GROUP

CLIMATE CONTROL SYSTEM 12

(18000 & 19000)

SECTION 12-00 Climate Control System—Service

VEHICLE APPLICATION

Capri.

GENERAL INFORMATION

Whenever components in the engine compartment or instrument panel areas are being serviced, the battery ground cable must be disconnected to eliminate the possibility of electrical shorts, burned-up wiring, and dangerous fires. Extreme care must be exercised when performing electrical tests where the battery must be connected to operate the system.

WARNING: CARBON MONOXIDE IS COLORLESS, ODORLESS AND DANGEROUS. IF IT IS NECESSARY TO OPERATE THE ENGINE WITH THE VEHICLE IN A CLOSED AREA SUCH AS A GARAGE, ALWAYS USE AN EXHAUST COLLECTOR TO VENT THE EXHAUST GASES OUTSIDE THE CLOSED AREA.

Safety Precautions

The refrigerant used in the air conditioner system is Refrigerant-12. Refrigerant-12 is non-explosive, non-flammable, and non-corrosive. It has practically no odor, and is heavier than air. Although it is classified as a safe refrigerant, certain precautions must be observed to protect the parts involved and the person working on the unit. Use only Refrigerant-12 such as Motorcraft YN-1A or YN-7 or equivalent. Liquid Refrigerant-12, at normal atmospheric pressures and temperatures, evaporates so quickly that it has a tendency to freeze anything it contacts. **For this reason, extreme care must be taken to prevent any liquid refrigerant from coming in contact with the skin and especially the eyes.**

Refrigerant-12 is readily absorbed by most types of oil. For this reason, a bottle of sterile mineral oil and a quantity of weak boric acid solution must always be kept nearby when servicing the air conditioning system. Should any liquid refrigerant get into the eyes, immediately use a few drops of mineral oil to wash them out, then wash the eyes clean with weak boric acid solution. Seek a doctor's aid immediately even though irritation may have ceased. **Always wear safety goggles when servicing any part of the refrigerant system.** The Refrigerant-12 in the system is always under pressure. Because the system is tightly sealed, heat applied to any part could cause this pressure to build up excessively.

WARNING: TO AVOID A DANGEROUS EXPLOSION, NEVER WELD, USE A BLOW TORCH, SOLDER, STEAM CLEAN, BAKE BODY FINISHES, OR USE ANY EXCESSIVE AMOUNT OF HEAT IN THE IMMEDIATE AREA OF ANY PART OF THE AIR CONDITIONING SYSTEM OR REFRIGERANT SUPPLY TANK, WHILE THEY ARE CLOSED TO THE ATMOSPHERE, WHETHER FILLED WITH REFRIGERANT OR NOT.

The liquid refrigerant evaporates so rapidly that the resulting refrigerant gas will displace the air surrounding the area where the refrigerant is released.

WARNING: TO PREVENT POSSIBLE SUFFOCATION IN ENCLOSED AREAS, ALWAYS DISCHARGE THE REFRIGERANT FROM AN AIR CONDITIONING SYSTEM INTO THE GARAGE EXHAUST COLLECTOR. ALWAYS MAINTAIN GOOD VENTILATION SURROUNDING THE WORK AREA.

Although Refrigerant-12 gas, under normal conditions, is non-poisonous, the discharge of refrigerant gas near an open flame can produce a very poisonous gas. This gas is generated if a flame-type leak detector is used. Make certain that Refrigerant-12 is both stored and installed in accordance with all state and local ordinances.

When admitting Refrigerant-12 gas into the A/C system, always keep the tank in an upright position if charging on the low side (gas) of the A/C system. If the tank is on its side or upside down, liquid Refrigerant-12 will enter the system and may damage the compressor.

CAUTION: Never charge on the low side of the A/C system with the refrigerant in a liquid state.

Service Precautions

1. **Never open or loosen a connection before discharging the system refrigerant.**
2. **When loosening a connection, if any residual pressure is evident, allow it to leak off before opening the fitting.**
3. **A system which has been opened to replace a component, or one which has discharged through leakage, must be evacuated before charging.**
4. **Immediately after disconnecting a component from the system, seal the open fitting with a cap or plug.**
5. **Before disconnecting a component from the system, clean the outside of the fittings thoroughly.**
6. **Do not remove the sealing caps from a replacement component until ready to install.**
7. **Refrigerant oil will absorb moisture from the atmosphere if left uncapped. Do not open any container until ready to use and install the cap immediately after using. Store the oil only in a clean moisture-free container.**
8. **Before connecting an open fitting, always install a new seal ring. Coat the fitting and seal with refrigerant oil before connecting.**
9. **When installing a refrigerant line, avoid sharp bends. Position the line away from the exhaust or any sharp edges which may chafe the line.**

GENERAL INFORMATION (Continued)

10. **Tighten fittings only to the specified torque. The aluminum fittings used in the refrigeration system will not tolerate over-tightening.**
11. **When disconnecting a fitting, use a wrench on both halves of the fitting to prevent twisting of the refrigeration lines or tubes.**
12. **Do not open a refrigeration system or uncap a replacement component until it is ready to be installed. This will prevent condensation from forming inside of the component.**
13. **Keep service tools and the work area clean. Contamination of a refrigeration system through careless work habits must be avoided.**

DESCRIPTION AND OPERATION

Air Conditioning System

Compressor and Magnetic Clutch

The compressor is a rotary pump of swashplate design driven by a belt from the engine crankshaft. The compressor is mounted on the engine at the front RH side of the engine compartment. The compressor pumps the gas R-12 into a high-pressure, high-temperature state and circulates the refrigerant through the system. Refer to Section 12-03 for compressor and clutch service.

Condenser

The A/C condenser is an aluminum fin and tube design heat exchanger located in front of the radiator. It cools compressed refrigerant gas by allowing air to pass over fins and tubes to attract and dissipate heat. The refrigerant condenses from a gas to a liquid as it is cooled.

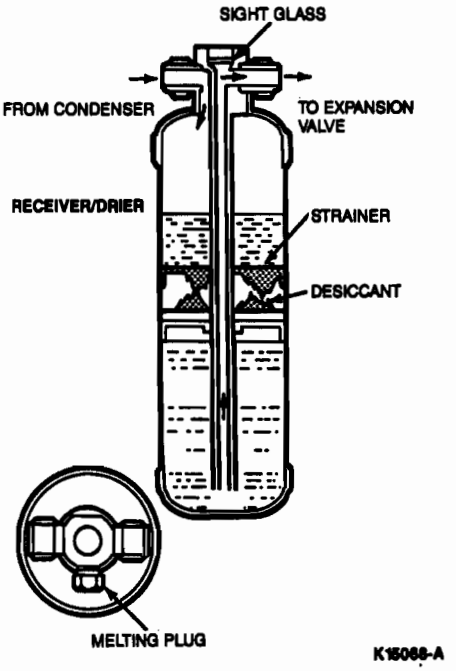
Receiver/Drier

The receiver/drier is mounted on the front LH side of the engine compartment and is placed in-line between the condenser outlet and the thermostatic expansion valve (evaporator inlet).

The receiver/drier has the following features:

- It acts as a storage tank for liquid refrigerant which leaves the condenser when the system is operating in a low heat load condition. This also ensures a solid flow of liquid refrigerant to the expansion valve.
- It contains a material called desiccant which acts as a drier by absorbing moisture in the system.
- It filters the system of foreign particles and dirt that may block or damage system valves or the compressor.
- A sight glass is installed for checking the condition of the refrigerant in the system.
- A high-pressure relief valve called a melting plug is installed next to the sight glass and will melt when the refrigerant temperature rises to 105°C (221°F), discharging high-pressure refrigerant into the atmosphere.

NOTE: The receiver/drier should be replaced whenever the system has been opened for extended periods of time, or if there is evidence of moisture in the system (i.e., internal corrosion of metal lines or if the refrigerant oil is thick and dark).



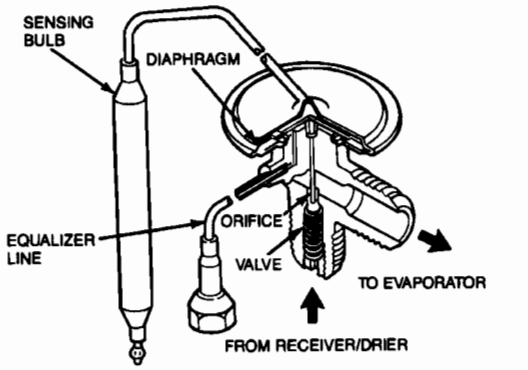
Thermostatic Expansion Valve—TXV

The thermostatic expansion valve, positioned at the evaporator inlet, senses the temperature and pressure of the refrigerant at the evaporator outlet, then meters the appropriate amount of refrigerant into the evaporator. It is essential that liquid refrigerant is not allowed to pass into the compressor, as serious damage can result. The expansion valve is used as a controlling device that allows just the right amount of high-pressure liquid refrigerant to enter the evaporator to obtain maximum cooling and, at the same time, provide for complete evaporation of the liquid refrigerant in the evaporator.

As the evaporator begins to starve (not enough refrigerant) or flood (too much refrigerant) the temperature and pressure increase or decrease at the evaporator outlet and also inside the sensing bulb and equalizing line. These pressures act on the bottom and top of the expansion valve diaphragm. The diaphragm along with the super heat spring opens or closes the valve to allow more or less high-pressure liquid refrigerant into the evaporator inlet.

DESCRIPTION AND OPERATION (Continued)

Thermostatic Expansion Valve



Evaporator

The evaporator, located inside the cooling unit, works as a heat exchanger. The evaporator core is a fin / tube aluminum design and is located in the path of force circulated air. Fresh or recirculated air is drawn in by the blower, which forces it through the evaporator. Inside the evaporator, the refrigerant, in a liquid state, evaporates and absorbs the heat from the passing air. This results in cool, clean and dehumidified air being discharged at the registers.

De-Icing Switch

This switch prevents compressor operation when the refrigerant in the evaporator is near the freezing point. It consists of a thermal device which controls an electrical switch in series with the compressor clutch coil electrical circuit.

High and Low Pressure Switch

The high and low pressure switch is installed on the liquid line beneath the high side gauge port between the evaporator and receiver dryer. This switch protects the compressor if the refrigerant pressure becomes too high or low by interrupting the compressor clutch circuit.

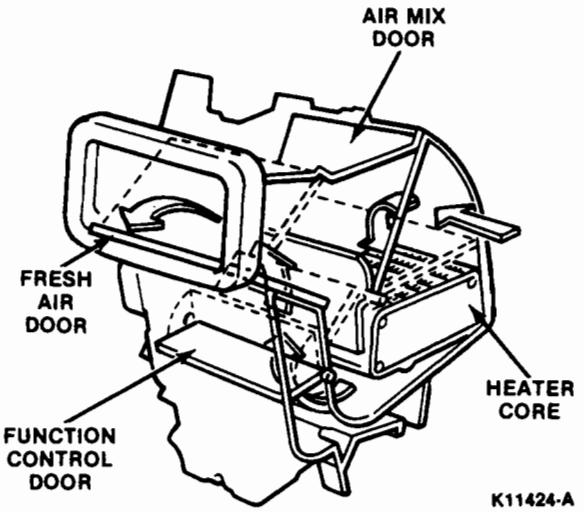
Cooling Fan Override

When the air conditioner system is operating, it is necessary for the cooling fan to operate full time. Cooling fan operation is controlled by a coolant temperature sensor at the thermostat housing.

Heating Systems and Control Doors

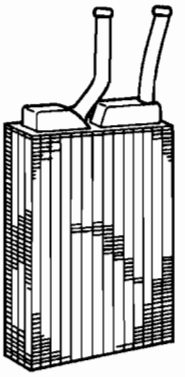
Outside air comes through an opening at the upper cowl and into the air inlet duct attached to the blower case assembly. The blower case contains the blower motor that forces outside or recirculated air inside to the heater assembly. The heater assembly contains a heater core, through which hot coolant from the engine flows. The air passes around and through the heater core and discharges through the various outlet doors.

The air mix door determines the amount of air going through the heater core. The functional control door determines the routing of the heated air. The air doors are positioned by control cables and levers.



Heater Core

The heater core consists of a number of flat, hollow, metal ribbons that are corrugated to take maximum advantage of engine coolant flow.

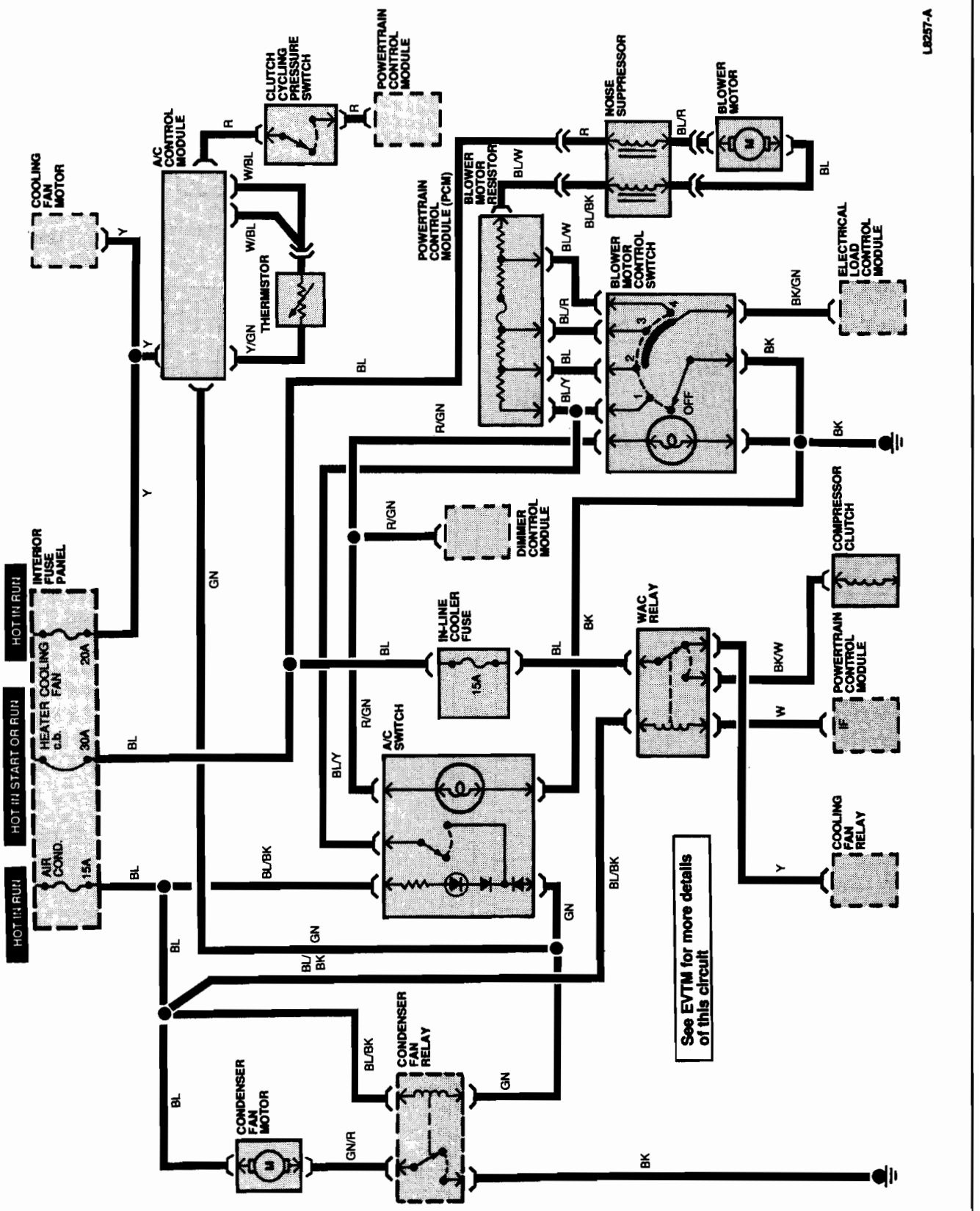


Rear Window Defroster

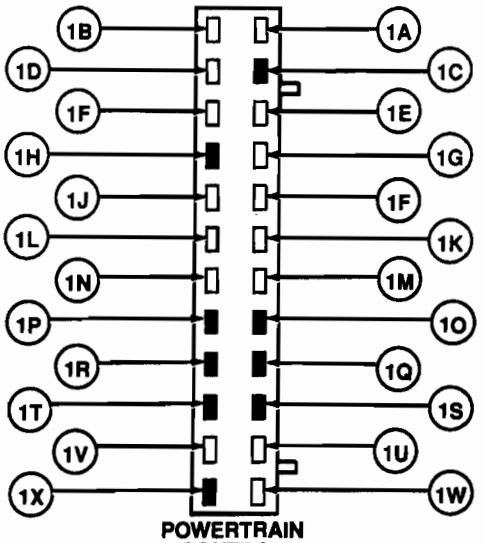
The rear window defroster system consists of a switch, system wiring and a series of grid wires baked on the inside surface of the rear window. When the control switch is moved to the ON position, current is directed to the grid wires on the rear window. The heated grid wires keep the rear window. The heated grid wires keep the rear window clear of fog or ice.

DIAGNOSIS AND TESTING

Electrical Schematic—Air Conditioning System



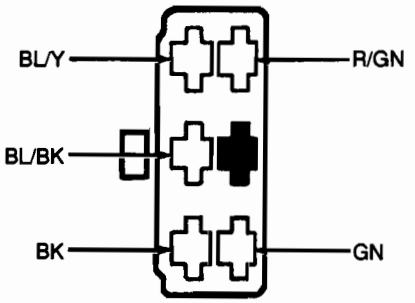
DIAGNOSIS AND TESTING (Continued)



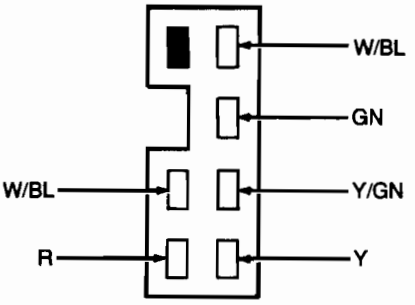
POWERTRAIN CONTROL MODULE Q3240-A

Pin Number	Wire Color	Circuit Function
1A	LG/R	MIL Lamp
1B	GN/BK	Self Test Output
1C	—	Not Used
1D	BK/BL	Switch Monitor Lamp
1E	GN/O	Idle Switch
1F	W	WAC Relay
1G	R/BL	Park/Neutral Position Switch, Clutch Pedal Position Switch
1H	—	Not Used
1I	BL	Electrical Load Control Module
1J	W/GN	Brake On/Off (BOO) Switch
1K	GN/R	Power Steering Pressure Switch
1L	R	A/C Control Switch
1M	Y/BL	Ignition Diagnostic Monitor
1N	Y	Cylinder Identification Sensor
1O	—	Not Used
1P	—	Not Used
1Q	—	Not Used
1R	—	Not Used
1S	—	Not Used
1T	—	Not Used
1U	LG/Y	Ignition Control Module (Non-Turbo) Knock Control Unit 1 (Turbo)
1V	BK	Ground (Non-Turbo Only)
1W	Y	Self Test Input
1X	—	Not Used

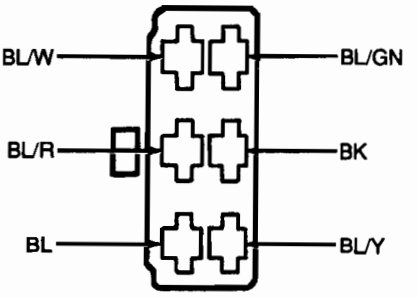
TQ3240A



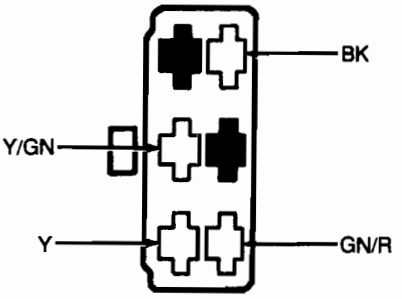
A/C CONTROL SWITCH L8258-A



A/C CONTROL MODULE L8259-A



BLOWER MOTOR CONTROL SWITCH L8260-A



COOLING FAN RELAY L8261-A

System Inspection—Air Conditioning System

1. Visually inspect the components of the air conditioning system.

DIAGNOSIS AND TESTING (Continued)

VISUAL INSPECTION CHART

Mechanical	Electrical

• Drive Belt Integrity
• Compressor Clutch Slippage
• Compressor Clutch Sluggish Response or Excessive Wear
• Air Circulation
• A/C Operation Check (with Blower ON, A/C Switch Depressed)
• Engine Cooling Fan Operation
	• Blown Fuses:
	  • 15 amp AIR COND
	  • *COOLING FAN
	• Popped Out (Unset) HEATER Circuit Breaker (Needs to be Reset)
	• Damage to Wiring Harness
	• Loose or Corroded Connectors.
	• Erratic Blower Motor Control

* 20 amp on non-turbo manual, 25 amp on all other applications.

2. Move and flex the A/C circuit wiring or harnesses wherever accessible to detect malfunctions due to looseness, corrosion, or other damage.
3. In checking the compressor clutch, verify that the clutch engages instantly and brings the compressor up to speed immediately without any perceptible slippage.
4. If an obvious cause for malfunction can be found, correct the cause of malfunction if possible, before proceeding further.
5. If the cause for malfunction is not visually evident, determine condition and refer to the condition chart.

A/C Performance Test

1. Connect the manifold gauge set.
2. Run the engine at 2000 rpm.
3. Turn the A/C on.
4. Turn the blower on high.
5. Recirc/fresh air lever on recirculation.
6. Open windows.
7. Place a thermometer in the center console duct.
8. Place a thermometer in the blower inlet under the RH side of the dash.
9. Wait 5-10 minutes for the A/C system to stabilize.
10. The high-pressure gauge should read 1372-1517 kPa (199-220 psi) (if too low, cover the condenser; if too high, spray water through the condenser). If the pressure cannot be brought within specification, record the pressure once it stabilizes and proceed to the condition chart.
11. Determine the temperature difference between the air inlet and the center console duct.

CONDITION CHART—AIR CONDITIONING SYSTEM

CONDITION	POSSIBLE SOURCE	ACTION
• No Cooling or Insufficient Cooling	• Clutch condition. • Drive belt tension and condition. • Moisture, air, excessive oil or refrigerant in system. • Compressor. • Thermostatic expansion valve. • Insufficient refrigerant. • Leaks. • Clogged refrigerant circulation system. • Blocked evaporator or condenser. • Circuit.	• Inspect, service as required. Go to **A1.**
• Intermittent Cooling	• Clutch slipping. • Drive belt tension and condition. • Thermostatic expansion valve. • Excessive moisture in system. • Insufficient refrigerant. • Compressor clutch circuit.	• Inspect, service as required. Go to **A1.** • Go to **B2.**
• No Compressor Clutch Operation	• Circuit. • Fuses. • Clutch cycling pressure switch. • Clutch condition. • Belt tension and condition. • Thermostatic switch.	• Go to **B2.**
• Blows Frost Out of Ducts (After Several Minutes of Operation)	• Plugged evaporator drain. • Excessive refrigerant. • Thermistor.	• Clear blockage. • Go to **A2.** • Go to **B24.**
• Compressor Engaged, Compressor Runs Constantly (No Cycling)	• WAC relay. • Circuit. • Thermistor.	• Go to **B1.** • Go to **B24.**

DIAGNOSIS AND TESTING (Continued)

CONDITION CHART—AIR CONDITIONING SYSTEM (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Improper Blower Motor Operation	• Motor • Circuit. • Blower motor resistor. • Blower motor control switch.	• Refer to Pinpoint Test D—Heating and Defrosting System.
• Condenser Fan Runs Constantly	• Condenser fan relay. • Circuit. • Condenser fan motor.	• Go to **C2.**
• Condenser Fan Never Runs	• Fuse. • Circuit. • Condenser fan relay. • Condenser fan motor.	• Go to **C2.**

PINPOINT TEST A—AIR CONDITIONING SYSTEM PRESSURE

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	CHECK SYSTEM INTEGRITY		
	• Inspect A/C system hoses and plumbing for signs of wear, leaks, cracks, loose connectors or other damage. • Inspect compressor clutch for signs of leaks (oil or refrigerant residue present on compressor case). • Inspect drive belt for proper tension condition and signs of wear. • **Does system appear to be in good condition?**	Yes ▶ No ▶	GO to **A2.** SERVICE or REPLACE damaged components as required.
A2	CHECK SYSTEM PRESSURES		
	• Connect a manifold set to the A/C system. • Key ON, engine idling at 2000 rpm. • Blower on high. • A/C ON, temperature blend lever to extreme left (cool position). • Wait 5 minutes for system to stabilize. • Observe the gauges and feel the temperatures of the suction and pressure lines near the compressor. • Look for built up condensation on the A/C plumbing near the compressor and receiver/drier. • Compare gauge readings and system temperatures to the following charts.		

DIAGNOSIS AND TESTING (Continued)

CHECK SYSTEM PRESSURES — Continued

Gauge Reading	Pressure Side Plumbing (High)	Suction Side Plumbing (Low)	Sight Glass	Possible Source	Action To Take
HI: 199-220 psi LO: 19-25 psi	Warm and dry	Cool and dry	Bubbles only after shut-off	Normal operation.	RETURN to condition chart.
HI: 114-128 psi LO: 0-12 psi (too low)	Warm and dry	Warm and dry	Bubbles all the time Never bubbles	Insufficient refrigerant. Empty system.	TEST for leaks. EVACUATE and RECHARGE system.
HI: 235-280 psi LO: 34-44 psi (too high)	Warm and dry	Cool and dry	No bubbles after shut-off	Excessive refrigerant. System oil level too low. Condenser obstruction. Condenser fan not operating.	EVACUATE and RECHARGE. Put in proper amount of oil. Clear obstruction. RETURN to condition chart.
HI: 260-290 psi (too high) LO: 25-35 psi (too high)	Warm	Heavy dew or frost build-up	No bubbles after shut-off	Expansion valve stuck open. Heat sensing bulb improperly installed.	SERVICE or REPLACE expansion valve as required. Reinstall properly.
HI: 270-330 psi (too high) LO: 25-35 psi	Warm	Warm		Air in system. Oil contamination.	EVACUATE and RECHARGE, if same symptom is present after recharge, SERVICE or REPLACE receiver/drier.

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CHECK SYSTEM PRESSURES — Continued

Gauge Reading	Pressure Side Plumbing	Suction Side Plumbing	Possible Source	Action To Take
HI: Fluctuates LO: Fluctuates between vacuum and normal pressure	Warm	Fluctuates between cool and warm	Moisture in system	EVACUATE, SERVICE or REPLACE expansion valve and receiver / drier. RECHARGE system.
HI: 70-150 psi (too low) LO: Vacuum (too low)	Warm	Frost or dew on new expansion valve	Dirt or moisture in system is blocking expansion valve or equalizer tube.	EVACUATE, SERVICE or REPLACE expansion valve and receiver / drier. RECHARGE system.
HI: 70-150 psi (too low) LO: 25-35 psi (too high)	Warm	Warm	Damaged compressor.	SERVICE or REPLACE compressor as outlined.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B—AIR CONDITIONING SYSTEM

TEST STEP		RESULT ▶	ACTION TO TAKE
B1	CHECK SYSTEM INTEGRITY		
	• Check for fully charged battery. • Check for blown fuses, corrosion, poor electrical connections, signs of opens, shorts or damage to the wiring harness. NOTE: If a blown fuse is replaced and fails immediately, there is a short to ground in the system. • Key ON, engine idling. • A/C ON. • Blower ON. • Shake the wiring harness vigorously and look for signs of opens or shorts. • Tap each connector and look for signs of bad connections. • **Does system appear to be in good condition?**	Yes ▶ No ▶	GO to **B2.** SERVICE or REPLACE damaged components as required.
B2	CHECK FOR CLUTCH VOLTAGE		
	• Engine ON. • A/C ON, blower ON. • Measure voltage on the BK/W wire at the compressor clutch connector. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **B3.** GO to **B4.**
B3	CHECK CLUTCH RESISTANCE		
	• Key OFF, A/C OFF. • Allow engine to cool. • Disconnect compressor clutch connector. • Measure resistance between compressor clutch connector (clutch side) and compressor clutch case. • **Is resistance between 2.7 and 3.5 ohms?**	Yes ▶ No ▶	CHECK condition of drive belt, clutch material and compressor. SERVICE as required. SERVICE compressor clutch ground. If all OK, REPLACE compressor clutch.
B4	CHECK FOR SHORT IN CLUTCH WIRE		
	• Key OFF. • Disconnect compressor clutch and WAC relay. • Measure resistance between BK/W wire at WAC relay connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE BK/W wire from WAC relay to compressor clutch. GO to **B5.**
B5	CHECK COMPRESSOR CLUTCH WIRE		
	• Key OFF. • Disconnect compressor clutch and WAC relay. • Measure resistance of BK/W wire between WAC relay and compressor clutch. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **B6.** SERVICE BK/W wire.
B6	CHECK FOR VOLTAGE FROM WAC RELAY		
	• Engine idling. • A/C ON, blower ON. • Measure voltage on BK/W wire at WAC relay. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **B12.** GO to **B7.**
B7	CHECK HEATER CIRCUIT BREAKER		
	• Locate interior fuse panel. • Check 30 amp heater circuit breaker. • **Is the reset button on circuit breaker sticking out?**	Yes ▶ No ▶	GO to **B8.** GO to **B9.**
B8	CHECK SYSTEM		
	• Push in reset button on the heater circuit breaker. • Key ON. • **Did reset button pop out again?**	Yes ▶ No ▶	SERVICE the BL wire at the interior fuse panel for a short to ground. GO to **B9.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B—AIR CONDITIONING SYSTEM (Continued)

	TEST STEP	RESULT ▶	ACTION TO TAKE
B9	CHECK IN-LINE COOLER FUSE		
	• Check 15 amp in-line COOLER fuse. • **Is fuse OK?**	Yes ▶ No ▶	GO to **B11.** GO to **B10.**
B10	CHECK SYSTEM		
	• Replace 15 amp in-line COOLER fuse. • Key ON. • **Does fuse fail again?**	Yes ▶ No ▶	SERVICE BL wire between the in-line fuse and WAC relay for a short to ground. GO to **B11.**
B11	CHECK FOR VOLTAGE TO WAC RELAY		
	• Key ON. • Measure voltage on BL wire at the WAC relay connector. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **B12.** SERVICE BL wire.
B12	CHECK FUSE		
	• Check 15 amp AIR COND fuse. • **Is fuse OK?**	Yes ▶ No ▶	GO to **B15.** GO to **B13.**
B13	CHECK SYSTEM		
	• Replace 15 amp AIR COND fuse. • Key ON. • **Does fuse fail again?**	Yes ▶ No ▶	GO to **B14.** GO to **B15.**
B14	CHECK FOR SHORT(S) TO GROUND		
	• Key OFF. • Locate and disconnect interior fuse panel connector. • Locate and disconnect following components: — A/C switch — WAC relay — Condenser fan motor — Condenser fan relay • Measure resistance between the BL wire at the interior fuse panel connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE BL wire(s) for short(s) to ground. GO to **B15.**
B15	CHECK POWER SUPPLY TO WAC RELAY		
	• Key ON. • Measure voltage on BL/BK wire at the connector. • **Is voltage greater than 10 volts?** NOTE: The BL/BK wire changes to a BL wire at a splice before the interior fuse panel (See electrical schematic).	Yes ▶ No ▶	GO to **B16.** SERVICE BL/BK wire between the interior fuse panel and WAC relay.
B16	CHECK WAC RELAY OPERATION		
	• Key ON. • Ground the W wire at WAC relay with a jumper wire. • Measure voltage on BK/W wire at WAC relay. • **Is voltage greater than 10 volts with W wire grounded and less than 1 volt with W wire open?**	Yes ▶ No ▶	GO to **B17.** REPLACE WAC relay.
B17	CHECK VOLTAGE TO PCM		
	• Locate and disconnect PCM connector. • Key ON. • Measure voltage on W wire at PCM connector. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **B18.** SERVICE W wire between WAC relay and PCM.
B18	CHECK FUSE		
	• Check 20 amp COOLING FAN fuse. • **Is fuse OK?**	Yes ▶ No ▶	GO to **B21.** GO to **B19.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B—AIR CONDITIONING SYSTEM (Continued)

TEST STEP		RESULT	ACTION TO TAKE
B19	CHECK SYSTEM		
	• Replace COOLING FAN fuse[1]. • Key ON. • Check fuse. • **Did the fuse fail again?**	Yes ▶ No ▶	GO to **B20.** GO to **B21.**
B20	CHECK FOR SHORT TO GROUND		
	• Key OFF. • Locate and disconnect the interior fuse panel connector. • Locate and disconnect the cooling fan motor and A/C control module. • Measure the resistance between the Y wire at the interior fuse panel connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE Y wire(s). GO to **B21.**
B21	CHECK POWER SUPPLY TO A/C CONTROL MODULE		
	• Disconnect A/C control module connector. • Key ON, A/C OFF. • Measure voltage on Y wire at A/C control module connector. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **B22.** SERVICE Y wire between the interior fuse panel and A/C control module.
B22	CHECK A/C CONTROL MODULE OPERATION		
	• Checks are made at harness side of the A/C control module connector with module connected. • Check A/C control module voltages as listed below with:	Yes ▶ No ▶	GO to **B23.** REPLACE A/C control module.

Key ON, A/C OFF: Blower OFF:	Key ON, A/C OFF: Blower ON:
R: Greater than 10V	2.2V
Y: Greater than 10V	Greater than 10V
GN: Greater than 10V	1.5V
W/BL: Greater than 10V	3.3V
W/BL: Greater than 10V	3.3V
Y/GN: Greater than 10V	1.5V

	• **Are measured voltages correct?**		
B23	CHECK WIRE TO A/C SWITCH AND CONDENSER FAN RELAY		
	• Key OFF. • Disconnect A/C switch, A/C control module and condenser fan relay. • Measure resistance between GN wire at A/C control module to A/C switch and condenser fan relay. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **B24.** SERVICE GN wire(s) in question.
B24	CHECK THERMISTOR CIRCUIT		
	• Key OFF. • Disconnect A/C control module and thermistor. • Measure resistance of each wire between A/C control module and thermistor. Two W/BL wires. One Y/GN wire. • **Is resistance less than 5 ohms on each wire?**	Yes ▶ No ▶	GO to **B25.** SERVICE each wire between A/C control module and thermistor as required.

1 20 amp on non-turbo manual, 25 amp on all other applications.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B—AIR CONDITIONING SYSTEM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B25	CHECK THERMISTOR		
	• Remove thermistor. • Measure resistance between W/BL and Y/GN wire terminals on the thermistor. • Apply liquid freon or other cooling liquid to sensing bulb on switch to bring temperature of the sensing bulb below 32°F. • **Is resistance less than 1,500 ohms with sensing bulb warm (above 77°F) and more than 4,500 ohms with sensing bulb cold (32°F or below)?**	Yes ▶ No ▶	GO to **B26.** REPLACE thermistor.
B26	CHECK POWER SUPPLY TO A/C SWITCH		
	• Disconnect A/C switch. • Key ON. • Measure voltage on BL/BK wire at A/C switch connector. • **Is reading greater than 10 volts?**	Yes ▶ No ▶	GO to **B27.** SERVICE the BL/BK wire.
B27	CHECK A/C SWITCH OPERATION		
	• Key ON, A/C ON. • Check A/C switch voltages at harness side of connector with: **Key ON, A/C ON: Blower ON:** — GN: Less than 2V; BL/BK: Greater than 10V; BL/Y: Less than 1V **Key ON, A/C OFF: Blower OFF:** — Greater than 10V; Greater than 10V; Greater than 10V • **Are measured voltages the same?**	Yes ▶ No ▶	GO to **B28.** REPLACE A/C switch.
B28	CHECK WIRE TO BLOWER MOTOR CONTROL SWITCH AND BLOWER MOTOR RESISTOR		
	• Key OFF. • Measure resistance of BL/Y wire(s) between A/C switch, blower motor control switch and blower motor resistor. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **B29.** SERVICE BL/Y wire(s) in question.
B29	CHECK WIRE BETWEEN A/C CONTROL MODULE AND CLUTCH CYCLING PRESSURE SWITCH		
	• Key OFF. • Disconnect clutch cycling pressure switch and A/C control module connectors. • Measure resistance of R wire between clutch cycling pressure switch connector and A/C control module connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **B31.** SERVICE the R wire.
B30	CHECK CLUTCH CYCLING PRESSURE SWITCH		
	• Connect a manifold set to the service gauge port valves. • Disconnect the clutch cycling pressure switch connector. • Measure resistance between R wire terminals of the clutch cycling pressure switch. • **Is resistance less than 5 ohms when the system high side pressure is above 206 ± 20 kPa (30 ± 3 psi)?**	Yes ▶ No ▶	GO to **B31.** REPLACE clutch cycling pressure switch. NOTE: If high side pressure is below 206 ± 20 kPa (30 ± 3 psi) CHECK refrigerant system. REFER to test step **A1.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST B—AIR CONDITIONING SYSTEM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
B31	CHECK WIRE BETWEEN CLUTCH CYCLING PRESSURE SWITCH AND PCM		
	• Key OFF. • Disconnect PCM and clutch cycling pressure switch. • Measure resistance of R wire between clutch cycling pressure switch and PCM. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	REFER to Powertrain Control / Emissions Diagnosis Manual[2] for diagnosis of the PCM. SERVICE R wire.

PINPOINT TEST C—CONDENSER FAN SYSTEM

TEST STEP		RESULT ▶	ACTION TO TAKE
C1	SYSTEM INTEGRITY CHECK		
	• Check for fully charged battery. • Check for blown fuses, corrosion, poor electrical connections, signs of opens, shorts or damage to the wiring harness. NOTE: If a blown fuse is replaced and fails immediately there is a short to ground in the circuit. • Key ON, engine idling. • A / C ON. • Blower ON. • Shake wiring harness vigorously from the condenser fan motor to the condenser fan relay and the refrigerant pressure switch. Look for signs of opens or shorts. • Tap each connector and look for signs of bad connections. • **Does system appear to be in good condition?**	Yes ▶ No ▶	GO to **C2.** SERVICE or REPLACE damaged components as required.
C2	CHECK FUSE		
	• Check 15 amp AIR COND fuse. • **Is fuse OK?**	Yes ▶ No ▶	GO to **C5.** GO to **C3.**
C3	CHECK SYSTEM		
	• Replace 15 amp AIR COND fuse. • Key ON. • **Does fuse fail again?**	Yes ▶ No ▶	GO to **C4.** GO to **C5.**
C4	CHECK FOR SHORT(S) TO GROUND		
	• Locate and disconnect the interior fuse panel connector. • Locate and disconnect the condenser fan motor, condenser fan relay, WAC relay, and A / C Switch connectors. • Measure the resistance between the BL wire at the interior fuse panel connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE the BL wire(s) in question. GO to **C5.**
C5	CHECK FUSE		
	• Check COOLING FAN fuse[3]. • **Is fuse OK?**	Yes ▶ No ▶	GO to **C8.** GO to **C6.**
C6	CHECK SYSTEM		
	• Replace COOLING FAN fuse[3]. • Key ON. • **Does fuse fail again?**	Yes ▶ No ▶	GO to **C7.** GO to **C8.**

2 Can be purchased as a separate item.
3 20 amp on non-turbo manual, 25 amp on all other applications.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST C—CONDENSER FAN SYSTEM (Continued)

	TEST STEP	RESULT ▶	ACTION TO TAKE
C7	CHECK FOR SHORT(S) TO GROUND • Locate and disconnect the interior fuse panel connector. • Locate and disconnect the A/C control module and cooling fan motor connectors. • Measure the resistance between the Y wire at the interior fuse panel connector and ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE the Y wire(s). GO to **C8.**
C8	CHECK POWER SUPPLY TO CONDENSER FAN MOTOR • Key ON. • Measure voltage on BL wire at condenser fan motor. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **C9.** SERVICE BL wire between condenser fan motor and interior fuse panel.
C9	CHECK POWER SUPPLY TO CONDENSER FAN RELAY • Key ON. • Measure voltage on BL/BK wire at condenser fan relay connector. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **C10.** SERVICE BL/BK wire between condensor fan relay and interior fuse panel.
C10	CHECK CONDENSER FAN RELAY CONTROL CIRCUIT • Key OFF. • Disconnect A/C control module, condenser fan relay, and A/C switch. • Measure resistance of GN wire between each of the above components. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **C11.** SERVICE GN wire(s) in question.
C11	CHECK CONDENSER FAN MOTOR OPERATION • Key OFF. • Disconnect condenser fan motor. • Apply 12 volts to BL wire terminal at the condenser fan motor. • Ground GN/R wire terminal at the condenser fan motor. • **Does the condenser fan motor run?**	Yes ▶ No ▶	GO to **C12.** REPLACE condenser fan motor.
C12	CHECK WIRE TO CONDENSER FAN RELAY • Key ON. • Disconnect condenser fan relay. • Measure resistance of GN/R wire between condenser fan relay and condenser fan motor. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **C13.** SERVICE GN/R wire.
C13	CHECK CONDENSER FAN RELAY GROUND (CONDENSER FAN MOTOR) • Disconnect condenser fan relay connector. • Measure resistance between BK wire at the condenser fan relay connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **C14.** SERVICE BK wire.
C14	CHECK CONDENSER FAN RELAY • Disconnect condenser fan relay. • Measure resistance between GN/R wire terminal and BK wire terminal of relay. • **Is resistance greater than 10,000 ohms?** • Apply 12 volts to BL/BK wire terminal and ground GN wire terminal. • Measure resistance between GN/R terminal and BK terminal. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	RETURN to condition chart. REPLACE condenser fan relay.

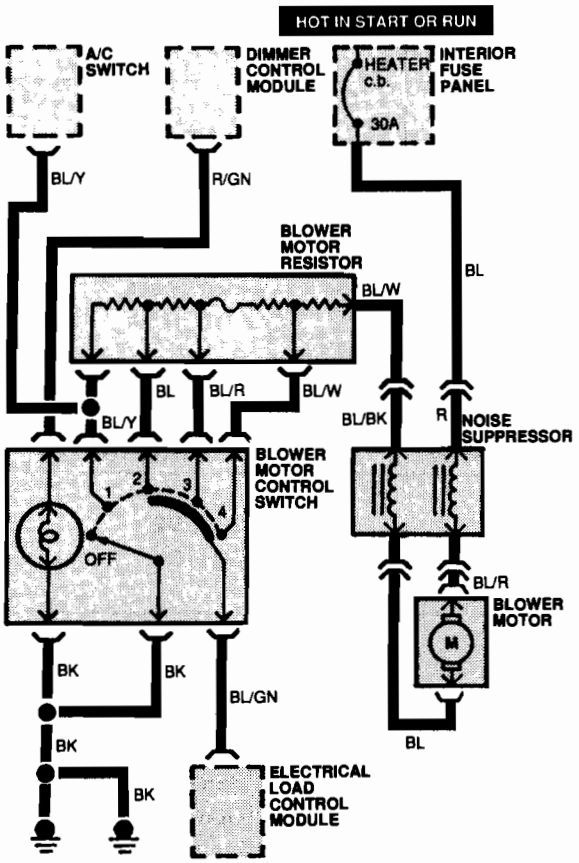
DIAGNOSIS AND TESTING (Continued)

CONDITION CHART—HEATING SYSTEM MECHANICAL DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Insufficient, Erratic, or No Heat or Defrost	• Low coolant due to coolant leaks.	• Fill system to proper level. Pressure test system and radiator cap. Service as required. Refer to Section 03-03.
	• Engine overheating.	• Check water pump drive belt. Refer to Section 03-03. • Remove debris from radiator and / or condenser cooling fins. • Check electric cooling fan motor for proper operation. Refer to Section 03-03. • Check thermostat for proper operation. Refer to Section 03-03. • Check water pump for damage or restricted cooling system or heater core. Refer to Section 03-03.
	• Blocked air inlet. • Heater flaps sticking or inoperative.	• Check air inlet for leaves, etc. Clean as required. • Check heater control unit operation. Service as required. • Check cable operation. Service as required. • Disconnect cable(s). Check control unit and flap operation. Service as required.
• Air Comes Out Defroster Outlet Only, or Air Distribution Not Controllable	• Cables disconnected or out of adjustment.	• Inspect control unit and cables. Service as required as outlined.
• Vent System Leaks Air When in OFF Position	• Vent / Recirc. door not sealing.	• Check door for obstructions, damaged seal. Service as required. • Check control cable for proper adjustment and operation. Service as required.

DIAGNOSIS AND TESTING (Continued)

Electrical Schematic—Heating and Defrosting System



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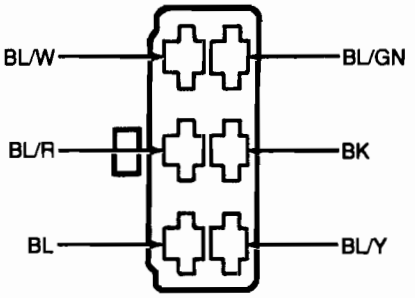
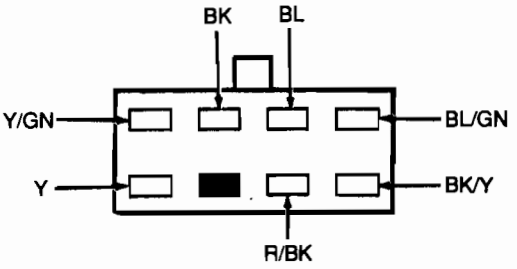
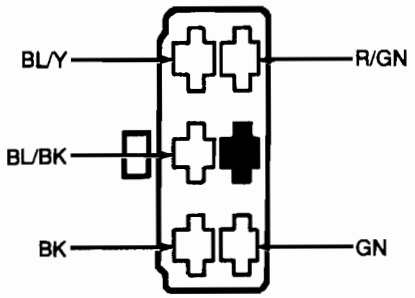


BLOWER MOTOR CONTROL SWITCH L8260-A



ELECTRICAL LOAD CONTROL MODULE L8264-A



A/C CONTROL SWITCH L8258-A

System Inspection—Heating and Defrosting System

12. Visually inspect the components of the heating and defrosting system.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Coolant Level • Heater Hose (Kinked, Pinched, Leaking) • Air Movement (Ducts Blocked or Leaking) • Blower Motor Inlet Blocked • Air Distribution Door(s) Adjustment • Control Levers and Linkage Movement • Cable Freedom and Adjustment	• Popped Out (Unset) HEATER Circuit Breaker (Needs to be Reset) • Damage to Wiring Harness • Loose or Corroded Connectors • Damaged Blower Motor Resistor • Damaged Blower Motor Control Switch

2. If fault is not visually evident, verify condition and refer to the following condition chart.

CONDITION CHART—HEATING AND DEFROSTING SYSTEM

CONDITION	POSSIBLE SOURCE	ACTION
• Blower Motor Does Not Operate	• Circuit breaker. • Blower motor resistor. • Blower motor. • Blower motor control switch. • Circuit.	• Go to **D1.** • Go to **D7.** • Go to **D5.** • Go to **D12.** • Go to **D4.**
• Blower Motor Runs Constantly	• Blower motor resistor. • Blower motor control switch. • Circuit.	• Go to **D7.** • Go to **D12.** • Go to **D4.**

DIAGNOSIS AND TESTING (Continued)

CONDITION CHART—HEATING AND DEFROSTING SYSTEM (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Blower Motor Does Not Run in All Speeds	• Blower motor resistor. • Blower motor control switch. • Circuit.	• Go to **D7.** • Go to **D12.** • Go to **D4.**
• Intermittent Blower Motor Operation	• Blower motor resistor • Blower motor control switch. • Circuit	• Go to **D7.** • Go to **D12.** • Go to **D4.**
• Improper Air Circulation (Air Comes Out of Wrong Duct)	• Temperature control levers. • Temperature control cables. • Air distribution doors.	• Go to **E2.** • Go to **E1.** • Go to **E2.**
• No Heat (Blower Motor Functioning Properly)	• Coolant level. • Heater hoses. • Engine thermostat. • Heater core. • Temperature blend cable.	• Visually inspect level. • Visually inspect hoses. • Go to **F1.** • Go to **F2.** • Go to **F4.**

PINPOINT TEST D—HEATING AND DEFROSTING SYSTEM

TEST STEP		RESULT ▶	ACTION TO TAKE
D1	CHECK HEATER CIRCUIT BREAKER		
	• Locate interior fuse panel. • Check 30 amp HEATER circuit breaker. • **Is reset button on the circuit breaker sticking out?**	Yes ▶ No ▶	GO to **D2.** GO to **D4.**
D2	CHECK SYSTEM		
	• Push in the reset button on HEATER circuit breaker. • Key ON. • **Did reset button pop out?**	Yes ▶ No ▶	GO to **D3.** GO to **D4.**
D3	CHECK FOR SHORT TO GROUND		
	• Key OFF. • Disconnect positive battery cable. • Locate and disconnect interior fuse panel connector. • Locate and disconnect the blower motor. • Measure resistance between BL wire at the interior fuse panel connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE BL wire. GO to **D4.**
D4	CHECK SUPPLY TO BLOWER MOTOR		
	• Disconnect blower motor connector. • Key ON. • Measure voltage on BL/R wire at blower motor connector. • **Is voltage greater than 10 volts?** NOTE: Refer to electrical schematic for noise suppressor in circuit. If there is no voltage on the BL/R wire at the blower motor connector, check for voltage (greater than 10 volts) on BL wire at the noise supressor connector. If there is proper voltage at the noise supressor connector, REPLACE noise supressor. If not, SERVICE the BL wire between noise supressor and interior fuse panel.	Yes ▶ No ▶	GO to **D5.** SERVICE circuit between the interior fuse panel and blower motor. Refer to note.
D5	CHECK BLOWER MOTOR		
	• Key OFF. • Disconnect blower motor connector. • Apply 12 volts to BL/R wire terminal on the blower motor. • Ground BL wire. • **Does blower motor run?**	Yes ▶ No ▶	GO to **D6.** REPLACE blower motor.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D—HEATING AND DEFROSTING SYSTEM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
D6	CHECK CIRCUIT TO BLOWER MOTOR RESISTOR		
	• Locate noise supressor connector. • Measure resistance between the BL wire at the blower motor connector and the BL / W wire at the noise supressor connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **D7.** REPLACE the noise supressor.
D7	CHECK BLOWER MOTOR RESISTOR		
	NOTE: The BL / W wire in the electrical schematic is "hard-wired" to the blower motor resistor. • Measure resistance from the BL / W wire at the noise supressor connector to the following wires at the blower motor resistor connector:	Yes ▶ No ▶	GO to **D8.** REPLACE blower motor resistor.

WIRE	RESISTANCE
BL / Y	2.6 ohms
BL	1.2 ohms
BL / R	.6 ohms
BL / W	.1 ohms

	• **Are resistances correct?**		
D8	CHECK WIRES TO BLOWER MOTOR CONTROL SWITCH		
	• Locate blower motor control switch connector. • Measure resistance of the following wires between the blower motor resistor and the blower motor control switch:	Yes ▶ No ▶	GO to **D9.** SERVICE wire(s) in question.

WIRE
BL / Y
BL
BL / R
BL / W

	• **Are resistances less than 5 ohms?**		
D9	CHECK WIRE TO A / C SWITCH		
	• Locate A / C switch connector. • Measure resistance of the BL / Y wire between the A / C switch and the blower motor control switch. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **D10.** SERVICE BL / Y wire.
D10	CHECK WIRE TO ELECTRICAL LOAD CONTROL MODULE		
	• Measure resistance of the BL / GN wire between blower motor control switch and the electrical load control module. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **D11.** SERVICE BL / GN wire.
D11	CHECK BLOWER MOTOR CONTROL SWITCH GROUND		
	• Measure resistance between the BK wire at the blower motor control switch and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **D12.** SERVICE BK wire.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST D—HEATING AND DEFROSTING SYSTEM (Continued)

TEST STEP	RESULT ▶	ACTION TO TAKE
D12 CHECK BLOWER MOTOR CONTROL SWITCH		
• Disconnect blower motor control switch. • Measure resistance between the BK wire (terminal) and the wire colors (terminals) listed below at the following switch positions:	Yes ▶ No ▶	RETURN to the condition chart. REPLACE blower motor control switch.

SWITCH POSITION	WIRE COLOR	RESISTANCE
OFF	All Colors	Greater than 10,000 ohms
1	BL/Y	Less than 5 ohms
	All Others	Greater than 10,000 ohms
2	BL BL/GN	Less than 5 ohms
	All Others	Greater than 10,000 ohms
3	BL/R BL/GN	Less than 5 ohms
	All Others	Greater than 10,000 ohms
4	BL/W BL/GN	Less than 5 ohms
	All Others	Greater than 10,000 ohms

• Reconnect blower motor control switch.
• **Are resistances correct?**

PINPOINT TEST E—VENTILATION AIR FLOW SYSTEM

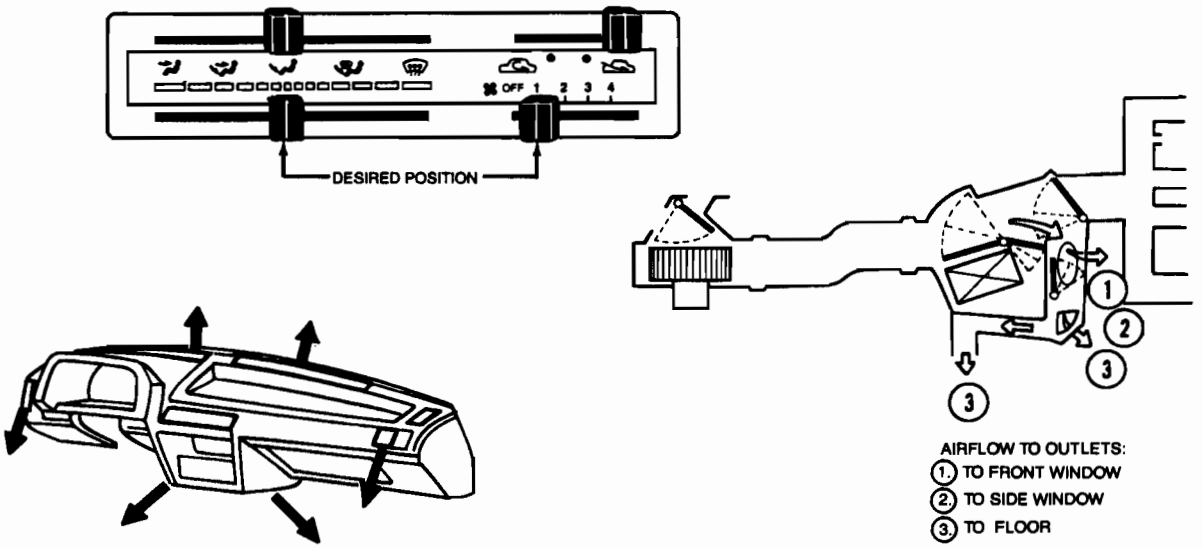
TEST STEP	RESULT ▶	ACTION TO TAKE
E1 CHECK CABLE OPERATION		
• Locate control panel. • Slide temperature control lever, air intake control lever and the air flow control lever back and forth. • **Do levers slide smoothly?**	Yes ▶ No ▶	GO to **E2.** CHECK control panel and cables for damage, SERVICE/REPLACE as required.
E2 CHECK AIR FLOW SELECTOR SYSTEM FUNCTION		
• With ignition switch ON and the blower control switch set to position 4 for maximum air flow, change the position settings of the air flow selector. Verify that they conform to the specified air flow patterns as listed.	Yes ▶ No ▶	GO to **E3.** SERVICE, ADJUST, or REPLACE the heater or its outlet door or components as required.

Air Flow Selector Position	Specified Air Flow Pattern (Exit Locations Shown)
Panel	Ventilator outlets
Hi-Lo	Ventilator and floor outlets
Floor	Floor outlets and small amount to defroster outlet
Mix	Floor and defroster outlets
Def	Defroster outlets

• **Do air flow patterns conform to the specified patterns for each of the tested selector positions?**

DIAGNOSIS AND TESTING (Continued)

Floor



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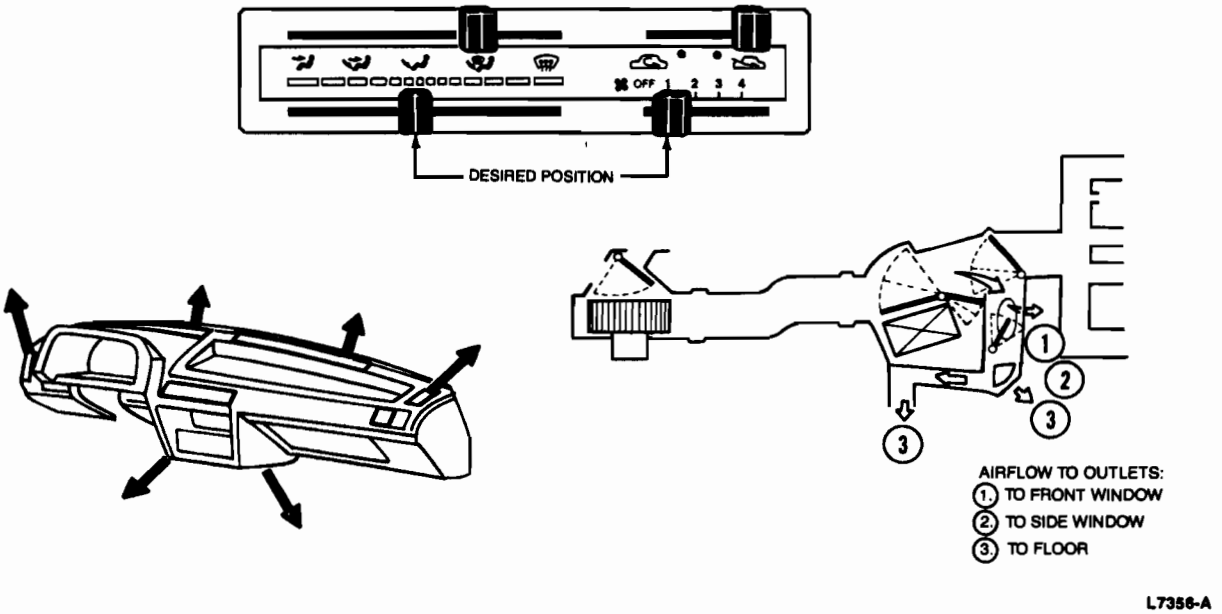
Mix



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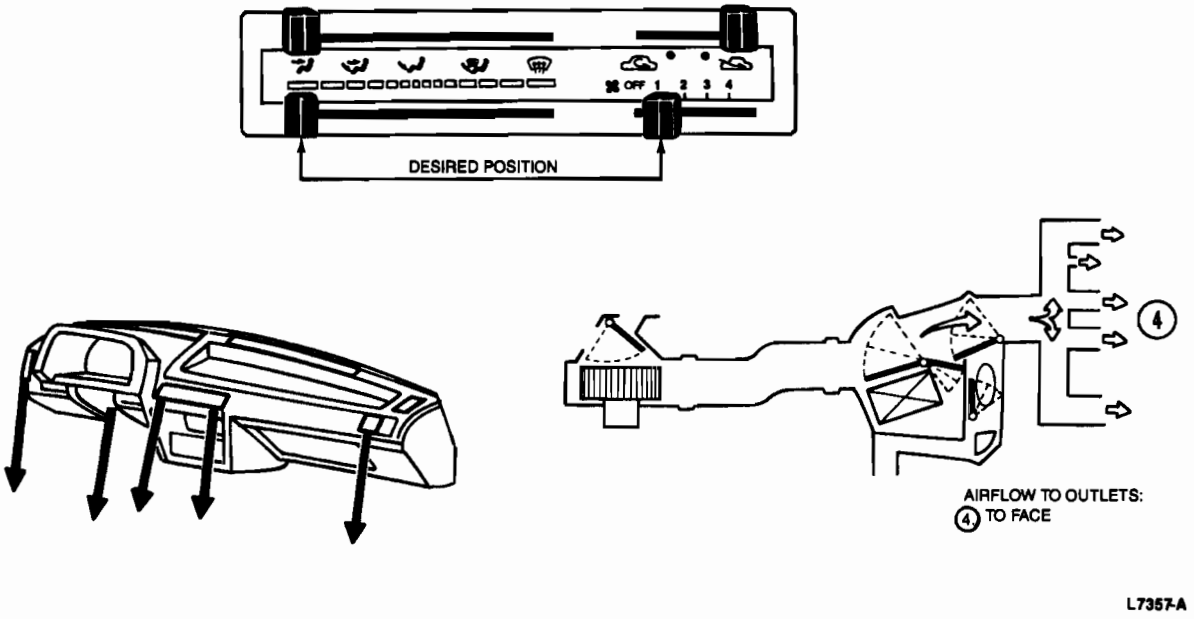
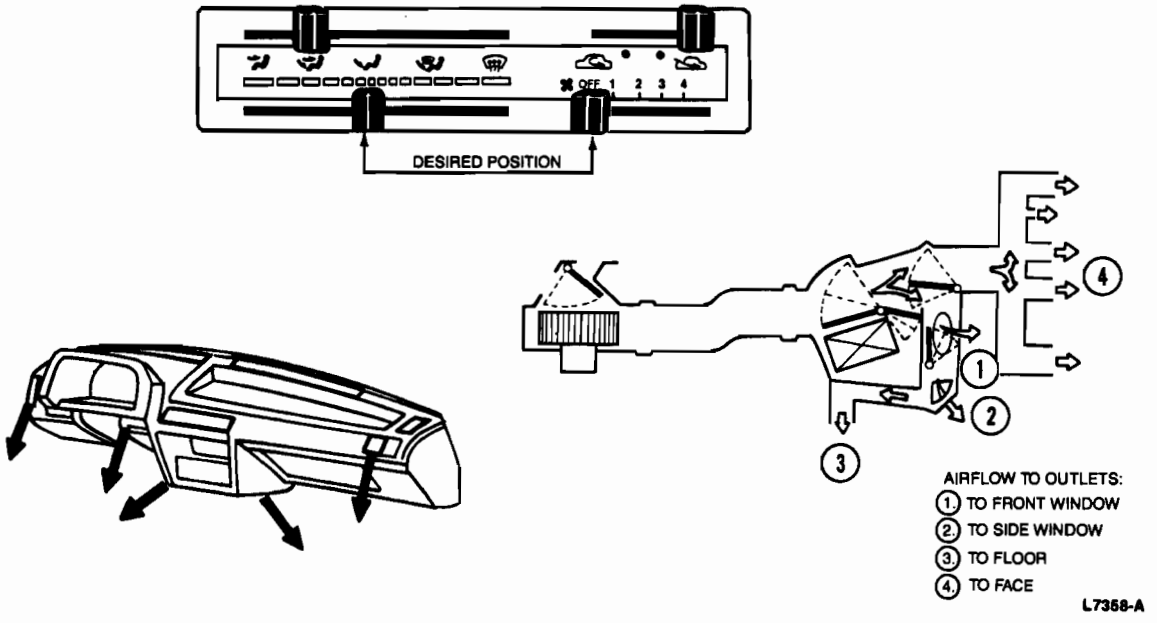
DIAGNOSIS AND TESTING (Continued)

Panel

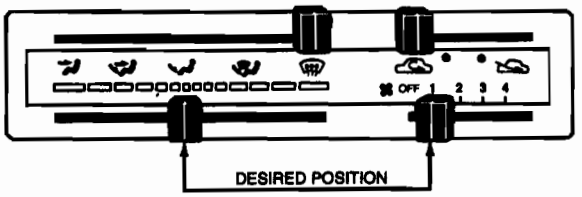


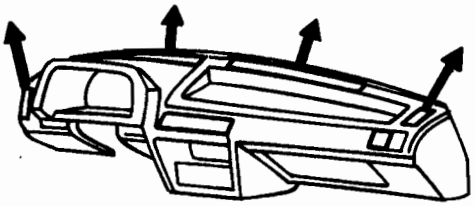
HI-Lo

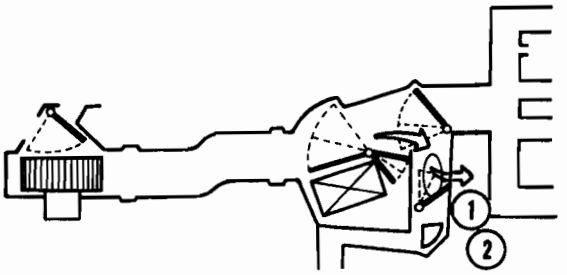


DIAGNOSIS AND TESTING (Continued)

Def







AIRFLOW TO OUTLETS:
1. TO FRONT WINDOW
2. TO SIDE WINDOW

L7359-A

PINPOINT TEST E — VENTILATION AIR FLOW (CONTINUED)

TEST STEP		RESULT ▶	ACTION TO TAKE
E3	With ignition switch ON, and the fan speed control lever set to position 4 for maximum air flow, change the selector setting from recirculation (REC) to fresh air (FRESH) and verify that the air movement conforms to the specified patterns as listed.		
		Yes ▶	RETURN to condition chart.
		No ▶	SERVICE / REPLACE blower unit, air intake control lever or linkage as required.

Air Intake Control Lever Position	Air flow Movement
REC	Air flow at REC air inlet openings under the instrument panel can be felt.
FRESH	No airflow at instrument REC air inlet openings, at instrument panel openings, nothing felt.

- **Does air flow conform to the specified patterns for each of the tested selector lever positions?**

PINPOINT TEST F — TEMPERATURE CONTROL SYSTEM

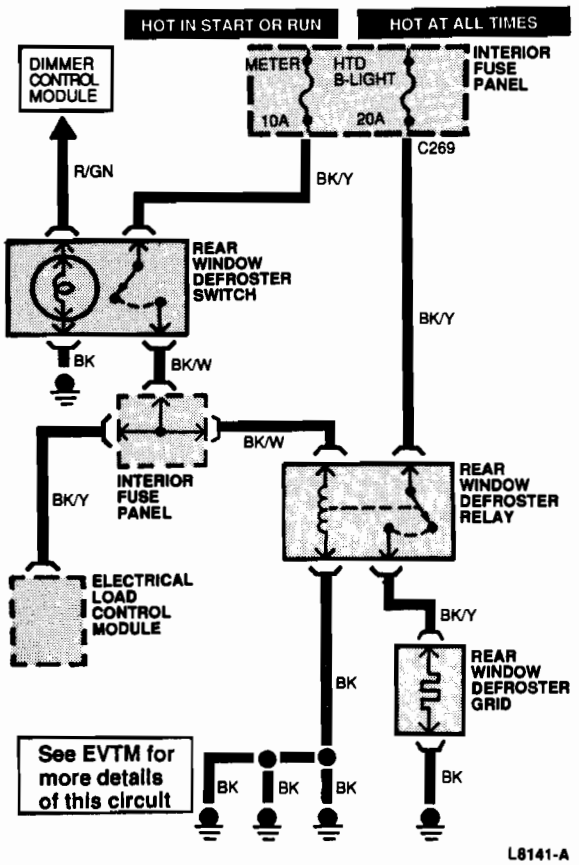
TEST STEP		RESULT ▶	ACTION TO TAKE
F1	CHECK ENGINE THERMOSTAT FUNCTION		
	• Check engine coolant level. • Start and warm up the engine until the coolant temperature stabilizes. • Verify the reported condition by checking the heater for adequate heat output (temperature blend lever to extreme right, airflow selector lever at panel, blower at position 4). • **Is heat output inadequate?**	Yes ▶ No ▶	GO to **F2.** REFER to Section 03-03.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F—TEMPERATURE CONTROL SYSTEM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
F2	CHECK HEATER CORE FOR AIR FLOW BLOCKAGE		
	• Check the heater core blower motor housing and connecting air passages for blockage (such as leaves, paper, etc.). • **Is heater core and its connecting air passages free of blockage?**	Yes ▶ No ▶	GO to **F3.** REMOVE components and clean as required.
F3	CHECK HEATER CORE FOR COOLANT BLOCKAGE		
	• Refer to Section 03-03 for the correct heater core block flush procedure. • **Is heater core free of blockage to coolant flow?**	Yes ▶ No ▶	GO to **F4.** REPLACE heater core.
F4	CHECK TEMPERATURE BLEND FUNCTION		
	• Start and warm up the engine to normal operating temperature. • Set the blower control switch to position 4. • Set the air flow selector lever to panel. • Move the temperature blend lever gradually from extreme left to extreme right and verify that the air temperature gradually increases from cold to hot. • **Does the temperature blend function properly and is the air hot with the lever at its extreme right?**	Yes ▶ No ▶	RETURN to the condition chart. ADJUST the temperature blend cable to close off all bypass air around the heater core when the temperature blend lever is set to the extreme right. REFER to adjustments.

Electrical Schematic—Rear Window Defroster System



System Inspection—Rear Window Defroster System

1. Visually inspect the components of the rear window defroster system.

VISUAL INSPECTION CHART

Mechanical	Electrical

• Damaged Rear Window Defroster Grid	• Blown Fuses:
	  • 10 amp METER
	  • 20 amp HTD B-LIGHT
	• Damage to Wiring Harness
	• Loose or Corroded Connectors
	• Damaged Rear Window Defroster Switch

2. Check the wiring harness for obvious signs of shorts, opens, bad connections or damage.
3. If fault is not visually evident, determine condition and refer to the following condition chart.

DIAGNOSIS AND TESTING (Continued)

CONDITION CHART—REAR WINDOW DEFROSTER SYSTEM

CONDITION	POSSIBLE SOURCE	ACTION
• Rear Window Defroster Not Working at All	• Fuse(s). • Rear window defroster switch. • Rear window defroster relay. • Rear window defroster grid. • Circuit.	• Go to **G1.**
• Rear Window Defroster Grid Not Working in Some Places	• Rear window defroster filament(s).	• Go to **G17.**
• Rear Window Defroster Working Indicator Lamp is Not Working	• Damaged indicator lamp.	• Refer to the diagnosis and testing procedures in Section 13-01.

PINPOINT TEST G—REAR WINDOW DEFROSTER SYSTEM

TEST STEP		RESULT ▶	ACTION TO TAKE
G1	CHECK REAR WINDOW DEFROSTER		
	• Turn ignition switch to the ON position. • Turn rear window defroster switch ON and check rear window defroster.	Rear window defroster not working at all ▶	GO to **G2.**
		Rear window defroster not working in some places ▶	GO to **G17.**
G2	CHECK REAR WINDOW DEFROSTER INDICATOR		
	• Turn rear window defroster switch ON. • Check to see that the rear window defroster switch indicator lamp comes on. • **Does the indicator lamp come on?**	Yes ▶	GO to **G6.**
		No ▶	GO to **G3.**
G3	CHECK FUSE		
	• Locate interior fuse panel. • Check the 10 amp METER fuse. • **Is fuse OK?**	Yes ▶	GO to **G6.**
		No ▶	GO to **G4.**
G4	CHECK SYSTEM		
	• Replace the 10 amp METER fuse. • Key ON. • Turn rear window defroster switch ON. • **Does fuse fail again?**	Yes ▶	GO to **G5.**
		No ▶	GO to **G6.**
G5	CHECK FOR SHORTS TO GROUND		
	• Locate and disconnect the rear window defroster switch. • Locate and disconnect the interior fuse panel connector. • Measure resistance between the BK/Y wire at the interior fuse panel connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶	SERVICE BK/Y wire between interior fuse panel and rear window defroster switch.
		No ▶	GO to **G6.**
G6	CHECK REAR WINDOW DEFROSTER SWITCH GROUND		
	• Locate and disconnect rear window defroster switch connector. • Measure resistance between the BK wire at rear window defroster switch connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶	GO to **G7.**
		No ▶	SERVICE BK wire.
G7	CHECK POWER SUPPLY TO REAR WINDOW DEFROSTER SWITCH		
	• Key ON. • Measure voltage on the BK/Y wire at the rear window defroster switch. • **Is voltage greater than 10 volts?**	Yes ▶	GO to **G8.**
		No ▶	SERVICE BK/Y wire.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST G—REAR WINDOW DEFROSTER SYSTEM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
G8	CHECK POWER ON WIRE AT REAR WINDOW DEFROSTER SWITCH		
• Key ON. • Measure voltage on the BK/W wire at the rear window defroster switch. • **Are readings OK?**		Yes ▶ No ▶	GO to **G10.** GO to **G9.**
G9	CHECK REAR WINDOW DEFROSTER SWITCH FUNCTION		
• Key OFF. • Disconnect rear window defroster switch connector. • Measure resistance between the BK/W and the BK/Y terminals on the switch. • **Are readings OK?**		Yes ▶ No ▶	SERVICE BK/W wire. REPLACE rear window defroster switch.
G10	CHECK WIRE TO REAR WINDOW DEFROSTER RELAY		
• Locate rear window defroster relay. • Key ON. • Measure voltage on the BK/W wire at the rear window defroster relay. • **Are readings OK?**		Yes ▶ No ▶	GO to **G11.** SERVICE BK/W wire.
G11	CHECK REAR WINDOW DEFROSTER RELAY GROUND		
• Key OFF. • Measure resistance between the BK wire at rear window defroster relay and ground. • **Is resistance less than 5 ohms?**		Yes ▶ No ▶	GO to **G12.** SERVICE BK wire.
G12	CHECK POWER SUPPLY TO REAR WINDOW DEFROSTER RELAY		
• Measure voltage on the BK/Y wire at the rear window defroster relay. • **Is voltage greater than 10 volts?**		Yes ▶ No ▶	GO to **G14.** GO to **G13.**
G13	CHECK FUSE		
• Locate interior fuse panel. • Check 20 amp HTD B-LIGHT fuse. • **Is fuse OK?** NOTE: If the fuse fails after replacement, check the BK/Y wire between the interior fuse panel and rear window defroster relay for a short to ground.		Yes ▶ No ▶	SERVICE BK/Y wire. REPLACE fuse.
G14	CHECK REAR WINDOW DEFROSTER RELAY		
• Disconnect rear window defroster relay. • Apply 12 volts to the BK/W terminal, and ground the BK terminal of the relay. • Measure resistance between both of the BK/Y terminals on the relay. • **Is resistance less than 5 ohms?**		Yes ▶ No ▶	GO to **G15.** REPLACE rear window defroster relay.

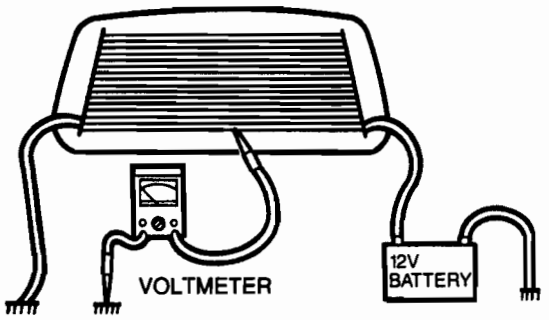
	Voltage
Defroster ON	Greater than 10 volts
Defroster OFF	Less than 1 volt

	Resistance
Switch ON	Less than 5 ohms
Switch OFF	Greater than 10,000 ohms

	Voltage
Defroster ON	Greater than 10 volts
Defroster OFF	Less than 1 volt

DIAGNOSIS AND TESTING (Continued)

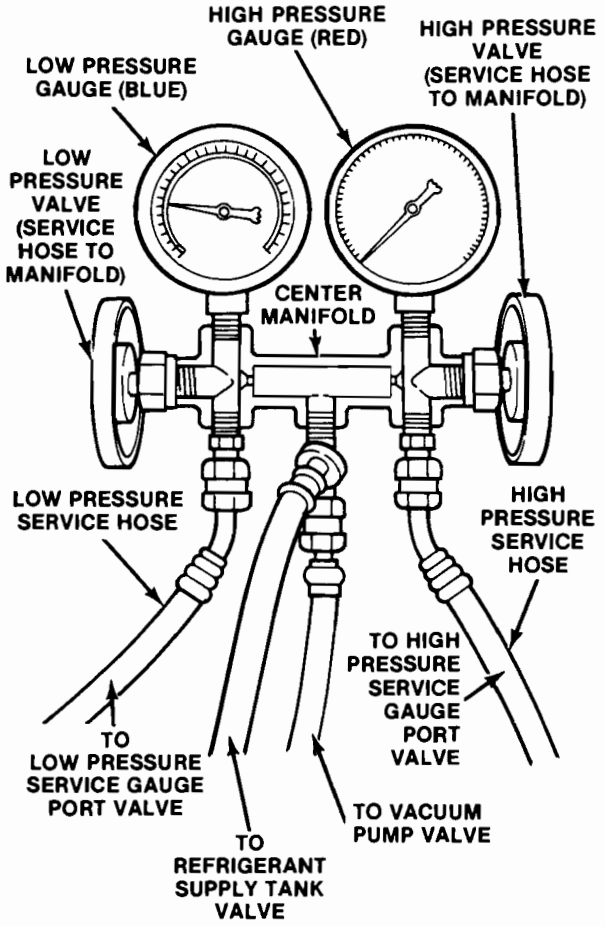
PINPOINT TEST G—REAR WINDOW DEFROSTER SYSTEM (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
G15	CHECK VOLTAGE AT REAR WINDOW DEFROSTER GRID		
	• Key ON. • Turn rear window defroster switch ON. • Measure voltage on the BK/Y wire at the rear window defroster grid connector. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	GO to **G16.** SERVICE BK/Y wire.
G16	CHECK REAR WINDOW DEFROSTER GRID GROUND		
	• Key OFF. • Measure resistance between the BK wire at the rear window defroster grid connector and ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **G17.** SERVICE BK wire.
G17	CHECK REAR WINDOW DEFROSTER FILAMENT		
	• Turn rear window defroster switch to ON position. • Check voltage at center of each filament as shown.  N9462-A	Voltmeter reads: 6V (± 1V) ▶ 12V or 0V (± 1V) ▶	GO to the next filament. SERVICE the filament being measured.

REFRIGERANT SYSTEM SERVICE

Connecting Manifold Gauge Set

1. Turn both manifold gauge set valves all the way to the right to close the high- and low-pressure hoses to the center manifold and hose. Rotunda High Side Adapter Set D81L-19703-A or Motorcraft Tool YT-354 or 355 or equivalent must be used to connect the manifold gauge set or charging station to the high-pressure service gauge port valve.



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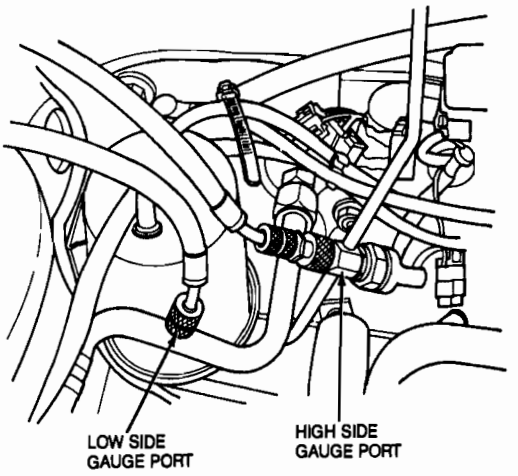
2. Remove the caps from the high- and low-pressure service (Schrader) access gauge port valves.
3. If the manifold gauge set or charging station hoses do not have valve depressing pins in them, install either Straight or Curved Adapter T71P-19703-S and -R or equivalent (which have pins) on the low- and high-pressure hoses.
4. Connect high- and low-pressure refrigerant hoses to the respective high and low-pressure service access gauge port valves.



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System Discharging

Without Recovery System

Discharge the refrigerant from the system before removing or replacing any part of the refrigerant system.

1. Connect the manifold gauge set high- and low-pressure hoses to the respective high- and low-pressure service access gauge port valves as outlined.
2. Place the open end of the center hose in a shop towel and place in a garage exhaust outlet.
3. Slowly depressurize the refrigeration system by opening the low-pressure valve of the manifold gauge set just enough to allow the refrigerant to discharge slowly from the system. Discharging the refrigerant too fast will result in a loss of refrigerant oil from the system which will show up on the shop towel.
4. After the system is nearly discharged, open the high-pressure gauge valve very slowly to avoid losing any refrigerant oil and allow any refrigerant remaining in the compressor and high-pressure line to discharge.

With Recovery System

Rotunda Air Conditioning Refrigerant Reclaim System 158-00001 or equivalent allows the recovery and reuse of A/C system refrigerant after contaminants and moisture have been remove.

If a refrigerant recovery or recycling station is used, the following general procedures should be observed, in addition to the operating instructions provided by the equipment manufacturer.

WARNING: USE EXTREME CARE AND OBSERVE ALL SAFETY AND SERVICE PRECAUTIONS RELATED TO THE USE OF REFRIGERANTS.

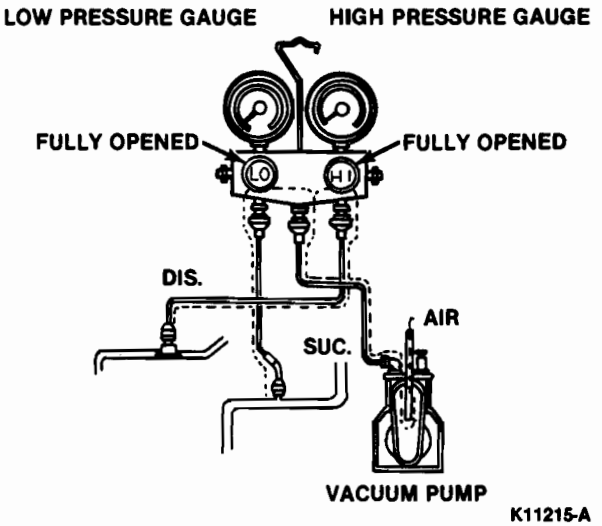
REFRIGERANT SYSTEM SERVICE (Continued)

1. Connect the refrigerant recycling station hose(s) to the vehicle service gauge ports and the recovery station inlet fitting.

   NOTE: Hoses should have shut-off devices or check valves within 12 inches of the hose end to minimize the introduction of non-condensable gases (air) into the recycling station, as well as to minimize the amount of refrigerant released when the hoses are disconnected.
2. Turn on the power to the recycling station to start the recovery process. Allow the recycling station to pump the refrigerant from the system until the station pressure goes into a vacuum. On some stations, the pump will be shut off automatically by a low-pressure switch in the electrical system. On other units, it may be necessary to manually turn off the pump.
3. Once the recycling station has evacuated the vehicle A/C system, close the station inlet valve (if so equipped). Then switch off the power supply.
4. Allow the vehicle A/C system to remain closed for about two minutes. Observe the system vacuum level as shown on the gauge. if the pressure does not rise, disconnect the recycling station hose(s).
5. If the system pressure rises, repeat Steps 2, 3 and 4 until the vacuum level remains stable for two minutes.
6. Perform the required service operations, then evacuate and recharge the A/C system as outlined.

System Evacuating

1. Leak test the system for as outlined.
2. Discharge the refrigerant from the system as outlined.
3. Connect the manifold gauge set as follows:
   - Low-pressure hose connected to the low-pressure service gauge port between evaporator and compressor.
   - High-pressure hose connected to the high-pressure service gauge port between the receiver/drier and the evaporator.
   - Connect the manifold gauge set center hose to a vacuum pump.
4. Open the manifold gauge set valves and start the vacuum pump.
5. Evacuate the system with the vacuum pump until the low-pressure gauge reads between 25-30 inches of mercury (vacuum). Continue the vacuum pump operation for 15 minutes. If a part of the system has been replaced, continue the vacuum pump operation for an additional 20 to 30 minutes.
6. When evacuation of system is complete, close manifold gauge set valves and turn vacuum pump off.
7. Check the low side gauge to be sure the system holds vacuum for 5 minutes. If vacuum is held for 5 minutes, proceed to charging the system. If vacuum is not held for 5 minutes, leak test the system as outlined. Service any leak(s) found and again evacuate the system.



System Charging

1. With the manifold gauge set valves closed to the center hose, disconnect the center hose from the vacuum pump.
2. Connect the center hose of the manifold gauge set to a refrigerant drum, Motorcraft Tool YT-280 or Tool YT-1034 or equivalent. Use only a safety tip dispensing valve. If a small can dispensing valve is used, install the small can(s) on the dispensing valve. (Refer to Charging from Small Containers in this Section).
3. Loosen center hose at the manifold gauge set and open refrigerant drum valve or small can dispensing valve. Allow refrigerant to escape in order to purge air and moisture from the center hose. Then, tighten center hose connection at the manifold gauge set.
4. Disconnect the wire harness connector from the low-pressure switch. Install a jumper wire across the two terminals of the connector.
5. Keep refrigerant can in an upright position and open manifold gauge set low side valve to allow refrigerant to enter system.
6. When no more refrigerant is being drawn into the system, start the engine and move the air door lever to the VENT position, the blower switch to the HI position and depress the A/C switch to draw the remaining refrigerant into the system. Continue to add refrigerant to the system until 700 g (24.8 oz.) of Refrigerant-12 is in the system. Then, close the manifold gauge set low-pressure valve and the refrigerant supply valve.

REFRIGERANT SYSTEM SERVICE (Continued)

7. Remove the jumper wire from the low-pressure switch connector and connect it to the low-pressure switch.
8. Operate the system until the pressures stabilize to verify normal operation and system pressure.
9. In high ambient temperature, it may be necessary to operate a high volume fan positioned to blow air through the radiator and condenser to aid in cooling the engine and prevent excessive refrigerant system pressure.
10. When charging is completed and system operating pressure is normal, disconnect the manifold gauge set from the vehicle. Install protective caps on the service gauge port valves.

Charging from Small Containers

Refrigerant-12 is available in cans as small as 14 ounces.

WARNING: DO NOT OPEN THE MANIFOLD GAUGE SET HIGH-PRESSURE (DISCHARGE) GAUGE VALVE WHEN CHARGING WITH SMALL CONTAINERS. THIS CAN CAUSE THE SMALL REFRIGERANT CONTAINER TO EXPLODE.

1. A special refrigerant dispensing valve and valve retainer such as Motorcraft Tool YT-280 or equivalent is required for connecting the small can to the A/C system. Use only a safety type refrigerant dispensing valve and follow the manufacturer's instructions when attaching the valve to the refrigerant container.
2. Connect the manifold gauge set to the system. Connect the center hose (normally connected to the large R-12 tank) to the special valve on the small can adapter. Make sure that the valve is closed (full clockwise position).
3. Once the can is connected, charge the system as outlined in the following procedure. When the can is empty, close the valve and remove the empty can. Connect a new can, open the valve again and continue charging until the specified weight of R-12 has entered the system. Note the capacity of the refrigerant cans. If they contain less than 16 ounces of refrigerant, compensation for weight less than 16 ounces must be made for each can of refrigerant used. For example, when a half pound of refrigerant is needed, such as with a 2-1/2 pound charge capacity, and 14 ounce cans of refrigerant are used, all but 2 ounces of the third 14 ounce can of refrigerant should be installed in the system. Weigh the can to make sure the correct amount of refrigerant is installed.

Triple Evacuation Procedure—Removing Air and Moisture Vapor

The triple evacuation procedure should be used when there are definite indications of moisture in the system. This procedure is effective in removing small amounts of moisture from the refrigeration system. This procedure should not be used if there is any indication of water (liquid) in the system. If the system is contaminated with a large quantity of water, complete system flushing will be required.

The principle of triple evacuation procedure is as follows:

The first evacuation removes about 90 percent of the air and moisture vapors in the system. New R-12 is then added to the system to mix with the remaining 10 percent. The system is evacuated for a second time drawing out all but about 1 percent of the air and moisture vapors. This system is charged again with R-12 and evacuated for a third time, removing practically all of the remaining moisture vapors.

Cleaning a Badly Contaminated System

A badly contaminated system presents a special problem and is the result of either using the wrong refrigerant oil, the compressor continuing to run during a refrigerant system failure, or improper cleaning following a previous failure. It may also be the result of prolonged operation with excessive moisture or water in the system.

If preliminary inspection shows that the system is badly contaminated with water, carbon and other decomposition products, it will be necessary to remove all these contaminants as well as clean and service or replace the compressor, expansion valve and receiver/drier.

Flushing Agents

A number of refrigerants may by used as flushing agents for cleaning a badly contaminated refrigerant system or the individual components. However, not many of them can easily be used. Some are more toxic to humans than others and serious side effects may result from exposure to them. The safety precautions should always be observed when handling any refrigerant.

Refrigerant as a flushing agent, must be in its liquid state in order to effectively wash the inside surfaces of the components. In its vaporized state, the vapor will not flush away the contaminant particles.

The Refrigerant Flushing chart should be used to aid in the selection of the refrigerant to be used as a flushing agent. Of the four types of refrigerants shown in the chart, two (R-12 and F-114) are better for usage when flushing equipment is not available for two important reasons: (1) greater pressure at a given ambient temperature and (2) least toxic to humans.

Remember, however, that as the ambient temperature increases, they become more difficult to use as a flushing agent because of their increased tendency to vaporize rather than remain a liquid.

REFRIGERANT SYSTEM SERVICE (Continued)

The remaining two refrigerants (F-11 and F-113) listed in the Refrigerant Flushing Chart are better suited for usage with Special Flushing (continuous circulation) equipment. The lower pressure / temperature relationships will keep the closed system pressure lower and should reduce the danger of accidental discharge. F-11 is also available in pressurized containers. This makes it suitable for usage when special flushing equipment is not available, however, F-11 is more toxic than R-12 and F-114.

CAUTION: Extreme caution and adherence to all safety precautions governing the use of refrigerants are necessary when flushing a system.

Refrigerant Flushing Information Chart

Refrigerant	Vaporizes °C(°F)①	Approximate Closed Container Pressure① kPa (psi)②					
		15.57°C (60°F)	21.13°C (70°F)	26.69°C (80°F)	32.25°C (90°F)	37.81°C (100°F)	Adaptability
R-12	-29.80 (-21.6)	393 (57)	483 (70)	579 (84)	689 (100)	807 (117)	Self Propelling
F-114	3.56 (38.4)	55.16 (8)	89.63 (13)	131 (19)	172 (25)	221 (32)	
F-11③	23.74 (74.7)	27 (8 in Hg)	10 (3 in Hg)	7 (1)	34 (5)	62 (9)	
F-113	47.59 (117.6)	74 (22 in Hg)	64 (19 in Hg)	54 (16 in Hg)	44 (13 in Hg)	27 (8 in Hg)	Pump Required

①At sea level atmospheric pressure.
②kPa (psi) unless otherwise noted.
③F-11 is also available in pressurized containers. This makes it suitable for usage when special flushing equipment is not available. However, it is more toxic than R-12 and F-114.

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After the system of individual components has been cleaned, the excess flushing refrigerant should be removed. This is done by blowing out with Refrigerant-12 or nitrogen. Be sure to use a pressure regulator on the nitrogen supply tank if nitrogen is used. The nitrogen supply tank pressure is extremely high and serious damage can result if the supply tank is not regulated.

System Components, Cleaning and Back-Flushing

Cleaning the refrigerant system components requires removal and replacement of some of the components and back-flushing other components. Periodic cleaning of the exterior surface of the condenser is also helpful to permit good air circulation through the condenser fins.

The safety precautions should be observed at all times. If the components are flushed with a refrigerant other than liquid R-12, it is necessary to remove the excess flushing agent by blowing out with Refrigerant-12 or with nitrogen. If nitrogen is used, a pressure regulator should be installed on the nitrogen supply tank to reduce the extremely high nitrogen supply pressure.

Different types of flushing equipment are commercially available for cleaning refrigerant systems. The most common type is a small cylinder containing the flushing agent and uses R-12 or shop air as a propellent. Follow the manufacturer's instructions and safety precautions when using this equipment.

Flushing Condenser and Related Refrigerant Lines

1. Discharge refrigerant system as outlined.
2. Remove compressor from vehicle for cleaning and service or replacement. If the compressor is cleaned or serviced, add the specified amount of refrigerant oil to the compressor prior to installing it in the vehicle. If the compressor is replaced, add the specified amount of refrigerant oil. Refer to Section 12-03.
3. Replace receiver / drier.
4. Separate the discharge line (inlet) from the condenser. Place a 1 / 2-inch I.D. hose onto the condenser fitting. Place the other end of the 1 / 2-inch I.D. hose into a suitable container.
5. Back-flush the condenser and liquid line from the liquid line connection at the evaporator core. Observe all safety precautions and follow the equipment manufacturer's instructions for operating the flushing equipment.
6. Back-flush the compressor discharge line. Observe all safety precautions and follow the manufacturer's instructions for operating the flushing equipment.
7. Connect all refrigerant lines. All tube O-ring connections should be cleaned and assembled with new O-rings lubricated with clean refrigerant oil. Tighten all tube O-ring connections securely with a backup wrench to prevent component damage.

REFRIGERANT SYSTEM SERVICE (Continued)

8. Leak test all connections and components as outlined. Service any leaks found and proceed to Step 9.
9. Purge the system to remove air and moisture vapor.
10. Evacuate and charge the refrigerant system to specifications with R-12 as outlined.
11. Performance test the refrigerant system to ensure quality cooling performance.

System Flushing with Special Flushing Equipment

Special refrigerant system flushing equipment is available from various air conditioning equipment manufacturers. This equipment provides a faster method of cleaning the major refrigerant system components without removing them from the vehicle. All restrictive components, however, such as the expansion valve must be removed. A temporary replacement for the removed expansion valve can be made by using tubing such as neoprene or plastic garden hose. This allows for the continuous circulation of a refrigerant system flushing agent so that all system contaminants can be washed out of the major refrigerant system components and hose assemblies, to be trapped in an external filter / dryer assembly.

CAUTION: Always check to be sure the flushing refrigerant is compatible with the hose material being used. Some hose materials may dissolve, swell or become brittle when used with certain refrigerants.

The safety precautions should be observed at all times. If the components in the following procedure are flushed with a refrigerant other than R-12, it is necessary to remove the excess flushing refrigerant by blowing out with Refrigerant-12 or with nitrogen. If nitrogen is used, a pressure regulator should be installed on the nitrogen supply tank to reduce the extremely high nitrogen supply pressure.

When cleaning a contaminated refrigerant system using the continuous circulation method, follow the method as recommended by the manufacturer of the special flushing equipment.

Leak Checking

Attach the manifold gauge set to the service gauge port valves. Leave both manifold gauge valves at the maximum clockwise (closed) position. Both gauges should show approximately 413 - 551 kPa (60 -80 psi) at 41°C (75°F) with the engine not running. If very little or no pressure is indicated, leave the vacuum pump valve closed, open the Refrigerant-12 tank valve, and set the low-pressure (suction) manifold gauge valve to the counterclockwise position. This opens the system to tank pressure. Check all refrigerant line connections, the compressor as outlined in the compressor Section of this manual, and the condenser, using a good refrigerant leak detector.

When using an electronic leak detector or equivalent, avoid inhaling the fumes. The smaller the flame the more sensitive it is to leaks. Therefore, to ensure accurate leak indication, keep the flame as small as possible. The copper element must be red hot. If it is burned away, replace the element. Hold the open end of the hose just below each suspected leak point for two or three seconds. The flame will normally be almost colorless. The slightest leak will be indicated by a bright green-blue flame. Check the manifold gauge set and hoses, as well as the rest of the system, for leaks.

If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Good ventilation is necessary to prevent this situation. A fan, even in a well ventilated area, is very helpful in removing small traces of refrigerant vapor.

WARNING: GOOD VENTILATION IS NECESSARY IN THE AREA WHERE A/C LEAK TESTING IS TO BE DONE. IF THE SURROUNDING AIR IS CONTAMINATED WITH REFRIGERANT GAS, THE LEAK DETECTOR WILL INDICATE THIS GAS ALL THE TIME. ODORS FROM OTHER CHEMICALS SUCH AS ANTIFREEZE, DIESEL FUEL, DISC BRAKE CLEANER OR OTHER CLEANING SOLVENTS CAN CAUSE THE SAME PROBLEM. A FAN, EVEN IN A WELL VENTILATED AREA, IS VERY HELPFUL IN REMOVING SMALL TRACES OF AIR CONTAMINATION THAT MIGHT AFFECT THE LEAK DETECTOR.

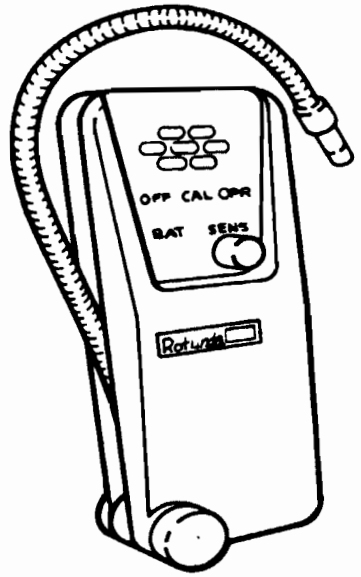
Another testing device can be used to detect leaking refrigerant gas. This device is called the Rotunda Leak Detector 055-00015 or equivalent. The control switch of the leak detector has two positions: OFF and ON. It also has a flexible sensing probe.

The detector will automatically calibrate itself and set the sensitivity level.

Move the probe at approximately 25mm (1 inch) per second in the suspected area. When escaping refrigerant gas is located, the ticking / beeping signal will increase in ticks / beeps per second. If the gas is relatively concentrated the signal will be increasingly shrill. Follow the instructions included with the detector to improve handling and operating techniques.

REFRIGERANT SYSTEM SERVICE (Continued)

Electronic Leak Detector



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Heat System

The following tests will help determine the cause of a problem in the heater system. These tests check for items such as: plugged heater core, leaking heater core or collapsed hoses. Loose defroster ducts and air leaks in the body may be located by visual inspection of the components.

Plugged Heater Core Test

Check to ensure the engine coolant is to the proper level, then start the engine and temporarily remove the heater outlet hose from the water pump. Very little or no flow of water from the core outlet indicates that the core or heater hose(s) is plugged.

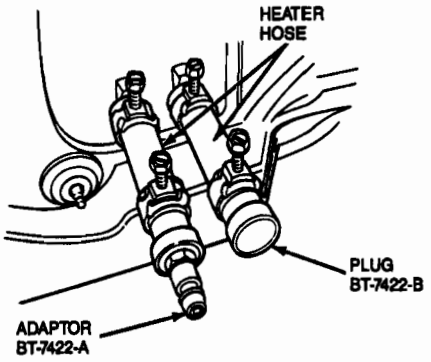
Heater Core Leak Test

Inspection

1. Inspect for visible evidence of coolant leakage at the hose to heater core attachments. A coolant leak at the hose could follow the heater core tube to the core and appear as a leak in the heater core.
2. Check the system for loose heater hose clamps. The clamps should be tightened to 1.7-2.4 N·m (16-22 lb-in).
3. If leakage is found, and hose clamps are over-tightened replace clamp and tighten to specification. An over-tightened clamp may cause leakage at hose connection.

Pressure Test

1. Drain the coolant from the cooling system.
2. Disconnect the heater hoses from the heater core tubes.
3. Install a short piece of heater hose approximately 101mm (4 inches) long on each heater core tube.
4. Fill the heater core and hoses with water and install Plug BT-7422-B and Adapter BT-7422-A from Rotunda Pressure Tester 021-00012 or equivalent in the hose ends. Secure the hoses, plug and adapter with hose clamps.



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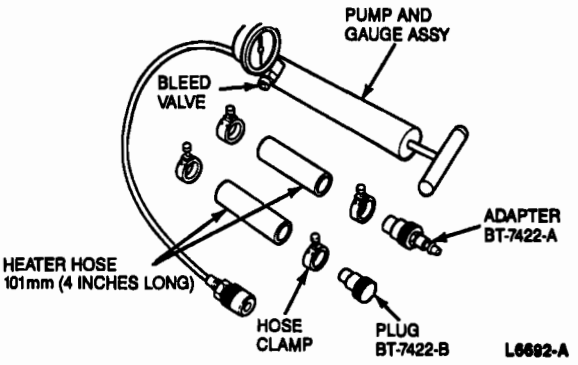
5. Attach the pump and gauge assembly Rotunda Pressure Tester 021-00012 or equivalent to the adapter. Close the bleed valve at the base of the gauge and pump 207 kPa (30 psi) of air pressure into the heater core.

Tools for Testing



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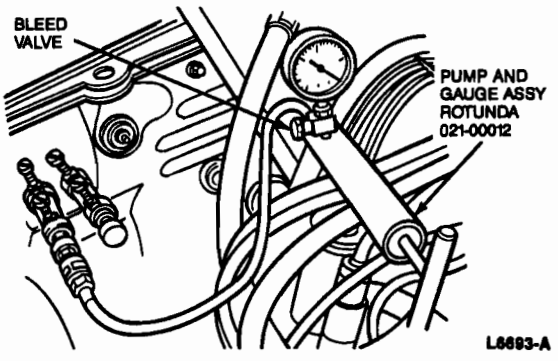
Installation of Tools



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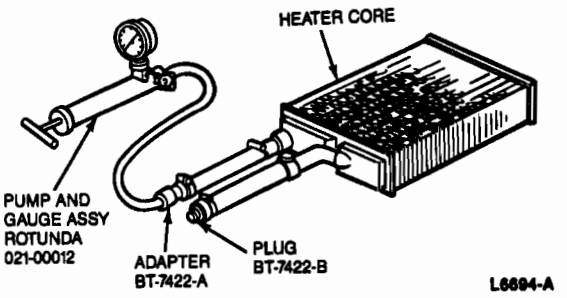
REFRIGERANT SYSTEM SERVICE (Continued)

6. Observe the pressure gauge for a minimum of three minutes. The pressure should not drop.
7. If the pressure does not drop, no leaks are indicated.
8. If the pressure drops, check the hose connections to the core tubes for leaks. If the hoses do not leak, remove the heater core from the vehicle and test the core as outlined.

Bench Test

1. Drain all coolant from the heater core.
2. Connect the test hoses with plug and adapter to the core tubes. Then, connect the air pump and gauge assembly to the adapter.
3. Apply 207 kPa (30 psi) of air pressure to the heater core with Rotunda Pressure Tester 021-00012 or equivalent, and submerge the core in water.
4. If a leak is observed, service or replace the heater core as necessary.



SPECIFICATIONS

Item	Function	Specification
High pressure (discharge) side	System pressure	199-220 psi
Low pressure (suction) side	System pressure	19-25 psi
Refrigerant pressure switch (BK/W — BK/Y)	Closed at	206 ± 3 kPa (30 ± 3 psi)
Thermostat	Thermostat resistance	Open at 77°F (1,500 ohms) closed at 32°F (4,500-5,200 ohms)
Refrigerant System	Oil capacity	300 ml (10 fluid oz)
Refrigerant System	Refrigerant type	Refrigerant 12 (R-12)
Refrigerant System	Oil type	C9AZ-19557-B (Motorcraft YN-2)
Refrigerant System	Refrigerant capacity	700 ± 50 grams (24.8 ± 1.8 oz)

SPECIAL SERVICE TOOLS

Tool Number	Description
D61L-19703-A	High Side Adapter Set
T71P-19703-R	Curved Adapter
T71P-19703-S	Straight Adapter

ROTUNDA EQUIPMENT

Model	Description
005-00015	Leak Detector
063-00010	Air Conditioning Service Tool Kit

(Continued)

ROTUNDA EQUIPMENT (Cont'd)

Model	Description
007-00001	Digital Volt-Ohmmeter
021-00012	Pressure Tester
023-00007	Dial Thermometer
063-00003	Safety Shield Goggles
023-00009	Small Can Adapter
158-00001	Air Conditioning Refrigerant Reclaim System

SECTION 12-02 Heating and Defrosting

VEHICLE APPLICATION

Capri.

DESCRIPTION

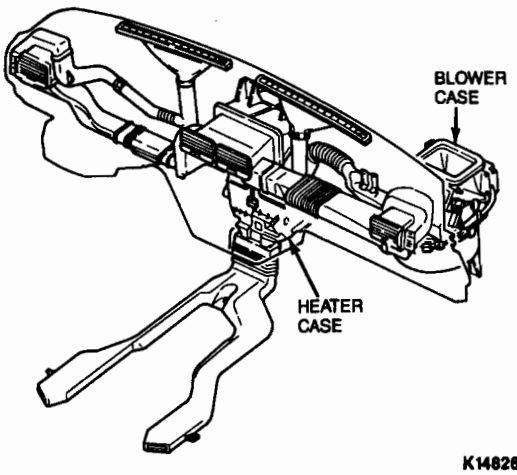
The heating system consists of a blower case, a heater case and various air distribution ducts.

The blower case is mounted to the dash panel behind the instrument panel on the passenger side. The blower case houses the blower motor, blower motor resistor and the recirculation / fresh air door.

The heater case is mounted to the dash panel behind the center of the instrument panel. The heater case houses the heater core, air discharge doors and air temperature door. All air control doors are cable-operated from the control panel located in the center of the instrument panel.

Airflow

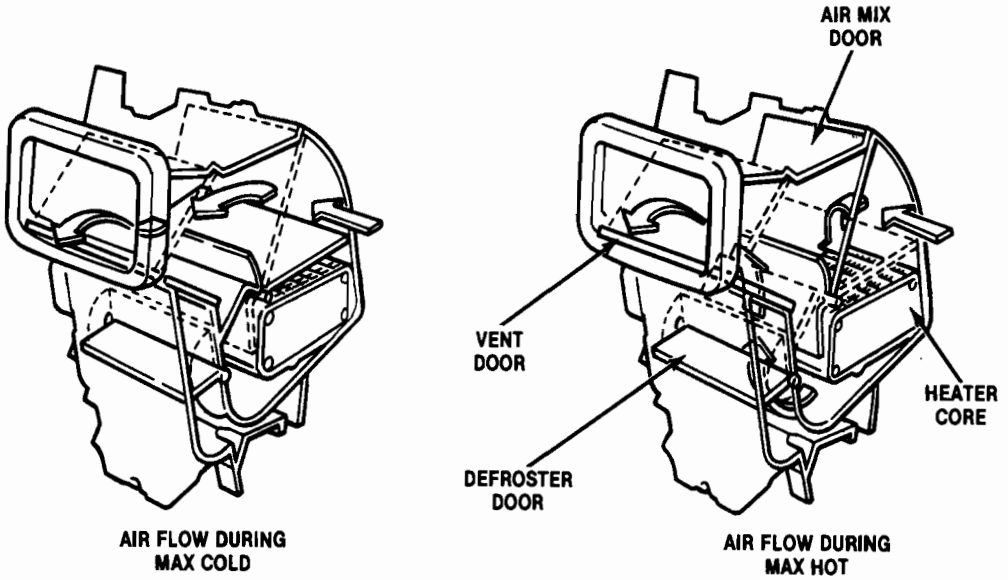
The heater assembly is a blend air system, receiving outside air or recirculated air depending on the position of the recirculation / fresh air door. The door is controlled by a cable from the control panel. Air enters the blower case and is forced by the blower motor into the heater case assembly. The air passes through the heater core or can bypass it depending on the position of the temperature control door. The air is then directed to the various registers according to the position of the vent and defroster doors.



DESCRIPTION (Continued)

Temperature Control

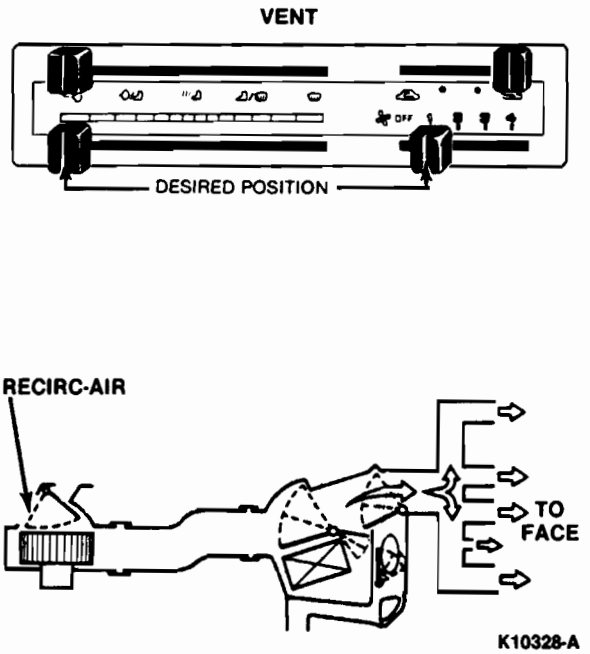
A temperature blend door directs air to flow through the heater core for heating or to bypass the heater core for cooling. It is controlled between COOL and WARM (blue and red) by the temperature lever of the control panel. Positioning the temperature lever in any position between COOL and WARM (blue and red) causes the air temperature door to direct more or less air through the heater core in order to achieve the desired temperature.



Air Distribution

The blended warm and cool air is distributed to the defroster outlets, the instrument panel registers or to the floor distribution outlets according to the position of the air discharge doors. The doors are controlled by a cable from the control panel.

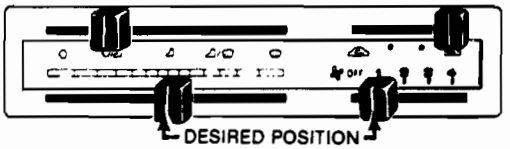
When the function selector lever is in the VENT position, all airflow is directed to the instrument panel registers.

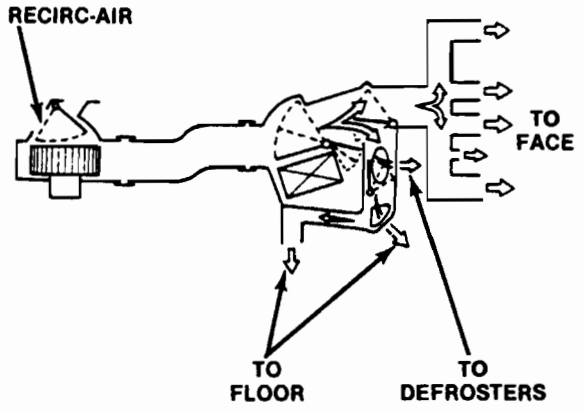


DESCRIPTION (Continued)

When the function selector lever is in the BI-LEVEL position, airflow is equally directed to all registers.

BI-LEVEL



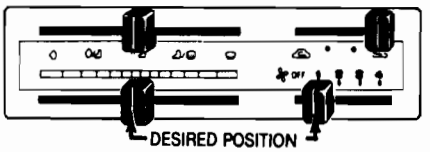


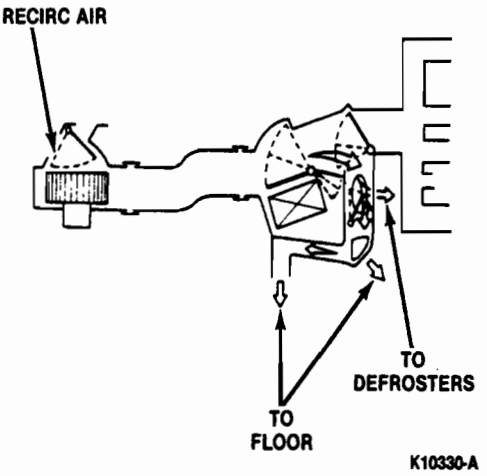
K10329-A

When the function selector lever is in the HEAT position, most of the airflow is directed to the floor registers with a small amount directed to the defrost registers.

NOTE: Objects stored under the front seats may restrict heat to the rear of the vehicle.

HEAT



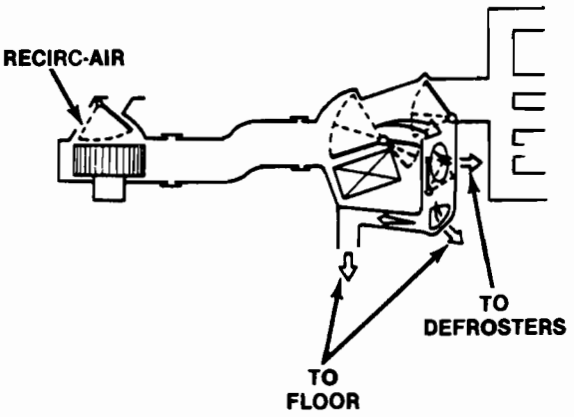


K10330-A

DESCRIPTION (Continued)

When the defrost selector lever is in the HEAT/DEFROST position, airflow is directed equally to the floor and defroster registers.

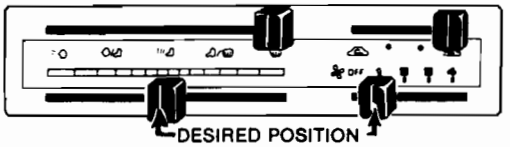
HEAT/DEF

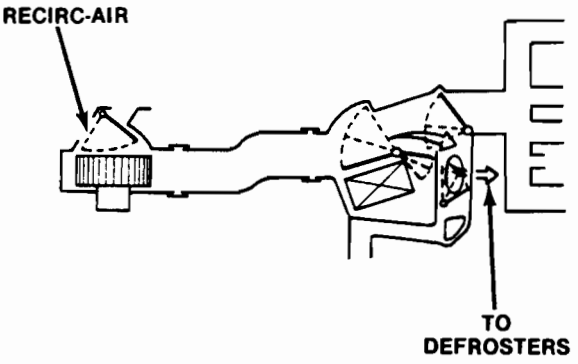


K10331-A

When the function selector lever is in the DEFROST position, all airflow is directed to the defroster registers.

DEF





K10332-A

Blower Switch

Blower motor operation is controlled by a five position switch in the lower right corner of the control panel. The switch is identified by a fan blade symbol on the face of the control panel. This switch directs the blower motor ground circuit current through, or around, the resistor assembly coils, to control blower speed.

When the switch is in the OFF position, the motor ground circuit is open and the blower motor does not operate.

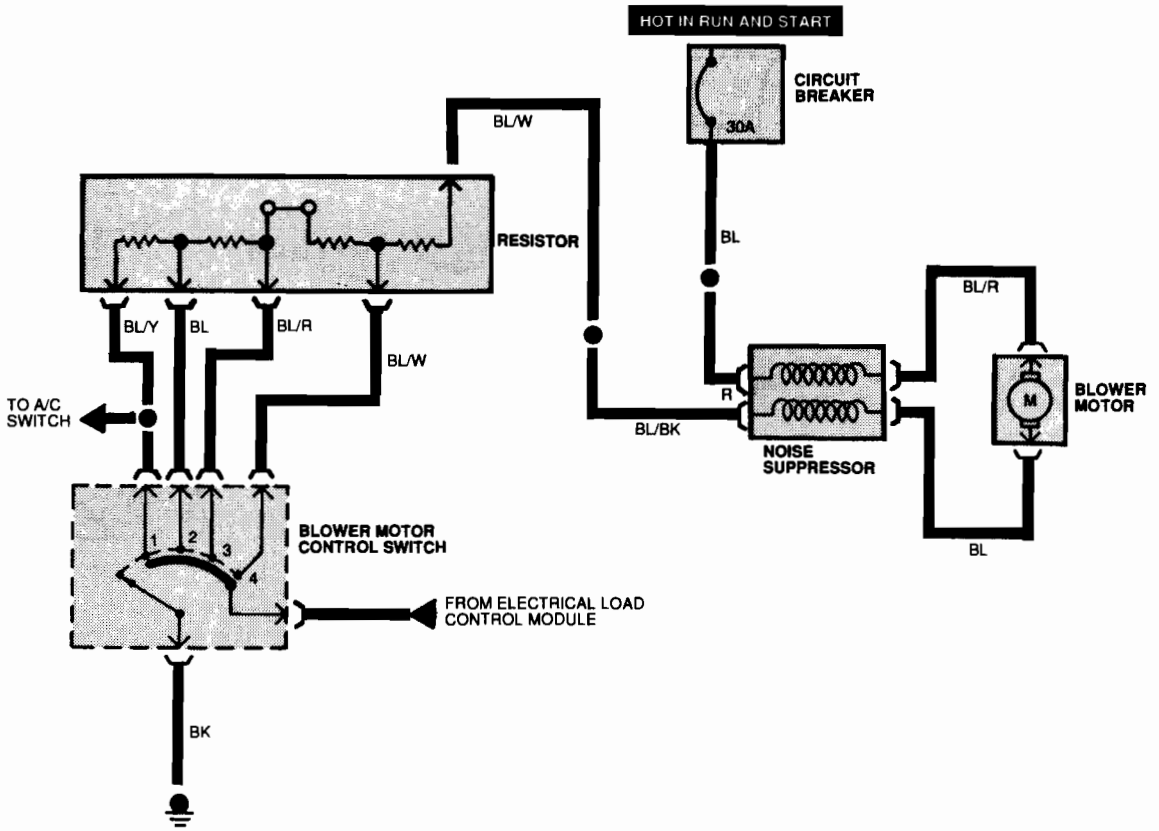
With the blower switch in position 1, current flow from the blower motor is restricted by three resistor coils in the resistor assembly.

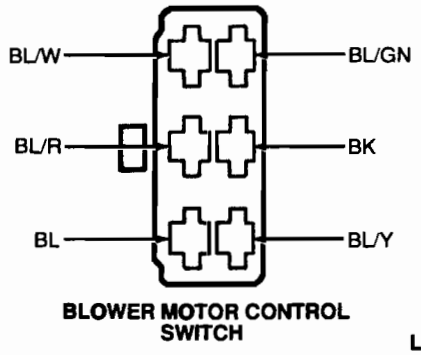
When the switch is moved to position 2, one of the resistor coils is bypassed out of the circuit and current flow from the blower motor is restricted by two resistor coils.

When the switch is moved to position 3, two of the resistor coils are bypassed out of the circuit and current flow from the blower motor is restricted by only one resistor coil.

DESCRIPTION (Continued)

When the switch is moved to position 4, all three resistor coils are bypassed out of the circuit and there is a direct ground circuit for the blower motor.





DIAGNOSIS AND TESTING

Refer to Section 12-00.

REMOVAL AND INSTALLATION

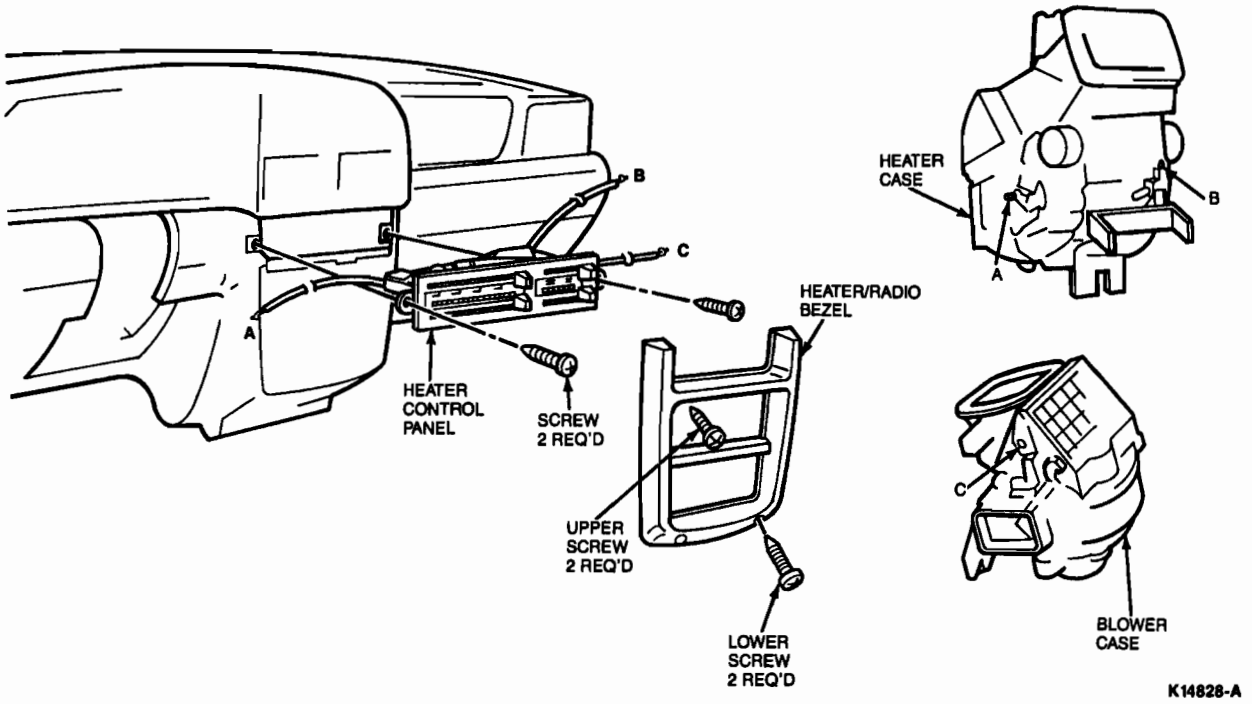
Heater Control Panel

Removal

1. Disconnect negative battery cable.
2. Remove storage compartment.
3. Remove heater / radio bezel.
4. Remove heater control panel retaining screws.
5. Lower glove compartment past its stop and remove glove compartment upper support.
6. Disconnect air door control cable.
7. Disconnect function selector cable at heater assembly.
8. Remove LH center carpet panel.
9. Disconnect temperature control cable at heater assembly.
10. Pull heater control panel from instrument panel far enough to gain access to electrical connectors and disconnect. Use caution so as not to damage control cables.

REMOVAL AND INSTALLATION (Continued)

11. Remove two screws and heater control panel assembly with cables attached.



Installation

1. Route cables into instrument panel using care not to kink them and position heater control panel in instrument panel.
2. Connect electrical connectors.
3. Install heater control panel with retaining screws.
4. Connect temperature control cable, function selector cable and air door control cable.
5. Check and adjust control cables, as outlined.
6. Install LH center carpet panel.
7. Install glove compartment upper support.
8. Return glove compartment to closed position.
9. Install heater / radio trim bezel and storage compartment.
10. Connect negative battery cable.
11. Check for proper operation.

Blower Switch

Removal

NOTE: The heater control panel must be partially removed to gain access to blower switch. The cables do not have to be removed.

1. Partially remove heater control panel as outlined.
2. Remove blower switch knob.
3. Remove blower switch retaining screws and remove blower switch.

Installation

1. Install blower switch to heater control panel with retaining screws.
2. Install blower knob.
3. Install heater control panel, as outlined.

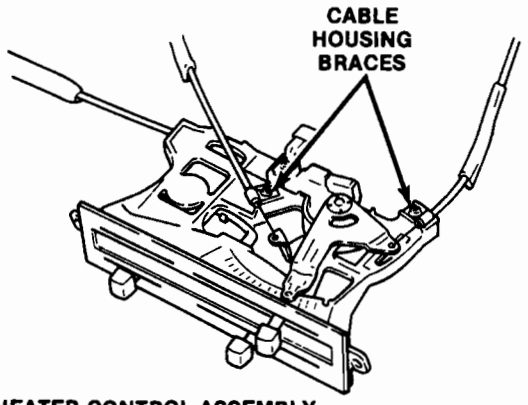
Control Cables

Removal

1. Remove heater control panel as outlined.
2. Remove cable(s) clamps from housing brace on control panel.

REMOVAL AND INSTALLATION (Continued)

3. Disconnect cable(s) from control panel.



HEATER CONTROL ASSEMBLY K10335-A

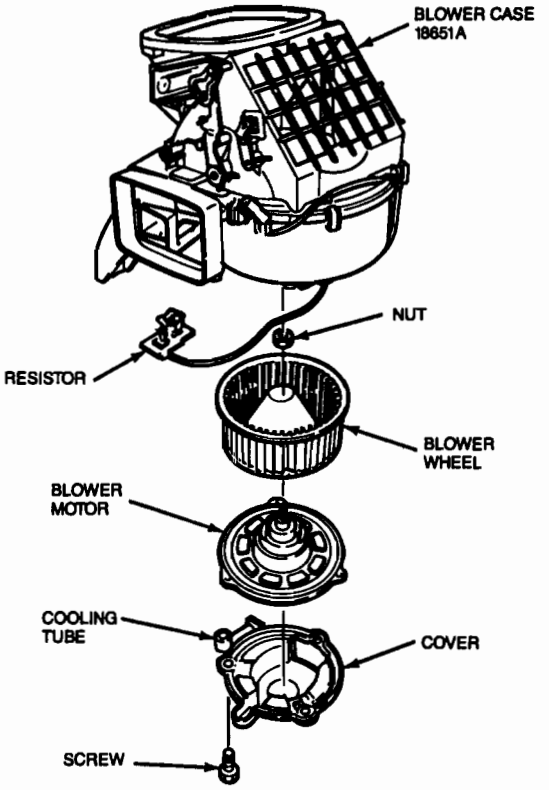
Installation

1. Connect cable(s) to control panel.
2. Install cable(s) to housing brace with clamp(s) on control panel.
3. Route cable(s) and install control panel as outlined.
4. Adjust cables as outlined.

Blower Motor

Removal

1. Disconnect negative battery cable.
2. Disconnect electrical connector at blower motor.
3. Remove three screws retaining motor and cover to blower case.
4. Remove cover, cooling tube and blower motor.
5. Remove nut retaining blower wheel to blower motor. Remove blower wheel.
6. Remove gasket from blower motor.



K14830-A

Installation

1. Position gasket onto blower motor.
2. Install blower wheel onto blower motor.
3. Install attaching nut.
4. Position blower motor, cooling tube, and cover into blower case.
5. Install three screws.
6. Connect electrical connector to blower motor.
7. Connect negative battery cable.
8. Check operation of blower motor.

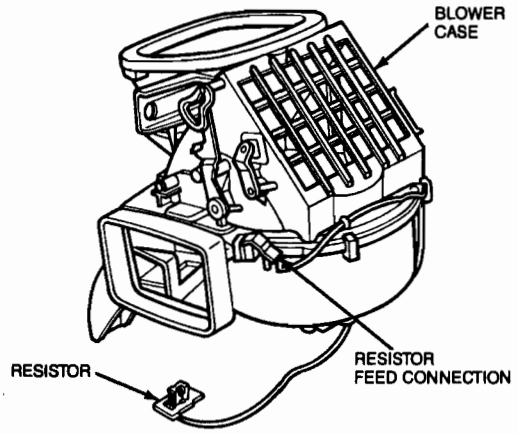
Blower Motor Resistor

Removal

1. Disconnect negative battery cable.
2. Disconnect electrical connectors at resistor and blower motor.
3. Remove two screws and resistor from blower case.
4. Lower glove compartment below stops.

REMOVAL AND INSTALLATION (Continued)

5. Disconnect blower feed connector.



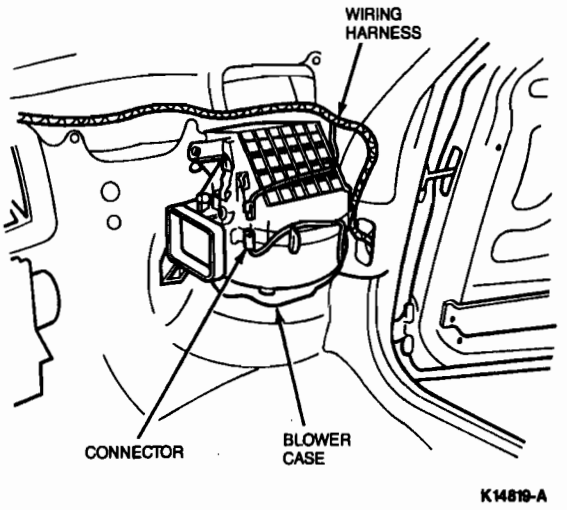
Installation

1. Connect blower feed connector to resistor.
2. Return glove compartment to the closed position.
3. Position resistor into blower case and install two screws.
4. Connect electrical connectors at resistor and blower motor.
5. Connect negative battery cable.
6. Check operation of blower motor.

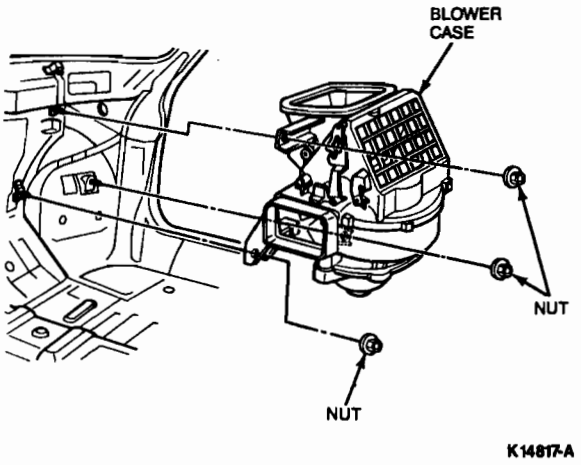
Blower Case Assembly

Removal

1. Disconnect negative battery cable.
2. Remove air door control cable at blower case as outlined under Air Door Cable, Adjustments.
3. Disconnect electrical connectors from resistor and blower motor. Remove wiring harness from blower case and position out of the way.



4. Disconnect duct work from blower case.
5. It may be necessary to loosen instrument panel mounting bolts and slightly raise instrument panel assembly to provide clearance for removal. Refer to Section 01-12.
6. Remove three nuts and remove blower case.

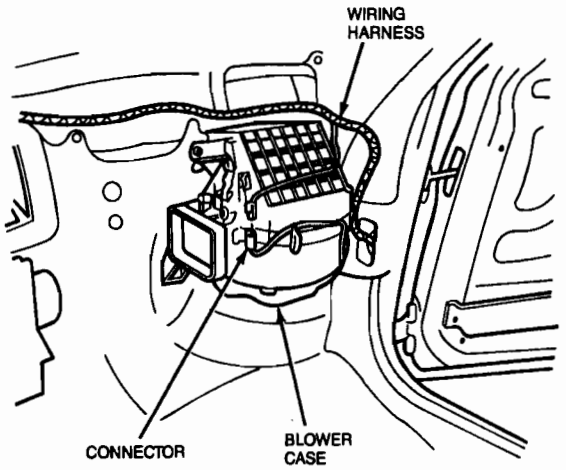


Installation

1. Position blower case and install three nuts. Tighten to 7-10 N·m (5-7 lb-ft).
2. Connect duct work to blower case.

REMOVAL AND INSTALLATION (Continued)

3. Connect electrical connectors and fasten wiring harness to blower case.



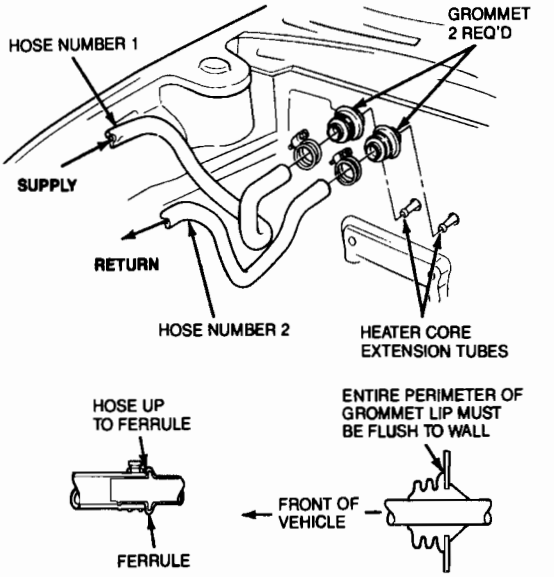
4. Connect and adjust control cable as outlined.
5. Position instrument panel and tighten mounting bolts. Refer to Section 01-12.
6. Connect negative battery cable.
7. Check operation of blower motor and control cable.

Heater Case

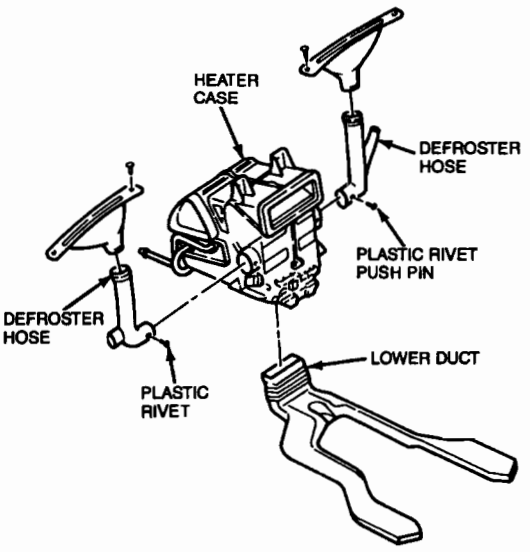
WARNING: NEVER REMOVE THE RADIATOR CAP UNDER ANY CONDITIONS WHILE THE ENGINE IS OPERATING. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN DAMAGE TO THE COOLING SYSTEM, ENGINE AND/OR PERSONAL INJURY. TO AVOID HAVING SCALDING HOT COOLANT OR STEAM BLOW OUT OF THE RADIATOR, USE EXTREME CARE WHEN REMOVING THE CAP FROM A HOT RADIATOR. WAIT UNTIL THE ENGINE HAS COOLED, THEN WRAP A THICK CLOTH AROUND THE RADIATOR CAP AND TURN IT SLOWLY TO THE FIRST STOP. STEP BACK WHILE THE PRESSURE IS RELEASED FROM THE COOLING SYSTEM, WHEN CERTAIN ALL PRESSURE HAS BEEN RELEASED, PRESS DOWN ON THE CAP (STILL WITH A CLOTH), TURN AND REMOVE IT.

Removal

1. Remove floor console and instrument panel. Refer to Section 01-12.
2. Drain cooling system. Refer to Section 03-03.
3. Disconnect heater hoses from heater core extension tubes. Plug heater tubes to prevent spilling coolant into passenger compartment.

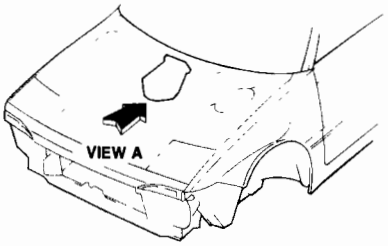


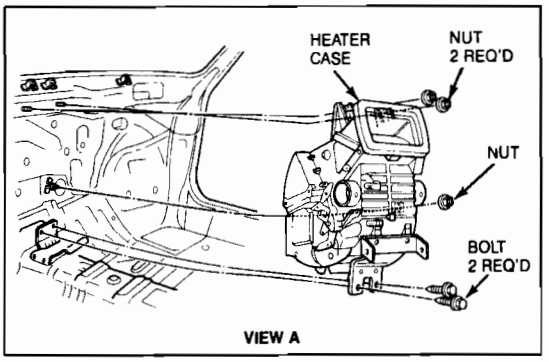
4. Remove plastic rivets and both defroster hoses.
5. Remove main air duct connecting heater case to blower case or air conditioning unit (if equipped).
6. Roll back carpet to gain access to lower duct and lower mounting bolts. It may be necessary to remove carpet fasteners.
7. Disconnect lower duct (rear seat supply) from heater case.



REMOVAL AND INSTALLATION (Continued)

8. Remove cable ends from heater case if still connected.
9. Remove wiring harness from heater case.
10. Remove two lower bolts, two upper nuts, and one center retaining nut from blower case.
11. Remove heater case.

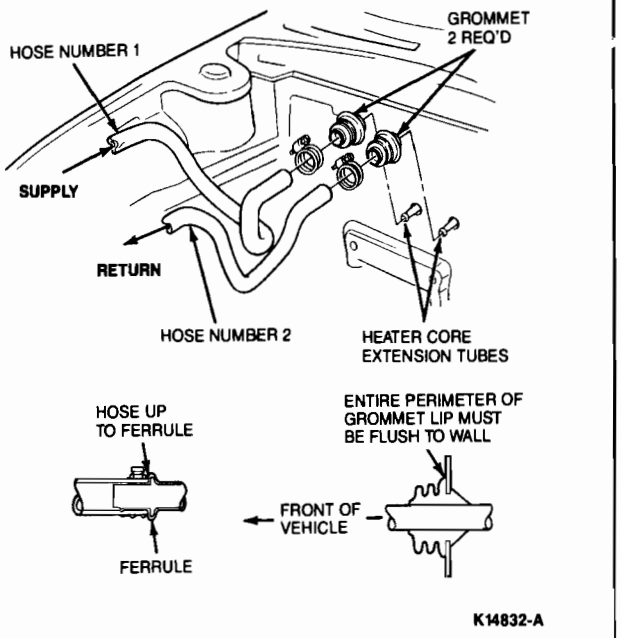




K14816-A

Installation

1. Position heater case onto mounting studs and guide extension tubes through dash panel. Make sure grommets are sealed around extension tubes.
2. Install two upper nuts, one center retaining nut, and two lower bolts. Tighten all fasteners to 7-10 N·m (5-7 lb-ft).
3. Install lower duct onto heater case.
4. Reposition carpet and install fasteners if removed.
5. Attach wiring harness to heater case.
6. Connect defroster hoses and main air duct to heater case. Install plastic retaining rivets.
7. Connect heater hoses as shown. Tighten clamps to 4-6 N·m (36-53 lb-in).
8. Fill cooling system. Refer to Section 03-03.



K14832-A

9. Install instrument panel assembly, if removed. Refer to Section 01-12.
10. Connect control cable to heater case and adjust as outlined.
11. Install floor console. Refer to Section 01-12.
12. Operate heater and check for leaks.

Heater Core

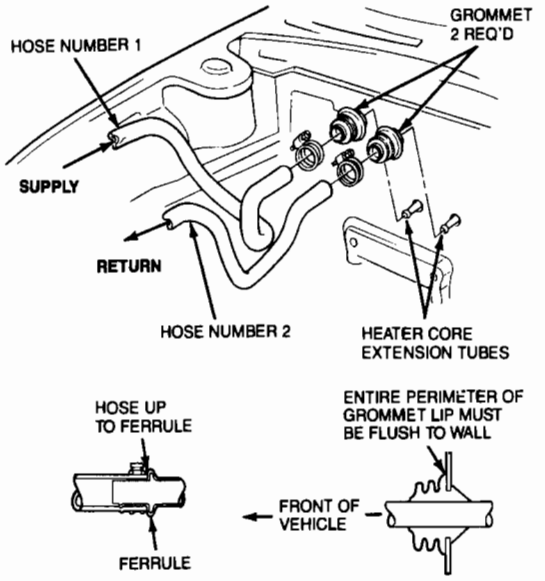
WARNING: NEVER REMOVE THE RADIATOR CAP UNDER ANY CONDITIONS WHILE THE ENGINE IS OPERATING. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN DAMAGE TO THE COOLING SYSTEM, ENGINE AND/OR PERSONAL INJURY. TO AVOID HAVING SCALDING HOT COOLANT OR STEAM BLOW OUT OF THE RADIATOR, USE EXTREME CARE WHEN REMOVING THE CAP FROM A HOT RADIATOR. WAIT UNTIL THE ENGINE HAS COOLED, THEN WRAP A THICK CLOTH AROUND THE RADIATOR CAP AND TURN IT SLOWLY TO THE FIRST STOP. STEP BACK WHILE THE PRESSURE IS RELEASED FROM THE COOLING SYSTEM, WHEN CERTAIN ALL PRESSURE HAS BEEN RELEASED, PRESS DOWN ON THE CAP (STILL WITH A CLOTH), TURN AND REMOVE IT.

Removal

1. Drain cooling system. Refer to Section 03-03.
2. Remove heater case as outlined.

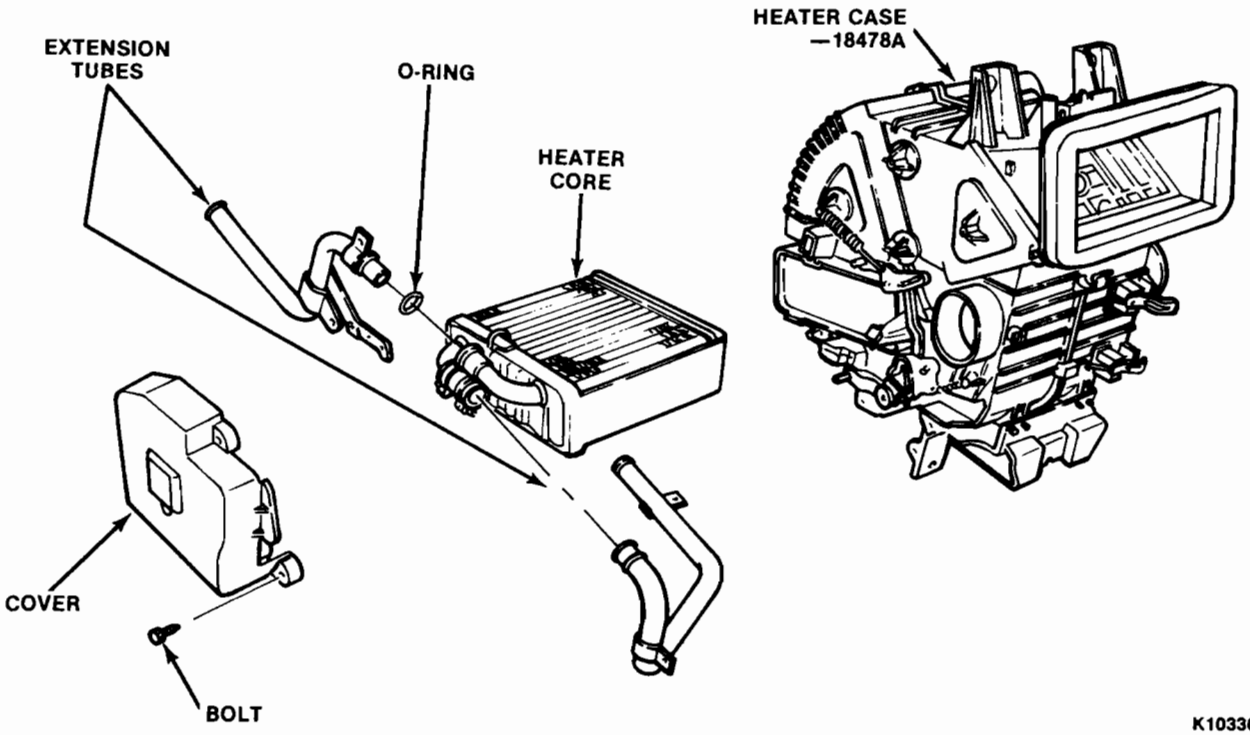
REMOVAL AND INSTALLATION (Continued)

3. Disconnect heater hoses from heater core extension tubes as outlined. Cap tubes to prevent spilling coolant into passenger compartment.



K14832-A

4. Remove three screws attaching heater core cover to heater case and remove cover.
5. Remove screws securing tube braces.
6. Loosen clamps and remove extension tubes from heater core. Remove O-ring from outlet tube.
7. Remove heater core by pulling straight out.
8. Remove extension tubes and grommets if necessary.

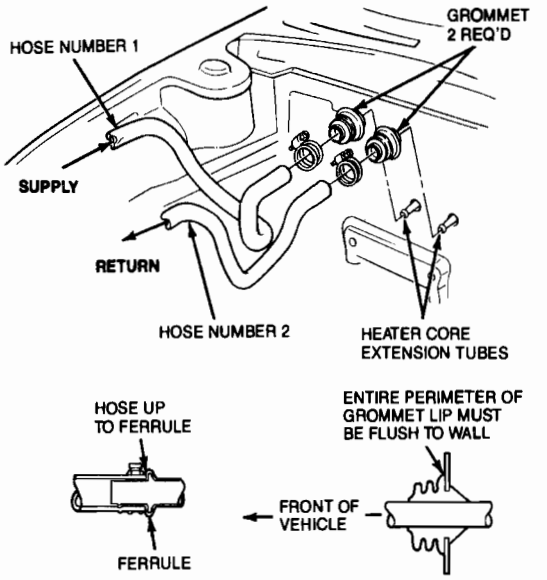


K10336-A

REMOVAL AND INSTALLATION (Continued)

Installation

1. Install grommets and extension tubes if removed. Make sure grommets are flush with engine compartment wall.



2. Install heater core into heater case.
3. Install a new O-ring onto outlet extension tube.
4. Connect extension tubes to heater core. Tighten clamps securely.
5. Secure extension tube braces with screws.
6. Install heater core cover with three screws.
7. Install heater case as outlined.
8. Connect heater hoses. Tighten clamps to 4-6 N·m (36-53 lb-in).
9. Fill cooling system. Refer to Section 03-03.
10. Operate heater and check for leaks.

Heater Hoses

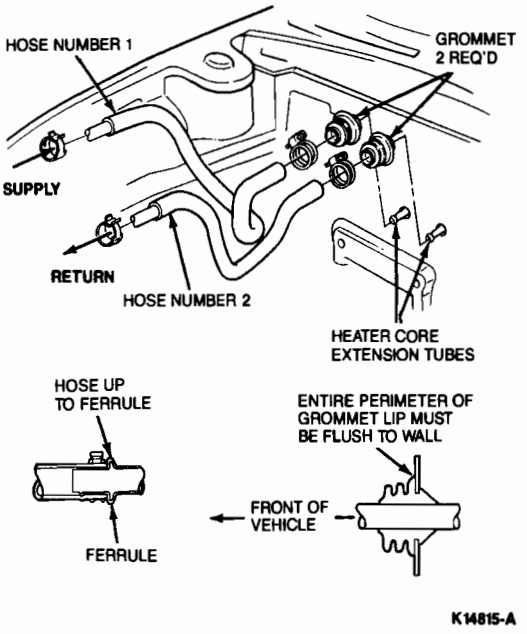
Heater hoses are marked with a colored dot at the engine end of each original equipment hose.

Hose number one (coolant supply to heater) has a red dot for naturally aspirated vehicles and a white dot for turbocharged vehicles.

Hose number two (coolant return to engine) is the same for both engines and uses a green dot.

Removal

1. Drain cooling system. Refer to Section 03-03.
2. Loosen clamps and disconnect heater hose(s) from heater core extension tubes.
3. Compress clamp and remove hose(s) from engine.



Installation

1. Make sure grommets are in place and flush with engine compartment wall as shown.
2. Place clamps on hose or fitting.

   NOTE: Colored dots are used on engine ends of original equipment hoses. Make sure dots face upward when installed to provide proper twist in hose.
3. Install hose and slide all the way up fitting until it reaches ferrule.
4. Install clamps. Tighten screw-type clamps to 4-6 N·m (36-53 lb-in).
5. Fill cooling system. Refer to Section 03-03.
6. Operate engine and heater. Check for leaks.

Registers, LH Side and Center

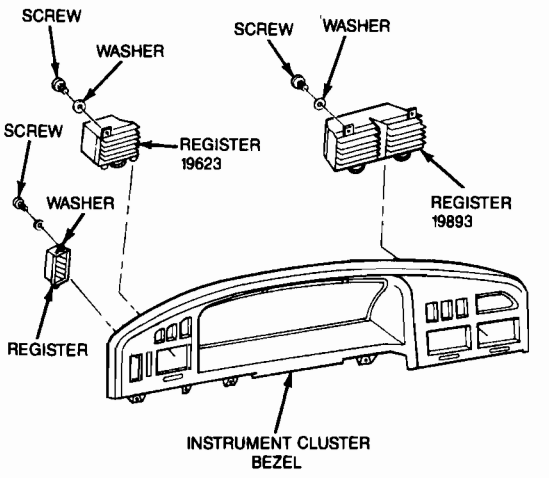
The LH side and center registers are attached to the rear of the instrument cluster bezel with screws and washers.

Removal and Installation

1. Remove instrument cluster bezel. Refer to Section 01-12.
2. Remove screws, washers and register(s).

REMOVAL AND INSTALLATION (Continued)

3. To install, reverse Removal procedure.

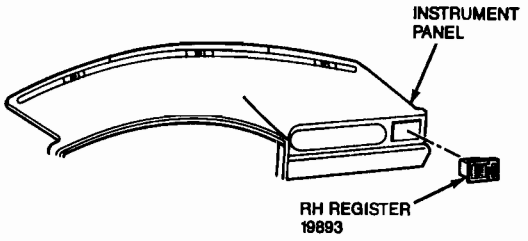


K14833-A

Register, RH Side

Removal and Installation

1. Gently pry register from instrument panel.
2. Position ducts located behind instrument panel.
3. Install register and make sure it is fully connected to ducts.

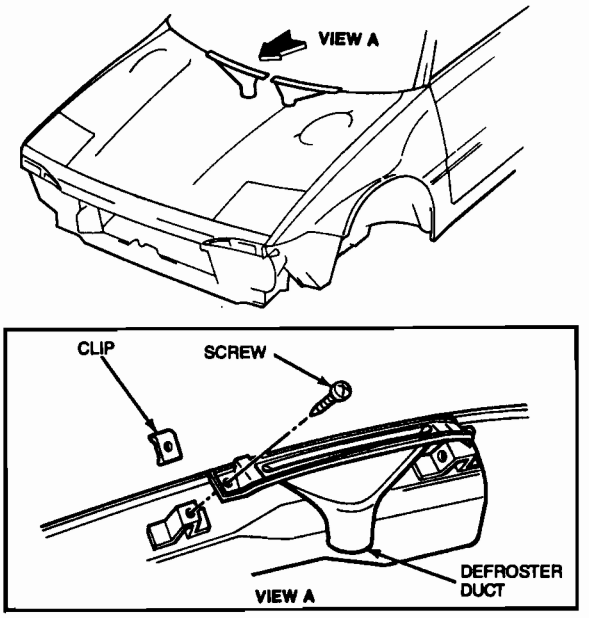


K14834-A

Defroster Ducts

Removal and Installation

1. Remove instrument panel. Refer to Section 01-12.
2. Remove duct retaining screws and duct(s).
3. To install, reverse Removal procedure.



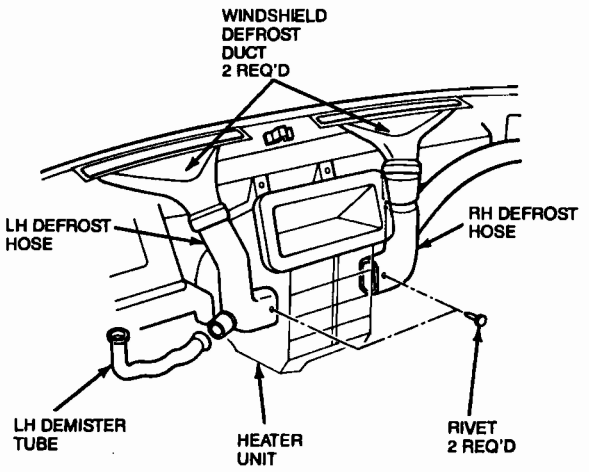
K14824-A

Defroster Tubes and Side Demister Tubes

NOTE: If servicing RH defroster ducts only, they can be serviced through the glove compartment opening after glove compartment support is removed. Refer to Section 01-12.

Removal and Installation

1. Remove instrument panel. Refer to Section 01-12.
2. Remove defroster and / or demister tubes.
3. To install, reverse Removal procedure.



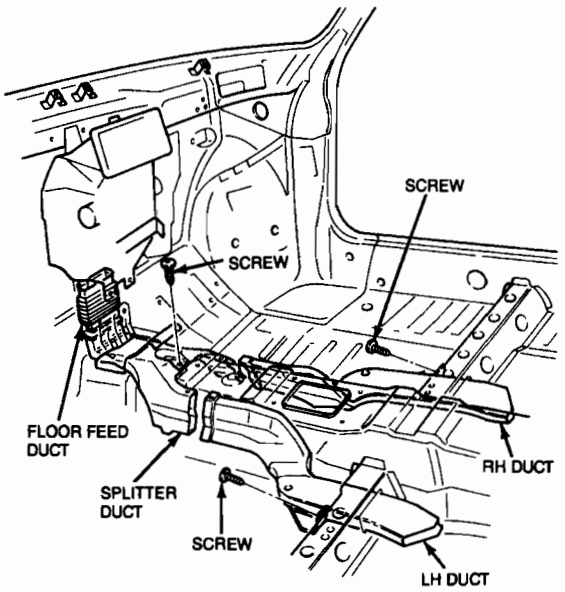
K14820-A

REMOVAL AND INSTALLATION (Continued)

Heat Ducts, Rear Seat

Removal and Installation

1. Remove carpet. Refer to Section 01-05.
2. Remove duct retaining screw and disconnect from splitter duct.
3. To install, reverse Removal procedure.

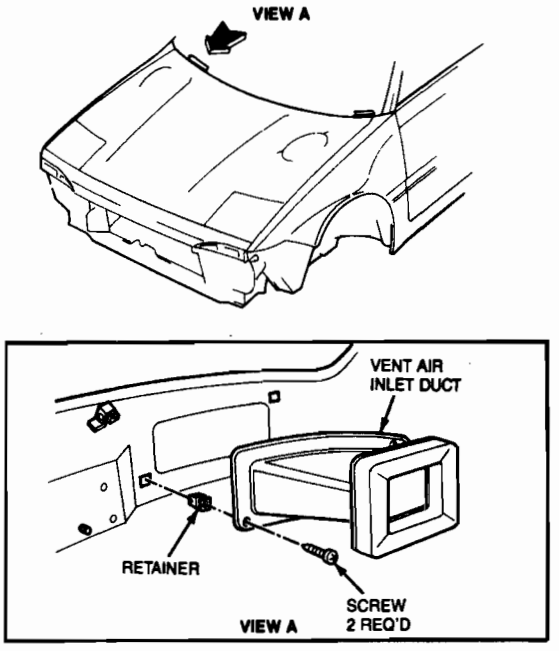


K14821-A

Air Inlet Duct

Removal and Installation

1. Remove instrument panel. Refer to Section 01-12.
2. Remove duct.
3. Inspect duct seal. Replace, if necessary.
4. To install, reverse Removal procedure.



K14825-A

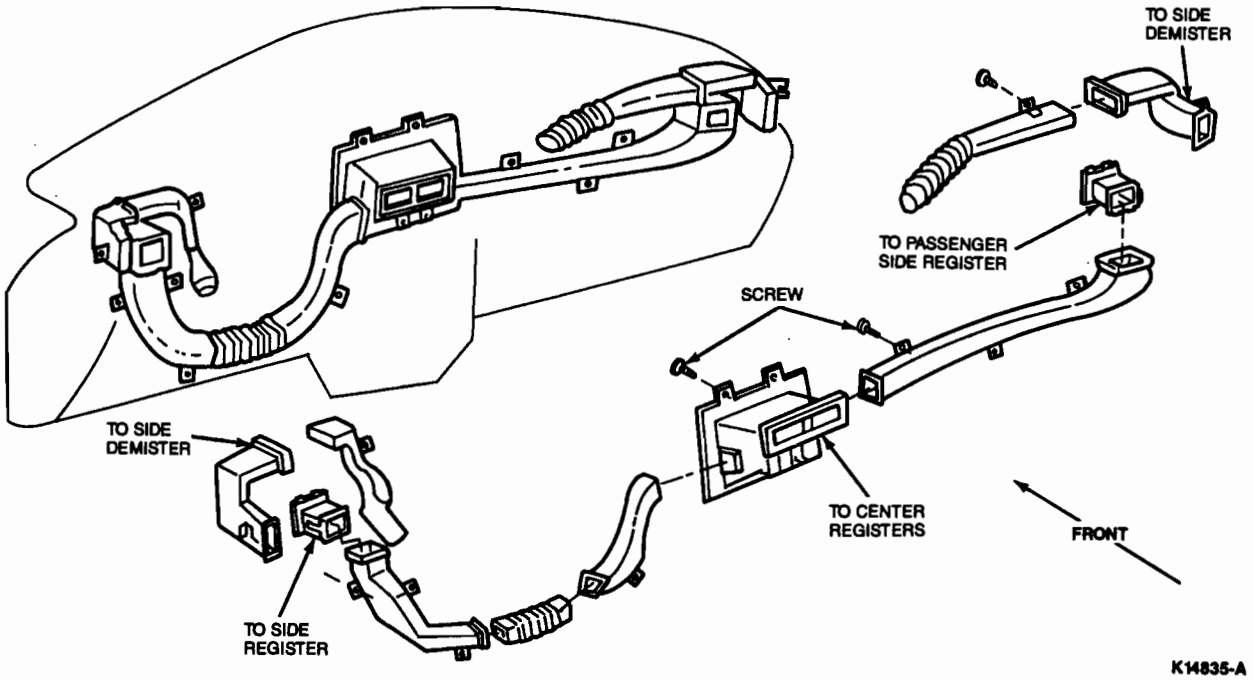
Instrument Panel Ducts

Removal and Installation

1. Remove instrument panel. Refer to Section 01-12.
2. Remove retaining screws and ducts, as necessary.

REMOVAL AND INSTALLATION (Continued)

3. To install, reverse Removal procedure.

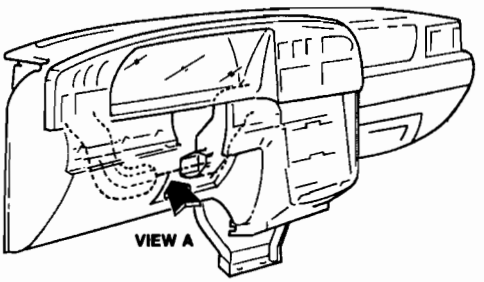


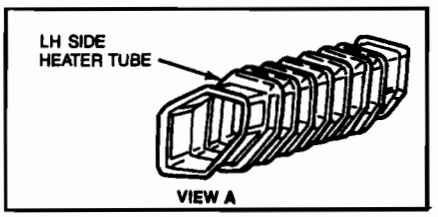
Heater Tube, LH

Removal and Installation

1. Remove steering column center trim cover.
2. Remove tube.

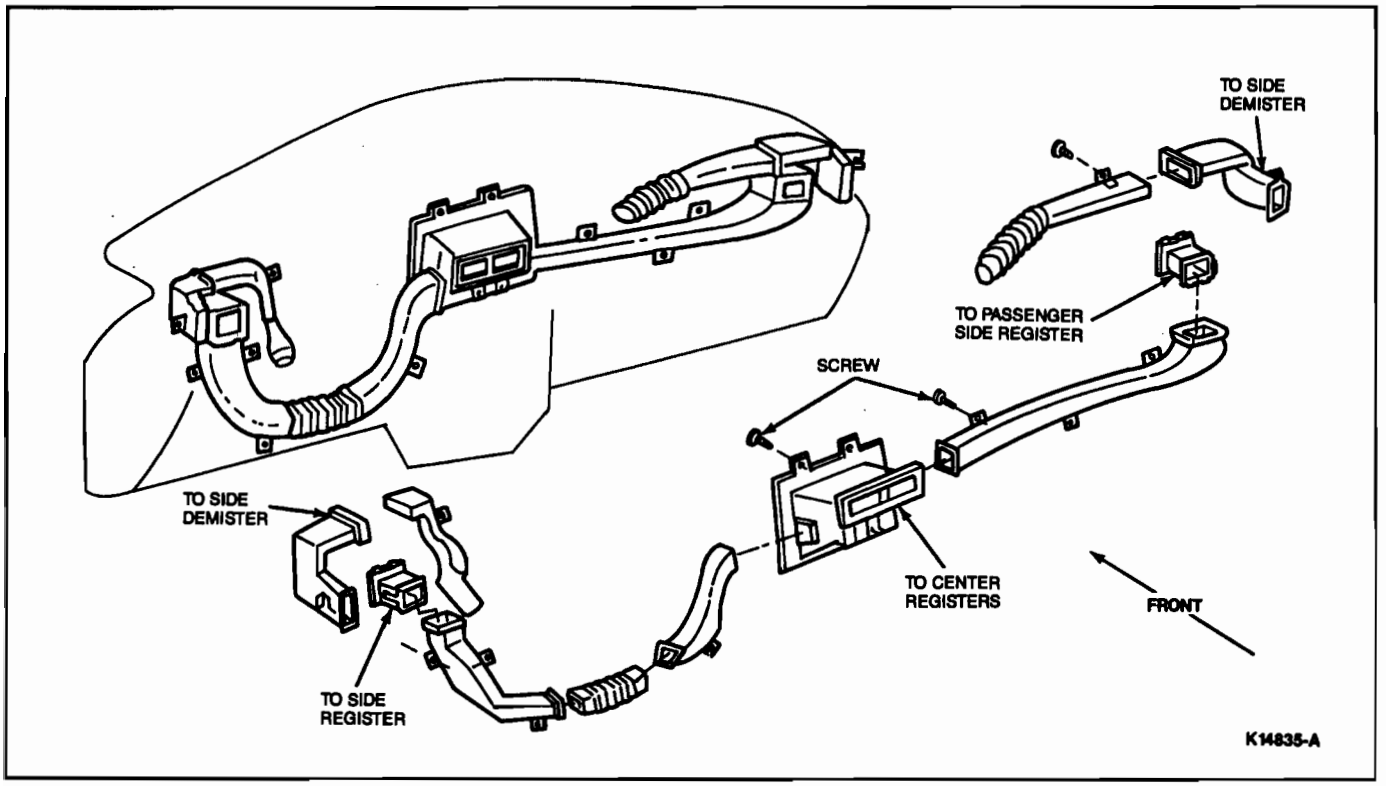
3. To install, reverse Removal procedure.





K14822-A

REMOVAL AND INSTALLATION (Continued)



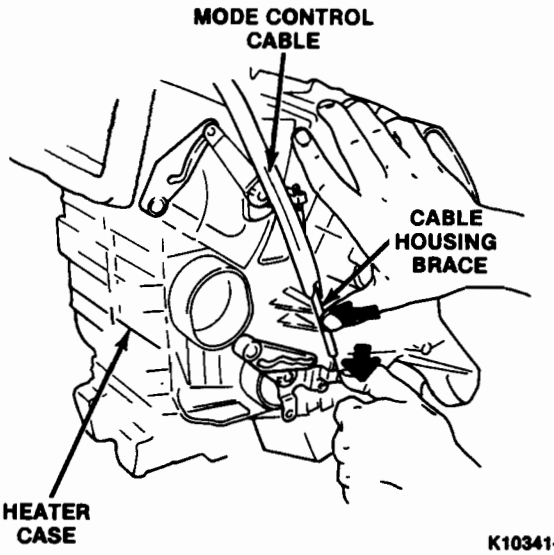
ADJUSTMENTS

Control Cable Adjustment

The control cables should be adjusted every time they are removed to ensure maximum travel of the air control doors.

Function Selector Cable

1. Remove RH center carpet panel.
2. Position function selector lever in DEFROST position.
3. Release cable from housing brace located on side of heater case.
4. With cable end on door lever pin, push door lever down to its extreme stop as shown.
5. Secure cable into cable housing brace.
6. Adjust function selector rod as outlined.

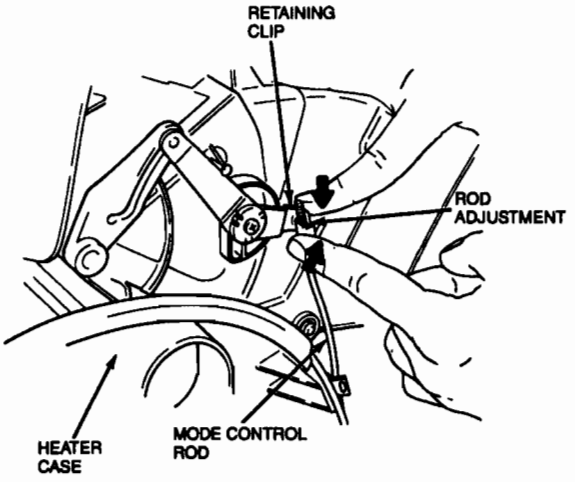


Function Selector Rod

1. Remove rod from retaining clip at heater case.
2. Push door lever downward to its extreme stop as shown.
3. Adjust rod to align with clip in heater case lever and secure rod into retaining clip.
4. Check lever for proper operation.

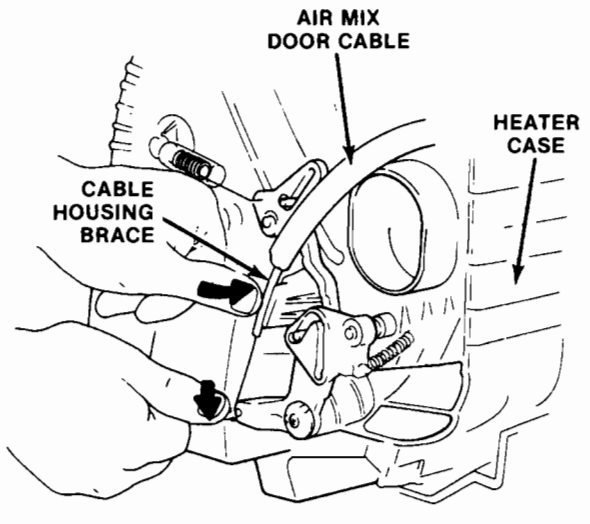
ADJUSTMENTS (Continued)

5. Install RH center carpet panel.



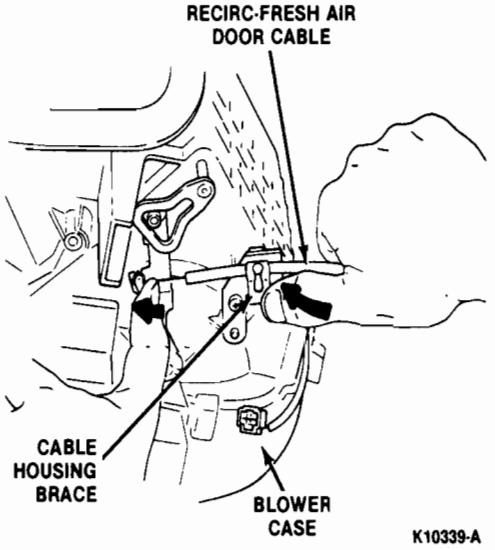
Temperature Control Cable

1. Remove LH center carpet panel.
2. Position temperature control lever in MAX-COLD position.
3. Remove cable from housing brace on side of heater case.
4. With cable end on door lever pin, push door lever down to its extreme stop as shown.
5. Secure cable into housing brace.
6. Check temperature control lever for proper operation.
7. Install LH center carpet panel.



Air Door Control Cable

1. Remove RH center carpet panel.
2. Position air door control lever in FRESH AIR position.
3. Remove cable from housing brace on side of blower case.
4. With cable end on door lever pin, push door lever forward to its extreme stop as shown.
5. Secure cable into housing brace.
6. Check air door control lever for proper operation.
7. Install RH center carpet panel.



SPECIFICATION

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Blower Case Retaining Nuts	7-10	5-7
Heater Case Retaining Bolts and Nuts	7-10	5-7
Heater Hose Clamps	4-6	35-53 (Lb-In)

SECTION 12-03 Air Conditioning System

VEHICLE APPLICATION

Capri.

DESCRIPTION AND OPERATION

The air conditioner has a fully integrated air blend system working together with the vehicle heater. This system features:

- A multi-speed fan.
- An independent air conditioning ON/OFF switch.
- Side window demist.
- Air conditioning or heating with recirculated/fresh air.
- Dehumidified heating for rapid demisting in humid climates.

There is an auxiliary condenser fan in addition to the electric cooling fan. Both operate continuously while the compressor magnetic clutch is engaged. A high- and low-pressure safety switch prevents possible damage to air conditioning components in the event of refrigerant loss.

Blower Switch

Blower motor operation is controlled by a five position switch in the lower right corner of the control panel. The switch is identified by a fan blade symbol on the face of the control panel. This switch directs the blower motor ground circuit current through, or around, the resistor assembly coils, to control blower speed.

When the switch is in the OFF position, the motor ground circuit is open and the blower motor does not operate.

With the blower switch in position one, current flow from the blower motor is restricted by three resistor coils in the resistor assembly.

When the switch is moved to position two, one of the resistor coils is bypassed out of the circuit and current flow from the blower motor is restricted by two resistor coils.

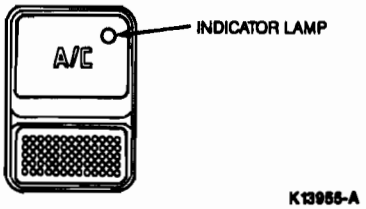
When the switch is moved to position three, two of the resistor coils are bypassed out of the circuit and current flow from the blower motor is restricted by only one resistor coil.

When the switch is moved to position four, all three resistor coils are bypassed out of the circuit and there is a direct ground circuit for the blower motor.

DESCRIPTION AND OPERATION (Continued)

A/C Switch

The A/C ON/OFF switch is located in the instrument panel. When the A/C mode is selected, the compressor clutch is engaged and air temperature off the evaporator is controlled by the de-ice switch to 1°C (34°F) to provide maximum cooling.



Compressor and Clutch

The compressor is a rotary pump of swashplate design and is belt driven by the engine crankshaft. It pumps the refrigerant into a high-pressure, high-temperature state and circulates the refrigerant through the system. The A/C compressor is engaged and disengaged by a magnetic clutch assembly. The clutch assembly consists of three major components: the pulley, pressure plate, and field coil. The pulley and field coil are attached to the front head of the compressor with snap rings. The hub is keyed to the compressor shaft and is retained by a single nut. The hub-to-pulley clearance is adjustable using adjustment shims. The clutch and shaft seal are the only serviceable items on the compressor. Refer to Section 03-05 for drive belt service.

A magnetic clutch is used to drive the compressor shaft. When voltage is applied to the clutch field coil through the A/C switch, the clutch pressure plate, which is solidly coupled to the compressor shaft, is drawn by magnetic force toward the pulley which rotates freely on the compressor front head casting. The magnetic force locks the clutch pressure plate and the pulley together as one unit. The compressor shaft then turns with the pulley. When voltage is removed from the clutch field coil, the clutch pressure plate moves away from the pulley and the compressor shaft stops rotating.

During operation, the air conditioning compressor pumps a metered quantity of pressurized liquid refrigerant into the evaporator core. The quantity of refrigerant passing into the evaporator is controlled by a temperature/pressure sensing expansion valve. Beyond the expansion valve, the refrigerant enters the low-pressure portion of the system. Without the high pressure to keep it in a liquid state, the refrigerant boils. As the refrigerant vaporizes, it absorbs heat from the air flowing over the evaporator cores and fins.

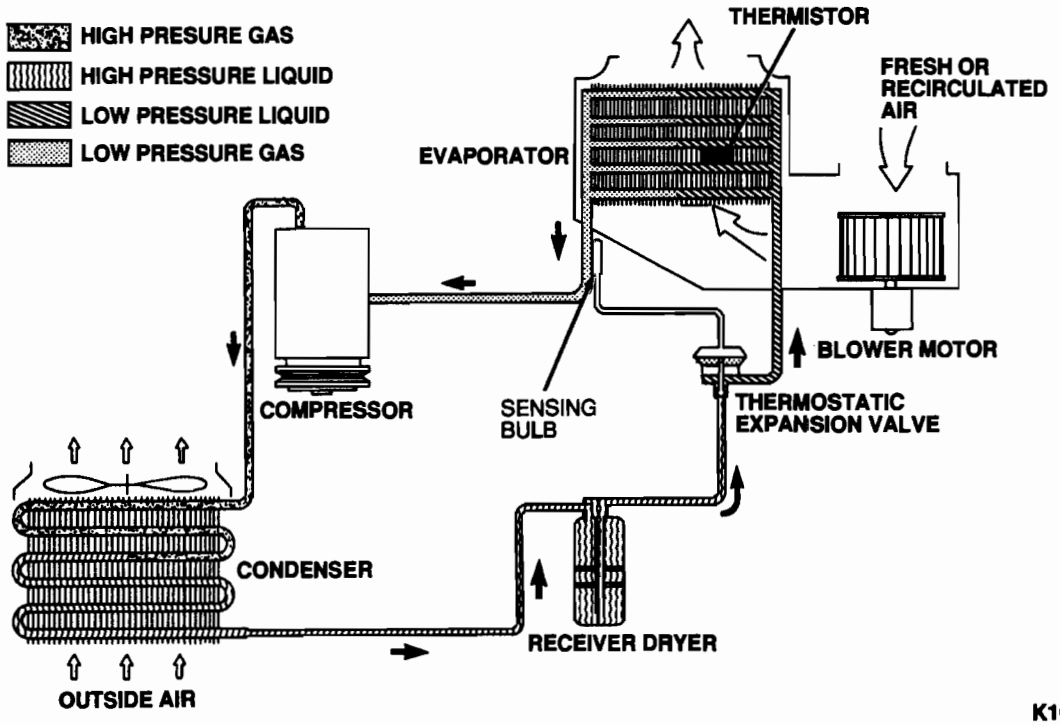
The compressor draws the vaporized refrigerant out of the evaporator, compresses it, and directs it into the condenser in front of the radiator. The stored heat is then removed by the air flowing over the condenser cores and fins, which condenses the refrigerant from a gas back to a liquid.

The pressurized liquid then flows to the receiver/dryer. This unit acts as a reservoir/filter and extracts any moisture that may be in the system. It also ensures a solid flow of liquid refrigerant to the expansion valve.

The expansion valve is used as a controlling device that allows just the right amount of high pressure liquid refrigerant to enter the evaporator to obtain maximum cooling and, at the same time, provide for complete evaporation of all liquid refrigerant in the evaporator. If the temperature in the evaporator rises, the expansion valve will allow a larger quantity of refrigerant into the evaporator. This will reduce the temperature inside the evaporator. As the evaporator begins to cool, the expansion valve will reduce the amount of refrigerant flow to the evaporator. The de-icing thermistor is mounted on the evaporator housing and prevents evaporator icing.

DESCRIPTION AND OPERATION (Continued)

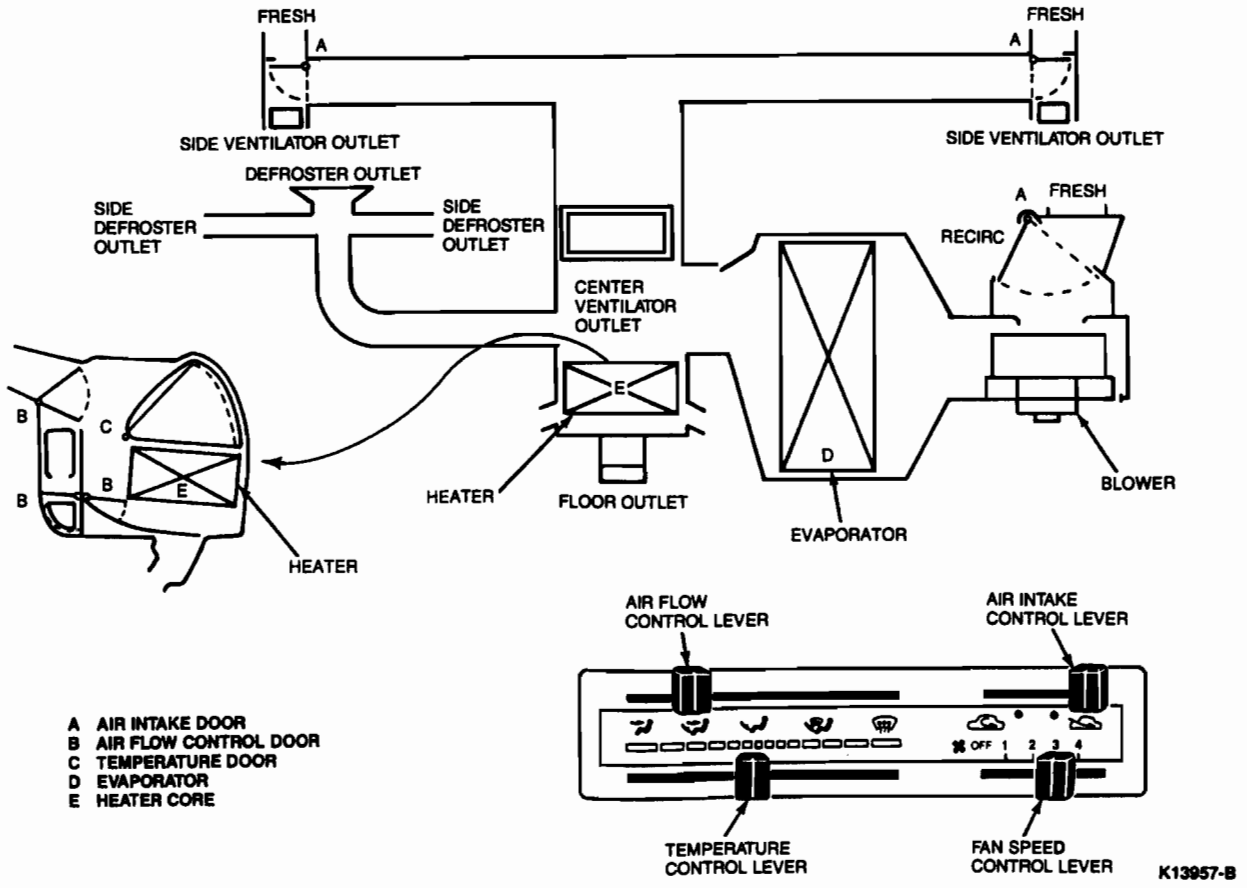
As the operation of the compressor reduces the available engine power, the idle speed will drop when the air conditioning system is switched on. At this time, the powertrain control module will increase the idle speed in order to maintain maximum cooling without affecting engine performance at idle.



DESCRIPTION AND OPERATION (Continued)

Airflow

The air conditioning / heater assembly is a blend-air system, receiving outside air or recirculated air depending on the position of the Recirc-Fresh air door. The door is controlled by a cable from the control panel. Air enters the blower case and is forced by the blower motor through the evaporator and on into the heater case assembly. The air passes through the heater core or bypasses it depending on the position of the temperature control door. The air is then directed to the various registers according to the position of the vent and defrost doors.

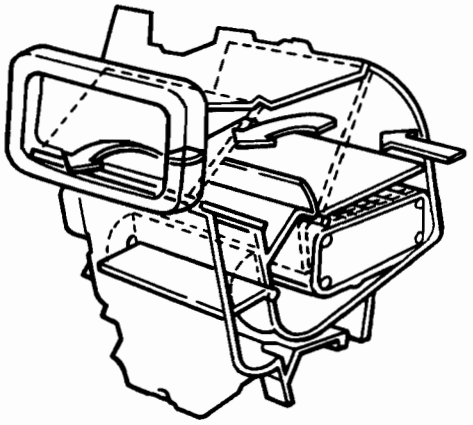


Temperature Control

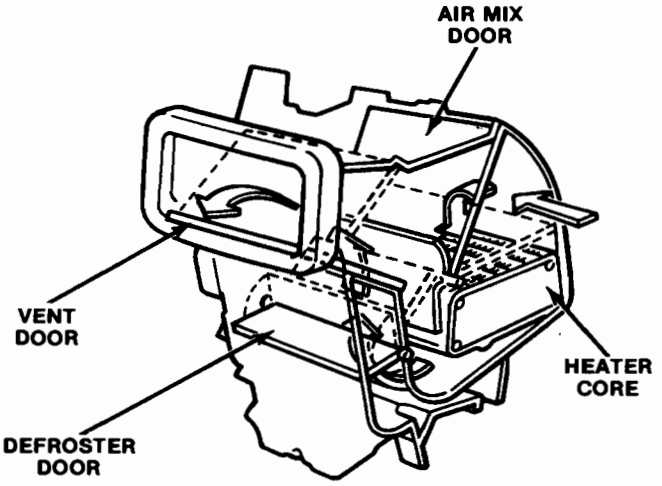
A temperature blend door directs ambient or air conditioned air to flow through the heater core for heating, or to bypass the heater core for cooling the vehicle. It is controlled between COOL and WARM by the temperature lever of the control panel.

DESCRIPTION AND OPERATION (Continued)

Positioning the temperature lever in any position between COOL and WARM will cause the air temperature door to direct more or less air through the heater core in order to achieve the desired temperature.



AIR FLOW DURING MAX COLD



AIR FLOW DURING MAX HOT

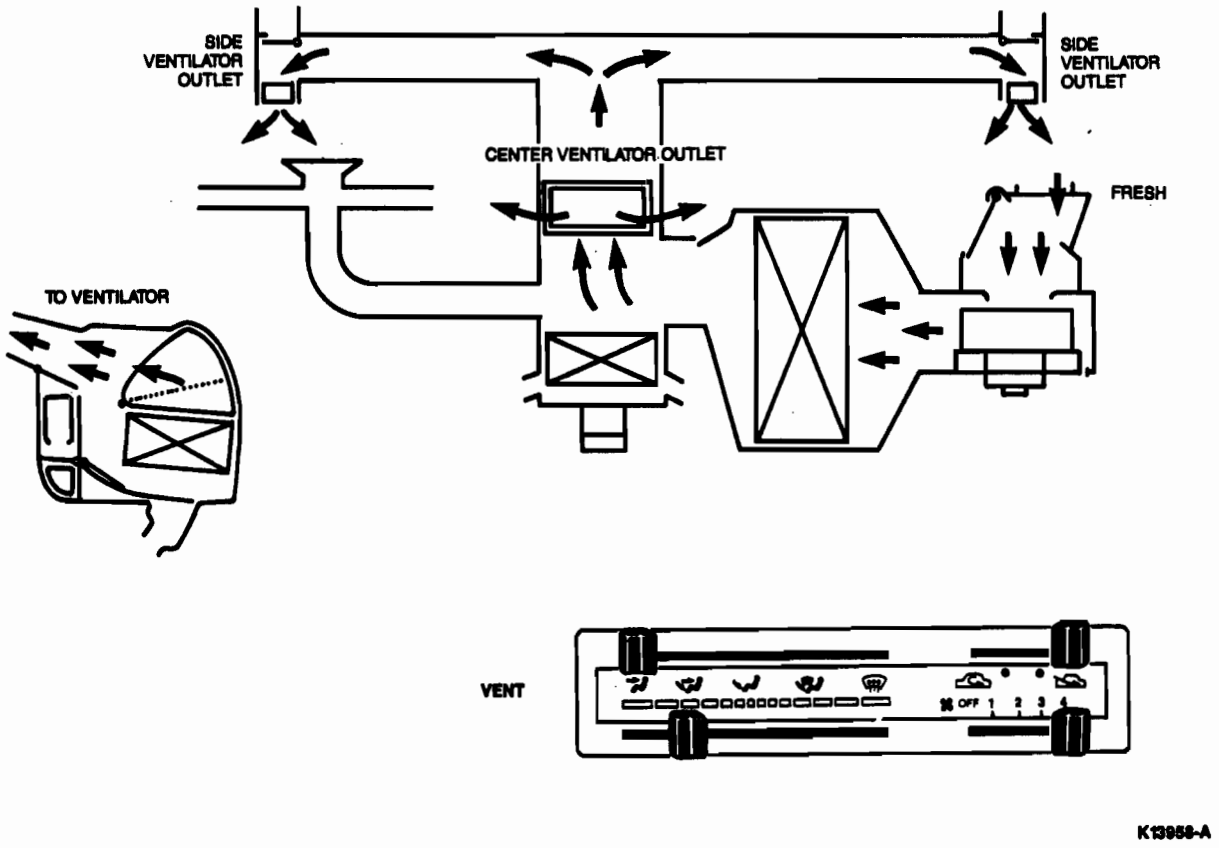
K10327-A

Air Distribution

The blended warm and cool air is distributed to the defroster outlets, the instrument panel registers or to the floor distribution outlets according to the position of the air discharge doors. The doors are controlled by a cable from the control panel.

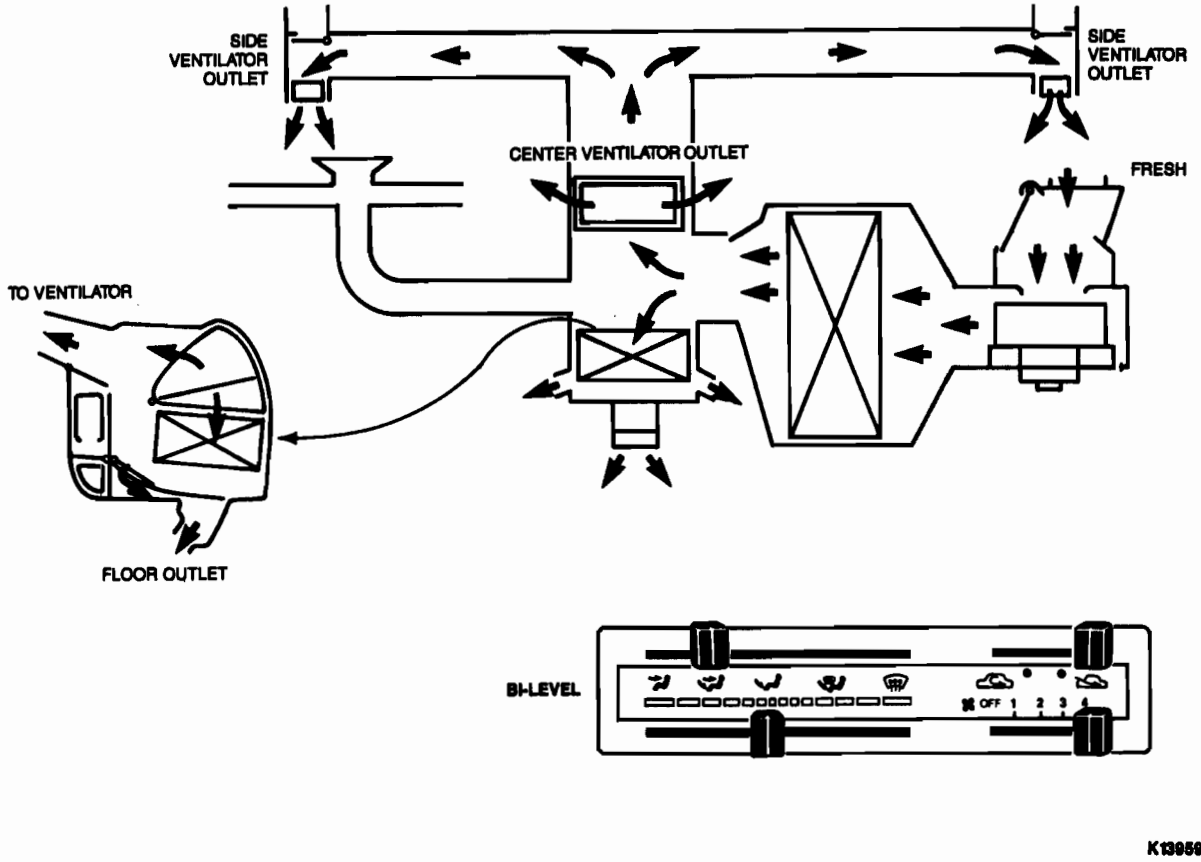
DESCRIPTION AND OPERATION (Continued)

When the function selector lever is in the VENT position, all airflow is directed to the instrument panel registers.



DESCRIPTION AND OPERATION (Continued)

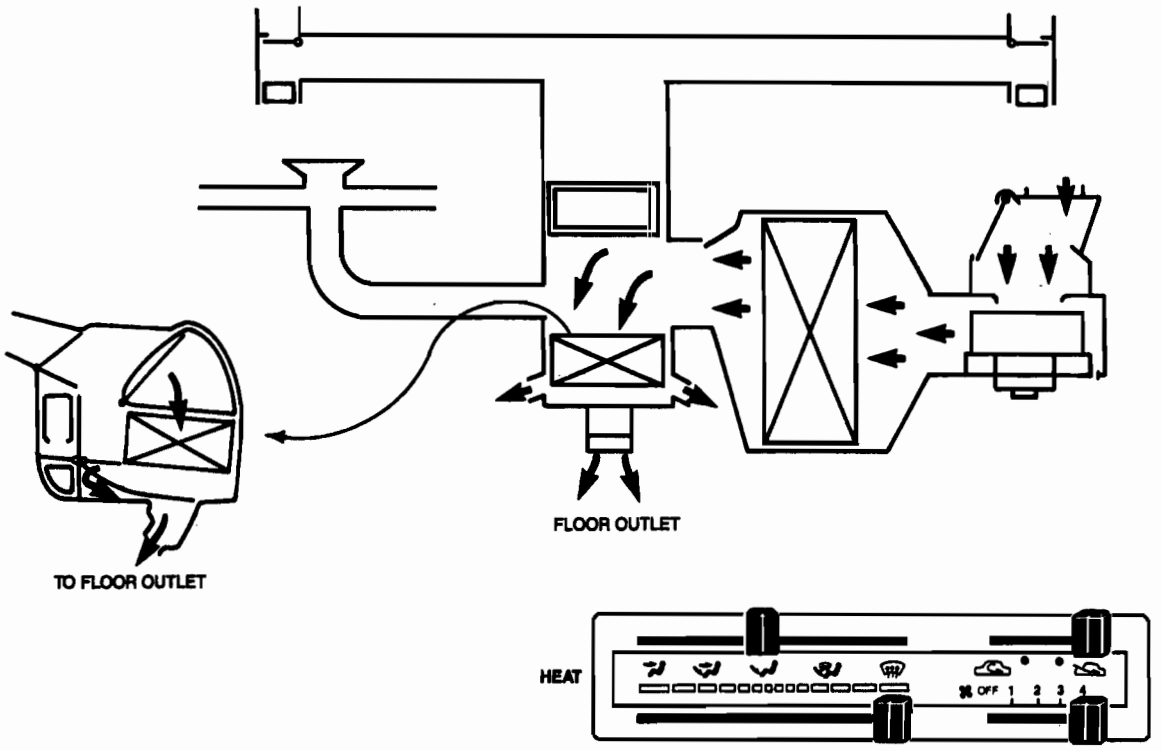
When the function selector lever is in the BI-LEVEL position, airflow is equally directed to all registers.



DESCRIPTION AND OPERATION (Continued)

When the function selector lever is in the HEAT position, all of the airflow is directed to the floor registers.

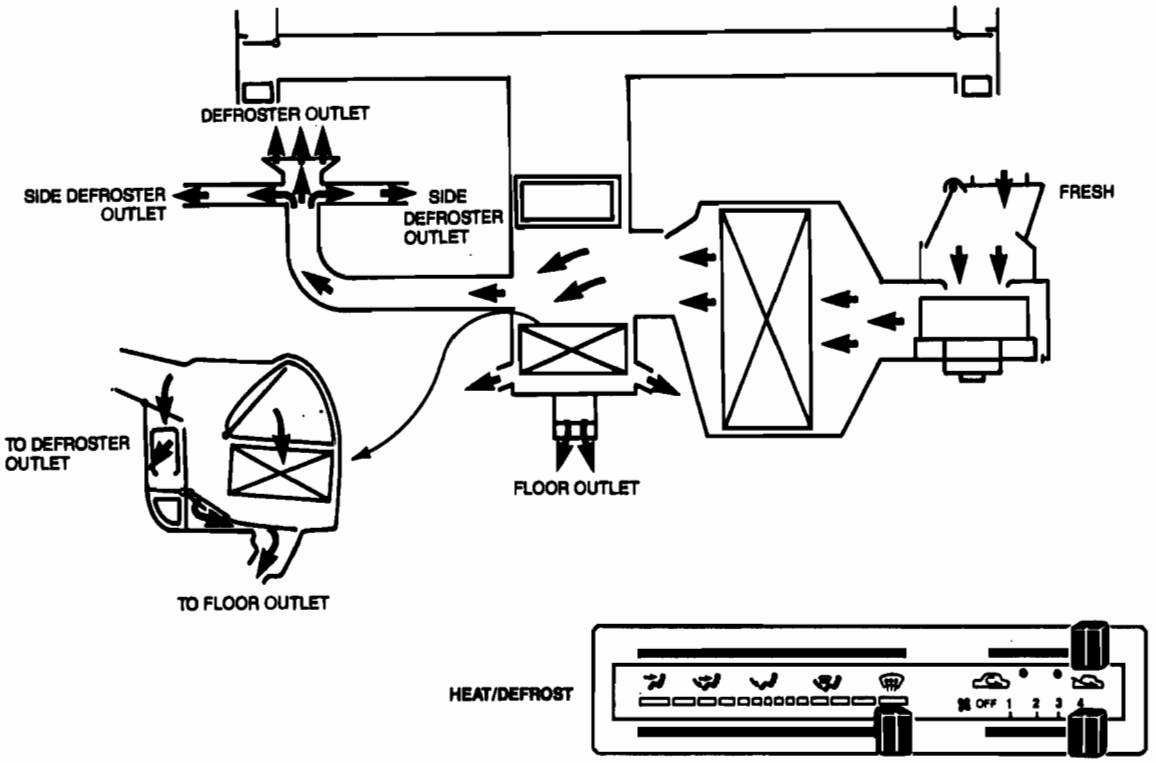
NOTE: Storing items under the front seats may restrict heat to the rear seat.



K13960-A

DESCRIPTION AND OPERATION (Continued)

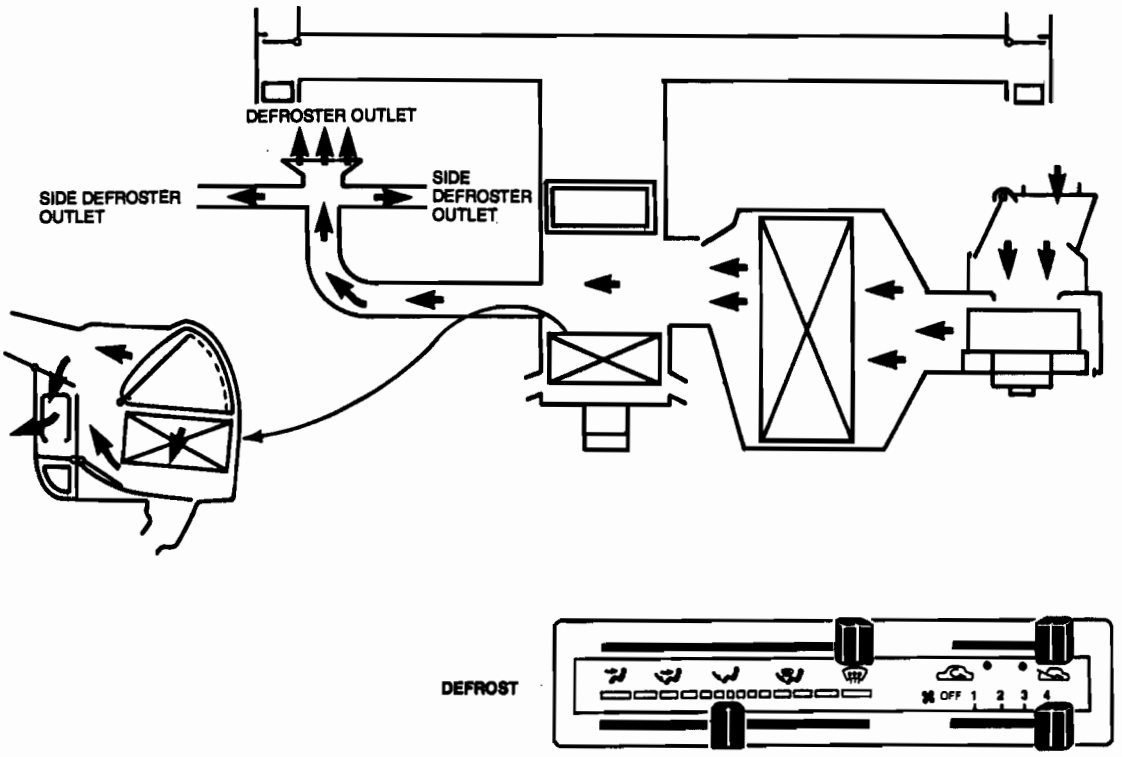
When the function selector lever is in the HEAT/DEFROST position, airflow is directed equally to the floor and defroster registers.



K13961-A

DESCRIPTION AND OPERATION (Continued)

When the function selector lever is in the DEFROST position, all airflow is directed to the defroster registers.



DIAGNOSIS AND TESTING

Refer to Section 12-00.

REMOVAL AND INSTALLATION

Condenser

Removal

1. Disconnect negative battery cable.
2. Discharge refrigerant from system. Refer to Section 12-00.
3. Drain cooling system. Refer to Section 03-03.
4. Disconnect upper radiator hose from radiator.
5. Disconnect lower radiator hose from radiator.
6. Remove upper radiator mounts.
7. Disconnect cooling fan connector and release harness retainer.
8. Disconnect coolant overflow hose.
9. Remove radiator and fan assembly.
10. Disconnect and plug A/C lines to prevent moisture from entering the system.
11. Position wiring harness out of way.
12. Remove condenser retaining bolts.
13. Carefully remove the condenser.

Installation

1. Add 25-30 ml (0.845-1.014 oz) of compressor oil to condenser if installing a new condenser.
2. Carefully install condenser and install retaining bolts.
3. Connect A/C lines. Tighten discharge line fitting to 20-25 N·m (15-18 lb-ft). Tighten liquid line fitting to 12-15 N·m (9-11 lb-ft).
4. Install radiator and fan assembly. Connect electrical connector and install harness retainer.

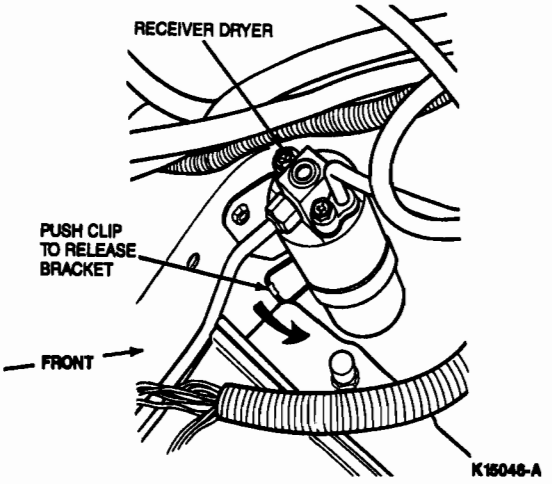
REMOVAL AND INSTALLATION (Continued)

5. Connect coolant hoses. Fill cooling system. Refer to Section 03-03.
6. Connect negative battery cable.
7. Evacuate and charge A/C system. Refer to Section 12-00.

Receiver Dryer

Removal

1. Disconnect negative battery cable.
2. Discharge refrigerant from system. Refer to Section 12-00.
3. Remove the air cleaner assembly and front mounting bracket. Refer to Section 03-12.
4. Disconnect and plug A/C lines to prevent dirt and moisture from entering system.
5. Loosen bracket and remove receiver dryer.



Installation

1. Add 15-20ml (0.507-0.676 oz) of compressor oil to receiver dryer if it was replaced.
2. Install receiver dryer into bracket.
3. Connect the A/C lines making sure to connect line coming from condenser to port marked "IN".
4. Tighten line connection retaining screws to 12-15 N·m (9-11 lb-ft).
5. Install air cleaner assembly and mounting bracket. Refer to Section 03-12.
6. Connect negative battery cable.
7. Evacuate and recharge the air conditioning system. Refer to Section 12-00.

A/C Hose

Removal

1. Disconnect negative battery cable.
2. Discharge refrigerant from system. Refer to Section 12-00.
3. Remove or release retaining straps or brackets as required.
4. Disconnect and plugs A/C hose(s) to prevent dirt and moisture from entering system.

Installation

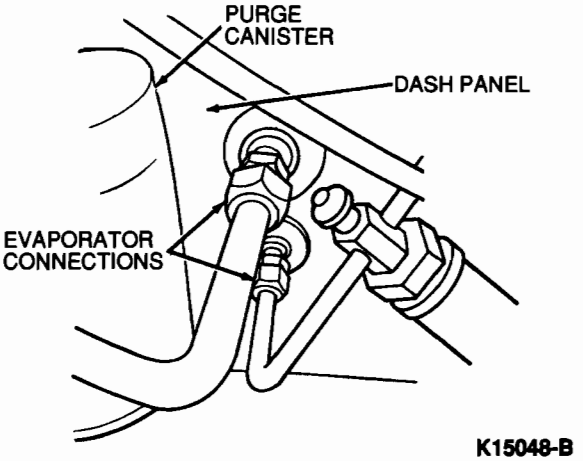
1. Install new line(s) with new O-rings(s), and tighten according to specifications.

   NOTE: It is not necessary to add any compressor oil when replacing hoses or valves.
2. Install brackets or retaining straps if removed.
3. Evacuate and recharge the air conditioning system. Refer to Section 12-00.
4. Connect the negative battery cable.

Evaporator Assembly

Removal

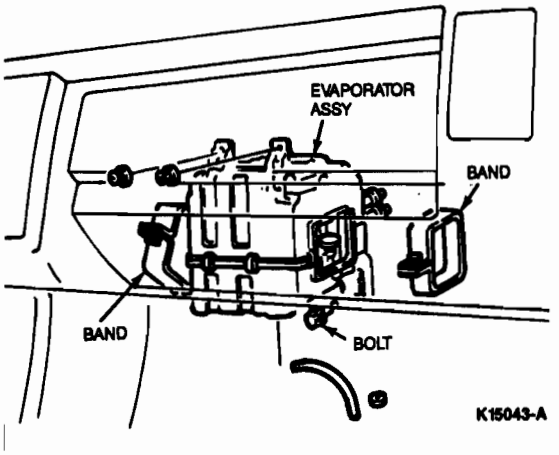
1. Disconnect negative battery cable.
2. Discharge refrigerant from system. Refer to Section 12-00.
3. Disconnect and plug A/C lines from evaporator in engine compartment to prevent dirt and moisture from entering system.



4. Remove the glove compartment. Refer to Section 01-12.
5. Remove glove compartment upper panel.
6. Remove upper panel bracket.
7. Disconnect electrical connectors and release harness retainers.
8. Remove defroster tube.
9. Remove air duct bands.

REMOVAL AND INSTALLATION (Continued)

10. Remove drain hose.
11. Remove evaporator mount bolts and nuts.
12. Carefully remove evaporator.



Installation

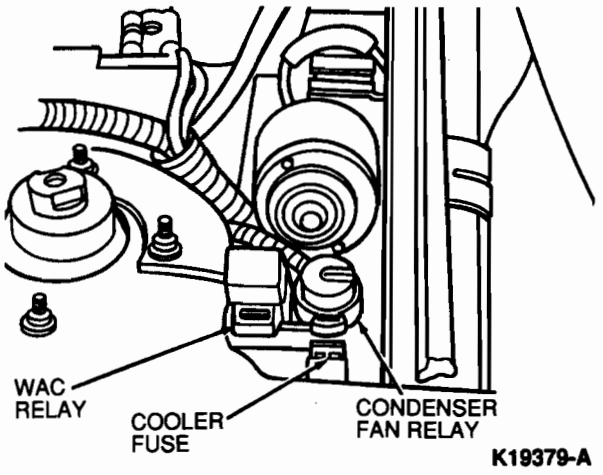
1. Add 25-30 ml (0.845-1.014 oz) of compressor oil to the evaporator if evaporator is being replaced.
2. Carefully position evaporator assembly and install retaining bolts and nuts. Tighten to 9-13 N·m (7-9.5 lb-ft).
3. Make sure evaporator grommet in dash panel is in proper position.
4. Install air duct bands.
5. Install drain hose.
6. Connect electrical connector and install harness retainers.
7. Install defroster tube.
8. Install glove compartment upper panel bracket.
9. Install glove compartment upper panel.
10. Install glove compartment.
11. Unplug liquid line and install to evaporator inlet. Tighten fitting to 12-15 N·m (9-11 lb-ft).
12. Unplug suction line and install to evaporator outlet. Tighten fitting to 30-35 N·m (23-25 lb-ft).
13. Connect negative battery cable.
14. Evacuate and recharge the air conditioning system. Refer to Section 12-00.

Expansion Valve

Refer to Evaporator Disassembly.

A/C Relays

The air conditioning relays are mounted on a bracket behind the LH strut tower.



Removal and Installation

1. Lift relay and rubber retaining boot from bracket.
2. Disconnect relay electrical connector.
3. Remove relay from retaining boot.
4. To install, reverse Removal procedure.

Condenser Fan

Removal

1. Remove front bumper assembly. Refer to Section 01-19.
2. Disconnect fan harness connector, and release retaining strap.
3. Remove transaxle cooler from bracket, if equipped, and position aside.
4. Remove fan retaining nuts and remove fan and bracket assembly.

Installation

1. Install fan and bracket assembly. Tighten retaining nuts to 8-11 N·m (71-97 lb-in).
2. Install transaxle cooler, if equipped.
3. Connect fan electrical connector and install harness retaining strap.
4. Install front bumper assembly. Refer to Section 01-19.

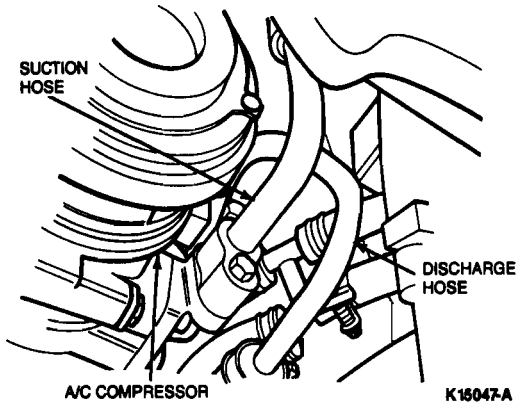
Compressor

Removal

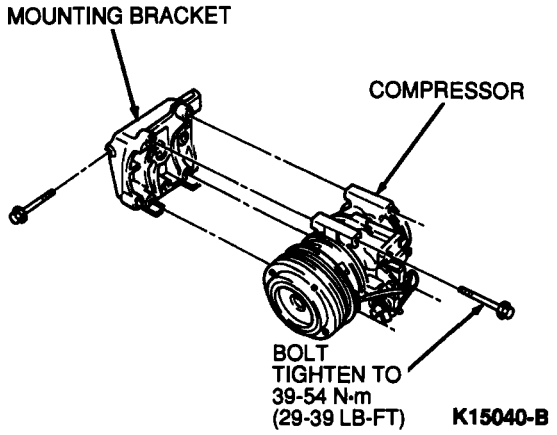
1. Run engine at fast idle with the air conditioner on for 10 minutes, then shut the engine OFF.
2. Disconnect negative battery cable.
3. Remove compressor drive belt. Refer to Section 03-05.
4. Discharge refrigerant from A/C system. Refer to Section 12-00.

REMOVAL AND INSTALLATION (Continued)

5. Raise vehicle on a hoist. Refer to Section 00-02.
6. Remove underbody covers. Refer to Section 01-02.
7. Disconnect magnetic clutch electrical connector.
8. Disconnect suction and discharge hose assembly from compressor. Cap the open fittings to keep moisture and dirt out of system.



9. Remove compressor mounting bolts and remove compressor.



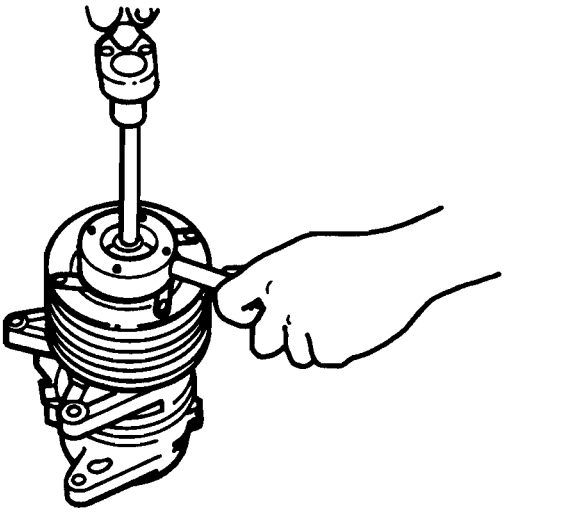
Installation

1. Add 61-100 ml (2.05-3.38 oz) of refrigerant oil to compressor if compressor was replaced.
2. Position compressor and install retaining bolts. Tighten to 39-54 N·m (29-39 lb-ft).
3. Connect suction and discharge hose assembly to compressor.
4. Connect magnetic clutch electrical connector.
5. Install underbody covers. Refer to Section 01-02.
6. Lower vehicle.
7. Install compressor drive belt. Refer to Section 03-05.
8. Connect negative battery cable.
9. Evacuate and recharge the system. Refer to Section 12-00.

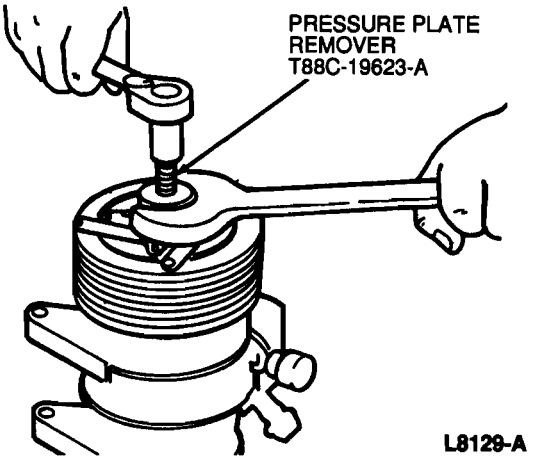
Pressure Plate, Pulley and Field Coil

Removal

1. Remove compressor as outlined.
2. Remove compressor shaft nut.

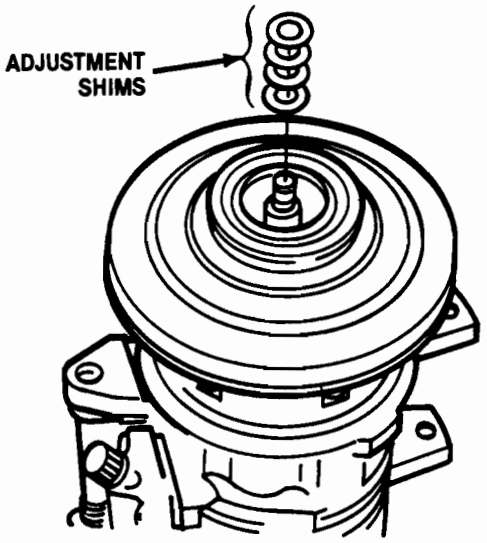


3. Remove pressure plate using Pressure Plate Remover T88C-19623-A or equivalent.



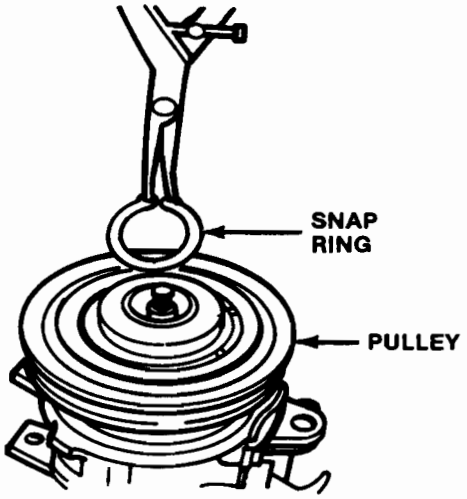
REMOVAL AND INSTALLATION (Continued)

4. Remove adjustment shims from shaft.



K11232-A

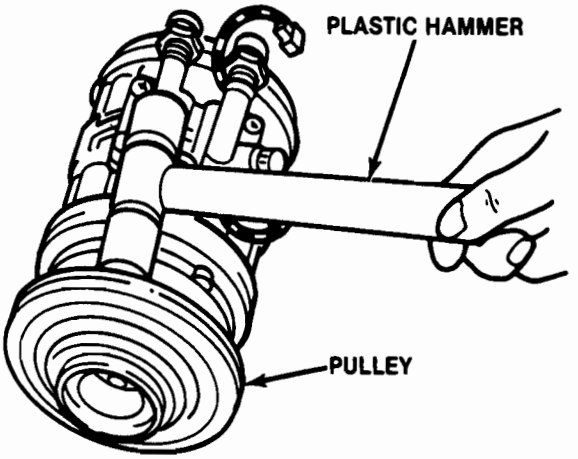
5. Remove snap ring retaining pulley.



K11233-A

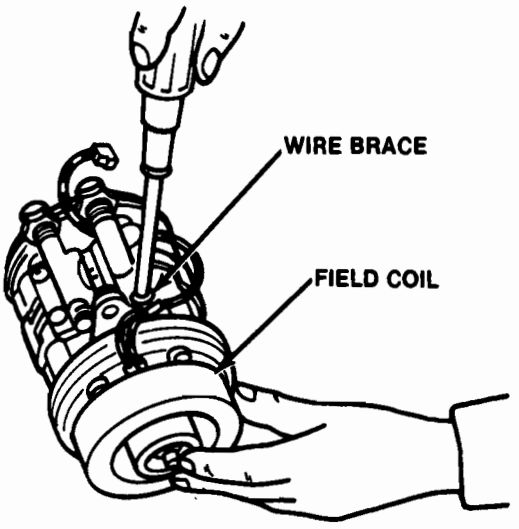
6. Remove pulley using a plastic hammer.

CAUTION: Take care not to damage pulley when tapping.



K11234-A

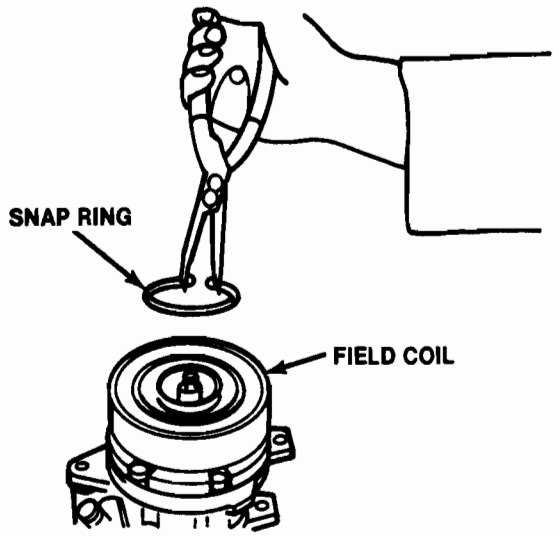
7. Remove field coil wire brace at compressor.



K11235-A

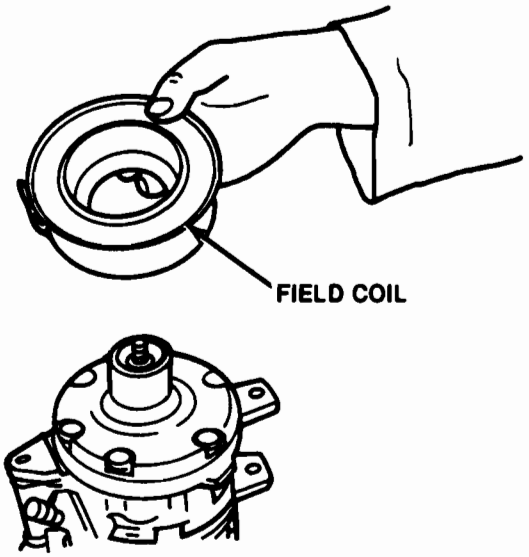
REMOVAL AND INSTALLATION (Continued)

8. Remove snap ring from field coil.



K11236-A

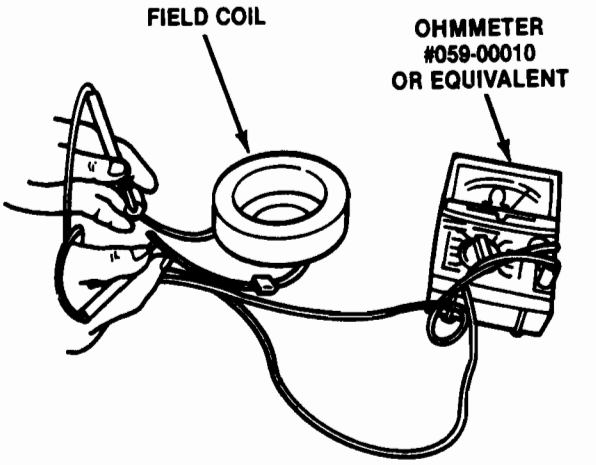
9. Remove field coil.



K11237-A

Inspection

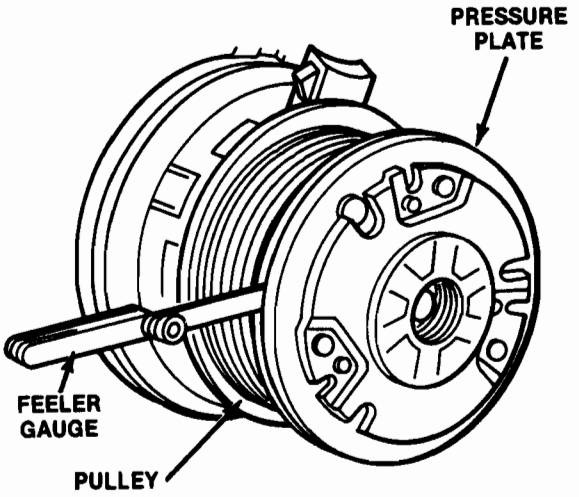
1. Inspect pressure plate and pulley surfaces for wear or scoring. Replace if worn or damaged.
2. Check pulley bearing for wear or leakage and replace if worn or damaged.
3. Measure resistance of field coil with Rotunda Dwell-Tach-Volts-Ohms Tester 059-00010 or equivalent. Resistance reading should be 2.7-3.1 ohms at 20°C (68°F). Replace field coil if not within specification.



K11238-A

Installation

1. Position field coil and secure with snap ring.
2. Install field coil wire brace on compressor.
3. Position pulley onto compressor and secure with snap ring.
4. Install adjustment shims and pressure plate onto compressor shaft. Add or subtract shims to obtain a clearance between pressure plate and pulley of 0.4-0.7mm (0.016-0.027 inch).



K11239-A

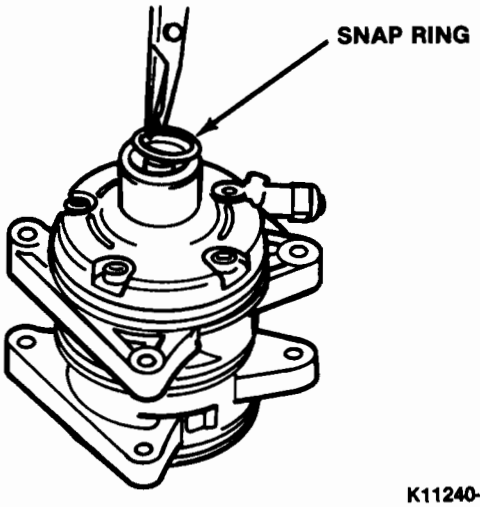
5. Install compressor shaft nut onto compressor shaft.
6. Install compressor as outlined.

REMOVAL AND INSTALLATION (Continued)

Shaft Seal

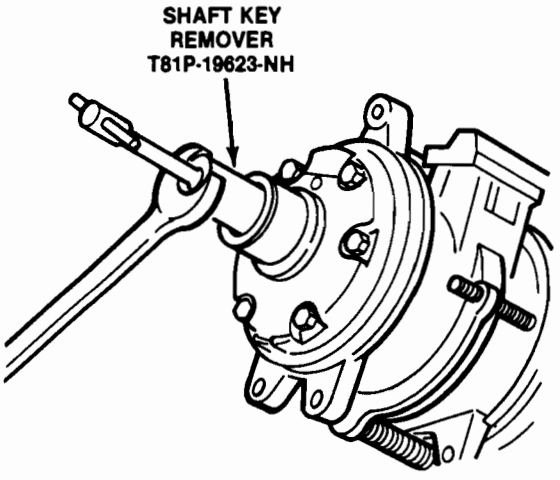
Removal

1. Remove compressor as outlined.
2. Remove pressure plate, pulley and field coil as outlined.
3. Remove felt seal.
4. Remove snap ring.



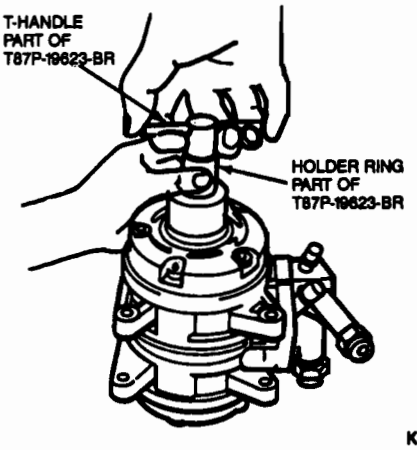
K11240-A

5. Remove key from shaft using Shaft Key Remover T81P-19623-NH or equivalent.



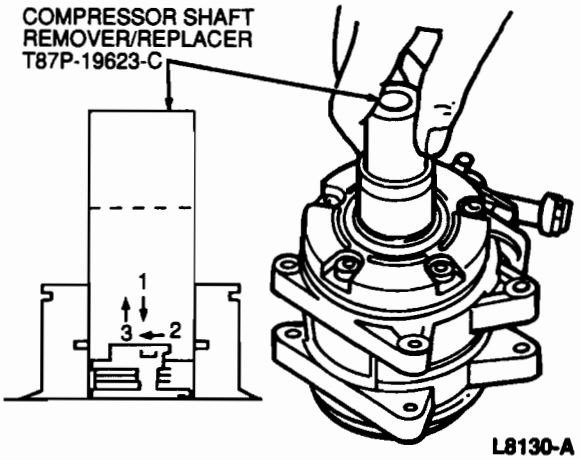
K11241-A

6. Remove shaft thrust plate as follows:
   a. Insert Compressor Shaft Seal Seat Remover T87P-19623-BR or equivalent into seal bore and against seal thrust plate.
   b. Push holder ring downward and pull up on T-handle, removing thrust plate.



K15070-A

7. Remove shaft thrust seal as follows:
   a. Insert Compressor Shaft Seal Remover / Replacer T87P-19623-C or equivalent, into seal bore against seal.
   b. Press lightly against seal while turning tool clockwise.
   c. Pull up to remove seal.

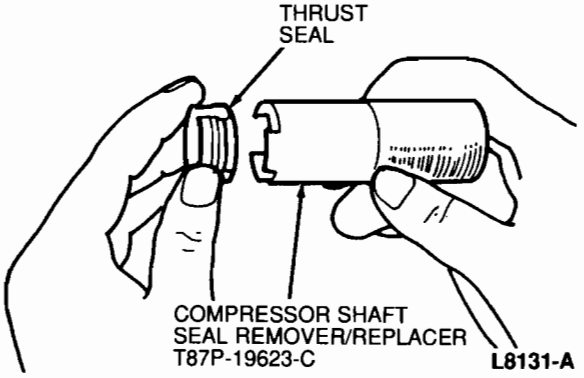


L8130-A

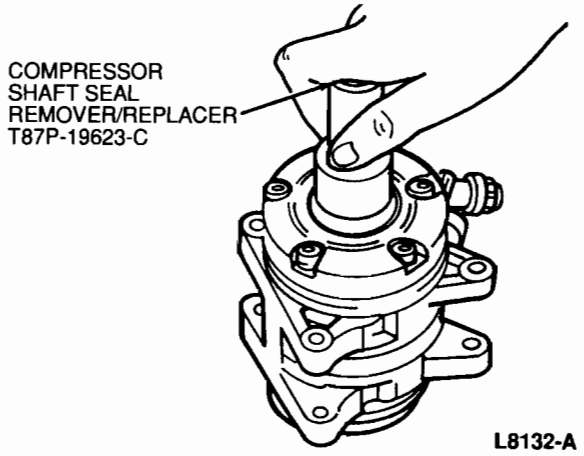
REMOVAL AND INSTALLATION (Continued)

Installation

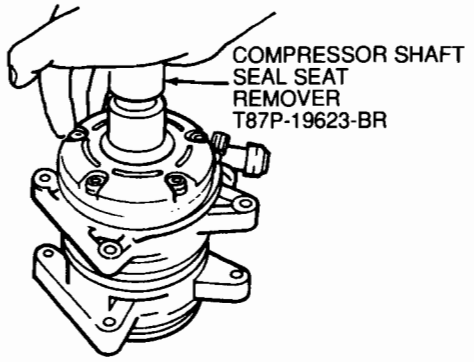
1. Install new seal onto Compressor Shaft Seal Remover / Replacer T87P-19623-C or equivalent.



2. Apply refrigerant oil to seal and seal bore.
3. Install seal into seal bore and turn tool counterclockwise to release.



4. Install thrust plate using Compressor Shaft Seal Seat Remover T87P-19623-BR or equivalent.

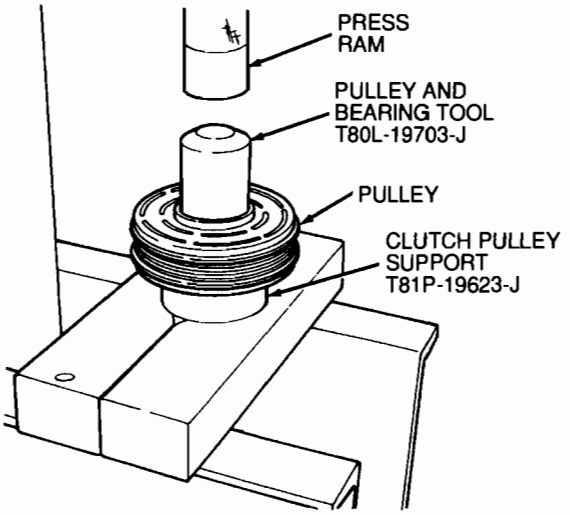


5. Install key into shaft groove.
6. Install snap ring and felt seal.
7. Install field coil, pulley and pressure plate as outlined.
8. Install compressor as outlined.

Clutch Pulley Bearing

Removal

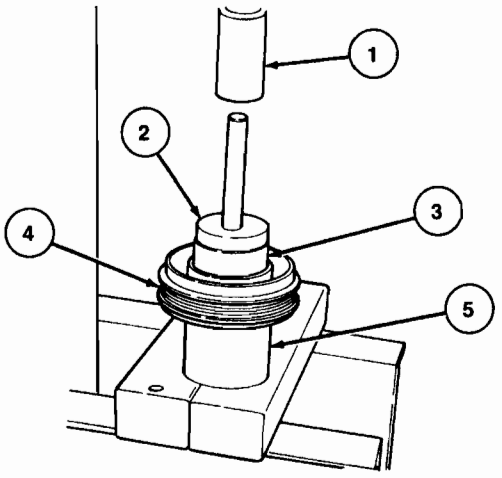
1. Remove compressor as outlined.
2. Remove pressure plate, pulley and field coil as outlined.
3. Remove the pulley bearing using Clutch Pulley Support T81P-19623-J, Pulley and Bearing Tool T80L-19703-J or equivalent and a hydraulic press.



Installation

1. Install bearing into pulley using Clutch Pulley Support T81P-19623-J, Pulley Bearing Replacer T80L-19703-C or equivalent and a hydraulic press.

REMOVAL AND INSTALLATION (Continued)



K15072-B

Item	Part Number	Description
1	—	Press Ram
2	T80L-19703-C	Pulley Bearing Replacer
3	—	Bearing
4	—	Pulley
5	T81P-19623-J	Clutch Pulley Support

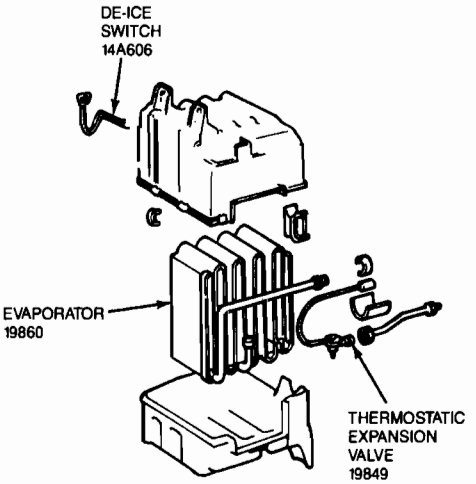
2. Install pressure plate, pulley and field coil as outlined.
3. Install compressor as outlined.

DISASSEMBLY AND ASSEMBLY

Evaporator Assembly

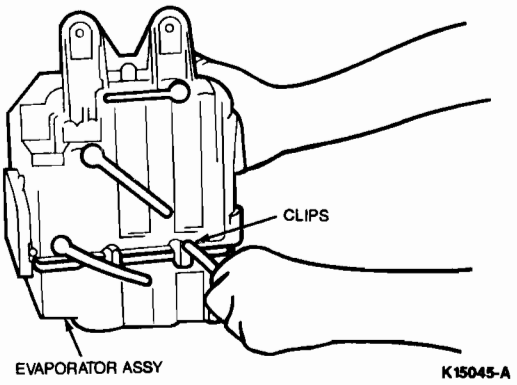
Disassembly

Evaporator Disassembled View



K15075-A

1. Remove 10 retaining clips.

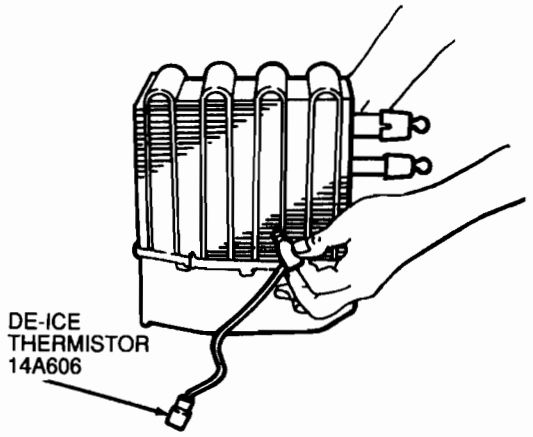


K15045-A

2. Separate case halves and remove evaporator.

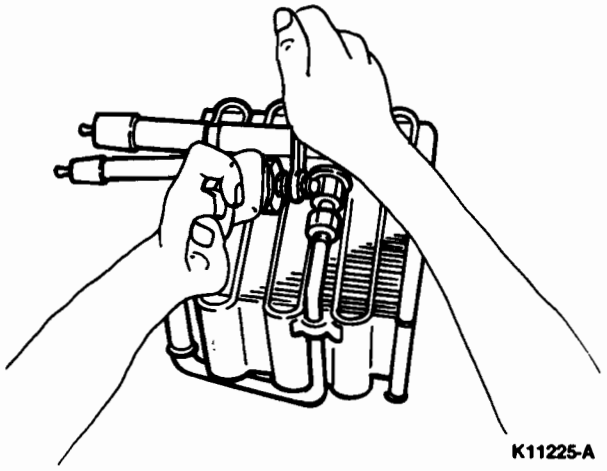
DISASSEMBLY AND ASSEMBLY (Continued)

3. Remove de-ice thermistor.



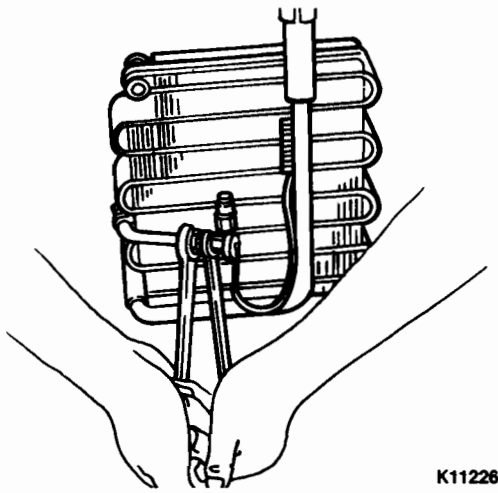
K15376-B

4. Disconnect liquid tube from inlet fitting of expansion valve.



K11225-A

5. Remove capillary tube from evaporator outlet.
6. Remove expansion valve from inlet fitting of evaporator.



K11226-A

Assembly

1. Install expansion valve to inlet fitting of evaporator. Tighten fitting to 12-15 N·m (9-11 lb-ft).
2. Connect liquid tube to inlet fitting of expansion valve. Tighten fitting to 12-15 N·m (9-11 lb-ft).
3. Install packing to fix capillary tube of expansion valve to outlet of evaporator.
4. Install de-ice thermistor.
5. Assemble case halves with ten retaining clips.

MAINTENANCE

Adding Refrigerant Oil

The compressor uses a 500 viscosity Refrigerant Oil C9AZ-19557-B or Motorcraft YN-2 or equivalent. A total oil charge of 80 ± 10 ml (2.7 ± .3 oz) is required in a new system.

It is important that only the specified type and quantity of refrigerant oil be used in the compressor. If there is excess oil in the system, it will circulate with the refrigerant, reducing the cooling capacity of the system. Too little oil will result in poor lubrication of the compressor.

When it is necessary to replace a component of the refrigerant system, the procedures given here must be followed to ensure that the total oil charge in the system is correct after the new part is installed. When the compressor is operated, oil gradually leaves the compressor and is circulated through the system with the refrigerant. Eventually a balanced condition is reached in which a certain amount of oil is retained in the compressor and a certain amount is continually circulated. If a component of the system is removed after the system has been operated, some oil will remain with it. To maintain the original total oil charge, it is necessary to compensate for this by replacing the oil in the new replacement part. The amount of oil to be added for each component is listed with each individual procedure.

ADJUSTMENTS

Refer to Section 12-00.

SPECIFICATIONS

REFRIGERANT CAPACITIES

Description	Grams	Ounces
R-12 Refrigerant	700±50	24±1.8
Refrigerant Oil	80± 10 (ml)	2.7±.3

SPECIFICATIONS (Continued)

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Liquid Line (3/8 inch)	12-15	9-11
Discharge Line (1/2 inch)	20-25	15-18
Suction Line (5/8 inch)	30-35	23-25
A/C Auxiliary Fan Nuts	8-11	71-97 (Lb-In)
A/C Compressor Bolts	39-54	29-39
Expansion Valve to Evaporator	12-15	9-11
Evaporator Retaining Nuts and Bolts	9-13	7-9.5

SPECIAL SERVICE TOOLS

Tool Number	Description
T80L-19703-J	Pulley and Bearing Tool
T80L-19703-C	Pulley Bearing Replacer

(Continued)

Tool Number	Description
T81P-19623-J	Clutch Pulley Support
T81P-19623-NH	Shaft Key Remover
T87P-19623-BR	Compressor Shaft Seal Seat Remover
T87P-19623-C	Compressor Shaft Seal Remover/Replacer
T88C-19623-A	Pressure Plate Remover

ROTUNDA EQUIPMENT

Model	Description
059-00010	Dwell-Tach-Volt Ohms Tester