A/C-HEATER SYSTEM - MANUAL

1993 Jeep Cherokee

1993 AIR CONDITIONING & HEAT
Chrysler Motors Manual A/C-Heater Systems

Jeep; Cherokee & Wrangler

A/C SYSTEMS SPECIFICATIONS

SPECIFICATIONS TABLE

Application	Specification
Compressor Type	Sanden SD-709 7-Cyl.
Compressor Belt Tension	
Serpentine Belt	
New	180-200 lbs. (82-91 kg)
Used	140-160 lbs. (64-73 kg)
System Oil Capacity	4.6 ozs.
Refrigerant (R-12) Capacity	
Cherokee	38.0 ozs.
Wrangler	32.0 ozs.
System Operating Pressures	
High Side	160-235 psi (11.2-16.5 kg/cm²)
Low Side	30-35 psi (2.1-2.5 kg/cm²)

DESCRIPTION & OPERATION

A/C-HEATER SYSTEM

Cherokee

The A/C clutch relay controls voltage supply to the compressor clutch. Electronic Control Unit (ECU) energizes the A/C clutch relay. ECU will not energize relay if evaporator temperature is too low, or if the refrigerant system pressure is too low.

ECU monitors evaporator temperature based upon the voltage reference it receives from the A/C sensor (evaporator thermistor) in the evaporator housing. ECU monitors refrigerant pressure through low pressure switch on receiver-drier. If refrigerant pressure is less than 28 psi (2.0 kg/cm²), the low pressure switch contacts open. ECU then stops compressor operation to prevent damaging the compressor.

NOTE: ECU may delay compressor clutch engagement for as many as 30 seconds.

Wrangler

The A/C clutch relay controls voltage supply to the compressor clutch. Electronic Control Unit (ECU) energizes the A/C clutch relay. ECU will not energize relay if evaporator temperature is too low, or if the refrigerant system pressure is too low.

If the switch contacts in the A/C thermostat are open (indicating evaporator temperature is too low), or if the low pressure switch contacts are open (indicating refrigerant system pressure is too low), the ECU will not energize the A/C clutch relay. A/C thermostat (temperature control thermostat) is in evaporator housing. Low pressure switch is on receiver-drier. System uses a 3-speed blower motor instead of a blower resistor.

CONTROL PANEL

Cherokee

The mode control lever (upper lever) operates a vacuum switch on the back of the control panel. The vacuum switch controls vacuum to defroster, floor, panel and fresh/recirculated air vacuum motors, as well as a vacuum-actuated heater control valve (water valve). The heater control valve closes when vacuum is applied to it.

The A/C switch is closed when the lever is in any of the A/C modes (MAX, NORM or BI-LEVEL). The temperature control lever (lower lever) moves a cable that controls the position of the blend-air door in the heater case.

Wrangler

The mode control lever (upper lever) moves 2 cables, one for the vent doors and one for the defrost/floor duct door. Lever also operates a vacuum switch on back of control panel.

The vacuum switch allows or denies vacuum to the fresh air door vacuum motor. The temperature control lever (lower lever) moves a cable that controls the position of the blend-air door in the heater case.

NOTE: System does not use a heater control valve (water valve). Coolant always flows through the heater core.

TROUBLE SHOOTING

INSUFFICIENT OR NO COOL AIR

1) Check blower motor operation. If blower motor operates, go to next step. If blower motor does not operate, check fuse. If fuse is blown, replace fuse. If fuse is okay, apply battery voltage directly to blower motor. If blower motor does not operate, replace blower motor. If blower motor operates, replace blower switch or repair wire harness.

2) Ensure airflow is correct. If airflow is not correct, check for correct operation of air distribution doors and for obstructions in vent channels. If airflow is correct, ensure compressor clutch is operating and drive belt is tightened to specification. Go to step 4).

3) If compressor clutch does not operate, check for battery voltage at compressor clutch connector. If voltage is present, replace the clutch. If voltage is not present, perform COMPRESSOR CLUTCH CIRCUIT test under TESTING.

4) Check refrigerant system for proper charge. Evacuate and charge system if necessary. Check pressure switch and replace if necessary. Check A/C sensor (Cherokee) or A/C thermostat (Wrangler) and replace if necessary. Check expansion valve and replace if necessary.

TESTING

A/C CLUTCH RELAY

Cherokee

1) A/C clutch relay is in engine compartment, in power distribution center. With engine at idle and MAX or NORM position selected, check voltage at Dark Blue/White wire of relay connector.

2) If voltage is not present, check for open Dark Blue/White wire or blown fuse F6 in power distribution center. If voltage is present, ground the Dark Blue/Orange wire at relay. If clutch engages, relay is okay. If clutch does not engage, replace relay.

BLOWER MOTOR

1) Using an ohmmeter, check resistance between blower motor housing and chassis ground. Zero ohms should be present. If resistance is zero, go to next step. If resistance is more than zero ohms, repair ground connection.

2) Disconnect blower motor connector. Apply battery voltage to blower motor connector. Replace motor if it does not operate smoothly at high speed.

BLOWER MOTOR CIRCUIT

Wrangler

1) Turn ignition on. Check voltage at ignition switch side of fuse No. 12. If no voltage is present, repair open in Black/Orange wire between fuse No. 12 and ignition switch. If battery voltage is present, check voltage on other side of fuse.

2) If battery voltage is not present, replace fuse. If battery voltage is present, check voltage at White wire terminal of blower switch. If battery voltage is present, go to next step. If battery voltage is not present, repair open White wire circuit between fuse No. 12 and blower switch.

3) With blower switch in LO position, check voltage at Dark Blue wire terminal of blower switch connector. If battery voltage is not present, replace blower switch. If battery voltage is present, go to next step.

4) With blower switch in MED position, check voltage at Green wire terminal. If battery voltage is not present, replace blower switch. If battery voltage is present, go to next step.

5) With blower switch in HI position, check voltage at Orange wire terminal. If battery voltage is not present, replace blower switch. If battery voltage is present, go to next step.

6) Turn ignition off. Check resistance between blower motor housing and chassis ground. If resistance is not zero ohms, repair ground wire between blower motor and ground. If resistance is zero ohms, go to next step.

7) Turn ignition on. With blower switch in LO position, check voltage at Dark Blue wire terminal of blower motor connector. If battery voltage is present, go to next step. If battery voltage is not present, repair Dark Blue wire between blower switch and blower motor.

8) With blower switch in MED position, check voltage at Green wire terminal. If battery voltage is present, go to next step. If battery voltage is not present, repair Green wire between blower switch and blower motor.

9) With blower switch in HI position, check voltage at Orange wire terminal. If battery voltage is present, blower motor circuit is okay. If battery voltage is not present, repair Orange wire between blower switch and blower motor.

NOTE: If blower motor fails to operate, and battery voltage was present at Dark Blue, Green and Orange wires, replace blower motor.

COMPRESSOR CLUTCH CIRCUIT

Cherokee

1) Apply battery voltage to compressor clutch connector terminal. If clutch engages, go to next step. If clutch does not engage, connect a jumper wire between clutch coil frame and chassis ground. If clutch engages, repair clutch coil ground circuit. If clutch does not engage, replace clutch coil.

2) Turn ignition and blower switch on. Set control lever to

MAX or NORM position. Check voltage at Light Green wire terminal of low pressure switch connector. If battery voltage is not present, repair circuit between low pressure switch and control panel.

3) If battery voltage is present, check voltage at Dark Blue/Orange wire terminal of low pressure switch connector. If battery voltage is present, go to next step. If battery voltage is not present, check refrigerant system charge. Recharge system if undercharged. If refrigerant system charge is okay, replace low pressure switch.

4) Start engine. Check voltage at Dark Blue/Black wire terminal of A/C clutch relay connector. If battery voltage is not present, check fuse No. 6 in engine compartment fuse block. Replace fuse if blown. If battery voltage is present, connect a jumper wire between ground and Dark Blue/Orange wire terminal of A/C clutch relay connector. If clutch does not engage, check wiring to ECU.

Wrangler

1) Apply battery voltage to compressor clutch connector terminal. If clutch engages, go to next step. If clutch does not engage, connect a jumper wire between clutch coil frame and chassis ground. If clutch engages, repair clutch coil ground circuit. If clutch does not engage, replace clutch coil.

2) Turn ignition and blower switch on. Set control lever to MAX position. Check voltage at Light Blue/Black wire terminal of low pressure switch connector. If battery voltage is not present, go to step 4). If battery voltage is present, check continuity between low pressure switch terminals.

3) If there is continuity, repair open Light Blue/Red wire circuit between low pressure switch and ECU. If there is no continuity, check refrigerant system charge. Recharge system if undercharged. If system charge is okay, replace low pressure switch.

NOTE: Both wire terminals at the A/C thermostat connector are Light Blue. It will be necessary to determine which wire is the circuit from the blower switch.

4) Check voltage at Light Blue wire terminal of A/C thermostat connector (wire that leads to A/C blower switch). See WIRING DIAGRAMS. If battery voltage is not present, repair open Light Blue wire circuit between A/C thermostat and blower switch.

5) If battery voltage is present, check voltage at other Light Blue wire of A/C thermostat. If battery voltage is not present, replace A/C thermostat. If battery voltage is present, repair open Light Blue/Black wire circuit between low pressure switch and A/C thermostat.

REMOVAL & INSTALLATION

A/C SENSOR

Removal & Installation (Cherokee)

Disconnect negative battery cable. Remove center console (if equipped). Remove lower instrument panel. Disconnect A/C sensor connector. See Fig. 1. Carefully remove A/C sensor and capillary tube from hole in housing. Avoid bending capillary tube. To install, reverse removal procedure.

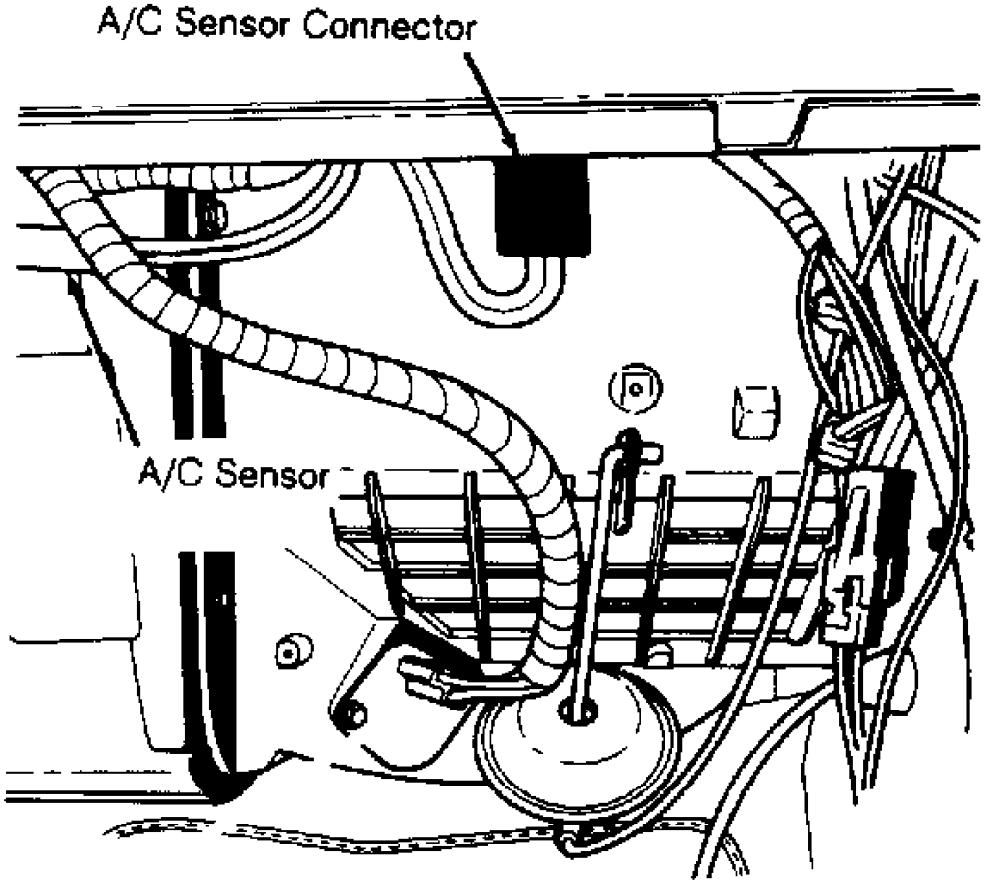

Fig. 1: Locating A/C Sensor (Cherokee)
Courtesy of Chrysler Corp.

A/C THERMOSTAT

Removal (Wrangler)

Remove evaporator housing. See EVAPORATOR & EVAPORATOR HOUSING under REMOVAL & INSTALLATION. Remove screws holding top and bottom halves of housing. Separate housing halves. Carefully remove A/C thermostat and capillary tube. Avoid bending capillary tube.

Installation

Insert capillary tube into evaporator core at least 2" (51 mm), and about 2.5" (64 mm) from top of evaporator. See Fig. 2. Install thermostat. To complete installation, reverse removal procedure.

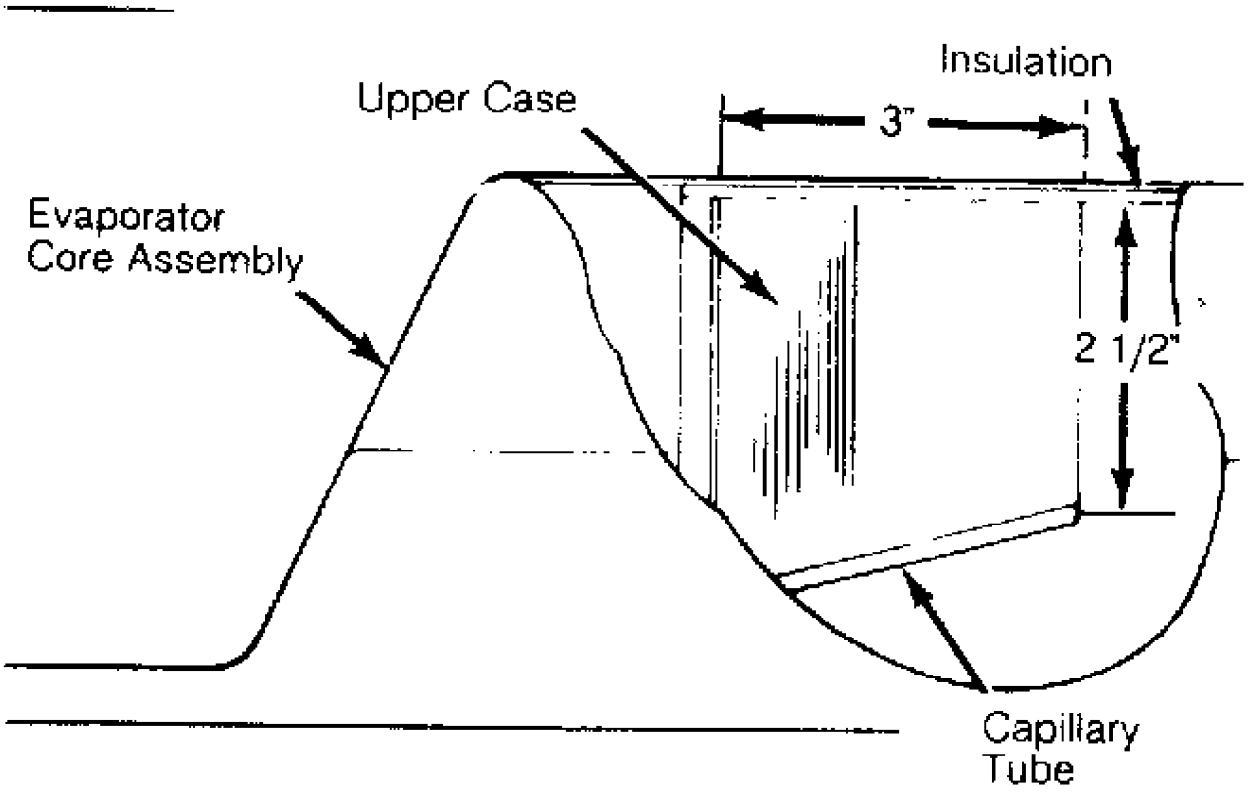

Fig. 2: Positioning Capillary Tube In Evaporator (Wrangler)
(Cross-Sectional View Shown)
Courtesy of Chrysler Corp.

COMPRESSOR

NOTE: System charge can be retained by isolating compressor from rest of system. This eliminates the need to evacuate and recharge system after installation. To isolate compressor, begin removal procedure at step 1). If fully discharging system, begin at step 3).

Removal

1) Connect service gauges. Close both valves on gauge. Set both service valves to mid-position. Start engine. Turn on A/C. Slowly turn low-side service valve clockwise toward front-seated position.

2) When low-side pressure is zero, stop the engine, turn off the A/C and quickly front-seat the low-side service valve. Front-seat the high-side service valve. Loosen the oil level check plug on the compressor to release any pressure in the compressor.

3) Disconnect negative battery cable. Disconnect clutch connector. Discharge A/C system using approved refrigerant recovery/recycling equipment (if compressor was not isolated).

4) With hoses attached to service valves, remove service valves from compressor. Remove drive belt. Remove compressor bolts and compressor.

Installation

1) To install, reverse removal procedure. If system was fully discharged, evacuate and charge system. If compressor was isolated before removal, air must be purged from compressor after service valve and hose assemblies are reconnected to compressor.

2) To purge air, cap the service gauge ports on both service valves. Turn low-side service valve counterclockwise until it stops (back-seated). This allows refrigerant to enter compressor. Set high-side service valve to mid-position.

3) Loosen gauge port cap on high-side service valve to allow refrigerant to purge air from the compressor. Back-seat high-side service valve, and then tighten gauge port cap. Air is now purged from compressor.

CONDENSER

Removal (Cherokee - 2.5L)

1) Drain coolant from radiator. Disconnect fan shroud and radiator hoses. Disconnect automatic transmission cooler lines (if equipped). Discharge A/C system using approved refrigerant recovery/recycling equipment.

2) Disconnect refrigerant hoses from condenser. Disconnect low pressure switch connector from switch on receiver-drier. Remove radiator, condenser and receiver-drier as an assembly. Separate condenser from radiator. Remove receiver-drier from condenser.

Installation

To install, reverse removal procedure. Add one ounce of refrigerant oil to system if replacing condenser. Fill cooling system. Evacuate and charge system.

Removal & Installation (Cherokee - 4.0L)

1) Remove cooling fan shroud and cooling fan. Remove upper crossmember and bracket. Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect A/C hoses from condenser and plug openings. Disconnect and separate condenser from radiator. Remove condenser.

2) To install, reverse removal procedure. Add one ounce of refrigerant oil to system if replacing condenser. Fill cooling system. Evacuate and charge system.

Removal & Installation (Wrangler)

1) Discharge A/C system using approved refrigerant recovery/recycling equipment. Drain cooling system. Remove cooling fan shroud and radiator. Disconnect liquid line from condenser. Remove condenser screws. Tilt bottom of condenser toward engine.

2) From under vehicle, disconnect evaporator to receiver-drier hose from receiver-drier. Remove receiver-drier and condenser as an assembly. Remove receiver-drier from condenser. To install, reverse removal procedure. Fill cooling system. Evacuate and charge system.

CONTROL PANEL

Removal & Installation

1) Disconnect negative battery cable. Remove screws from instrument panel bezel. Remove bezel. Remove radio (if equipped).

2) Remove control panel screws. Pull out control panel and disconnect vacuum hoses, wires and cables. Note locations for installation reference. Remove control panel. To install, reverse removal procedure.

RECEIVER-DRIER

Removal & Installation (Cherokee)

On 2.5L, remove condenser and receiver-drier as an assembly. See CONDENSER under REMOVAL & INSTALLATION. On 4.0L, discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect low pressure switch connector. Remove receiver-drier. To install, reverse removal procedure. Evacuate and charge system.

Removal & Installation (Wrangler)

Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect refrigerant lines from receiver-drier. Remove receiver-drier. To install, reverse removal procedure. Evacuate and charge system.

EVAPORATOR & EVAPORATOR HOUSING

Removal & Installation (Cherokee)

1) Disconnect negative battery cable. Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect blower motor connector and vent tube.

2) Remove console (if equipped). Remove lower instrument panel. Disconnect electrical connectors from blower motor resistor and A/C sensor. Disconnect vacuum hose at vacuum motor. Cut plastic strap holding evaporator housing to heater core housing.

3) Disconnect blend-air door control cable. Detach clip at rear of blower housing flange, and remove housing screws. Remove housing nuts from studs on engine compartment side of firewall. Remove evaporator drain tube.

4) Remove right kick panel. Remove instrument panel support bolt. Gently pull on right side of instrument panel, then rotate housing downward and toward rear of vehicle to disengage housing studs from firewall.

5) Remove evaporator housing. Disassemble evaporator housing and remove evaporator. To install, reverse removal procedure. Evacuate and charge system.

Removal & Installation (Wrangler)

1) Discharge A/C system using approved refrigerant recovery/recycling equipment. Disconnect low-side refrigerant hose from compressor. Disconnect high-side refrigerant hose from receiver-drier.

2) Remove evaporator housing-to-instrument panel screws and bracket. Lower evaporator housing, and pull hoses and grommet through opening. See Fig. 3. Disassemble evaporator housing and remove evaporator. To install, reverse removal procedure. Evacuate and charge system.

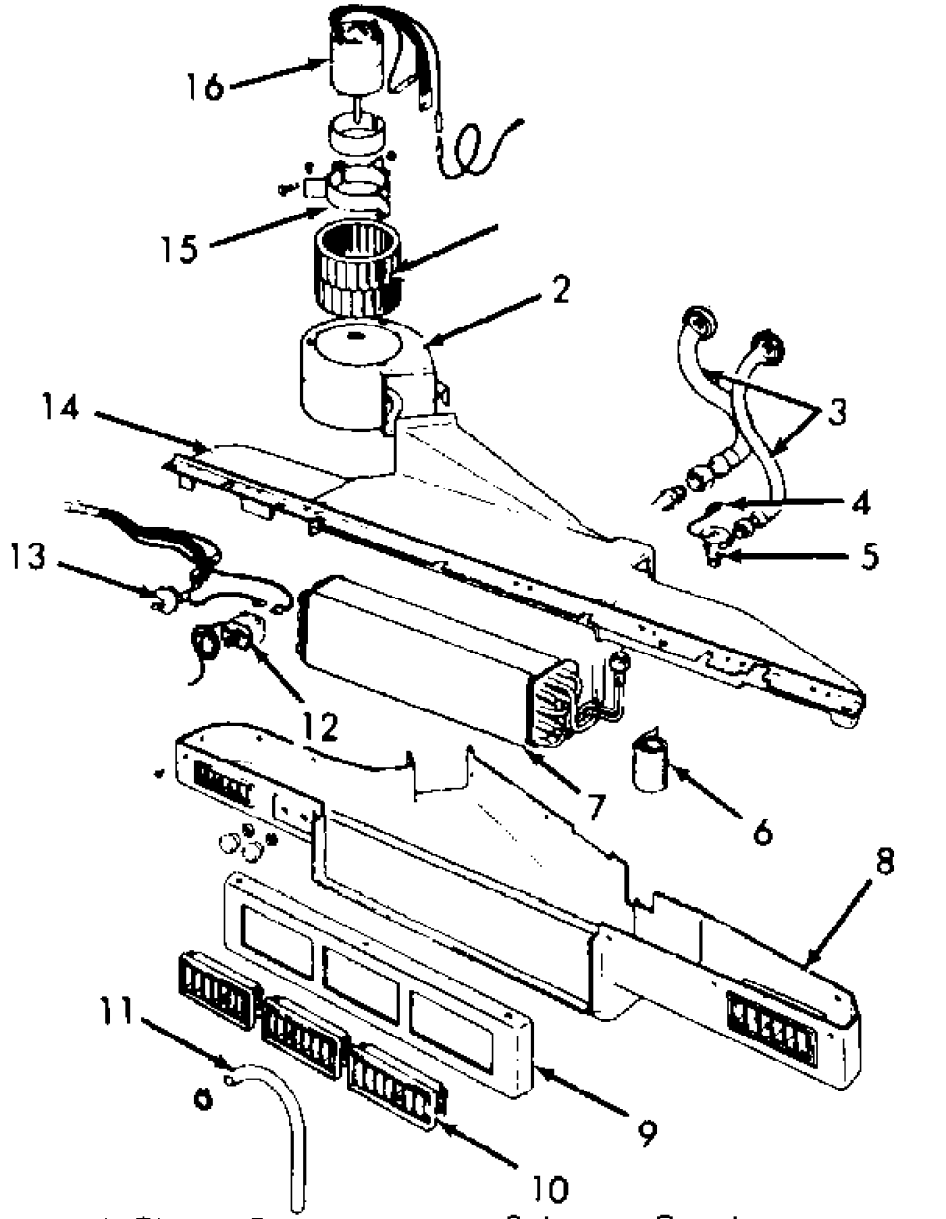

Fig. 3: Exploded View Of Evaporator Housing (Wrangler)
Courtesy of Chrysler Corp.

EXPANSION VALVE

Removal & Installation (Cherokee)

Discharge A/C system using approved refrigerant recovery/recycling equipment. Remove coolant reservoir and bracket. Disconnect refrigerant hoses from expansion valve. Disconnect expansion valve from evaporator tubes. Remove expansion valve. To install, reverse removal procedure. Evacuate and charge system.

Removal & Installation (Wrangler)

Discharge A/C system using approved refrigerant recovery/recycling equipment. Remove evaporator housing. Remove insulation from expansion valve. See Fig. 3. Mark location of capillary tube on evaporator tubing. Disconnect refrigerant hose from expansion valve. Remove expansion valve. To install, reverse removal procedure. Evacuate and charge system.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
A/C Compressor Bolt	20 (27)
Refrigerant Hoses	
Evaporator To Receiver-Drier	10 (14)
Expansion Valve To Evaporator	18 (24)
"O" Ring Fitting Type	24 (33)
Service Valve (Compressor Fitting) (1)	25 (34)
Steering Column Nut	20 (27)

(1) - Lubricate threads and "O" ring with compressor oil.

WIRING DIAGRAMS

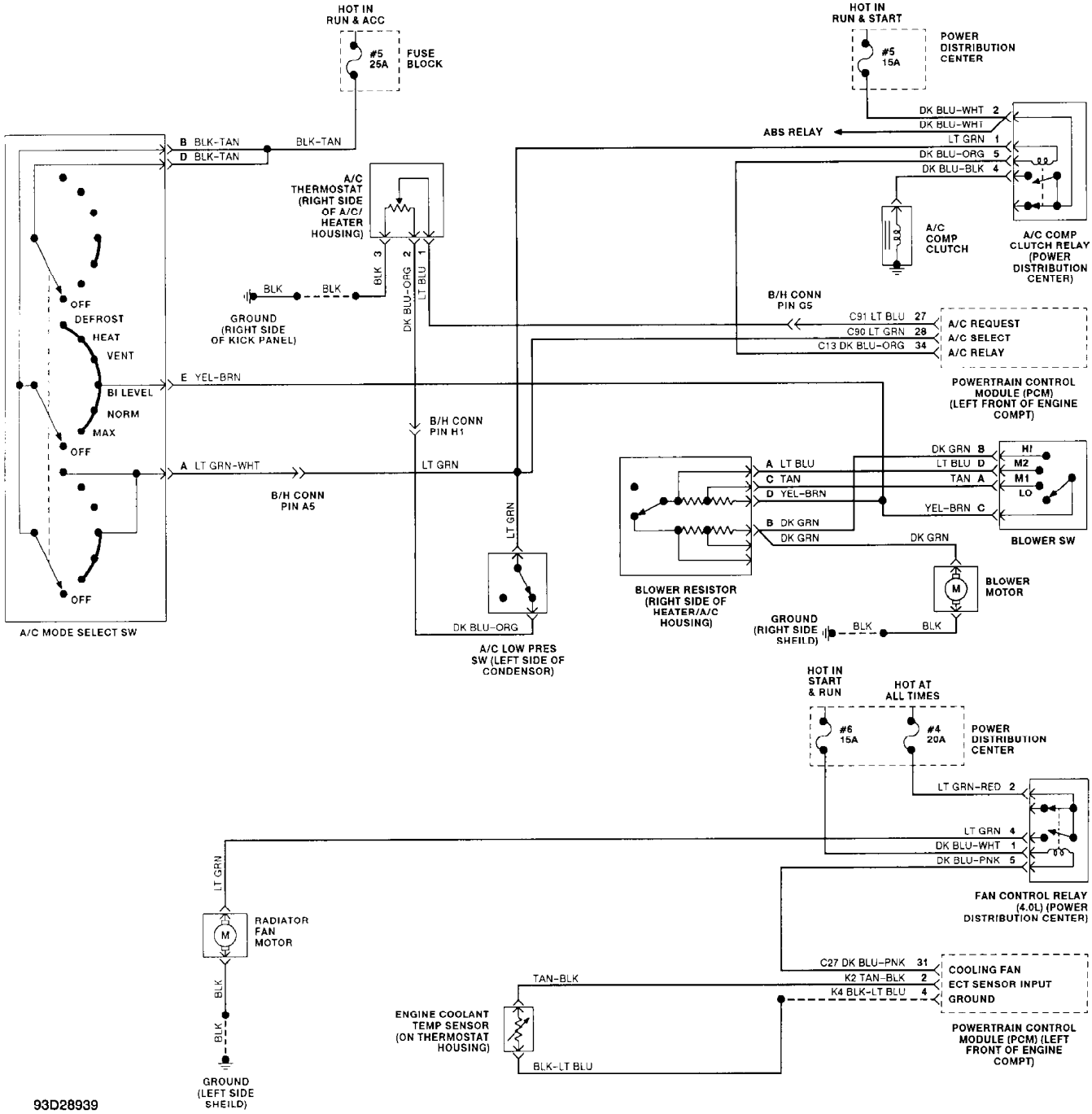

Fig. 4: Manual A/C-Heater System Wiring Diagram (Cherokee)

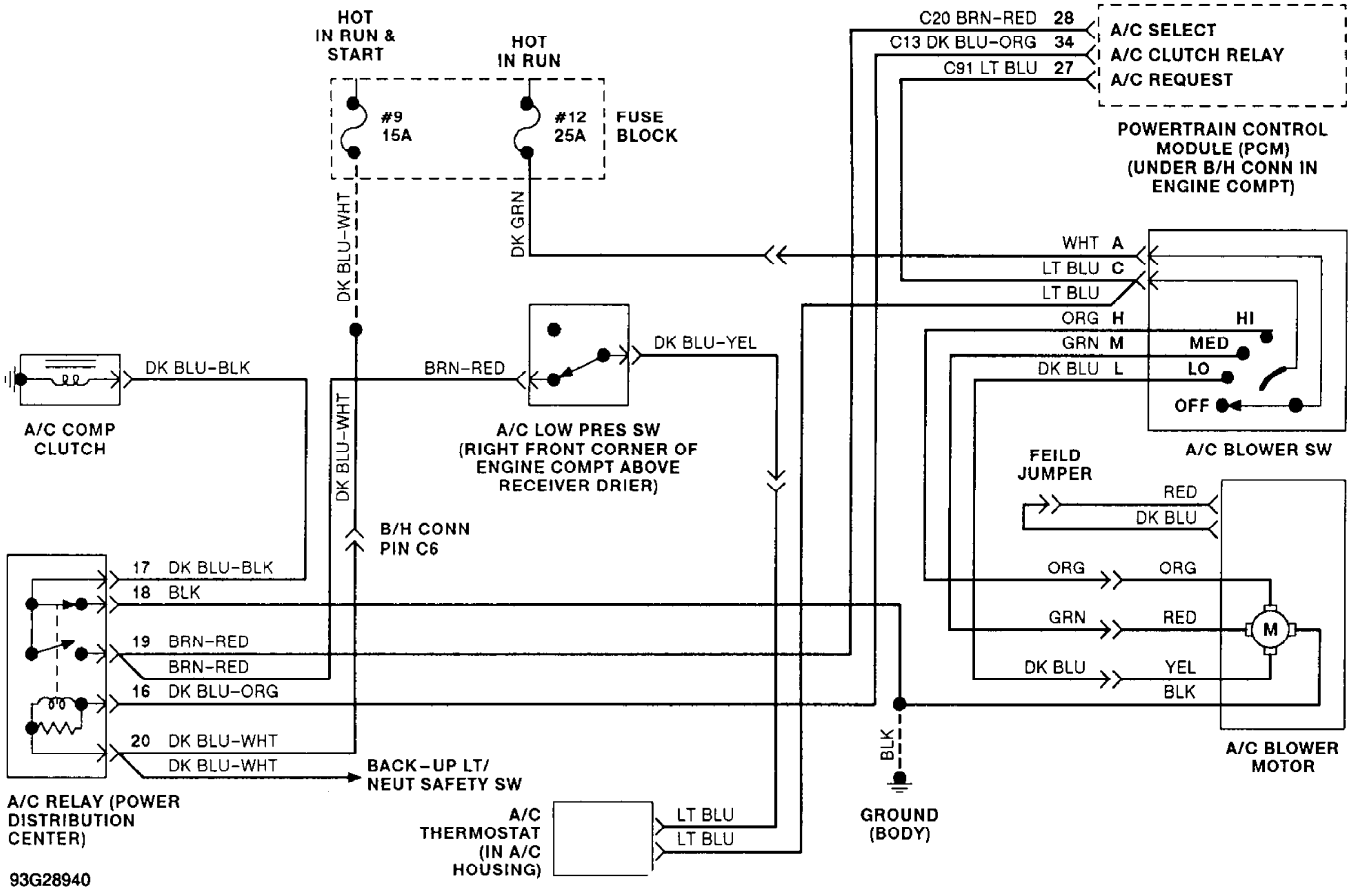

Fig. 5: Manual A/C-Heater System Wiring Diagram (Wrangler)