maintain the selected comfort level.

The solar sensor cannot be adjusted or repaired and, if faulty or damaged, it must be replaced.

VACUUM CHECK VALVE

A vacuum check valve is installed in the accessory vacuum supply line in the engine compartment, near the vacuum tap on the engine intake manifold. The vacuum check valve is designed to allow vacuum to flow in only one direction through the accessory vacuum supply circuits.

The use of a vacuum check valve helps to maintain the system vacuum needed to retain the selected heater-A/C mode settings. The check valve will prevent 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 in the engine compartment on the underside of the battery tray. The battery and battery tray must be removed from the vehicle to access the vacuum reservoir for service.

Engine vacuum is stored in the vacuum reservoir. The stored vacuum 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 through the

DIAGNOSIS AND TESTING (Continued)

cooled evaporator, the air transfers its heat to the refrigerant in the evaporator and the moisture in the air condenses on the evaporator 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.

If the vehicle has the optional Automatic Temperature Control (ATC) system, and has intermittent operational problems or fault codes, be certain that the 16-way wire harness connector on the heater-A/C housing is properly seated (Fig. 8). To check this condition, unplug the two wire harness connector halves, then plug them in again. Historical fault codes that could be stored as a result of this unseated wire harness connector condition are Codes 36, 38, and 39.

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) If the vehicle has the standard manual temperature control, set the heater-A/C mode control switch knob in the Panel position, the temperature control knob in the full cool (Recirculation Mode) position, the A/C button in the On position, and the blower motor switch knob in the highest speed position. If the vehicle has the optional ATC, set the heater-A/C mode control switch knob in the Panel position, the temperature control knob in the full cool position, the A/C and Recirc buttons in the On position, and the blower motor switch knob in the highest (manual) speed position.

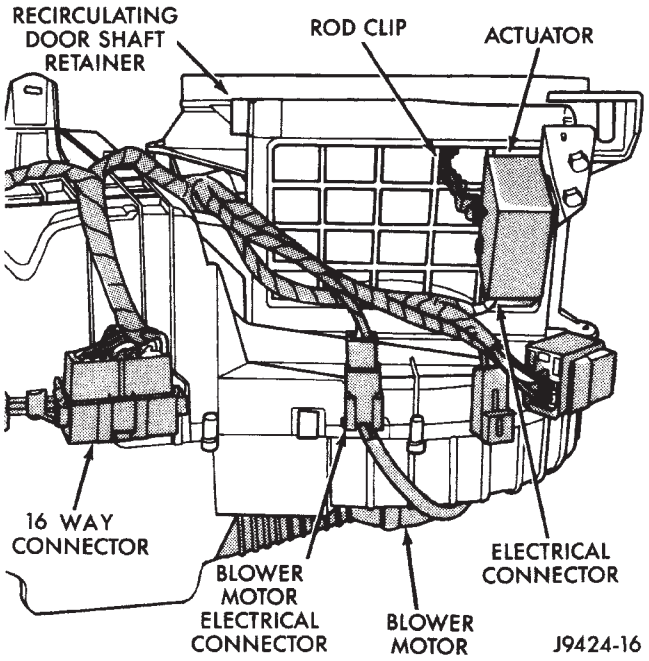

Fig. 8 16-Way Wire Harness Connector

(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. 9). Place a jumper wire across the terminals of the low pressure cycling clutch switch wire harness connector.

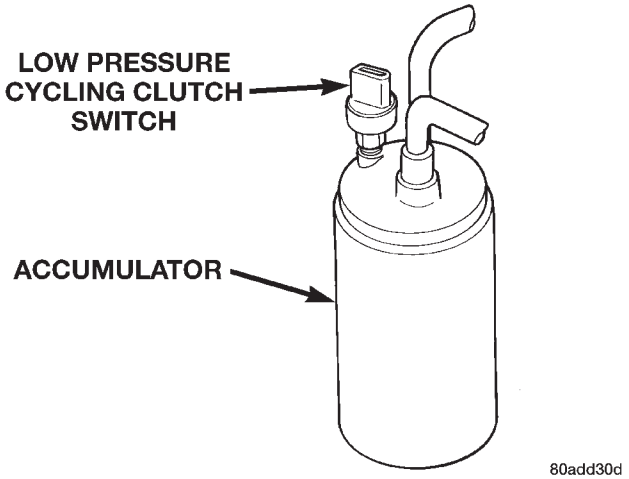

Fig. 9 Low Pressure Cycling Clutch Switch - Typical

DIAGNOSIS AND TESTING (Continued)

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

(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. 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.

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 fuseblock module. 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.
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.

HEATER PERFORMANCE

Before performing the following tests, refer to Group 7 - Cooling System for the procedures to check the radiator coolant level, serpentine drive belt tension, radiator air flow and the radiator fan operation. Also be certain that the accessory vacuum supply line is connected at the engine intake manifold.

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 heat position, and the blower motor switch knob in the highest speed position. Using a test thermometer, check the temperature of the air being discharged at the heater-A/C housing floor outlets. Compare the test thermometer reading to the Temperature Reference chart.

If the floor outlet air temperature is too low, refer to Group 7 - Cooling System to check the engine coolant temperature specifications. Both of the heater

DIAGNOSIS AND TESTING (Continued)

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

hoses should be hot to the touch. The coolant return heater hose should be slightly cooler than the coolant supply heater hose. If the return hose is much cooler than the supply hose, locate and repair the engine coolant flow obstruction in the cooling system. Refer to Group 7 - Cooling System for the procedures.

OBSTRUCTED COOLANT FLOW

Possible locations or causes of obstructed coolant flow:

- Pinched or kinked heater hoses.
- Improper heater hose routing.
- Plugged heater hoses or supply and return ports at the cooling system connections.
- A plugged heater core.

If proper coolant flow through the cooling system is verified, and heater 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 outlet air temperature cannot be adjusted with the temperature control knob on the heater-A/C control panel, the following could require service:

- The heater-A/C control.
- The blend air door actuator.
- The wire harness circuits for the heater-A/C control or the blend air door actuator.
- The blend-air door.
- Improper engine coolant temperature.

VACUUM SYSTEM

Vacuum control is used to operate the mode doors in the standard equipment manual temperature control system heater-A/C housing. Testing of the heater-A/C mode control switch operation will determine if the vacuum, and electrical 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 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. 10), 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.

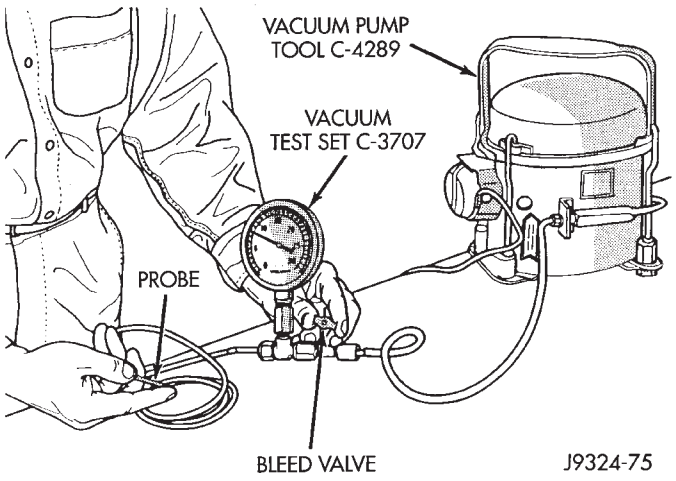

Fig. 10 Adjust Vacuum Test Bleed Valve

VACUUM CHECK VALVE

(1) Remove the vacuum check valve. The valve is located in the (black) vacuum supply tube at the engine intake manifold vacuum tap.

(2) Connect the test set vacuum supply hose to the heater-A/C control 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 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.

DIAGNOSIS AND TESTING (Continued)

HEATER-A/C CONTROLS

(1) Connect the test set vacuum probe to the heater-A/C vacuum supply (black) tube 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 position 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 from the back of the heater-A/C mode control switch on the control panel.

(2) Connect the test set vacuum hose probe to each port in the vacuum harness connector, one at a time, and pause after each connection (Fig. 11). 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 mode control switch. 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 colors, refer to the Vacuum Circuits chart (Fig. 12).

(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.

(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 millimeter (1/8-inch) inside diameter rubber hose.

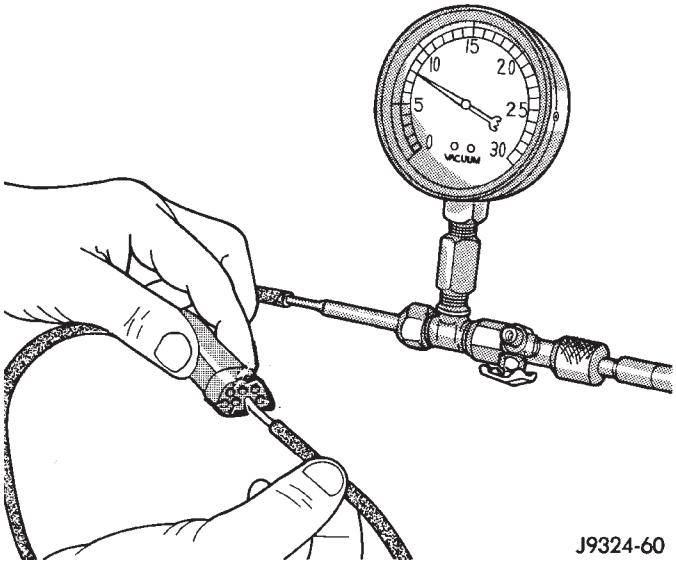

Fig. 11 Vacuum Circuit Test

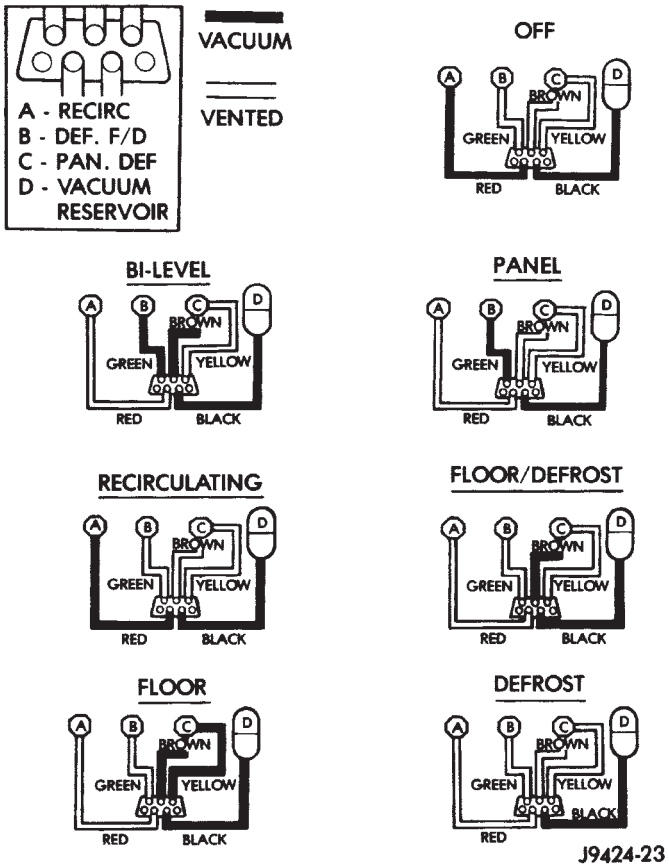

Fig. 12 Vacuum Circuits

DIAGNOSIS AND TESTING (Continued)

AUTOMATIC TEMPERATURE CONTROL SYSTEM

The Automatic Temperature Control (ATC) control module has a system self-diagnostic mode. The ATC control module is capable of troubleshooting each of its input and output circuits. When the control module detects a fault and places it in memory, an "Er" is momentarily displayed in the heater-A/C control panel vacuum fluorescent display area, but it will only be displayed once during each ignition cycle. The ATC system can also be diagnosed using a DRB scan tool and the proper Diagnostic Procedures manual.

The ATC control module is capable of three different types of self-diagnostic tests, as follows:

- Fault Code Tests
- Input Circuit Tests
- Output Circuit/Actuator Tests

The information that follows describes how to read the self-diagnostic display, how to enter the ATC control module self-diagnostic test mode, how to select the three self-diagnostic test types, and how to perform the three different tests.

SELF-DIAGNOSTIC DISPLAY

In the self-diagnostic mode, the test information is displayed in the vacuum fluorescent display area of the heater-A/C control. The area of the display where the temperature control comfort level is normally displayed is called the Test Selector. The Test Selector is used to display fault codes, identify the test mode, and show the values of the circuits being tested. The following information describes how the values in the Test Selector display should be interpreted.

(1) The Select Test mode will have only 00 displayed in the Test Selector, and no stick man will be displayed. This is the self-diagnostic mode from which the various tests may be selected.

(2) If the stick man floor arrow (bottom) is showing, the displayed Test Selector value will be a range of numbers below zero (Fig. 13).

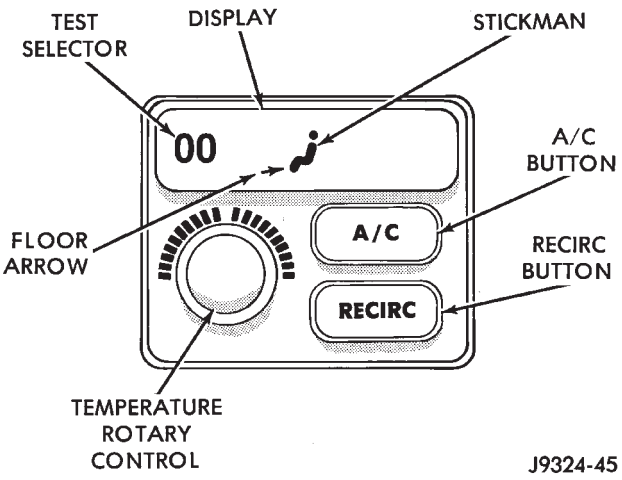

Fig. 13 Test Selector Values Below Zero

(3) If the stick man appears, but no arrows are showing, the displayed Test Selector value will be a range of numbers between zero and ninety-nine (Fig. 14).

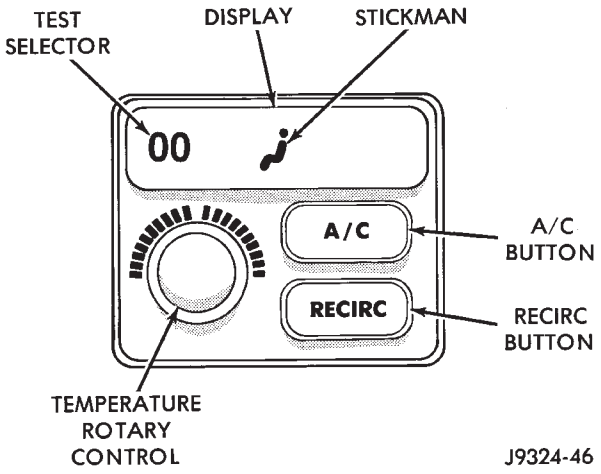

Fig. 14 Test Selector Values Between Zero and Ninety-Nine

(4) If the stick man panel arrow (middle) is showing, the displayed Test Selector value will be a range of numbers between 100 and 199 (Fig. 15).

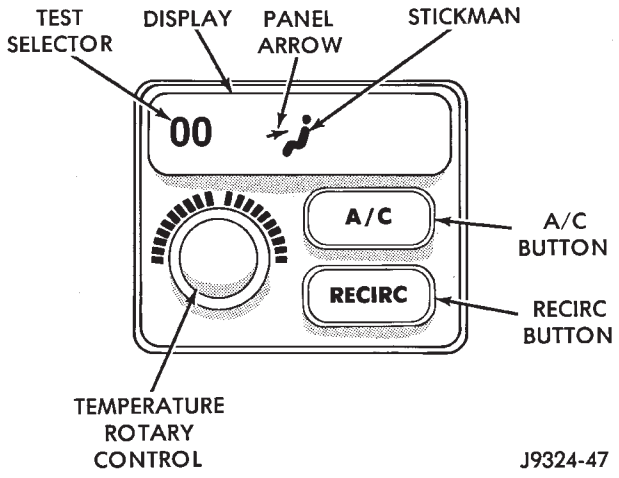

Fig. 15 Test Selector Values Between 100 and 199

(5) If the stick man panel (middle) and defrost (top) arrows are showing, the displayed Test Selector value will be a range of numbers between 200 and 255 (Fig. 16).

(6) At any time during the self-diagnostic tests, you may return to the Select Test mode by turning the rotary temperature control knob one click in either direction. Again, the stick man and arrows are not shown in the Select Test mode. At this point, you have the option of monitoring or testing another circuit (Fig. 17).

DIAGNOSIS AND TESTING (Continued)

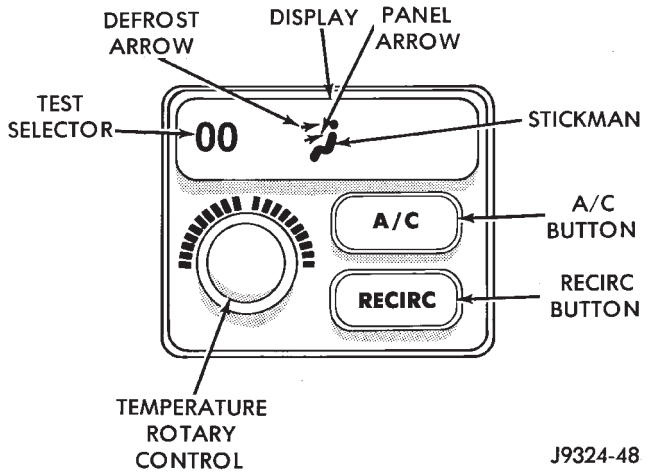

Fig. 16 Test Selector Values Between 200 and 255

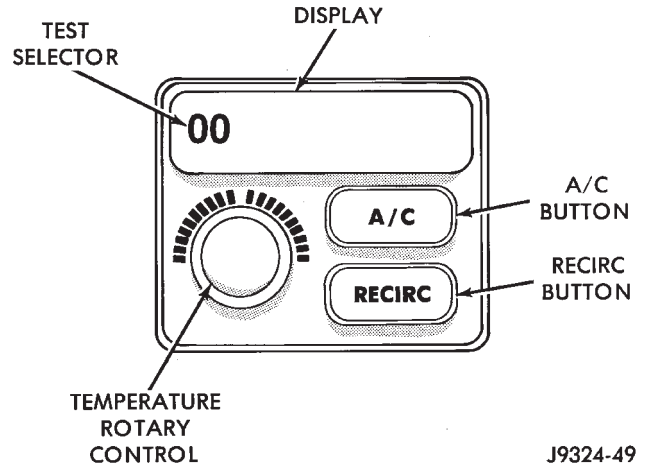

Fig. 17 Return to Select Test Mode

ENTERING THE ATC SELF-DIAGNOSTIC MODE

To enter the ATC self-diagnostic mode, perform the following:

(1) Depress the A/C and Recirc buttons at the same time and hold. Rotate the rotary temperature control knob clockwise one click.

(2) If you continue to hold the A/C and Recirc buttons depressed, the ATC control module will perform a Segment Test of the vacuum fluorescent display. In the Segment Test you should see all of the display segments illuminate. If a display segment fails to illuminate, the vacuum fluorescent display is faulty and the heater-A/C control must be replaced.

(3) After viewing the Segment Test, release the A/C and Recirc buttons. This will cause the Test Selector to display a “00” value, and no stick man will be displayed. This is the Select Test mode. At this point a number of tests can be selected, however, the Fault Code Test should be performed first.

FAULT CODE TESTS

Fault codes are two-digit numbers that identify a circuit that is malfunctioning. There are two different kinds of fault codes.

1. **Current Fault Codes** - Current means the fault is present right now. There are two types of current faults: input faults, and system faults.

2. **Historical Fault Codes** - Historical or stored means that the fault occurred previously, but is not present right now. A majority of historical fault codes are caused by intermittent wire harness or wire harness connector problems.

NOTE: A battery disconnect will erase all faults stored in Read Available Memory (RAM) of the ATC control module. It is recommended that all faults be recorded before they are erased.

RETRIEVING FAULT CODES

(1) To begin the Fault Code Tests you must be in the Select Test mode. With a “00” value displayed in the Test Selector and no stick man, push either the A/C or Recirc button.

(2) The stick man will appear indicating you have entered the Fault Code Tests. The values displayed in the Test Selector will range from “00” to “64.”

(3) Fault codes will appear and repeat if there are more than one. Record all of the fault codes, then see the Current and Historical Fault Code charts for the descriptions. If there are no fault codes, the “00” display value will remain displayed in the Test Selector.

(4) If a Fault Code “25” or “29” is displayed, the ATC control module must be replaced before any further testing is performed.

(5) For more detailed information about a fault code, see the Input Circuit Tests or the Output Circuit/Actuator Tests.

CLEARING FAULT CODES

Current faults are cleared whenever the problem goes away. To clear a historical fault, depress and hold either the A/C or Recirc button for at least three seconds. The faults have been cleared when two horizontal bars appear in the Test Selector display.

DIAGNOSIS AND TESTING (Continued)

Current Fault Codes

Fail Code/Description	Circuit Description
00 = No Faults	
02 = Circuit open	In-Vehicle Temperature Sensor
03 = Circuit open	Solar Sensor Input Circuit
04 = Circuit open	Front Panel Blower/Fan Control Input
05 = Circuit open	Front Panel Mode Control Input
06 = Circuit open	Blend Air Door Feedback Circuit
07 = Circuit open	Mode Door Feedback Circuit
08 = Feedback too high	Blower /Fan Feedback Circuit
10 = Circuit shorted	In-Vehicle Temperature Sensor
11 = Circuit shorted	Solar Sensor Input Circuit
12 = Circuit shorted	Front Panel Blower/Fan Control Input
13 = Circuit shorted	Front Panel Mode Control Input
14 = Circuit shorted	Blend Air Door Feedback Circuit
15 = Circuit shorted	Mode Door Feedback Circuit
16 = Feedback too low	Blower/ Fan Feedback Circuit
19 = Door not responding	Mode Door Feedback Circuit
20 = Door not responding	Blend Air Door Actuator Drive Circuit
21 = Door travel range too small	Mode Door Feedback Circuit
22 = Door travel range too large	Mode Door Feedback Circuit
23 = Door travel range too small	Blend Air Door Actuator Drive Circuit
24 = Door travel range too large	Blend Air Door Actuator Drive Circuit
25 = Calibration data error	Calibration and CPU Data
26 = BCM message missing	Collision Detection C2D Bus Inputs
27 = PCM message Missing	Collision Detection C2D Bus Inputs
29 = CPU error	Calibration and CPU Data
30 = Reserved	
31 = Reserved	
32 = Reserved	

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DIAGNOSIS AND TESTING (Continued)

Historical Fault Codes

Fail Code/Description	Circuit Description
34 = Circuit was open	In-Vehicle Temperature Sensor
35 = Circuit was open	Solar Sensor Input Circuit
36 = Circuit was open	Front Panel Blower/Fan Control Input
37 = Circuit was open	Front Panel Mode Control Input
38 = Circuit was open	Blend Air Door Feedback Circuit
39 = Circuit was open	Mode Door Feedback Circuit
40 = Feedback was too high	Blower/Fan Feedback Circuit
42 = Circuit was shorted	In-Vehicle Temperature Sensor
43 = Circuit was shorted	Solar Sensor Input Circuit
44 = Circuit was shorted	Front Panel Blower/Fan Control Input
45 = Circuit was shorted	Front Panel Mode Control Input
46 = Circuit was shorted	Blend Air Door Feedback Circuit
47 = Circuit was shorted	Mode Door Feedback Circuit
48 = Feedback was too low	Blower/Fan Feedback Circuit
51 = Door was not responding	Mode Door Feedback Circuit
52 = Door was not responding	Blend Air Door Actuator Drive Circuit
53 = Door travel range was too small	Mode Door Feedback Circuit
54 = Door travel range was too large	Mode Door Feedback Circuit
55 = Door travel range was too small	Blend Air Door Actuator Drive Circuit
56 = Door travel range was too large	Blend Air Door Actuator Drive Circuit
57 = Calibration data was in error	Calibration and CPU Data
58 = BCM message was missing	Collision Detection C2D Bus Inputs
59 = PCM message was missing	Collision Detection C2D Bus Inputs
61 = CPU was in error	Calibration and CPU Data
62 = Reserved	
63 = Reserved	
64 = Reserved	

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DIAGNOSIS AND TESTING (Continued)

INPUT CIRCUIT TESTS

In the Input Circuit Test mode, the status of input circuits can be viewed and monitored. If a failure occurs within an input circuit, the ATC control module will display a “?” for unknown values, “OC” for an open circuit, or “SC” for a short circuit in the Test Selector display area.

(1) To begin the Input Circuit Tests you must be in the Select Test mode.

(2) With a “00” value displayed in the Test Selector and no stick man, turn the rotary temperature control knob until the test number you are looking for appears in the Test Selector display. See the Circuit Testing charts for a listing of the test numbers, test items, test types, system tested, and displayed values.

(3) To see the circuit input values, depress the A/C or Recirc button. The values displayed will represent the input seen by the ATC control module.

OUTPUT CIRCUIT/ACTUATOR TESTS

In the Output Circuit/Actuator Test mode, the output circuits can be viewed, monitored, overridden, and tested. If a failure occurs in an output circuit, test the circuit by overriding the system. Test the actuator through its full range of operation. When the override control has been activated, the Test Selector display will be flashing. The Test Selector will display feedback information about the output circuit being tested.

(1) To begin the Output Circuit/Actuator Tests you must be in the Select Test mode.

(2) With a “00” value displayed in the Test Selector and no stick man, turn the rotary temperature control knob until the test number you are looking for appears in the Test Selector display. See the Circuit Testing charts for a listing of the test numbers, test items, test types, system tested, and displayed values.

(3) To see the output value, depress the A/C or Recirc button. The values displayed will represent the output from the ATC control module.

(4) To enter the actuator test, depress the A/C or Recirc button. The Test Selector display will blink, indicating you are in the actuator test mode. Manual tests are those in which you will have to depress and hold the A/C or Recirc button to control the output. Automatic tests are those in which you will have to depress the A/C or Recirc button once to generate the output.

DIAGNOSIS AND TESTING (Continued)

Circuit Testing

Test No.	Test Item	Test Type	System Tested	Displayed Values
01	Blower Control Switch (A/D)	I	Blower System	"?" "OC" "SC" 00-255
02	Blower Feedback	I	Blower System	"?" 00-255
03	Blower Speed	O/A	Blower System	00-255
04	Hi Blower Relay	–	–	Not Equipped
05	Mode Control A/D	I	Mode Door System	"OC" "SC" 00-255
06	Mode Door Feedback	I	Mode Door System	"OC" "SC" 00-255
07	Panel Stop	I	Mode Door System	"?" 00-255
				If "?" is displayed, activate Mode 11 to find panel stop position.
08	Defrost Stop	I	Mode Door System	"?" 00-255
				If "?" is displayed, activate Mode 11 to find defrost stop position.
09	A/C Request	O/A	A/C System	00 = OFF 01 = ON
10	Mode Door Position	O/A	Mode Door System	00-255
				It is possible to command the door position beyond the stops. The motor will try to move there.
11	Mode Motor	O/A	Mode Door System	Pressing A/C or RECIRC button for 3 sec. begins reinitalization.
				00 = searching for panel stop 01 = searching for defrost stop 02 = moving toward panel 03 = moving toward defrost 04 = in position 05 = stalled moving toward panel 06 = stalled moving toward defrost 07 = feedback error
12	Mode Motor Drive Lines	O	Mode Door System	00 = stopped (lines low) 01 = toward defrost 02 = toward panel 03 = stopped (lines high)
13	Recirc Door	O/A	Recirc Door System	00 = continuous operation (lines grounded) 01 = fresh 02 = recirc. 03 = stopped (lines open)
14	In-Vehicle Temp. A/D	I	Temperature Inputs	"OC" "SC" 00-255
15	Blend Door Feedback	I	Blend Door System	"OC" "SC" 00-255
16	Blend Door Cold Stop	I	Blend Door System	"?" 00-255
17	Blend Door Hot Stop	I	Blend Door System	"?" 00-255

TEST TYPE: I = Input O = Output O/A = Output/Actuator

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DIAGNOSIS AND TESTING (Continued)

Circuit Testing (cont.)

Test No.	Test Item	Test Type	System Tested	Displayed Values
19	In-Vehicle Temperature	I	Temperature Inputs	"OC" "SC" –40 to +60°C (–40 to + 140°F)
20	Ambient Sensor	I	CCD	–40 to +60°C (–40 to + 140°F)
21	Solar Sensor A/D	I	Sun Intensity Input	"OC" "SC" 00-255
22	Engine Coolant	I	CCD	"?" –40 to + 185°C (–40 to +260°F)
23	Vehicle Speed (MPH/KPM)	I	CCD	"?" 00-255
24	Engine RPM (x100)	I	CCD	00-82
25	Blend Door Motor	O/A	Blend Door System	Pressing A/C or RECIRC button for 3 sec. begins reinitialization.
				00 = searching for hot stop 01 = searching for cold stop 02 = moving to warmer 03 = moving to cooler 04 = in position 05 = stalled moving to warmer 06 = stalled moving to cooler 07 = feedback error
26	Blend Door Motor	O/A	Blend Door System	00-255
				It is possible to command the door position beyond the stops. The motor will try to move there.
27	Blend Door Motor Lines	O/A	Blend Door System	00 = stopped (lines low) 01 = toward cold 02 = toward hot 03 = stopped (lines high)
28	Lights On	I	Headlight Switch	00 = OFF 01 = ON
29	Dimming	I	PWD System	"?" 00-255
30	Dimming Level	O/A	Dimming System	"?" 00-255
31	ROM & EEPROM			00-FF
32	ROM & EEPROM			00-FF
33	ROM & EEPROM			00-FF
34	ROM & EEPROM			00-FF
35	ROM & EEPROM			00-FF
36	ROM & EEPROM			00-FF
37	ROM & EEPROM			00-FF
38	ROM & EEPROM			00-FF

TEST TYPE: I = Input O = Output O/A = Output/Actuator

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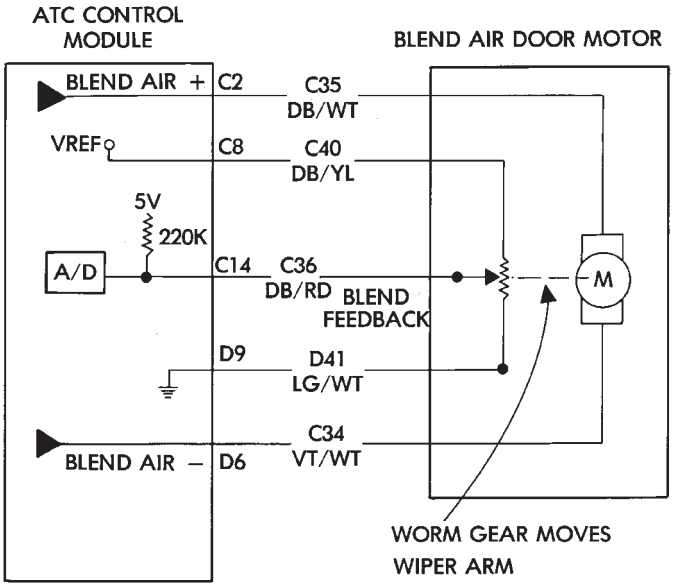
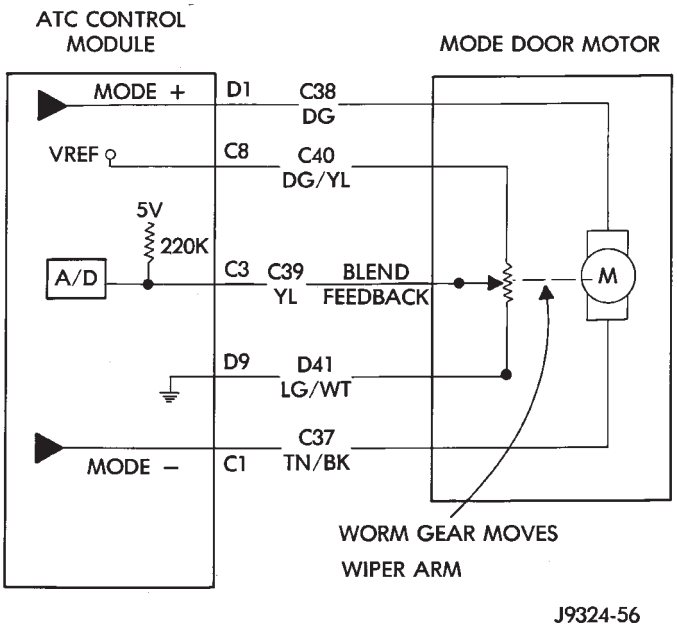
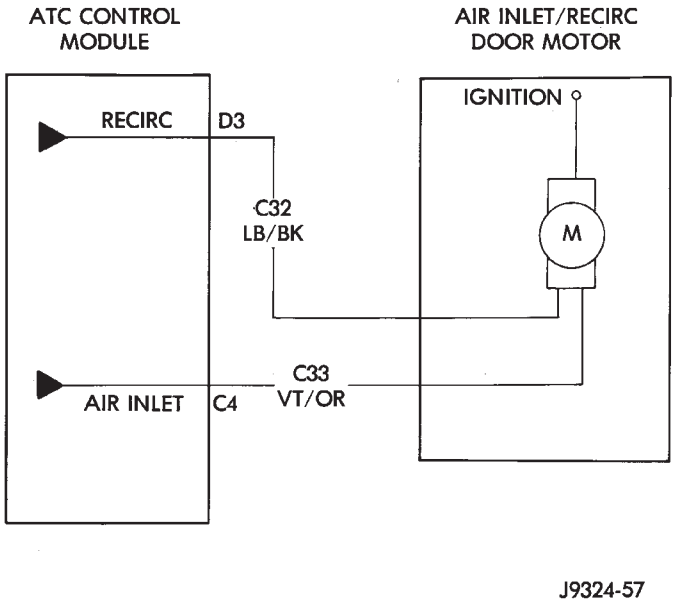
DIAGNOSIS AND TESTING (Continued)



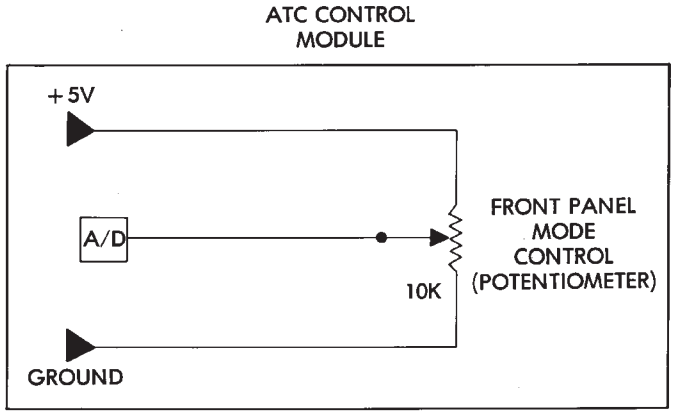
Blend Air Door Actuator Drive Circuit



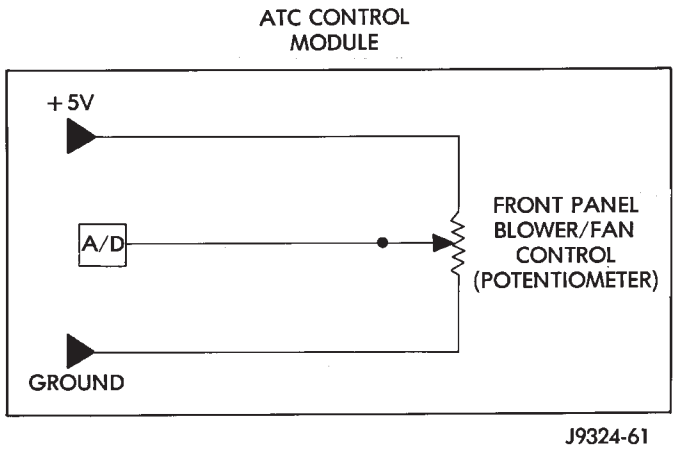
Mode Door Actuator Drive Circuit



Air Inlet/Recirc Door Actuator Drive Circuit

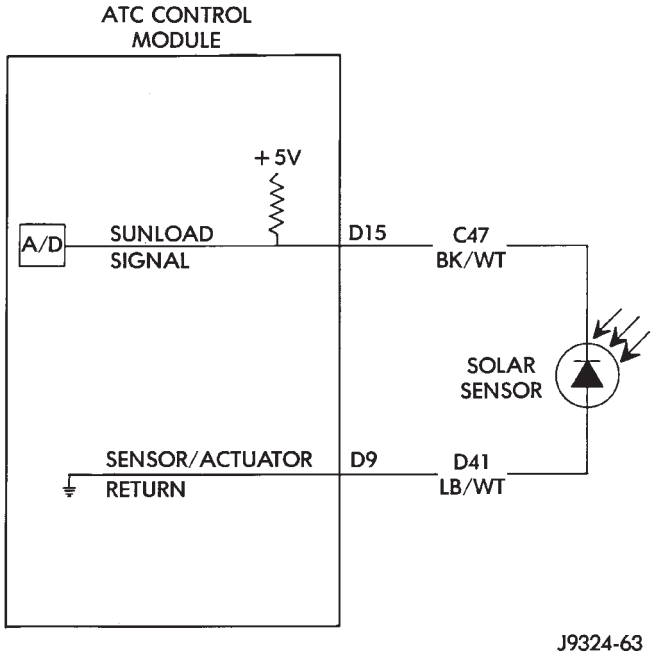


Front Panel Mode Control Circuit

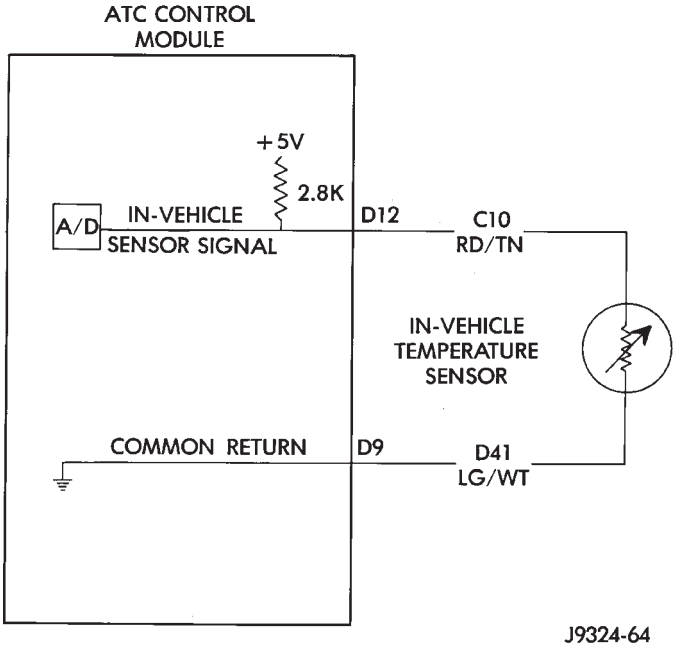


Front Panel Blower/Fan Control Circuit

DIAGNOSIS AND TESTING (Continued)



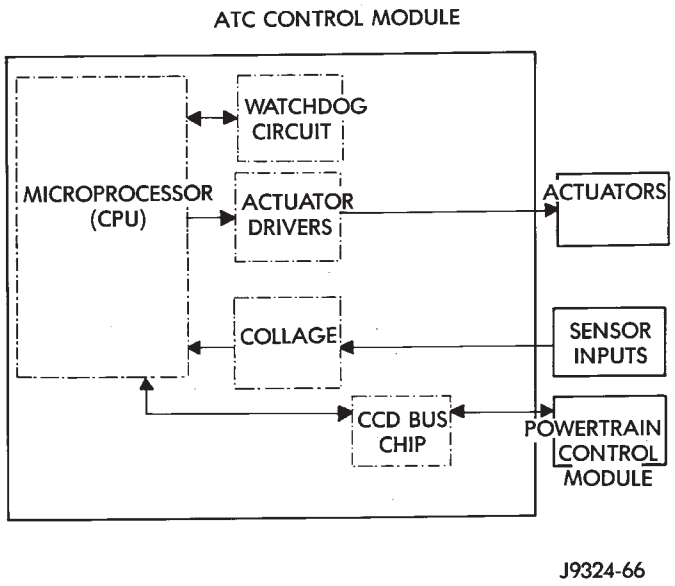
Solar Sensor Circuit



In-Vehicle Temperature Sensor Circuit

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.



Calibration and CPU Data

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 connections
- Faulty blower motor resistor (if the vehicle is so equipped)
- Faulty blower motor power module (if the vehicle is so equipped)
- 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 (if the vehicle is so equipped)
- Faulty blower motor power module (if the vehicle is so equipped)
- Faulty ATC control module (if the vehicle is so equipped)
- Faulty blower motor circuit wiring or wire harness connections.

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.

DIAGNOSIS AND TESTING (Continued)

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 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.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the blower motor resistor.

(3) Check for continuity between each of the blower motor switch input terminals of the resistor and the resistor output terminal. In each case there should be continuity. If OK, repair the wire harness circuits between the blower motor switch and the blower motor resistor or blower motor as required. If not OK, replace the faulty blower motor resistor.

BLOWER MOTOR SWITCH

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.

(1) Check for battery voltage at the fuse in the Power Distribution Center (PDC). If OK, go to Step 2. If not OK, repair the shorted circuit or component as required and replace the faulty fuse.

(2) Turn the ignition switch to the Off position. Disconnect and isolate the battery negative cable. Remove the heater-A/C control from the instrument panel. Check for continuity between the ground circuit cavity of the heater-A/C control wire harness connector and a good ground. There should be continuity. If OK, go to Step 3. If not OK, repair the open circuit to ground as required.

(3) With the heater-A/C control wire harness connector unplugged, place the heater-A/C 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 heater-A/C control as you move the blower motor switch knob 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 heater-A/C control connector and the blower motor resistor as required. If not OK, replace the faulty heater-A/C control unit.

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.

DIAGNOSIS AND TESTING (Continued)

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

(5) Check the refrigerant system charge. See Refrigerant System Charge in this group for the procedures.

(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, the heater-A/C control A/C switch in the On position, 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 the 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 four 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

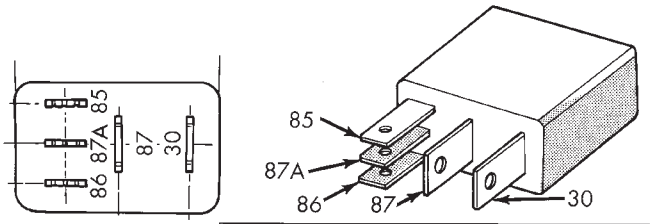
For circuit descriptions and diagrams, refer to 8W-42 - Air Conditioning/Heater in Group 8W - Wiring Diagrams.

The compressor clutch relay (Fig. 18) 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 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

Fig. 18 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 com-

DIAGNOSIS AND TESTING (Continued)

pressor 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

Before performing diagnosis of the high pressure cut-off switch, verify that the refrigerant system has the correct refrigerant charge. See Refrigerant System Charge in this group for the procedures.

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

(1) Disconnect and isolate the battery negative cable.

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

(3) Check for continuity between the two terminals of the high pressure cut-off switch. There should be continuity. If OK, test and repair the A/C switch sense 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. 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 the procedures.

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

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the low pressure cycling clutch switch wire harness connector from the switch on the accumulator fitting.

(3) Install a jumper wire between the two cavities of the low pressure cycling clutch switch wire harness connector.

(4) Connect a manifold gauge set to the refrigerant system service ports. See Refrigerant System Service Equipment in this group for the procedures.

(5) Connect the battery negative cable.

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

(7) Check for continuity between the two terminals of the low pressure cycling clutch switch. There should be continuity with a suction pressure reading of 262 kPa (38 psi) or above, and no continuity with a suction pressure reading of 141 kPa (20.5 psi) or below. If OK, test and repair the A/C switch sense 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 for the procedures. If the refrigerant system is low or empty; a leak at a refrigerant line, connector fitting, component, or component seal is likely.

An electronic leak detector designed for R-134a refrigerant is recommended for locating and confirming refrigerant system leaks. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

An oily residue on or near refrigerant system lines, connector fittings, components, or component seals can indicate the general location of a possible refrigerant leak. However, the exact leak location should be confirmed with an electronic leak detector prior to component repair or replacement.

To detect a leak in the refrigerant system, perform one of the following procedures:

SYSTEM EMPTY

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

(2) Connect and dispense 0.283 kilograms (0.625 pounds or 10 ounces) of R-134a refrigerant into the evacuated refrigerant system. See Refrigerant System Charge in this group for the procedures.

(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. Because R-134a refrigerant is heavier than air, the leak detec-

DIAGNOSIS AND TESTING (Continued)

tor probe should be moved slowly along the bottom side of all refrigerant lines, connector fittings and components.

(5) To inspect the evaporator coil for leaks, insert the electronic leak detector probe into the center instrument panel outlet. Set the blower motor switch to the lowest speed position, the A/C button in the On position, and select 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 turned on for five minutes.

(3) With the engine not running, use a electronic R-134a leak detector and search for leaks. Because R-134a refrigerant is heavier than air, the leak detector probe should be moved slowly along the bottom side of all refrigerant lines, connector fittings and components.

(4) To inspect the evaporator coil for leaks, insert the electronic leak detector probe into the center instrument panel outlet. Set the blower motor switch to the lowest speed position, the A/C button in the On position, and select the Recirculation Mode.

SERVICE PROCEDURES

REFRIGERANT RECOVERY

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

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to recover the refrigerant from an R-134a refrigerant system. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

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. If moisture and air enters the system and becomes mixed with the refrigerant, the compressor head pressure will rise above acceptable operating levels. This will reduce the performance of the air conditioner and damage the compressor. Evacuating the refrigerant system will remove the air and boil the moisture out of the system at near room temperature. To evacuate the refrigerant system, use the following procedure:

(1) Connect a R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 and a manifold gauge set to the refrigerant system of the vehicle.

(2) Open the low and high side valves and start the charging station 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.

(a) If the refrigerant system fails to reach the specified vacuum, the system has a leak that must be corrected. See Refrigerant System Leaks in this group.

(b) If the refrigerant system maintains the specified vacuum for five minutes, restart the vacuum pump, open the suction and discharge valves and evacuate the system for an additional ten minutes.

(3) Close all of the valves, and turn off the charging station vacuum pump.

(4) The refrigerant system is now ready to be charged with R-134a refrigerant. See Refrigerant System Charge in this group for the procedures.

REFRIGERANT SYSTEM CHARGE

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

After the refrigerant 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.

A R-134a refrigerant recovery/recycling/charging station that meets SAE Standard J2210 must be used to charge the refrigerant system with R-134a refrigerant. Refer to the operating instructions supplied by the equipment manufacturer for proper care and use of this equipment.

REFRIGERANT CHARGE CAPACITY

The R-134a refrigerant system charge capacity for this vehicle is 0.737 kilograms (1.625 pounds).

PARTIAL CHARGE METHOD

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

The partial charge method is used to add a partial charge to a refrigerant system that is low on refrigerant. To perform this procedure the evaporator inlet

SERVICE PROCEDURES (Continued)

and outlet tube temperatures are measured. The temperature difference is measured with a temperature meter with one or two clamp-on thermocouple probes. The difference between the evaporator inlet and outlet tube temperatures will determine the amount of refrigerant needed.

Before adding a partial refrigerant charge, check for refrigerant system leaks. See Refrigerant System Leaks in this group for the procedures. If a leak is found, make the necessary repairs before attempting a full or partial refrigerant charge.

(1) Attach a manifold gauge set to the refrigerant system service ports.

(2) Attach the two clamp-on thermocouple probes to the inlet and outlet tubes of the evaporator coil.

a. If a single thermocouple probe is used, attach the probe to the evaporator inlet tube just before the collar of the refrigerant line connector fitting. The probe must make contact with the bottom surface of the evaporator inlet tube.

b. If dual thermocouple probes are used, attach probe 1 to the evaporator inlet tube, and probe 2 to the evaporator outlet tube. Attach both probes to the evaporator tubes just before the collar of the refrigerant line connector fittings. The probes must make contact with the bottom surfaces of the evaporator inlet and outlet tubes.

(3) Open all of the windows or doors of the passenger compartment.

(4) Set the A/C button on the heater-A/C controls to the on position, the temperature control knob in the full cool position, select the Recirculation Mode, and place the blower motor switch in the highest speed position.

(5) Start the engine and hold the engine idle speed at 1,000 rpm. Allow the engine to warm up to normal operating temperature.

(6) The compressor clutch may cycle, depending upon ambient temperature, humidity, and the refrigerant system charge level. If the compressor clutch cycles, unplug the wire harness connector from the low pressure cycling clutch switch on the accumulator. Install a jumper wire between the two cavities of the switch wire harness connector.

(7) Hold the engine idle speed at 1,000 rpm.

(8) Allow three to five minutes for the refrigerant system to stabilize, then record the temperatures of the evaporator inlet and outlet tubes.

c. If a single probe is used, record the temperature of the evaporator inlet tube. Then remove the probe from the inlet tube and attach it to the evaporator outlet tube just before the collar of the refrigerant line connector fitting. The probe must make contact with the bottom surface of the evaporator outlet tube. Allow the thermocouple and meter time to stabilize, then record the temperature of the evaporator outlet tube. Subtract the inlet tube temperature reading from the outlet tube temperature reading.

d. If dual probes are used, record the temperatures of both the evaporator inlet and outlet tubes. Then subtract the inlet tube temperature reading from the outlet tube temperature reading.

(9) See the Low Charge Determination chart to determine the additional charge required. If the measured temperature differential is higher than 22° C to 26° C (40° F to 47° F), add 0.4 kilograms (14 ounces) of refrigerant.

(10) Allow three to five minutes for the refrigerant system to stabilize, then take a second set of thermocouple measurements. Record the temperature difference and see the Low Charge Determination chart (Fig. 19) to determine if an additional charge is required.

(11) Record the compressor discharge pressure. If the reading is higher than the pressure shown in the Compressor Discharge Pressure chart (Fig. 20), the system could be overcharged. If the reading is equal to, or lower, than the pressure shown in the chart, continue with this procedure.

(12) **EXAMPLE:** The ambient temperature is 21° C (70° F). The evaporator inlet tube temperature is 12° C (54° F) and the evaporator outlet tube temperature is 10° C (50° F). Subtract the inlet tube temperature from the outlet tube temperature. The difference is -2° C (-4° F). With a -2° C (-4° F) temperature differential at 21° C (70° F) ambient temperature, the system is fully charged.

(13) Add enough refrigerant to bring the refrigerant system up to a full charge.

(14) Remove the jumper wire from the low pressure cycling clutch switch wire harness connector and plug the connector back into the switch.

REFRIGERANT OIL LEVEL

When an air conditioning system is assembled at the factory, all components except the compressor are refrigerant oil free. After the refrigerant system has been charged and operated, the refrigerant oil in the compressor is dispersed throughout the refrigerant system. The accumulator, evaporator, condenser, and compressor will each retain a significant amount of the needed refrigerant oil.

It is important to have the correct amount of oil in the refrigerant system. This ensures 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 air conditioning 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. An oil loss may occur due to a rupture or leak from a refrigerant line, a connector fitting, a component, or a component seal. If a leak occurs, add 30

SERVICE PROCEDURES (Continued)

Open the windows and/or doors of the passenger compartment. Set the air conditioning controls to A/C, PANEL, RECIRC (temperature knob on full cool) and blower speed on HIGH. Set the engine speed at 1,000 RPM.

Evaporator Outlet and Inlet Temperature Differential

- If Outlet is WARMER than Inlet, temperature differential is plus (+).
- If Outlet is COLDER than Inlet, temperature differential is minus (-).

See the example in the Refrigerant Charge Check (Alternative Method).

Added Amount of R134a to Properly Charge A/C System	Ambient Temperature				
	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
	Differential Temperature				
0.90 lbs. (14 oz.)	+22°C (+40°F)	+23°C (+42°F)	+24°C (+43°F)	+25°C (+45°F)	+26°C (+47°F)
0.75 lbs. (12 oz.)	+12°C (+22°F)	+12°C (+23°F)	+13°C (+24°F)	+15°C (+26°F)	+16°C (+28°F)
0.60 lbs. (10 oz.)	+4°C (+8°F)	+5°C (+9°F)	+6°C (+10°F)	+7°C (+12°F)	+8°C (+13°F)
0.50 lbs. (8 oz.)	0°C (0°F)	+0°C (+1°F)	+1°C (+2°F)	+2°C (+3°F)	+3°C (+4°F)
0.40 lbs. (6 oz.)	-1°C (-2°F)	-1°C (-1°F)	+0°C (-0°F)	0°C (0°F)	0°C (0°F)
Recommended Charge	-2 to -6°C (-3 to -10°F)				

Note: A temperature differential of -2°C to -6°C (-3°F to -10°F) indicates an acceptable charge.

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Fig. 19 Low Charge Determination

Ambient Temperature	16°C (60°F)	21°C (70°F)	27°C (80°F)	32°C (90°F)	38°C (100°F)	43°C (110°F)
Compressor Discharge Pressure	1515 kPa (220 psi)	1655 kPa (240 psi)	1790 kPa (260 psi)	2070 kPa (300 psi)	2345 kPa (340 psi)	2690 kPa (390 psi)

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Fig. 20 Compressor Discharge Pressure

milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system after the repair has been made. Refrigerant oil loss will be evident at the leak point by the presence of a wet, shiny surface around the leak.

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

SERVICE PROCEDURES (Continued)

Refrigerant Oil Capacities		
Component	**ml**	**fl oz**
A/C System	220	7.44
Accumulator	120	4
Condenser	30	1
Evaporator	60	2
Compressor	drain and measure the oil from the old compressor - see text.	

REMOVAL AND INSTALLATION

AMBIENT TEMPERATURE SENSOR

(1) Disconnect and isolate the battery negative cable.

(2) Remove the radiator grille from the vehicle. Refer to Group 23 - Body for the procedures.

(3) Locate the ambient temperature sensor, on the radiator support behind the grille (Fig. 21).

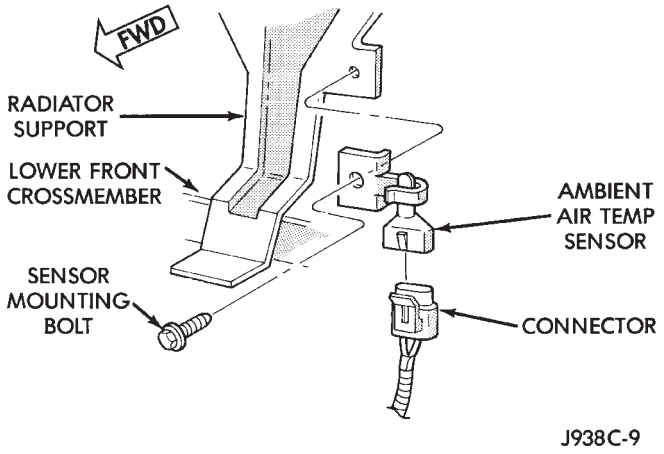

Fig. 21 Ambient Temperature Sensor Remove/Install

(4) Unplug the ambient temperature sensor wire harness connector.

(5) Remove the screw that secures the ambient temperature sensor to the radiator support.

(6) Remove the ambient temperature sensor from the vehicle.

(7) Reverse the removal procedures to install. Tighten the ambient temperature sensor mounting screw to 2.2 N·m (20 in. lbs.).

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. See Refrigerant Recovery in this group for the procedures.

(2) Remove the secondary clip from the spring-lock coupler.

(3) Fit the proper size A/C line disconnect tool (Special Tool Kit 7193) over the spring-lock coupler cage (Fig. 22).

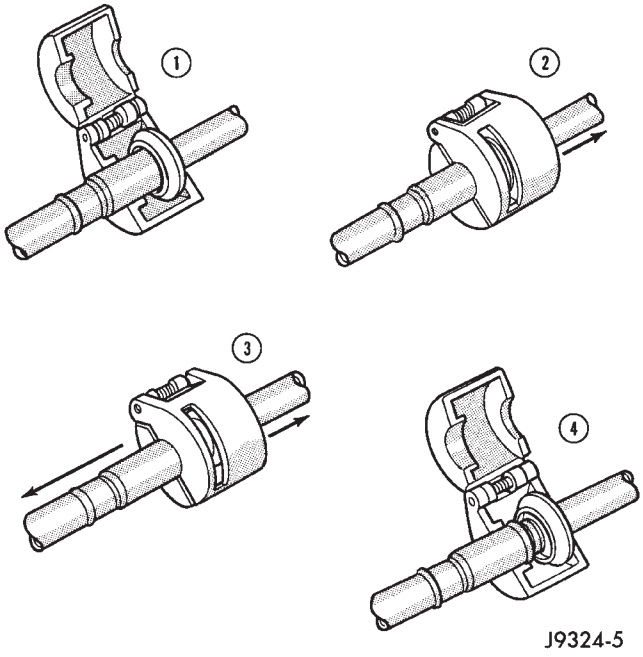

Fig. 22 Refrigerant Line Spring-Lock Coupler Disconnect

(4) Close the two halves of the A/C line disconnect tool around the spring-lock coupler.

(5) Push the A/C line disconnect tool into the open side of the coupler cage to expand the garter spring. Once the garter spring is expanded and while still pushing the disconnect tool into the open side of the coupler cage, pull on the refrigerant line attached to the female half of the coupler fitting until the flange on the female fitting is separated from the garter spring and cage on the male fitting within the disconnect tool.

NOTE: The garter spring may not release if the A/C line disconnect tool is cocked while pushing it into the coupler cage opening.

(6) Open and remove the A/C line disconnect tool from the disconnected spring-lock coupler.

(7) Complete the separation of the two halves of the coupler fitting.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Check to ensure that the garter spring is located within the cage of the male coupler fitting, and that the garter spring is not damaged.

(a) If the garter spring is missing, install a new spring by pushing it into the coupler cage opening.

(b) If the garter spring is damaged, remove it from the coupler 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 coupler fitting.

(3) Install new O-rings on the male half of the coupler 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-rings may allow the connection to leak intermittently during vehicle operation.

(4) Lubricate the male fitting and O-rings, 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 half of the coupler fitting over the male half of the fitting.

(6) Push together firmly on the two halves of the coupler fitting until the garter spring in the cage on the male half of the fitting snaps over the flanged end on the female half of the fitting.

(7) Ensure that the spring-lock coupler is fully engaged by trying to separate the two coupler halves. This is done by pulling the refrigerant lines on either side of the coupler away from each other.

(8) Reinstall the secondary clip over the spring-lock coupler cage.

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 mounted to a fitting on the discharge line between the compressor and the condenser inlet (Fig. 23).

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

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

(5) Remove the O-ring seal from the discharge line fitting and discard.

INSTALLATION

(1) Lubricate a new O-ring seal with clean refrigerant oil and install it on the discharge line fitting.

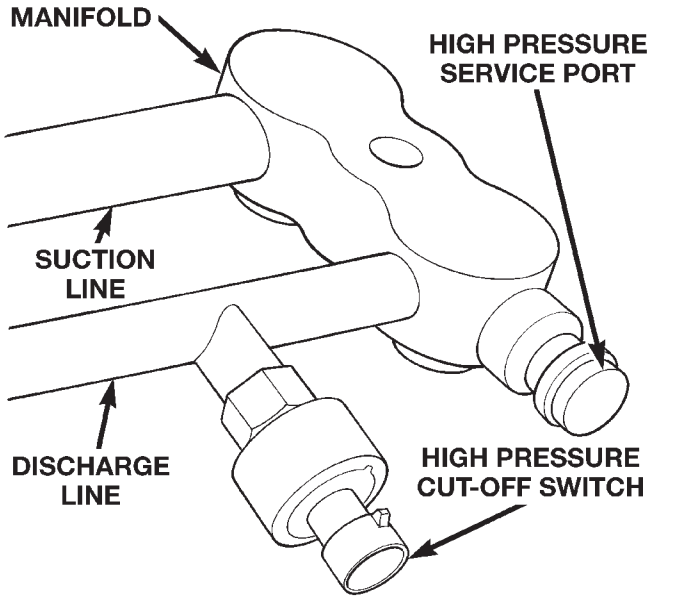

Fig. 23 High Pressure Cut-Off Switch Remove/Install - Typical

Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

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

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

(4) Connect the battery negative cable.

DISCHARGE LINE

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. 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. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

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

REMOVAL AND INSTALLATION (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(3) Remove the high pressure cut-off switch. See High Pressure Cut-Off Switch in this group for the procedures.

(4) Disconnect the discharge line refrigerant line fitting from the condenser inlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Remove the screw that secures the discharge line block fitting to the manifold on the compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Remove the discharge line assembly from the vehicle.

INSTALLATION

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

(2) Remove the tape or plugs from the refrigerant line fittings on the discharge line and the condenser inlet tube. Connect the discharge line refrigerant line coupler to the condenser inlet tube. See Refrigerant Line Coupler in this group for the procedures.

(3) Install the high pressure cut-off switch. See High Pressure Cut-Off Switch in this group for the procedures.

(4) Connect the battery negative cable.

(5) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(6) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

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. See Refrigerant Recovery in this group for the procedures.

(2) Disconnect and isolate the battery negative cable.

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

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

(5) Remove the screws that secure the suction line and discharge line block fittings to the manifold on the compressor. Install plugs in, or tape over all of the opened refrigerant fittings.

(6) Remove the screws that secure the compressor to the mounting bracket (Fig. 24) or (Fig. 25).

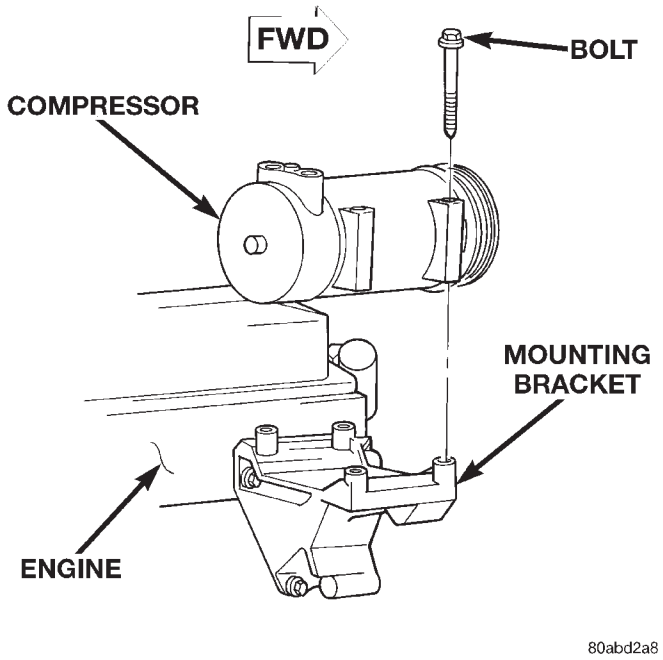

Fig. 24 Compressor Remove/Install - 6 Cylinder Engine

(7) Remove the compressor from the mounting bracket.

INSTALLATION

NOTE: If a replacement compressor is being installed, be certain to check the refrigerant oil level. See Refrigerant Oil Level in this group for the procedures. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(1) Install the compressor to the mounting bracket. Tighten the mounting screws to 28 N·m (21 ft. lbs.).

(2) Remove the tape or plugs from all of the opened refrigerant line fittings. Install the suction line and discharge line block fittings to the manifold

REMOVAL AND INSTALLATION (Continued)

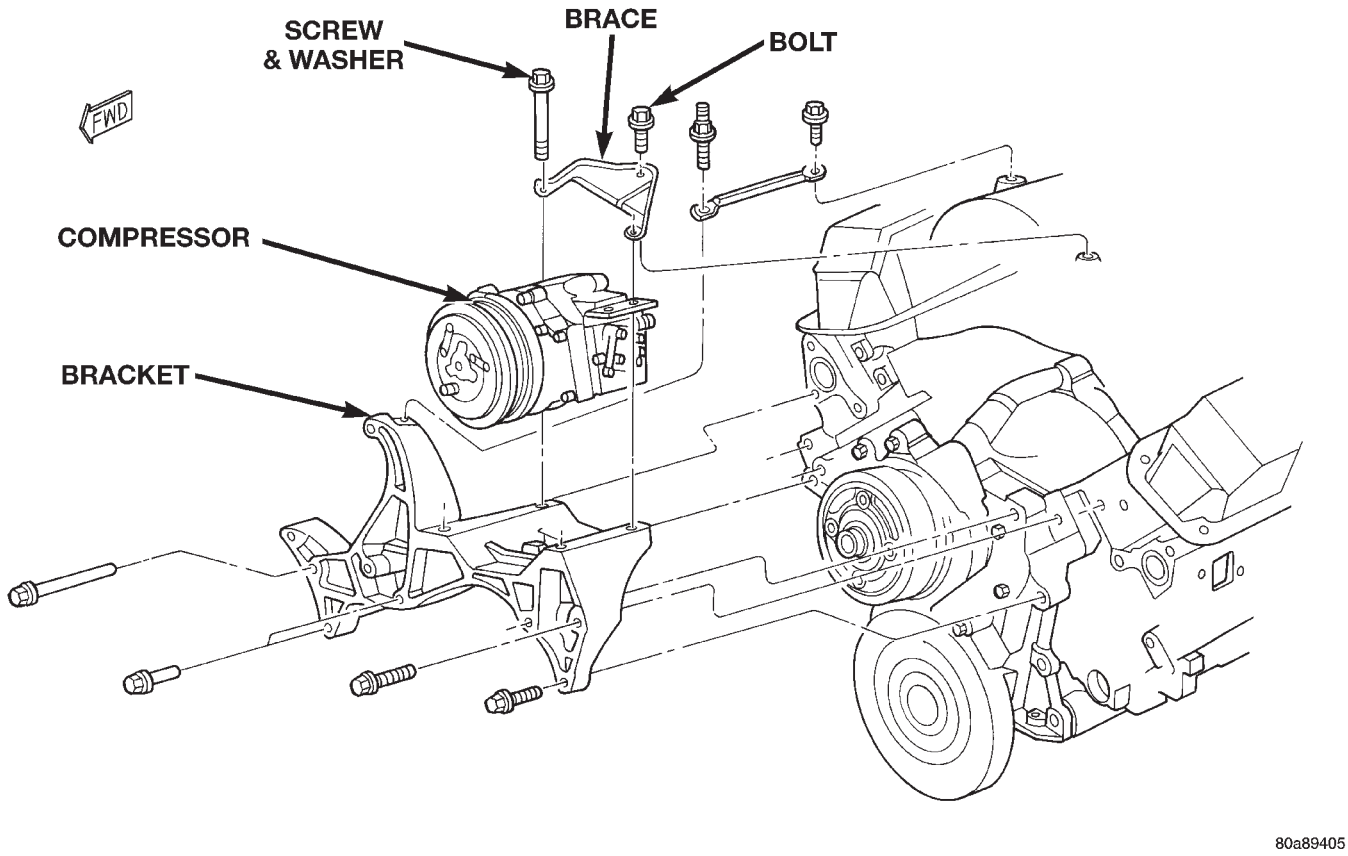

Fig. 25 Compressor Remove/Install - 8 Cylinder Engine

on the compressor. Tighten the mounting screws to 28 N·m (250 in. lbs.).

(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 the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(7) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

HIGH PRESSURE RELIEF VALVE

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. See Refrigerant Recovery in this group for the procedures.

(3) Turn the relief valve counterclockwise to remove it from the compressor manifold (Fig. 26). Install a plug in, or tape over the opened relief valve fitting on the compressor manifold.

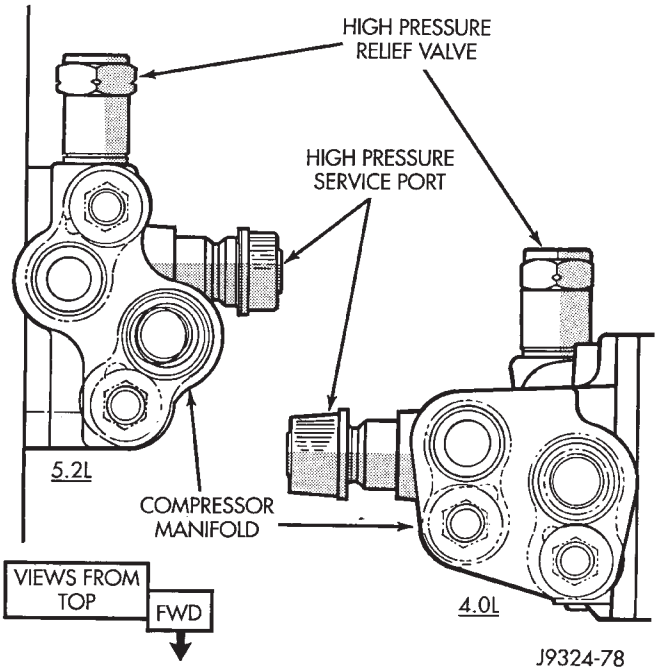

Fig. 26 High Pressure Relief Valve - Typical

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Remove the tape or plug from the relief valve fitting on the compressor manifold.

(2) Install the high pressure relief valve in the compressor manifold fitting.

(3) Connect the battery negative cable.

(4) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(5) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

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 bolt that secures the compressor clutch to the compressor shaft (Fig. 27). A band-type oil filter wrench may be used to secure the clutch during bolt removal.

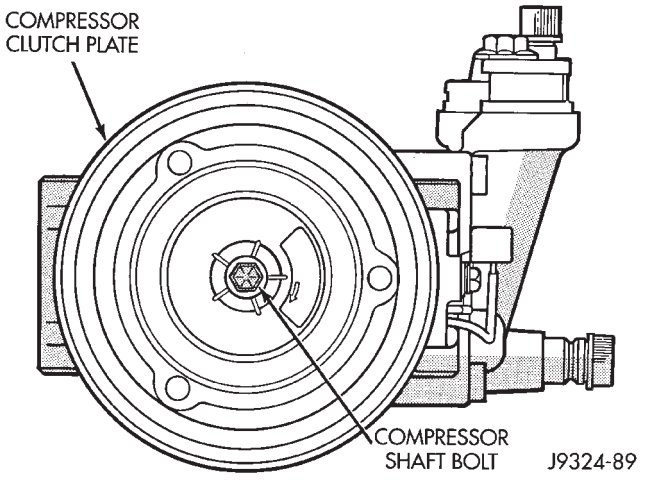

Fig. 27 Compressor Shaft Bolt

(4) Tap the clutch plate with a plastic mallet to release it from the splines on the compressor shaft. Remove the clutch plate and shim(s) from the compressor shaft (Fig. 28).

CAUTION: Do not pry between the clutch plate assembly and the pulley to remove it from the compressor shaft. Prying may damage the clutch plate assembly.

(5) Remove the external snap ring that secures the compressor clutch pulley to the nose of the compressor front housing with snap ring pliers (Special Tool C-4574) and slide the pulley assembly off of the compressor (Fig. 29).

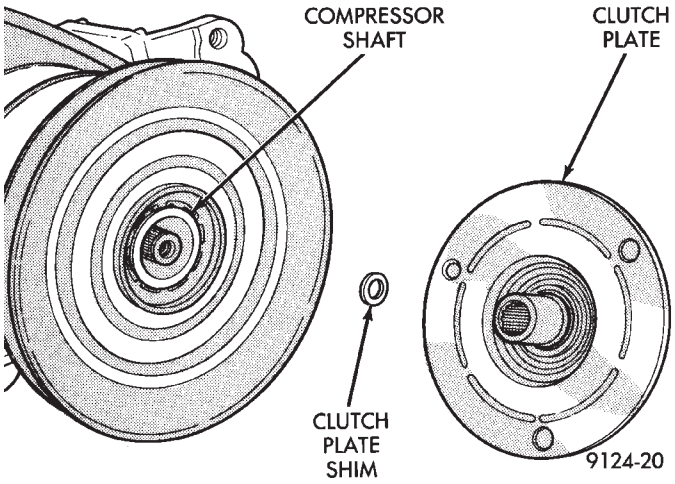

Fig. 28 Clutch Plate and Shim

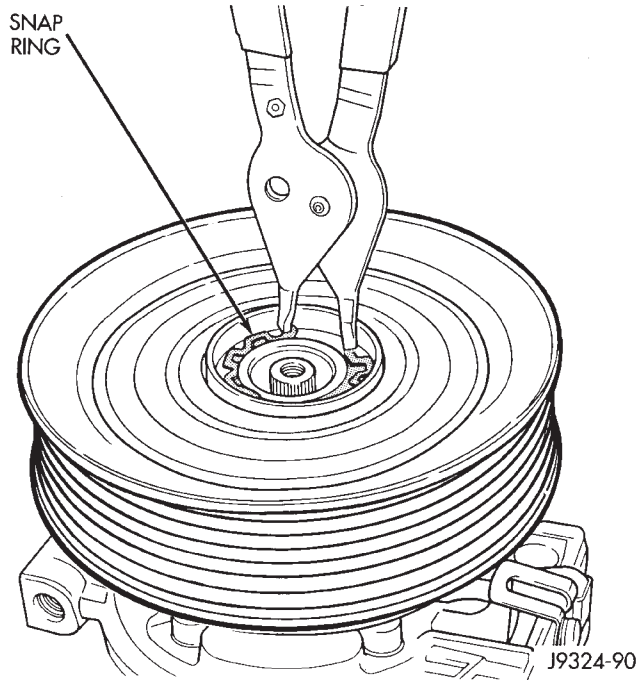

Fig. 29 Pulley Snap Ring Remove/Install

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

(7) Remove the external snap ring that secures the compressor clutch coil to the nose of the compressor front housing with snap ring pliers and slide the coil assembly off of the compressor (Fig. 30).

INSPECTION

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

REMOVAL AND INSTALLATION (Continued)

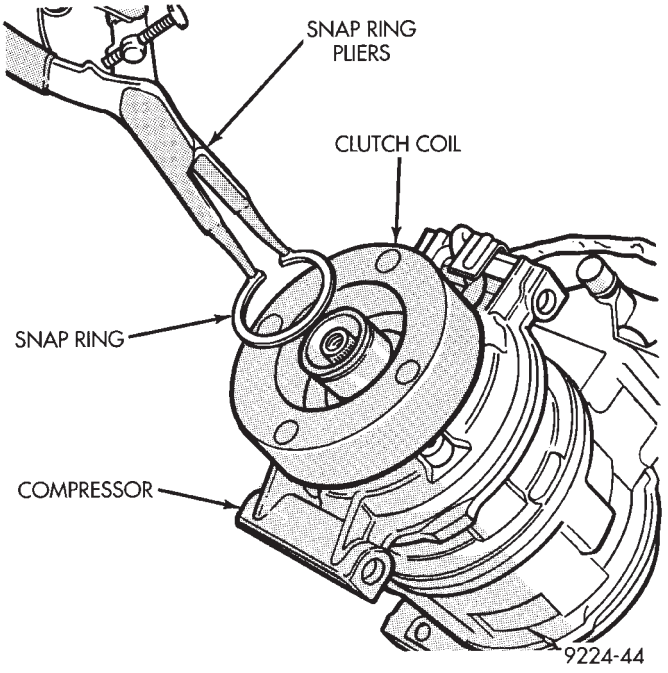

Fig. 30 Clutch Coil Snap Ring Remove/Install

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

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

INSTALLATION

(1) Align the dowel pin on the back of the clutch field coil with the hole in the compressor front housing and press the field coil into place over the nose of the compressor.

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

(3) Install the clutch field coil and snap ring with snap ring pliers (Special Tool C-4574). The bevel side of the snap ring must be facing outward. Also, both eyelets of the snap ring must be to the right or left of the pin on the compressor. Press in on the snap ring to be certain that 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.

(4) Install the pulley assembly onto the compressor. If necessary, place a block of wood on the friction surface and tap gently with a hammer (Fig. 31).

CAUTION: Do not mar the pulley friction surface.

(5) Install the pulley assembly retaining snap ring (bevel side outward) with snap ring pliers (Special Tool C-4574). Press in on the snap ring to be certain that it is properly seated in the groove.

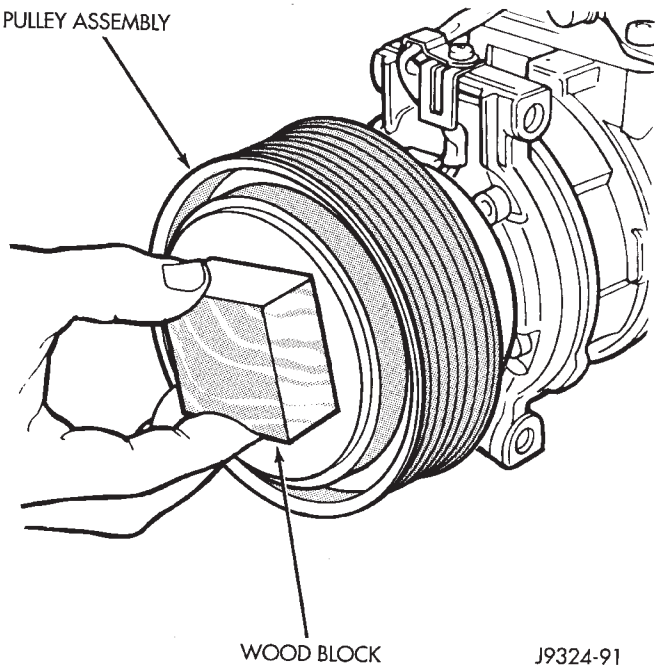

Fig. 31 Pulley Assembly Install

(6) If the original clutch plate assembly and pulley assembly are to be reused, the old shim(s) can be used. If not, place a stack of shim(s) equal to the old shim(s) on the shaft against the shoulder.

(7) Install the clutch plate assembly onto the shaft.

(8) With the clutch plate assembly tight against the shim(s), measure the air gap between the clutch plate and the pulley face with feeler gauges. The air gap should be between 0.35 to 0.65 millimeter (0.014 to 0.026 inch). If the proper air gap is not obtained, add or subtract shims as needed until the desired air gap is obtained.

(9) Install the compressor shaft bolt. Tighten the bolt to 13 N·m (115 in. lbs.).

NOTE: The shims may compress after tightening the shaft bolt. Check the air gap in four or more places to verify the air gap is still correct. Spin the pulley before performing a final check of the air gap.

(10) 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

REMOVAL AND INSTALLATION (Continued)

times (five seconds on, then five seconds off). During this procedure, set the heater-A/C control in the Recirculation Mode, the A/C button in the on position, 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. 32).

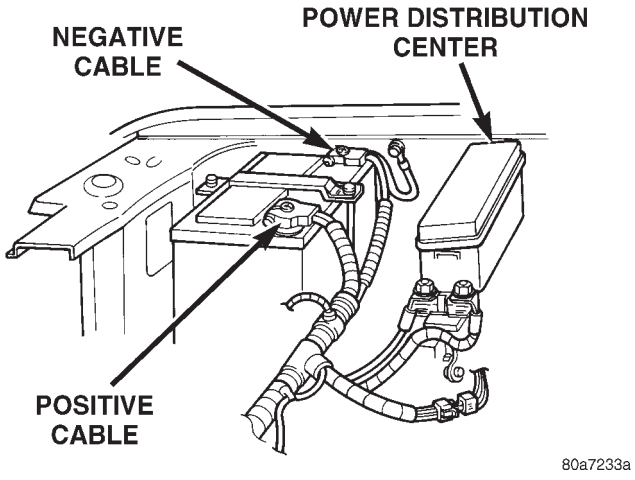

Fig. 32 Power Distribution Center

(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.

(8) Test the relay operation.

LIQUID LINE

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free.

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. See Refrigerant Recovery in this group for the procedures.

(3) Unsnap the plastic retainer clips that secure the liquid line to the inner fender shield and the dash panel in the engine compartment.

(4) Disengage the liquid line from the plastic retainer clips.

(5) Disconnect the liquid line refrigerant line fitting from the evaporator inlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Disconnect the liquid line from the condenser outlet tube refrigerant line fitting. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(7) Remove the liquid line from the plastic clip that secures it to the right inner fender shield.

(8) Remove the liquid line from the vehicle.

INSTALLATION

(1) Remove the tape or plugs from the refrigerant line fittings on the condenser outlet tube and the condenser end of the liquid line. Connect the liquid line to the condenser outlet tube refrigerant line coupler. See Refrigerant Line Coupler in this group for the procedures.

(2) Remove the tape or plugs from the refrigerant line fittings on the evaporator end of the liquid line and from the evaporator inlet tube. Connect the liquid line refrigerant line coupler to the evaporator inlet tube. See Refrigerant Line Coupler in this group for the procedures.

(3) Install the liquid line into the plastic retainer clips that secure it to the inner fender shield and the dash panel and snap the retainer clips closed.

(4) Connect the battery negative cable.

(5) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(6) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

FIXED ORIFICE TUBE

The fixed orifice tube is located in the liquid line near the condenser. If the fixed orifice tube is faulty or plugged, the liquid line unit must be replaced. See Liquid Line in this group for the service procedures.

REMOVAL AND INSTALLATION (Continued)

LOW PRESSURE CYCLING CLUTCH SWITCH

REMOVAL

(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.

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

(4) Remove the O-ring seal from the accumulator fitting and discard.

INSTALLATION

(1) Lubricate a new O-ring seal with clean refrigerant oil and install it on the accumulator fitting. Use only the specified O-rings as they are made of a special material for the R-134a system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

(2) Install and tighten the low pressure cycling clutch switch on the accumulator fitting. The switch should be hand-tightened onto the accumulator fitting.

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

(4) Connect the battery negative cable.

ACCUMULATOR

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

The suction lines from the evaporator outlet tube to the accumulator, and from the accumulator to the suction port of the compressor manifold are integral to the accumulator. If either suction line or the accumulator is faulty or damaged, the accumulator assembly must be replaced.

Any kinks or sharp bends in the refrigerant plumbing will reduce the capacity of the entire air conditioning system. Kinks and sharp bends reduce the flow of refrigerant in the system. 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. In addition, the flexible hose refrigerant lines should be routed so they are at least 80 millimeters (3 inches) from the exhaust manifold.

High pressures are produced in the refrigerant system when the air conditioning compressor is operating. Extreme care must be exercised to make sure that each of the refrigerant system connections is pressure-tight and leak free. It is a good practice to inspect all flexible hose refrigerant lines at least once a year to make sure they are in good condition and properly routed.

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the low pressure cycling clutch switch from the accumulator. See Low Pressure Cycling Clutch Switch in this group for the procedures.

(3) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(4) Disconnect the suction line refrigerant line fitting from the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Remove the screw that secures the suction line block fitting to the manifold on the compressor. Install plugs in, or tape over all of the opened refrigerant line fittings.

(6) Loosen the screw that clamps the band of the accumulator support bracket around the accumulator (Fig. 33).

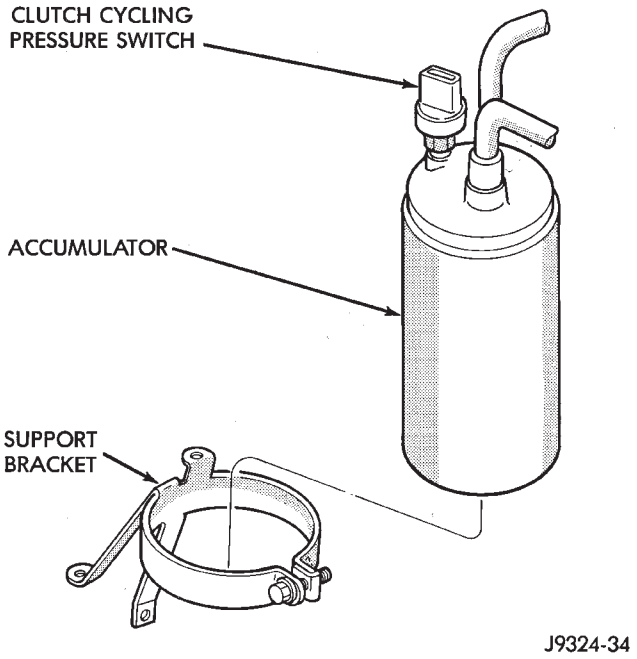

Fig. 33 Accumulator and Support Bracket

(7) Remove the accumulator from the support bracket.

INSTALLATION

(1) Install the accumulator through the band of the support bracket. Be certain that the index tab on the side of the accumulator is aligned with the notch in the support bracket band.

(2) Tighten the clamp screw in the support bracket band to 12 N·m (105 in. lbs.).

(3) Remove the tape or plugs from the suction line block fitting and the manifold on the compressor.

REMOVAL AND INSTALLATION (Continued)

Install the suction line block fitting to the manifold on the compressor. Tighten the mounting screw to 28 N·m (250 in. lbs.).

(4) Remove the tape or plugs from the refrigerant line fittings on the suction line and the evaporator outlet tube. Connect the suction line refrigerant line coupler to the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures.

(5) Install the low pressure cycling clutch switch onto the accumulator fitting. See Low Pressure Cycling Clutch Switch in this group for the procedures.

(6) Connect the battery negative cable.

(7) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(8) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

NOTE: If the accumulator is replaced, add 120 milliliters (4 fluid ounces) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

CONDENSER

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 (Fig. 34).

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

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

(4) Remove the upper bolts from the two radiator braces (Fig. 35).

(5) Remove the two nuts that secure the radiator to the upper crossmember (Fig. 36).

REMOVAL AND INSTALLATION (Continued)

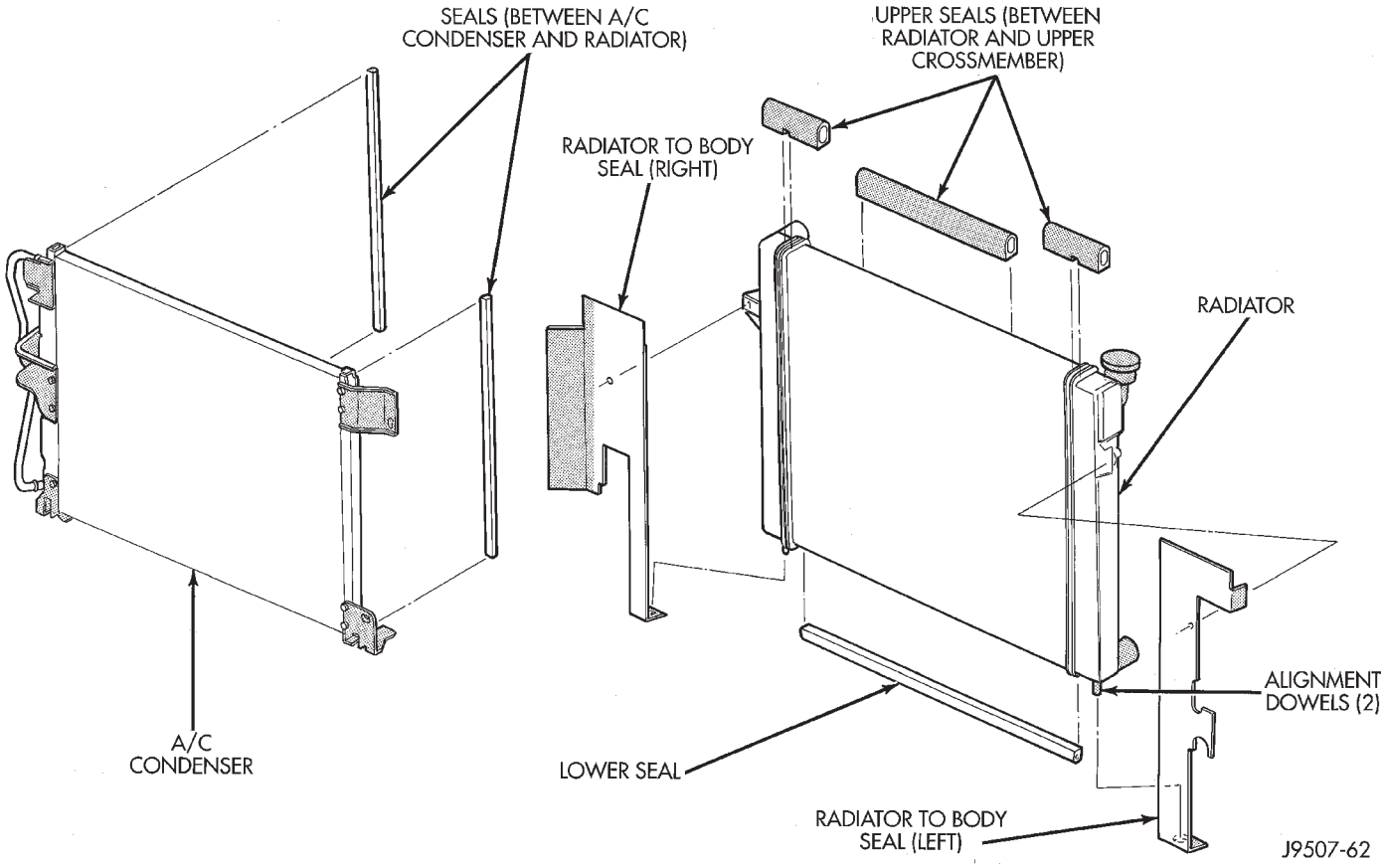

Fig. 34 Air Seals

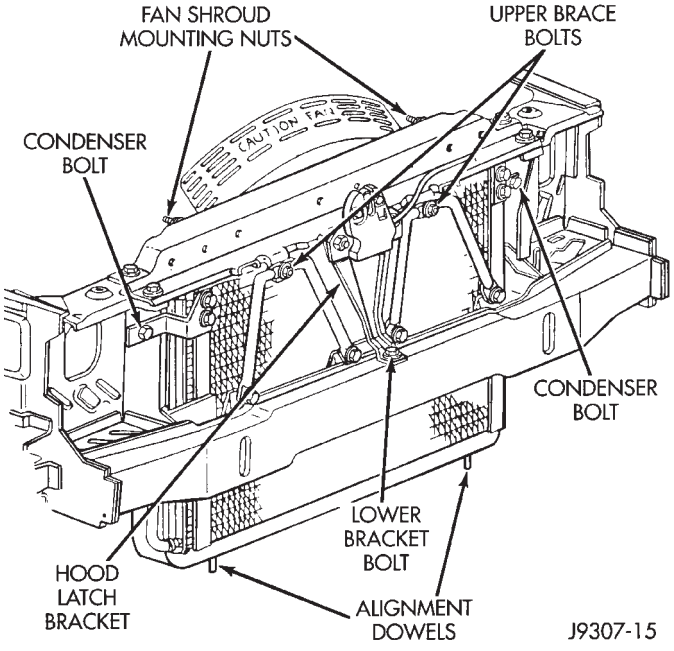

Fig. 35 Condenser Mounting

(6) Reach through the grille opening and remove the bolt that secures the lower hood latch support to the lower front crossmember.

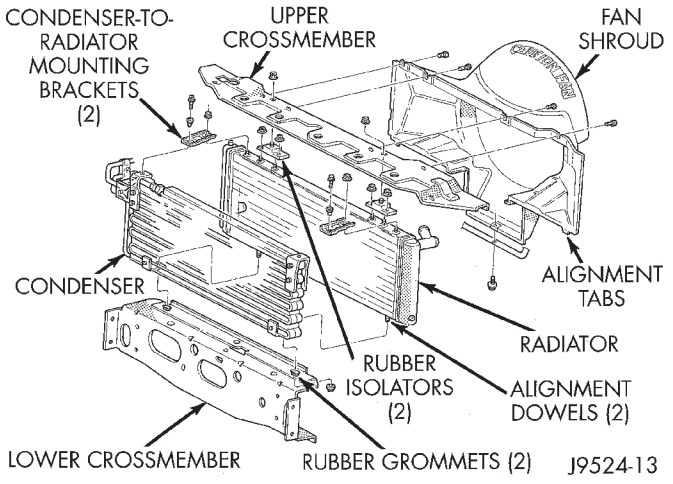

Fig. 36 Radiator Upper Crossmember - Typical

(7) The radiator upper crossmember can be adjusted left or right through the use of its slotted mounting holes. Before removal, mark the original position of the crossmember.

(8) Remove the remaining bolts that secure the radiator upper crossmember to the body. Do not remove the hood latch or hood latch cable from the crossmember. Lift the crossmember straight up and lay it to the side.

REMOVAL AND INSTALLATION (Continued)

(9) Disconnect the discharge line and liquid line refrigerant line fittings from the condenser. See Refrigerant Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(10) Remove the four bolts that secure the lower condenser.

(11) Remove the two bolts that secure the upper condenser.

(12) Carefully lift the condenser out of the vehicle.

INSTALLATION

(1) Carefully position the condenser in the vehicle.

(2) Install and tighten the two bolts that secure the upper condenser.

(3) Install and tighten the four bolts that secure the lower condenser.

(4) Remove the tape or plugs from the refrigerant line fittings on the discharge line, liquid line and the condenser. Connect both of the refrigerant line couplers to the condenser. See Refrigerant Line Coupler in this group for the procedures.

(5) Align the radiator upper crossmember with the scribe marks. Install and tighten the bolts that secure the radiator upper crossmember to the body.

(6) Install and tighten the nuts that secure the radiator to the upper crossmember.

(7) Reach through the grille opening to install and tighten the bolt that secures the lower hood latch support to the lower front crossmember.

(8) Install and tighten the two bolts that secure the radiator braces to the upper radiator crossmember.

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

(10) Connect the battery negative cable.

(11) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(12) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

NOTE: If the condenser is replaced, add 30 milliliters (1 fluid ounce) of refrigerant oil to the refrigerant system. Use only refrigerant oil of the type recommended for the compressor in the vehicle.

VACUUM CHECK VALVE

(1) Unplug the heater-A/C vacuum supply line connector at the vacuum check valve near the engine intake manifold vacuum adapter fitting.

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

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

(4) Reverse the removal procedures to install.

VACUUM RESERVOIR

(1) Remove the battery from the battery tray. Refer to Group 8A - Battery for the procedures.

(2) Remove the five screws that secure the battery tray to the vehicle.

(3) Pull up the battery tray far enough to access and unplug the vacuum harness connector from the reservoir (Fig. 37).

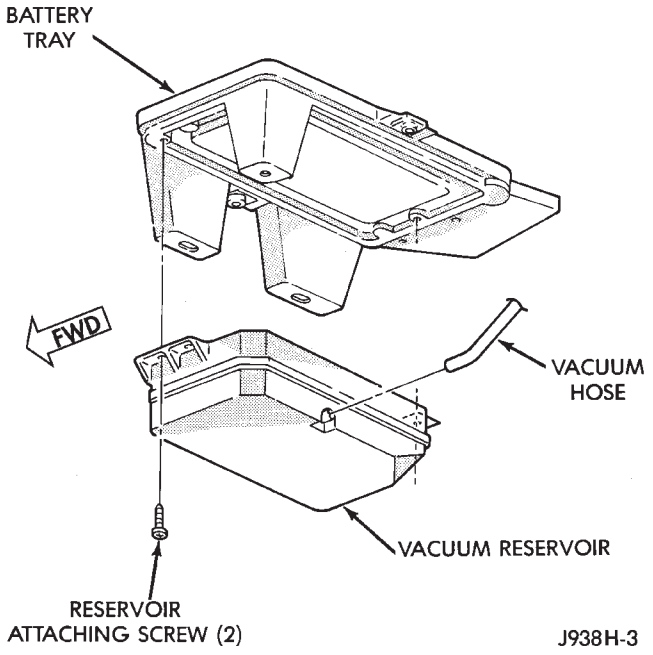

Fig. 37 Vacuum Reservoir Remove/Install

(4) Remove the battery tray and vacuum reservoir from the vehicle as a unit.

(5) Remove the two screws that secure the vacuum reservoir to the underside of the battery tray.

(6) Remove the vacuum reservoir from the battery tray.

(7) Reverse the removal procedures to install. Tighten the reservoir mounting screws to 1 N·m (10 in. lbs.). Tighten the battery tray mounting screws to 8 N·m (70 in. lbs.).

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 AND INSTALLATION (Continued)

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the inboard switch pod bezel from the instrument panel. Refer to Switch Pod Bezel in Group 8E - Instrument Panel Systems for the procedures.

(3) Remove the three screws that secure the heater-A/C control to the instrument panel (Fig. 38).

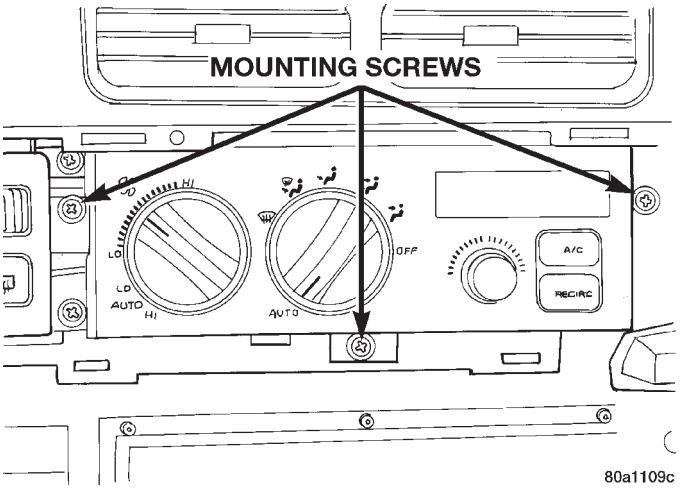

Fig. 38 Heater-A/C Control Remove/Install

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

(5) Unplug the wire and/or vacuum harness connectors from the back of the heater-A/C control (Fig. 39).

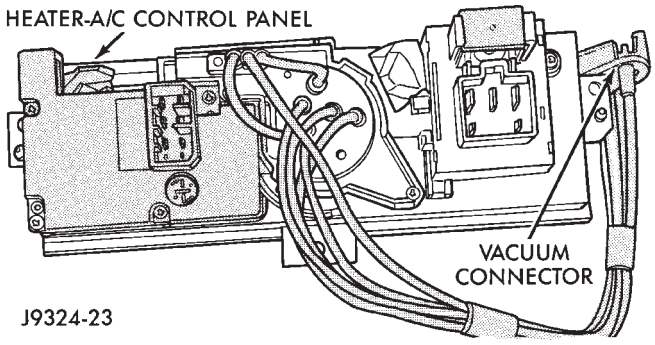

Fig. 39 Heater-A/C Control Connections - Typical

(6) Remove the heater-A/C control from the instrument panel.

INSTALLATION

(1) Plug the wire harness and/or vacuum harness connectors into the back of the heater-A/C control.

(2) Position the heater-A/C control in the instrument panel and secure it with three screws. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reinstall the inboard switch pod bezel onto the instrument panel. Refer to Switch Pod Bezel in Group 8E - Instrument Panel Systems for the procedures.

(4) Connect the battery negative cable.

SOLAR SENSOR

The solar sensor is used only on models with the optional Automatic Temperature Control (ATC) system.

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) Using a trim stick or another suitable wide flat-bladed tool, gently pry the cowl top trim panel off of the instrument panel top pad (Fig. 40).

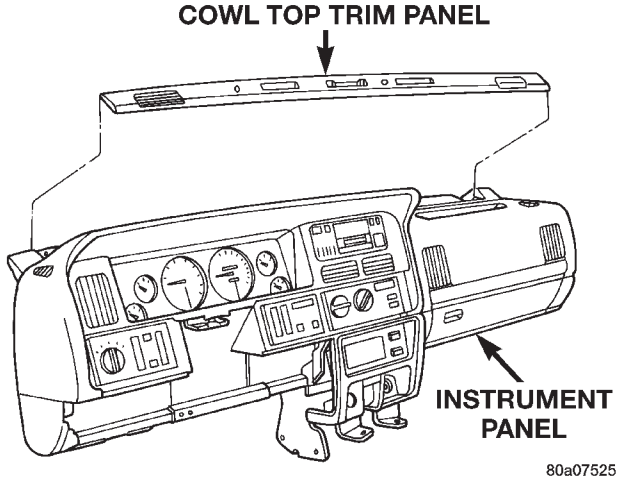

Fig. 40 Cowl Top Trim Remove/Install

(3) Pull the trim panel up far enough to access the solar sensor, which is located between the passenger side and center defroster outlets.

(4) Twist the solar sensor to remove it from the receptacle in the cowl top trim panel (Fig. 41).

(5) Pull the sensor out from the instrument panel far enough to access and unplug the wire harness connector from the instrument panel wire harness.

(6) Remove the solar sensor from the instrument panel.

REMOVAL AND INSTALLATION (Continued)

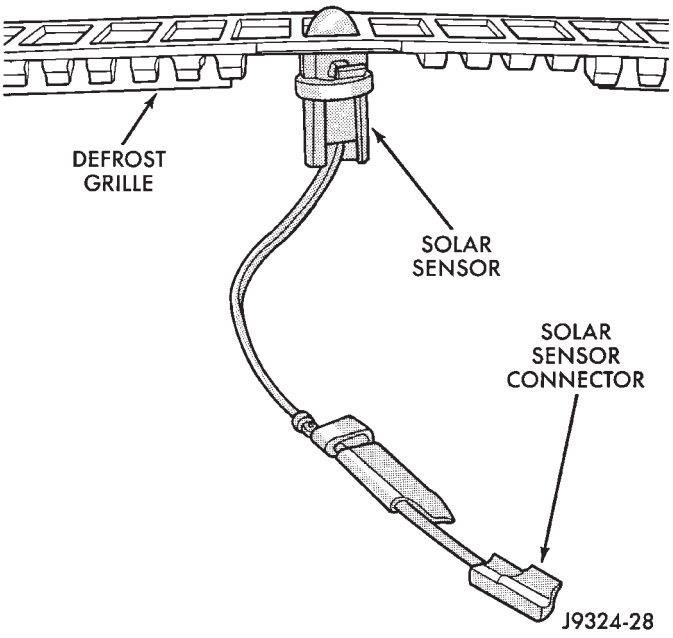

Fig. 41 Solar Sensor

INSTALLATION

(1) Plug the solar sensor wire harness connector into the instrument panel wire harness.

(2) Insert the solar sensor into the receptacle on the bottom of the cowl top trim panel and twist the sensor to lock it into place.

(3) Press the cowl top trim panel down until the snap clip retainers engage in the top of the instrument panel.

(4) Connect the battery negative cable.

IN-VEHICLE TEMPERATURE SENSOR

The in-vehicle temperature sensor is used only on models with the optional Automatic Temperature Control (ATC) system.

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 glove box module from the instrument panel. Refer to Glove Box Module in Group 8E - Instrument Panel Systems for the procedures.

(3) Disconnect the in-vehicle temperature sensor aspirator hose at the in-line splice connector, located under the instrument panel near the passenger side of the floor panel transmission tunnel (Fig. 42).

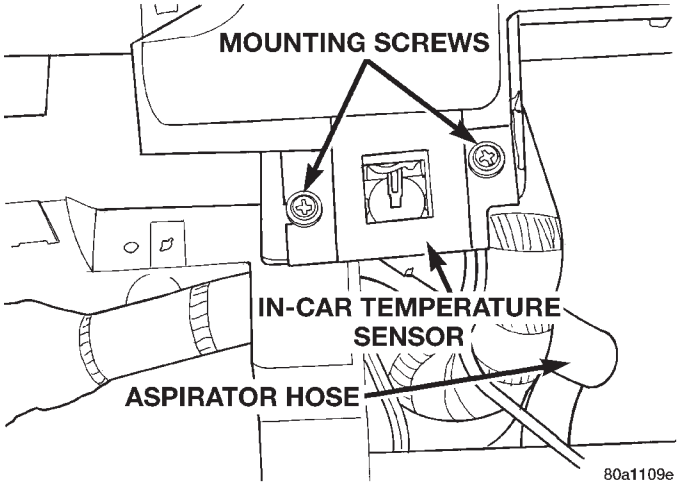

Fig. 42 In-Vehicle Temperature Sensor

(4) Reach behind the in-vehicle temperature sensor to unplug the wire harness connector from the instrument panel wire harness.

(5) Remove the two screws that secure the in-vehicle temperature sensor to the instrument panel.

(6) Remove the in-vehicle temperature sensor from the instrument panel.

INSTALLATION

(1) Insert the in-vehicle temperature sensor into the instrument panel.

(2) Install the two screws that secure the in-vehicle temperature sensor to the instrument panel. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(3) Plug the in-vehicle temperature sensor wire harness connector into the instrument panel wire harness.

(4) Connect the in-vehicle temperature sensor aspirator hose to the in-line splice connector.

(5) Reinstall the glove box module to the instrument panel. Refer to Glove Box Module in Group 8E - Instrument Panel Systems for the procedures.

(6) Connect the battery negative cable.

BLOWER MOTOR

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Disconnect the blower motor cooling tube from the nipple on the blower motor housing (Fig. 43).

(3) Disengage the blower motor wire harness from the wire harness retainer.

(4) Unplug the blower motor wire harness connector from the heater-A/C housing wire harness.

REMOVAL AND INSTALLATION (Continued)

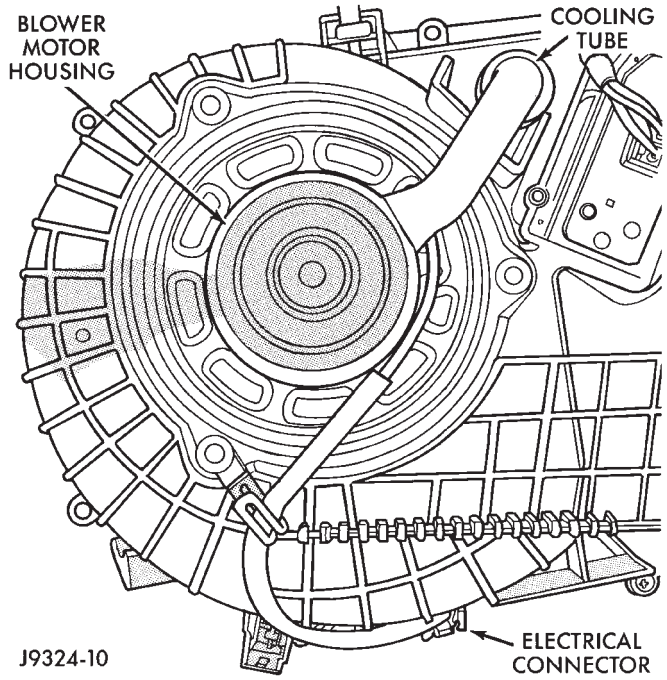

Fig. 43 Blower Motor Remove/Install

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

(6) Lower the blower motor and wheel from the heater-A/C housing.

(7) Remove the blower wheel retainer clip (Fig. 44).

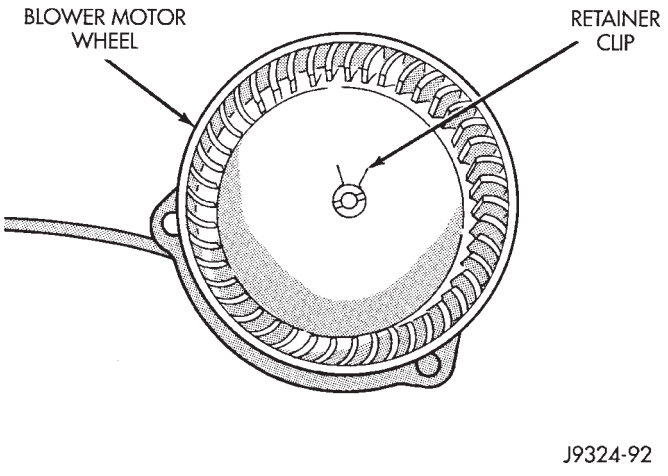

Fig. 44 Blower Motor Wheel

(8) Remove the blower wheel from the blower motor shaft

INSTALLATION

(1) Press the blower wheel hub onto the blower motor shaft. Be sure the flat on the shaft is indexed with the flat inside the hub.

(2) Install the blower wheel retainer clip. The ears of the retainer clip must be over the flat surface on the blower motor shaft.

(3) Be certain that the blower motor seal is installed on the blower motor housing (Fig. 45).

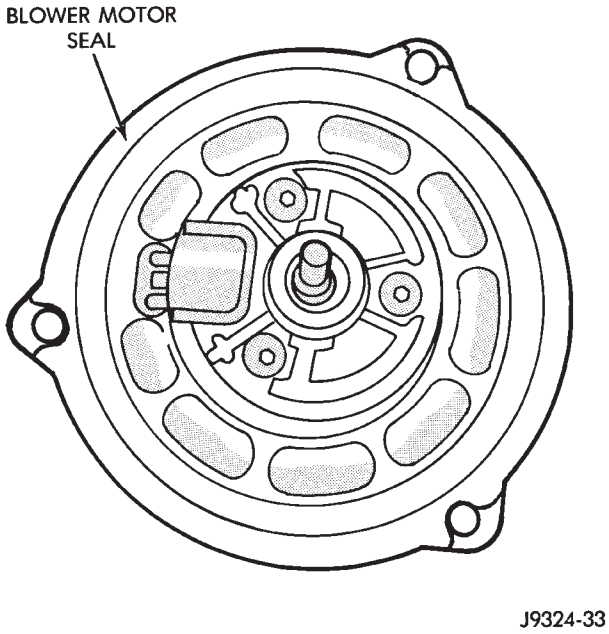

Fig. 45 Blower Motor Seal

(4) Install the blower motor in the heater-A/C housing with three mounting screws. tighten the mounting screws to 2.2 N·m (20 in. lbs.).

(5) Plug the blower motor wire harness connector into the heater-A/C housing wire harness.

(6) Install the blower motor wire harness into the wire harness retainer.

(7) Connect the blower motor cooling tube to the nipple on the blower motor housing.

(8) Connect the battery negative cable.

BLOWER MOTOR RESISTOR AND POWER MODULE

REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the blower motor resistor or power module.

(3) Remove the screws that secure the blower motor resistor or power module to the heater-A/C housing.

(4) Remove the blower motor resistor or power module from the heater-A/C housing (Fig. 46).

INSTALLATION

(1) Install the blower motor resistor or power module to the heater-A/C housing. Tighten the mounting screws to 2.2 N·m (20 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

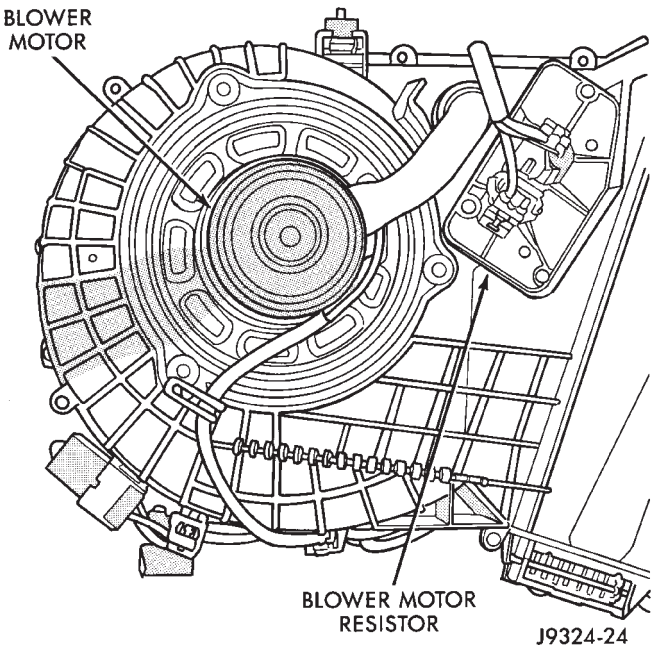

Fig. 46 Blower Motor Resistor or Power Module Remove/Install

(2) Plug in the wire harness connector to the blower motor resistor or power module.

(3) Connect the battery negative cable.

DOOR ACTUATOR

WARNING: ON VEHICLES EQUIPPED WITH AIR-BAGS, 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 PRE-CAUTIONS COULD RESULT IN ACCIDENTAL AIR-BAG DEPLOYMENT AND POSSIBLE PERSONAL INJURY.

The mode door actuators for vehicles equipped with the standard equipment manual temperature control system are vacuum controlled. The optional Automatic Temperature Control (ATC) system uses electric motors to actuate the mode doors. The temperature/blend-air door for all models is actuated by an electric motor. The service procedures for both types of actuators are covered by the following procedures.

HEAT/DEFROST - PANEL/DEFROST DOOR MOTOR

This motor is used only on models equipped with the optional Automatic Temperature Control (ATC) system.

(1) Disconnect and isolate the battery negative cable.

(2) Remove the two bolts that secure the center instrument panel support bracket to the left side of the floor panel transmission tunnel.

(3) Remove the two bolts that secure the center instrument panel support bracket to the instrument panel.

(4) Remove the center instrument panel support bracket from the vehicle.

(5) Unplug the wire harness connector from the heat/defrost - panel/defrost door motor (Fig. 47).

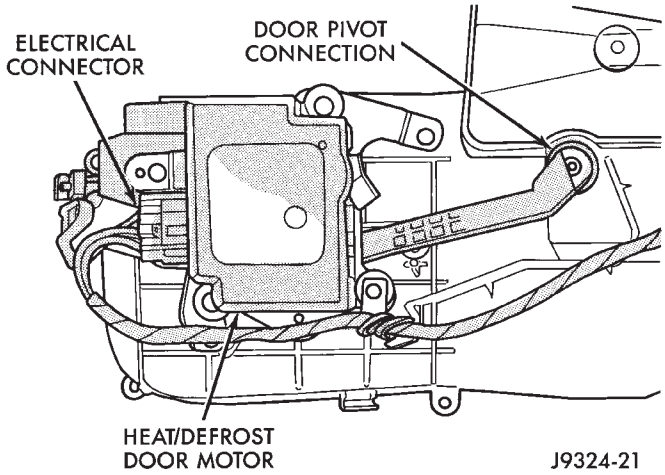

Fig. 47 Heat/Defrost - Panel/Defrost Door Motor Remove/Install

(6) Remove the three screws that secure the heat/defrost - panel/defrost door motor to the bottom of the heater-A/C housing.

(7) Remove the heat/defrost - panel/defrost door motor from the heater-A/C housing.

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

HEAT/DEFROST DOOR VACUUM ACTUATOR

This actuator is used only on models equipped with the standard manual temperature control system.

(1) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Turn the heater-A/C housing upside down on a work bench.

(3) Unplug the vacuum harness connector from the heat/defrost door vacuum actuator (Fig. 48).

(4) Disengage the heat/defrost door pivot connection from the heat/defrost door pivot pin.

(5) Remove the screws that secure the heat/defrost door vacuum actuator to the heater-A/C housing.

(6) Remove the heat/defrost door vacuum actuator from the heater-A/C housing.

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

REMOVAL AND INSTALLATION (Continued)

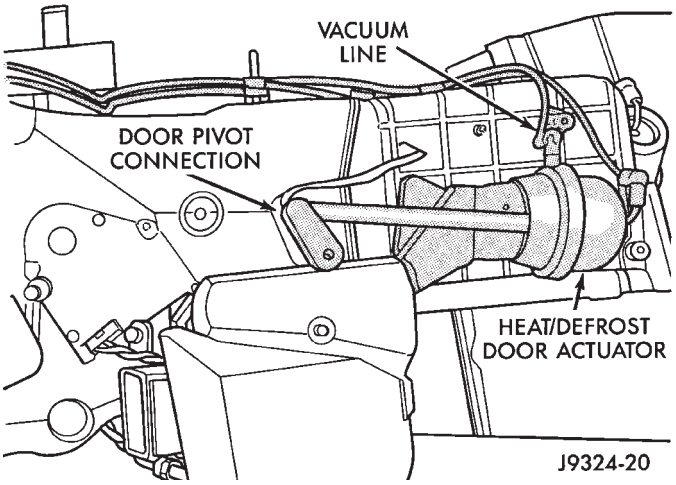

Fig. 48 Heat/Defrost Door Vacuum Actuator Remove/Install

PANEL/DEFROST DOOR VACUUM ACTUATOR

This actuator is used only on models equipped with the standard manual temperature control system.

(1) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Unplug the vacuum harness connector from the heat/defrost door vacuum actuator (Fig. 49).

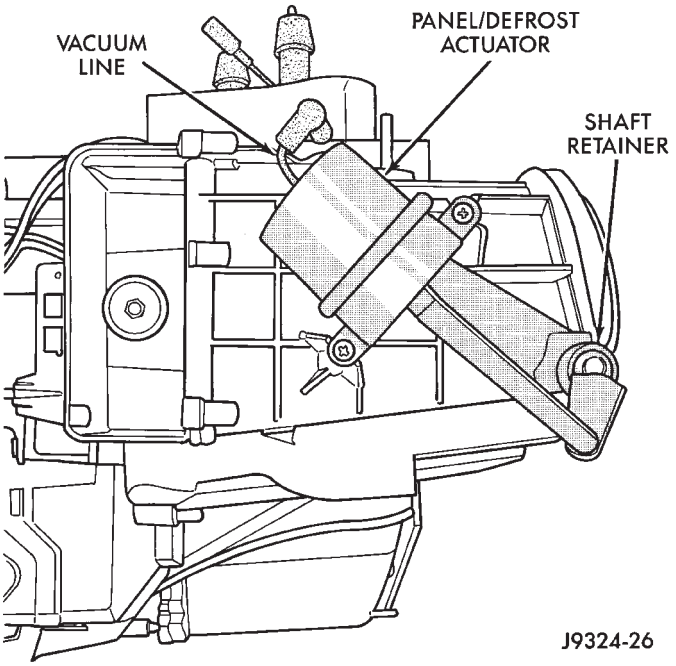

Fig. 49 Panel/Defrost Door Vacuum Actuator Remove/Install

(3) Disengage the panel/defrost door pivot connection from the panel/defrost door pivot pin.

(4) Remove the screws that secure the panel/defrost door vacuum actuator to the heater-A/C housing.

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

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

RECIRCULATION AIR DOOR MOTOR

This motor is used only on models equipped with the optional Automatic Temperature Control (ATC) system.

(1) Remove the instrument panel from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Unplug the wire harness connector from the recirculation air door motor (Fig. 50).

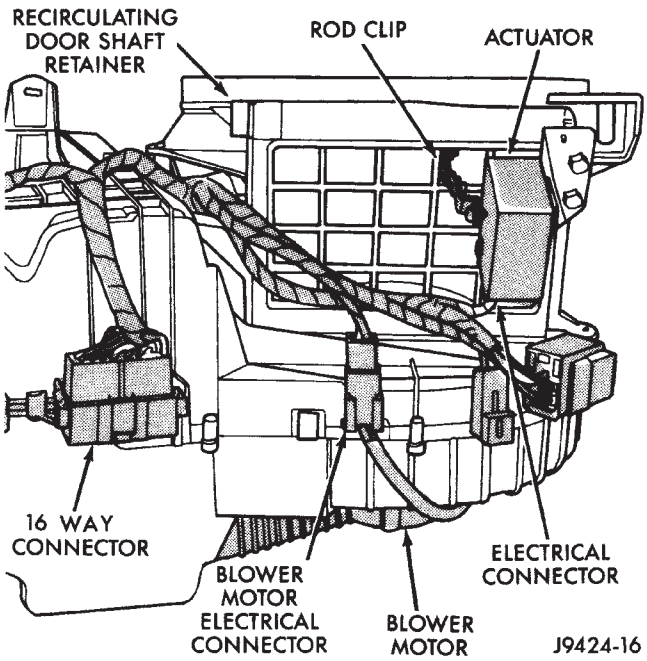

Fig. 50 Recirculation Air Door Motor Remove/Install

(3) Unsnap the retaining clip from the recirculation air door actuating rod at the recirculation air door lever.

(4) Disengage the recirculation air door actuating rod from the recirculation air door lever.

(5) Remove the screws that secure the recirculation air door motor to the heater-A/C housing.

(6) Remove the recirculation air door motor from the heater-A/C housing.

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

REMOVAL AND INSTALLATION (Continued)

RECIRCULATION AIR DOOR VACUUM ACTUATOR

This actuator is used only on models equipped with the standard manual temperature control system.

(1) Remove the instrument panel from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Unplug the vacuum harness connector from the recirculation air door vacuum actuator (Fig. 51).

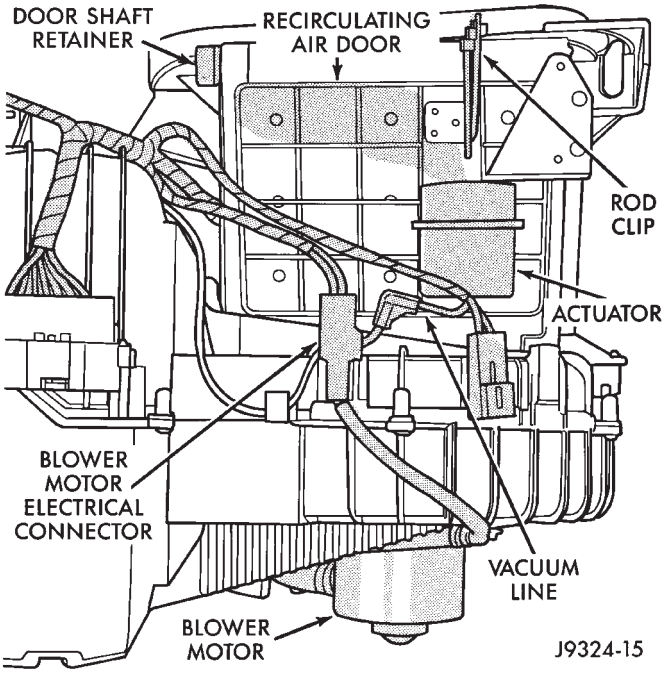

Fig. 51 Recirculation Air Door Vacuum Actuator Remove/Install

(3) Unsnap the retaining clip from the recirculation air door actuating rod at the recirculation air door lever.

(4) Disengage the recirculation air door actuating rod from the recirculation air door lever.

(5) Remove the screws that secure the recirculation air door vacuum actuator to the heater-A/C housing.

(6) Remove the recirculation air door vacuum actuator from the heater-A/C housing.

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

TEMPERATURE/BLEND-AIR DOOR MOTOR

The temperature/blend-air door motor is used on all models, whether equipped with manual or automatic temperature control. This motor is located under the heater-A/C housing directly over the floor panel transmission tunnel, and can be removed from the passenger compartment without instrument panel or heater-A/C housing removal.

(1) Disconnect and isolate the battery negative cable.

(2) Unplug the wire harness connector from the temperature/blend-air door motor (Fig. 52).

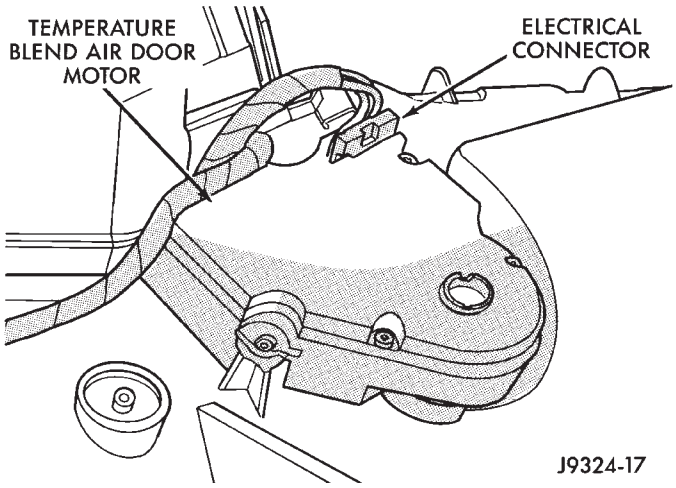

Fig. 52 Temperature/Blend-Air Door Motor Remove/Install

(3) Remove the screws that secure the temperature/blend-air door motor to the heater-A/C housing.

(4) Remove the temperature/blend-air door motor 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.).

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.

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REMOVAL

(1) Disconnect and isolate the battery negative cable.

(2) Remove the instrument panel from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(3) Recover the refrigerant from the refrigerant system. See Refrigerant Recovery in this group for the procedures.

(4) Disconnect the liquid line refrigerant line coupler from the evaporator inlet tube. See Refrigerant

REMOVAL AND INSTALLATION (Continued)

Line Coupler in this group for the procedures. Install plugs in, or tape over all of the opened refrigerant line fittings.

(5) Disconnect the suction line 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 opened refrigerant line fittings.

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

(7) Disconnect the heater hoses from the heater core tubes. Refer to Group 7 - Cooling System for the procedures. Install plugs in, or tape over the opened heater core tubes.

(8) If the vehicle is equipped with the manual temperature control system, unplug the heater-A/C system vacuum supply line connector from the tee fitting near the heater core tubes.

(9) Remove the coolant reserve/overflow bottle from the passenger side inner fender shield. Refer to Group 7 - Cooling System for the procedures.

(10) Remove the Powertrain Control Module (PCM) from the passenger side dash panel in the engine compartment and set it aside. Do not unplug the PCM wire harness connectors. Refer to Group 14 - Fuel System for the procedures.

(11) Remove the nuts from the heater-A/C housing mounting studs on the engine compartment side of the dash panel (Fig. 53).

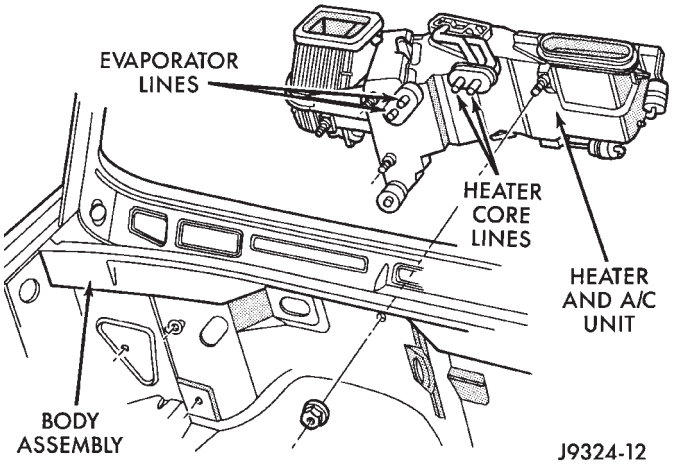

Fig. 53 Heater-A/C Housing Remove/Install

(12) Disengage the rear floor heat duct from the center floor heat duct adapter (Fig. 54).

(13) Unplug the heater-A/C housing wire harness connectors.

(14) Remove the heater-A/C housing mounting nuts from the studs on the passenger compartment side of the dash panel (Fig. 55).

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

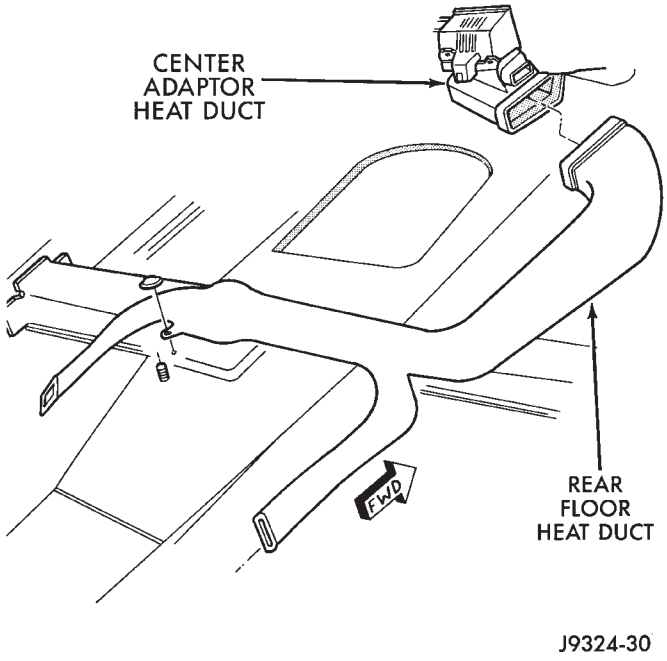

Fig. 54 Rear Floor Heat Duct

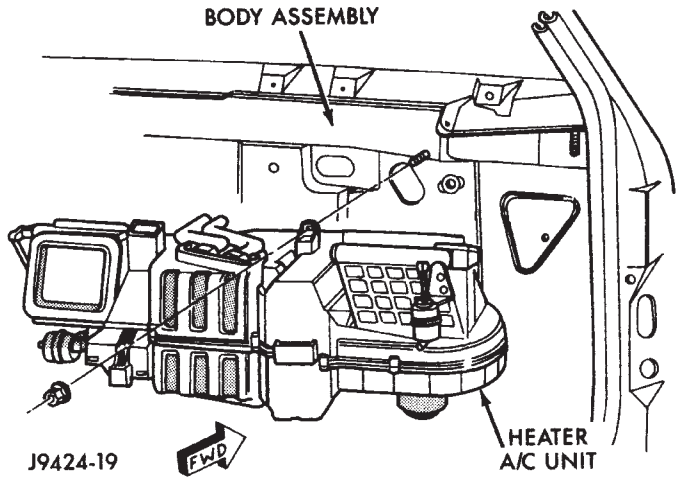

Fig. 55 Heater A/C Housing Remove/Install

INSTALLATION

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

(2) Install the heater-A/C housing mounting nuts to the studs on the passenger compartment side of the dash panel. Tighten the nuts to 4.5 N·m (40 in. lbs.).

(3) Connect the heater-A/C housing wire harness connectors.

(4) Reinstall the rear floor heat duct to the center floor heat duct adapter.

(5) Install and tighten the nuts onto the heater-A/C housing mounting studs on the engine compart-

REMOVAL AND INSTALLATION (Continued)

ment side of the dash panel. Tighten the nuts to 7 N·m (60 in. lbs.).

(6) Reinstall the PCM to the passenger side dash panel in the engine compartment. Refer to Group 14 - Fuel System for the procedures.

(7) Reinstall the coolant reserve/overflow bottle to the passenger side inner fender shield. Refer to Group 7 - Cooling System for the procedures.

(8) If the vehicle is equipped with the manual temperature control system, connect the heater-A/C system vacuum supply line connector to the tee fitting near the heater core tubes.

(9) Unplug or remove the tape from the heater core tubes. Connect the heater hoses to the heater core tubes and fill the engine cooling system. Refer to Group 7 - Cooling System for the procedures.

(10) Unplug or remove the tape from the suction line and the evaporator outlet tube fittings. Connect the suction line coupler to the evaporator outlet tube. See Refrigerant Line Coupler in this group for the procedures.

(11) Unplug or remove the tape from the liquid line and the evaporator inlet tube fittings. Connect the liquid line coupler to the evaporator inlet tube. See Refrigerant Line Coupler in this group for the procedures.

(12) Evacuate the refrigerant system. See Refrigerant System Evacuate in this group for the procedures.

(13) Charge the refrigerant system. See Refrigerant System Charge in this group for the procedures.

(14) Install the instrument panel in the vehicle. Refer to Group 8E - Instrument Panel Systems for the procedures.

(15) Connect the battery negative cable.

(16) Start the engine and check for proper operation of the heating and air conditioning systems.

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.

REMOVAL

(1) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Remove the screws and retainers that secure the heater core to the heater-A/C housing.

(3) Lift the heater core straight up and out of the heater-A/C housing (Fig. 56).

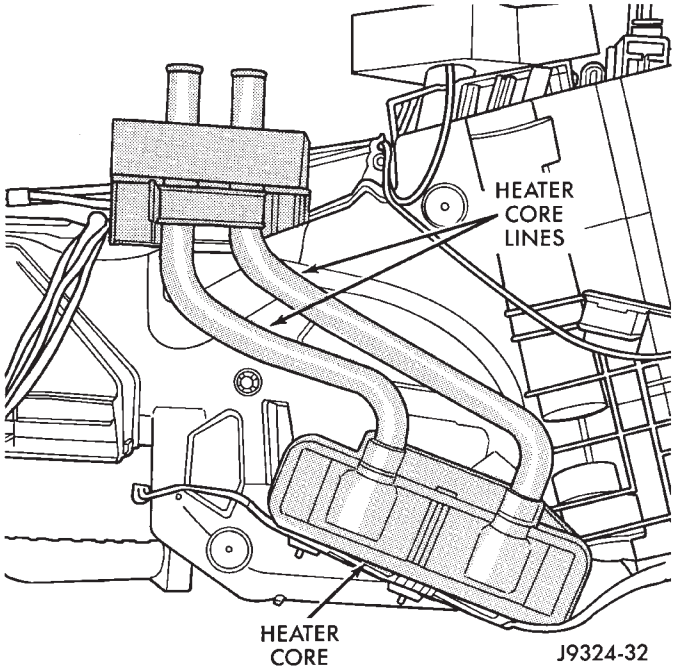

Fig. 56 Heater Core Remove/Install

INSTALLATION

(1) Lower the heater core into the heater-A/C housing.

(2) Position the retainers over the heater core tubes. Install and tighten the screws that secure the heater core and retainers to the heater-A/C housing. Tighten the screws to 2.2 N·m (20 in. lbs.).

(3) Reinstall the heater-A/C housing to the vehicle. See Heater-A/C Housing in this group for the procedures.

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.

TEMPERATURE/BLEND-AIR DOOR

(1) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Place the heater-A/C housing upside down on a work bench.

REMOVAL AND INSTALLATION (Continued)

(3) Unsnap the center floor heat duct adapter from the bottom of the heater-A/C housing.

(4) Remove the screws that secure the two housing halves to each other.

(5) Turn the heater-A/C housing right side up on the work bench and separate the top half of the heater-A/C housing from the bottom half.

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

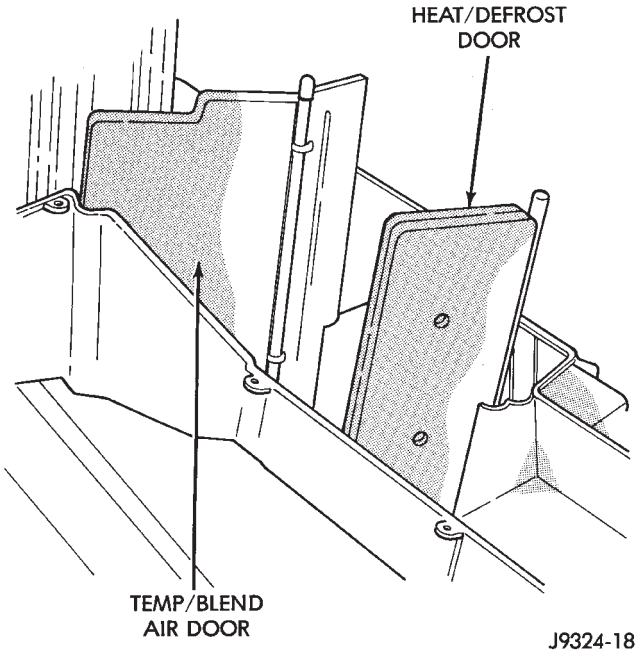

Fig. 57 Temperature/Blend-Air Door and Heat/ Defrost Door Remove/Install

NOTE: To reinstall the door-to-motor pivot connection, the motor must be removed from the heater-A/C housing. See Door Actuator in this group for the procedures.

(7) Reverse the removal procedures to install. Be certain that each of the door pivot pins align with the pivot holes in the heater-A/C housing. Tighten the heater-A/C housing screws to 2.2 N·m (20 in. lbs.).

PANEL/DEFROST DOOR AND LEVER

(1) Remove the instrument panel from the vehicle. Refer to Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Disengage the panel/defrost door actuating rod from the door pivot shaft retainer (Fig. 58) or (Fig. 59).

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry the panel/defrost door pivot shaft retainer from the pivot shaft.

(4) Remove the panel/defrost door through the top opening of the heater-A/C housing.

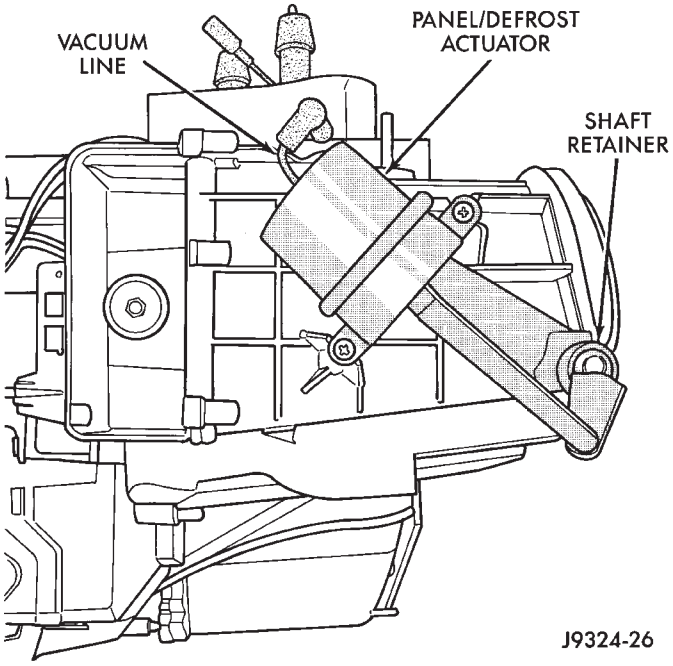

Fig. 58 Panel/Defrost Door Remove/Install - Manual Temperature Control

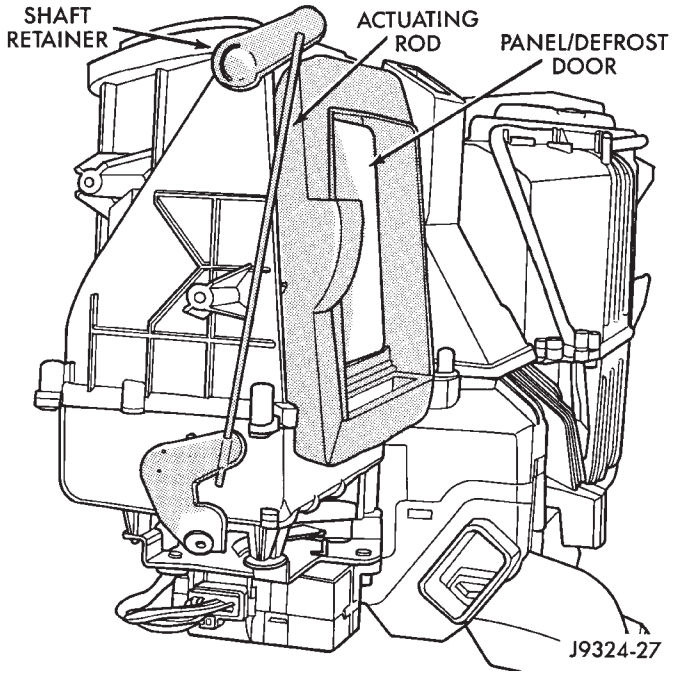

Fig. 59 Panel/Defrost Door Remove/Install - Automatic Temperature Control

(5) Reverse the removal procedures to install.

HEAT/DEFROST DOOR

(1) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Place the heater-A/C housing upside down on a work bench.

REMOVAL AND INSTALLATION (Continued)

(3) Remove the heat/defrost - panel/defrost door motor (ATC) or heat/defrost door vacuum actuator (manual) from the heater-A/C housing. See Door Actuator in this group for the procedures.

(4) Unsnap the center floor heat duct adapter from the bottom of the heater-A/C housing.

(5) Remove the screws that secure the two housing halves to each other.

(6) Turn the heater-A/C housing right side up on the work bench and separate the top half of the heater-A/C housing from the bottom half.

(7) Lift the heat/defrost door pivot shaft out of the pivot hole in the bottom half of the heater-A/C housing (Fig. 57).

(8) Reverse the removal procedures to install. Be certain that each of the door pivot pins align with the pivot holes in the heater-A/C housing. Tighten the heater-A/C housing screws to 2.2 N·m (20 in. lbs.).

RECIRCULATION AIR DOOR

(1) Remove the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Unsnap the retaining clip from the recirculation air door actuating rod at the recirculation air door lever.

(3) Using a trim stick or another suitable wide flat-bladed tool, gently pry the recirculation air door pivot shaft retainer from the pivot shaft.

(4) Remove the recirculation air door through the top opening of the heater-A/C 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 the heater-A/C housing from the vehicle. See Heater-A/C Housing in this group for the procedures.

(2) Place the heater-A/C housing upside down on a work bench.

(3) Unsnap the center floor heat duct adapter from the bottom of the heater-A/C housing.

(4) Remove the screws that secure the two housing halves to each other.

(5) Turn the heater-A/C housing right side up on the work bench and separate the top half of the heater-A/C housing from the bottom half (Fig. 60).

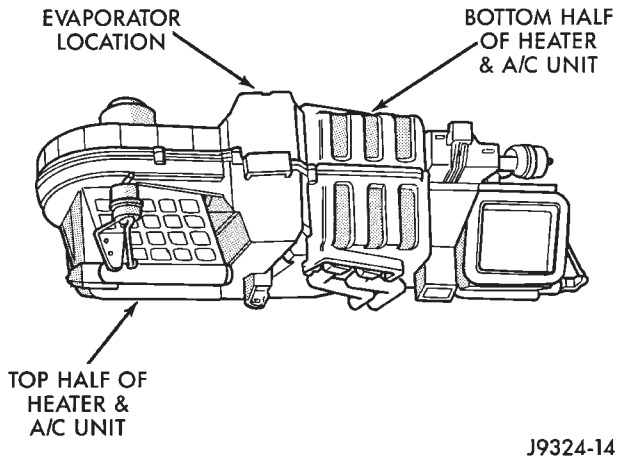

Fig. 60 Evaporator Coil Location in Heater-A/C Housing (Upside Down)

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

(7) Reverse the removal procedures to install. Be certain that the evaporator foam insulator wrap is reinstalled. Be certain that each of the door pivot pins align with the pivot holes in the heater-A/C housing. Tighten the heater-A/C housing screws to 2.2 N·m (20 in. lbs.).

NOTE: If the evaporator is replaced, add 60 milliliters (2 fluid ounces) of refrigerant oil to the refrigerant system.

DUCTS AND OUTLETS

DEFROSTER DUCT

(1) Remove the instrument panel assembly from the vehicle. See Instrument Panel Assembly in Group 8E - Instrument Panel Systems for the procedures.

(2) Remove the three screws that secure the defroster duct to the instrument panel armature.

(3) Remove the defroster duct from the instrument panel.

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

DEMISTER DUCT

(1) Remove the defroster duct from the instrument panel. See Defroster Duct in this group for the procedures.

(2) Remove the screws that secure the demister duct to the instrument panel armature.

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

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

REMOVAL AND INSTALLATION (Continued)

PANEL DUCT

(1) Remove the demister duct from the instrument panel. See Demister Duct in this group for the procedures.

(2) Remove the screws that secure the panel duct to the instrument panel armature.

(3) Remove the panel duct from the instrument panel.

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

FLOOR DUCT

(1) Remove the center floor console from the vehicle. Refer to Group 23 - Body for the procedures.

(2) Remove the right front seat from the vehicle. Refer to Group 23 - Body for the procedures.

(3) Remove the right side front door opening trim from the vehicle. Refer to Group 23 - Body for the procedures.

(4) Roll back the floor carpeting.

(5) Remove the nut that secures the floor duct to the stud on the floor panel transmission tunnel (Fig. 61).

(6) Disconnect the floor duct from the center floor heat duct adapter.

(7) Remove the floor duct from the vehicle.

(8) Reverse the removal procedures to install.

DEMISTER OUTLETS

(1) Using a trim stick or another suitable wide flat-bladed tool, gently pry the edge of the outlet away from the instrument panel top pad.

(2) To install, push the outlet firmly into the hole in the instrument panel top pad.

PANEL OUTLETS

The driver side and center panel outlets are only serviced as part of the instrument cluster bezel unit.

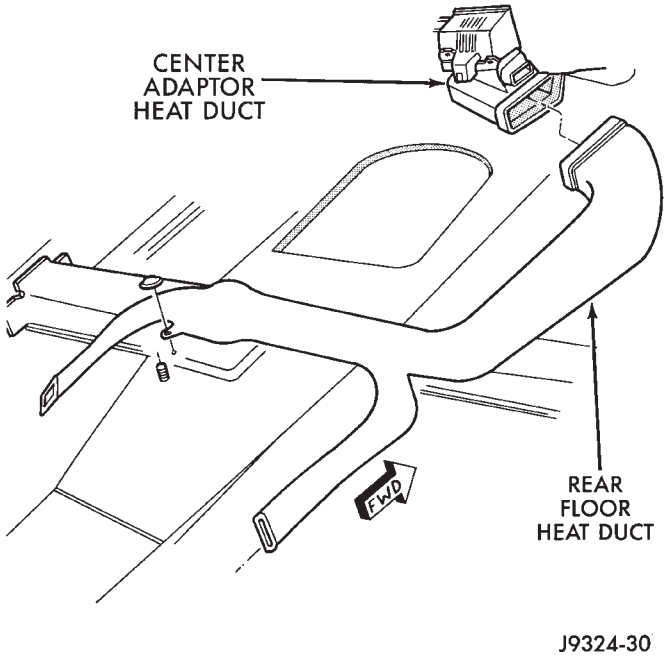

Fig. 61 Floor Duct Remove/Install

The passenger side panel outlets are available for service.

(1) Remove the instrument panel top pad from the instrument panel. Refer to Instrument Panel Top Pad in Group 8E - Instrument Panel Systems for the procedures.

(2) Remove the two screws that secure each outlet to the instrument panel side of the top pad.

(3) Remove the outlet from the top pad.

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