

SECTION : 7B

MANUAL CONTROL HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM

CAUTION : *Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.*

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SPECIFICATIONS

A/C SYSTEM CHARGING CAPACITY

Application	Description
R-134a System	750 20 g
Refrigerant Oil in A/C System	Synthetic PAG 265 ml

HEATER TEMPERATURE SPECIFICATIONS


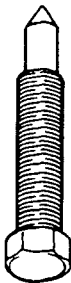
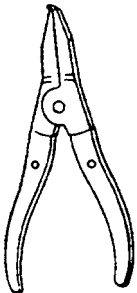
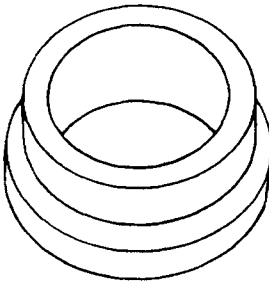

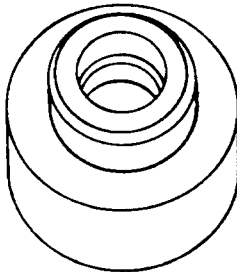

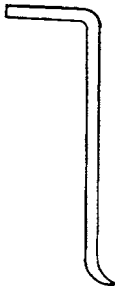
Ambient Air Temperature	Heater Outlet Air Temperature
–18°C (0°F)	54°C (129°F)
– 4°C (25°F)	59°C (138°F)
10°C (50°F)	64°C (147°F)
24°C (75°F)	68°C (154°F)

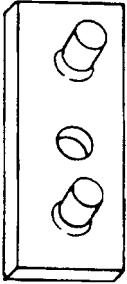

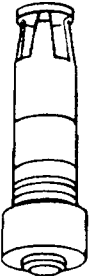
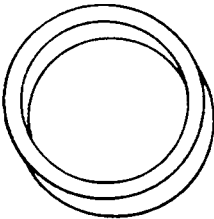
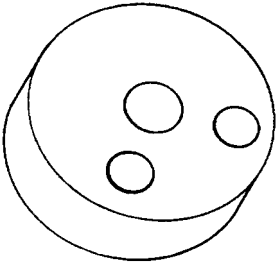
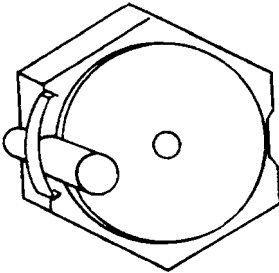
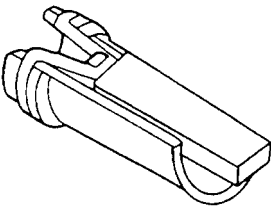
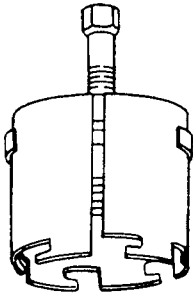
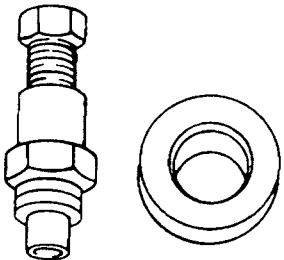

FASTENER TIGHTENING SPECIFICATIONS

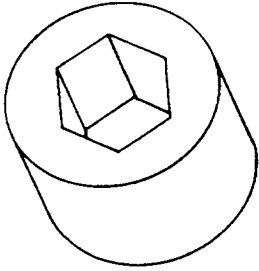
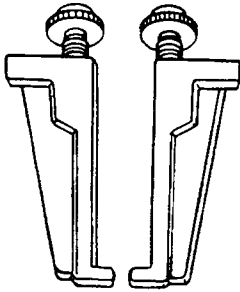
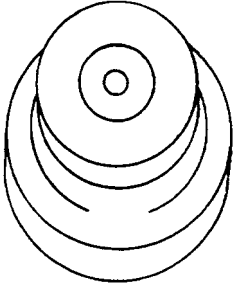
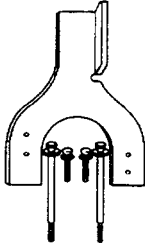
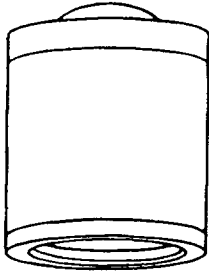
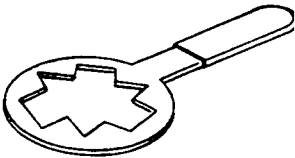
Application	N•m	Lb–Ft	Lb–In
Air Cleaner Housing Assembly Retaining Bolts	12	–	106
Band Clamp Bolt	5	–	44
Blower Motor–to–Heater/Air Distributor Case Screws	6	–	53
Blower Motor Resistor Screws	6	–	53
Clamp Bolts	4	–	35
Clutch Plate and Hub Assembly Retaining Nut	17	13	–
Controller Retaining Screws	4	–	25
Discharge Hose Connecting Block–to–Compressor Retaining Nut	33	24	–
Discharge Hose Connecting Block–to–Condenser Retaining Nut	16	12	–
Expansion Valve Bolts	10	–	89
Front Compressor–to–Bracket Mounting Bolts	35	26	–
Heater/Air Distributor Case Assembly Screws	8	–	71
Heater Core Cover Screws	3		26
Heater Core Retaining Bracket Screw	3		26
High–Pressure Pipe–to–Evaporator Flange Connecting Block Nut	10	–	89
High–Pressure Pipe–to–Receiver–Dryer Connecting Block Nut	10	–	89
Liquid Evaporator Pipe Clamp Bolt	4	–	35
Pressure Relief Valve	16	12	–
Pressure Transducer	10	–	89
Rear Compressor–to–Bracket Mounting Bolts	20	15	–
Receiver–Dryer to Condenser Pipe Nut	10	–	89
Suction Hose Clamp Bolt	10	–	89
Suction Hose Connecting Block Retaining Nuts	10	–	89
Suction Hose Support Clamp Retaining Bolt	5	–	44
Suction Hose Support Clamp Retaining Nut	5	–	44
Through–Bolts	10	–	89
Upper Condenser Mount Nuts	4	–	35
Vacuum Tank Mounting Nuts	4	–	35
Vacuum Tank–to–Bulkhead Nuts	4	–	35

SPECIAL TOOLS

SPECIAL TOOLS TABLE

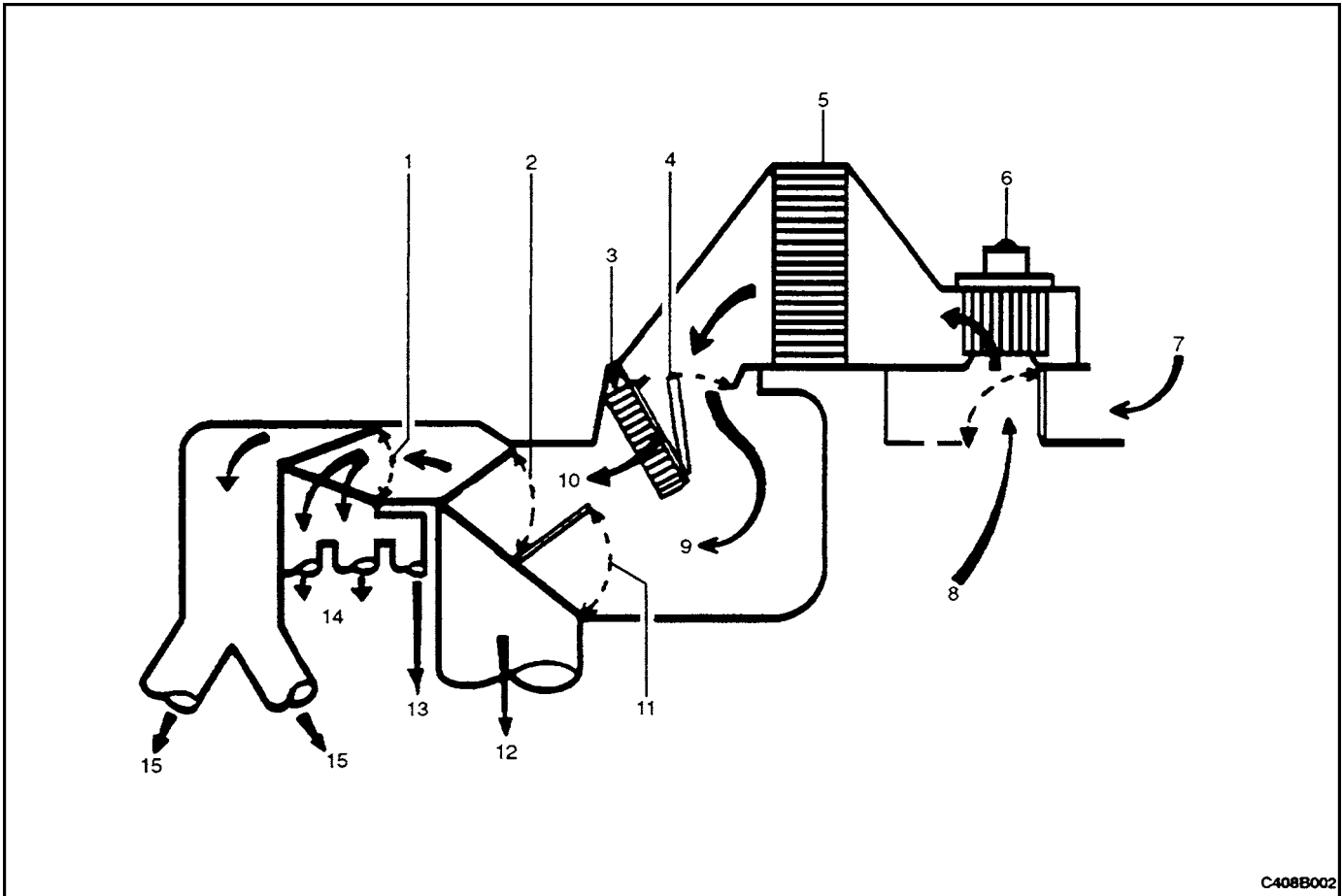
 A108B078	J-5403 Snap Ring Pliers	 A108B082	J-8433-3 Forcing Screw
 A108B079	J-6083 Snap Ring Pliers	 A108B084	J-9398-A Bearing Remover
 A108B080	J-8092 Driver Handle	 A108B085	J-9481 Bearing Installer
 A108B081	J-8433-1 Puller Crossbar	 A108B086	J-9553-1 O-Ring Remover

 <p>A108B087</p>	<p>J-9625-A Pressure Testing Connector</p>	 <p>A108B092</p>	<p>J-34993 Cylinder Alignment Rods</p>
 <p>A108B088</p>	<p>J-23128-A Seal Seat Remover and Installer</p>	 <p>A108B093</p>	<p>J-33017 Pulley Rotor and Bearing Installer</p>
 <p>A108B089</p>	<p>J-35372 Support Block</p>	 <p>A108B094</p>	<p>J-33019 Bearing Staking Tool Set Includes: J-33019-1 Bearing Staking Guide J-33019-2 Bearing Staking Pin</p>
 <p>A108B090</p>	<p>J-33011 O-Ring Installer</p>	 <p>A108B095</p>	<p>J-33020 Pulley Puller</p>
 <p>A108B091</p>	<p>J-33013-B Hub and Drive Plate Remover and Installer</p>	 <p>A108B096</p>	<p>J-34614 Shaft Seal Protector</p>

 <p>A108B097</p>	<p>J-33022 Shaft Nut Socket</p>	 <p>A108B100</p>	<p>J-33025 Clutch Coil Puller Legs</p>
 <p>A108B098</p>	<p>J-33023-A Puller Pilot</p>	 <p>A108B101</p>	<p>J-34992 Compressor Holding Fixture</p>
 <p>A108B099</p>	<p>J-33024 Clutch Coil Installer Adapter</p>	 <p>A108B102</p>	<p>J-33027 Clutch Hub Holding Tool</p>

SCHEMATIC AND ROUTING DIAGRAMS

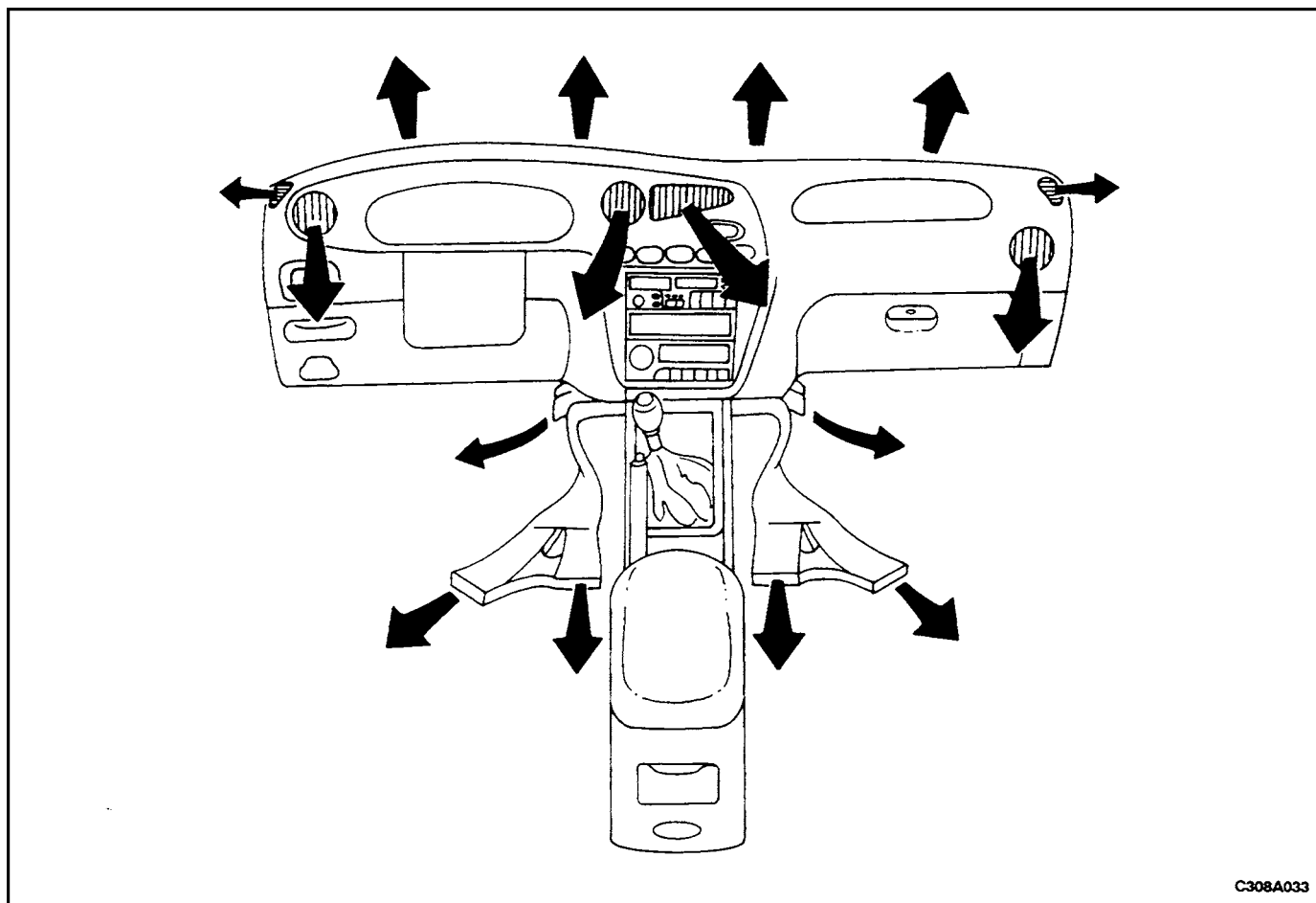
A/C AND HEATER AIRFLOW – TYPICAL

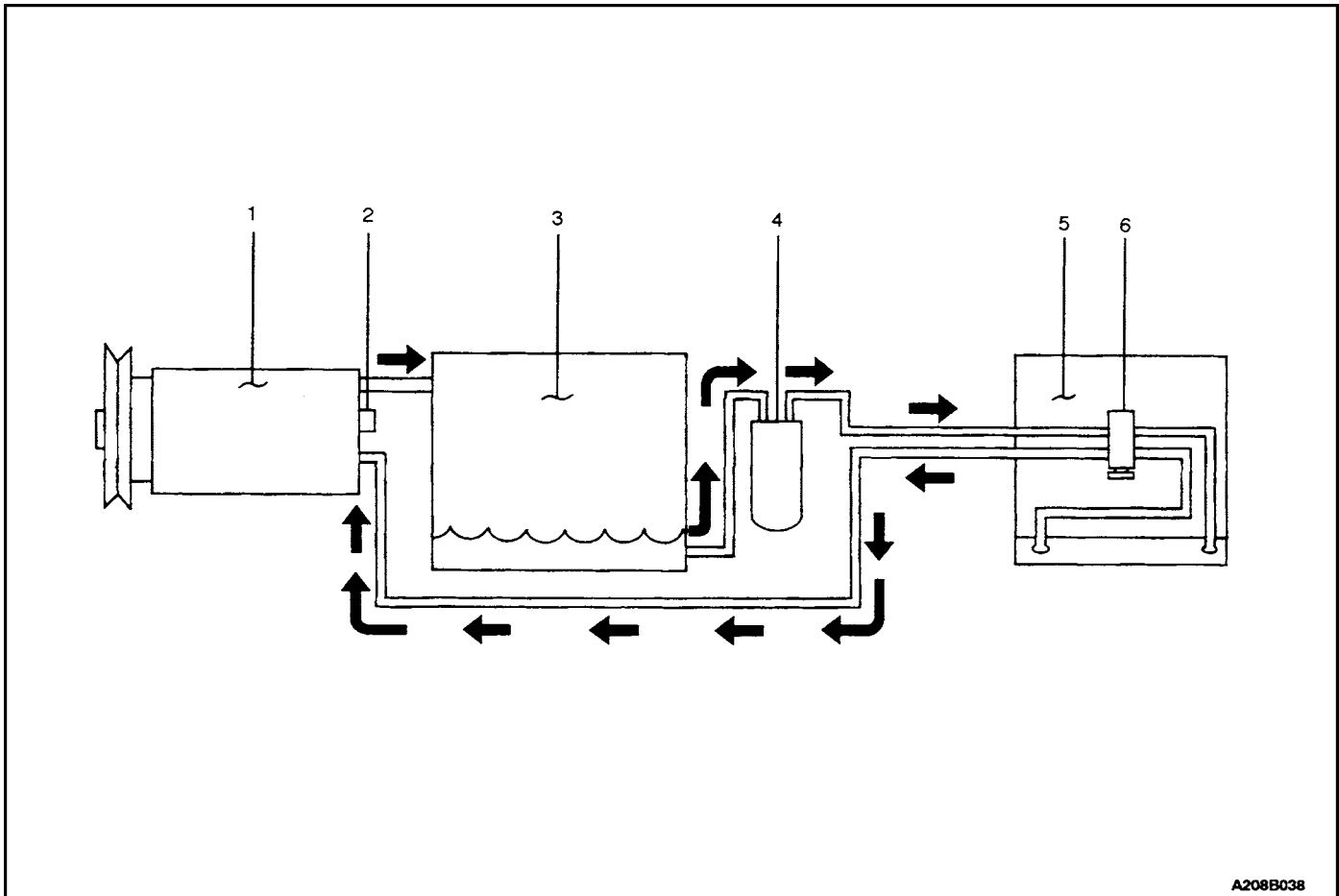


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| 1. Heater/Defroster Door | 9. Cold Air |
| 2. Upper Mode Door | 10. Hot Air |
| 3. Heater Core | 11. Lower Mode Door |
| 4. Temperature Door | 12. A/C Duct |
| 5. Evaporator Core | 13. Side Window Defogger |
| 6. Blower Motor | 14. Heater Outlets |
| 7. Outside Air | 15. Defroster Outlets |
| 8. Inside Air | |

AIRFLOW WITH REAR HEATING DUCT

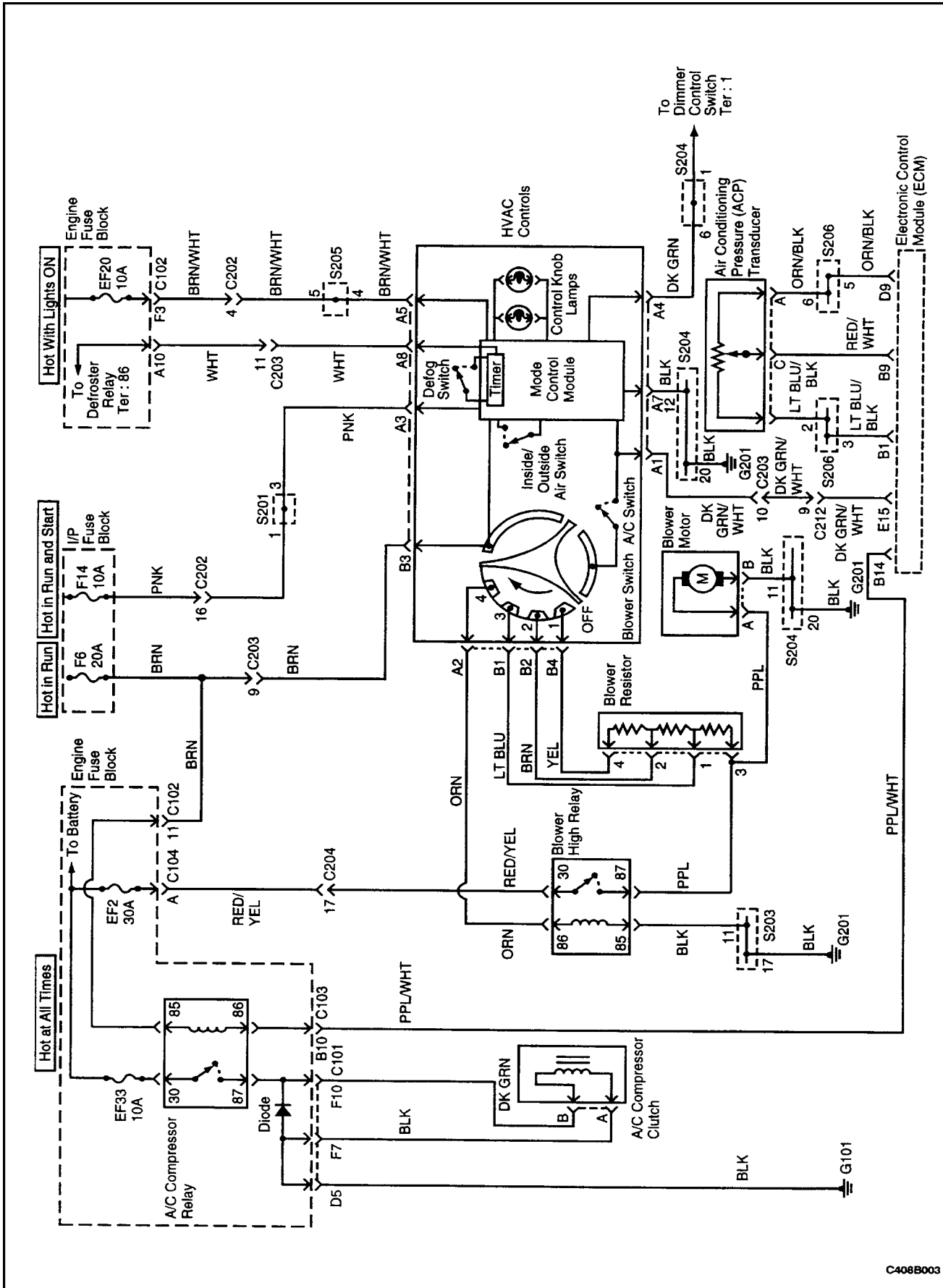


A/C SYSTEM – TYPICAL

1. Compressor
2. Pressure Relief Valve
3. Condenser

4. Receiver-Dryer
5. Evaporator
6. Expansion Valve

MANUAL CONTROL A/C DIAGRAM



DIAGNOSIS

HEATER SYSTEM

INSUFFICIENT HEATING OR DEFROSTING

CAUTION : *The cooling system is pressurized when hot. Injury can result from removing the surge tank cap before the engine is sufficiently cool.*

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?		Go to <i>Step 2</i>	System OK
2	Check the coolant level. Is the coolant level correct?		Go to <i>Step 4</i>	Go to <i>Step 3</i>
3	Add coolant, as needed. Is the repair complete?		System OK	Go to <i>Step 4</i>
4	Check the drive belts for tension or damage. Are the drive belts OK?		Go to <i>Step 6</i>	Go to <i>Step 5</i>
5	Correct any problem with the drive belts. Is the repair complete?		System OK	Go to <i>Step 6</i>
6	Check the coolant hoses for leaks or kinks. Are the coolant hoses OK?		Go to <i>Step 8</i>	Go to <i>Step 7</i>
7	Repair any problem with the coolant hoses. Is the repair complete?		System OK	Go to <i>Step 8</i>
8	Check the surge tank cap. Refer to <i>Section 1D, Engine Cooling</i> . Is the surge tank cap OK?		Go to <i>Step 10</i>	Go to <i>Step 9</i>
9	Repair or replace the surge tank cap, as needed. Is the repair complete?		System OK	Go to <i>Step 10</i>
10	1. Turn the A/C switch OFF. 2. Set the blower motor switch on maximum speed. 3. Set the heater control to full hot. 4. Turn the ignition ON. 5. Check for airflow from the vent outlet. Is there heavy airflow from the vent outlet?		Go to <i>Step 11</i>	Go to <i>Step 26</i>
11	Check for a change in the airflow at various blower speeds. Does the blower speed increase as the switch is turned from minimum to maximum?		Go to <i>Step 12</i>	Go to "Blower Electrical"
12	1. Turn the A/C switch OFF. 2. Set the temperature lever to full hot. 3. Set the blower motor switch on maximum speed. 4. With the engine sufficiently cool, remove the surge tank cap. 5. Start the vehicle and idle the engine. 6. Watch for the flow of the coolant. Is the coolant flow visible?		Go to <i>Step 14</i>	Go to <i>Step 13</i>

7B – 12 MANUAL CONTROL HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM

Step	Action	Value(s)	Yes	No
13	<ol style="list-style-type: none"> Check the system for the following problems: <ul style="list-style-type: none"> Restriction in the cooling system. Failed water pump impeller. Faulty thermostat. Make repairs to the cooling system, as needed. <p>Are the repairs complete?</p>		System OK	Go to <i>Step 14</i>
14	<ol style="list-style-type: none"> Install the surge tank cap. With the ignition ON, allow the engine to warm up for approximately 20 minutes. Drive the vehicle at 30 mph (48 km/h). Use a thermometer to measure the ambient air temperature and the discharge air temperature at the heater outlet. <p>Does the heater output meet the minimum values given?</p>	Refer to "Heater Temperature Specifications"	Go to <i>Step 15</i>	Go to <i>Step 16</i>
15	<ol style="list-style-type: none"> Check the vehicle for cold air leaks at the following locations: <ul style="list-style-type: none"> Dash. Heater cases. Vents. Check under the seat for obstructions. Repair any leaks or obstructions. <p>Are the repairs complete?</p>		System OK	
16	<ol style="list-style-type: none"> Turn the ignition OFF. Turn the temperature control knob to full cold, then to full hot. Listen for the sound of the temperature door slam just before reaching the end of the travel range of the control knob. <p>Does the door slam?</p>		Go to <i>Step 18</i>	Go to <i>Step 17</i>
17	<ol style="list-style-type: none"> Check the following aspects of the temperature door: <ul style="list-style-type: none"> Travel. Cables. Linkage. Verify the accuracy of the temperature controls at full hot. Verify the accuracy of the temperature controls at full cold. <p>Is the repair complete?</p>		System OK	
18	<ol style="list-style-type: none"> Set the temperature control knob to full hot. Start the vehicle. Check the temperature of the heater inlet hose and the heater outlet hose by feel. The air temperature around the hoses should be at least 29°C (84°F). <p>Is the heater inlet hose hot and the heater outlet hose warm?</p>		Go to <i>Step 19</i>	Go to <i>Step 22</i>
19	<p>Check the thermostat. Refer to <i>Section 1D, Engine Cooling</i>.</p> <p>Is the thermostat installed and seated properly?</p>		Go to <i>Step 20</i>	Go to <i>Step 21</i>

Step	Action	Value(s)	Yes	No
20	Replace the thermostat. Refer to <i>Section 1D, Engine Cooling</i> . Is the repair complete?		System OK	
21	Reinstall the thermostat. Is the repair complete?		System OK	
22	Inspect the heater hoses for proper installation. Are the heater hoses reversed?		Go to <i>Step 23</i>	Go to <i>Step 24</i>
23	Reinstall the heater hoses properly. Is the repair complete?		System OK	
24	1. Back flush the heater core. 2. Drain the cooling system. 3. Replace the coolant. 4. Warm the engine to an average operating temperature. 5. Feel the heater inlet hose and the heater outlet hose. Is the heater inlet hose hot and the heater outlet hose warm?		System OK	Go to <i>Step 25</i>
25	Replace the heatercore. Is the repair complete?		System OK	
26	Recheck the system using the "Control Settings/Correct Results" tests. Refer to "Improper Air Delivery or No Mode Shift" in this section. Is the repair complete?		System OK	Go to <i>Step 27</i>
27	Check for airflow from the defroster or the vent outlets. Is there high airflow from the defroster or the vent outlets?		Go to <i>Step 28</i>	Go to <i>Step 29</i>
28	1. Check the heater door at the floor and the vent door to get the proper airflow and to verify proper operation. 2. Repair, as required. Is the repair complete?		System OK	
29	Switch the mode knob to defrost. Is the defroster airflow OK?		Go to <i>Step 30</i>	Go to <i>Step 31</i>
30	1. Remove the heater outlet and check for obstructions. 2. Remove any obstructions in the heater outlet. Is the repair complete?		System OK	
31	Check for an airflow change at various blower speeds. Does the blower speed increase as the control is turned from minimum to maximum?		Go to <i>Step 32</i>	Go to "Blower Electrical"
32	Check for obstructions in the system at the blower inlet and at the air filter. Are there any obstructions?		Go to <i>Step 33</i>	Go to <i>Step 34</i>
33	Remove the obstructions in the system at the blower inlet or replace a clogged filter. Is the repair complete?		System OK	

7B – 14 MANUAL CONTROL HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM

Step	Action	Value(s)	Yes	No
34	<ol style="list-style-type: none"> Set the blower on maximum speed. Rotate the temperature control from full hot to full cold. Listen for an airflow change. Does the airflow change?		Go to <i>Step 35</i>	Go to <i>Step 36</i>
35	<ol style="list-style-type: none"> Check the following aspects of the temperature door: <ul style="list-style-type: none"> Travel. Cables. Linkage. Control. Verify the accuracy of the temperature control at full hot. Is the repair complete?		Go to <i>Step 1</i>	
36	<ol style="list-style-type: none"> Check the system for any obstruction between the blower and the system outlets. Remove any obstruction. Is the repair complete?		Go to <i>Step 1</i>	

BLOWER ELECTRICAL

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?		Go to <i>Step 2</i>	System OK
2	Turn the blower ON. Does the blower run at any speed?		Go to <i>Step 14</i>	Go to <i>Step 3</i>
3	<ol style="list-style-type: none"> Disconnect the power connector from the blower motor under the dashboard on the passenger's side of the vehicle. Turn the ignition ON. Turn the blower ON. Test for voltage on the connector. The terminal connected to the PPL wire is positive and the terminal connected to the BLK wire is negative. Is the voltage equal to the specified value?	11–14 v	Go to <i>Step 4</i>	Go to <i>Step 5</i>
4	Replace the blower motor. Is the repair complete?		System OK	
5	Check fuse EF2 in the engine fuse block. Is the fuse blown?		Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	<ol style="list-style-type: none"> Turn the ignition ON. Use a short detector to locate a possible short in the following locations: <ul style="list-style-type: none"> Fuse panel-to-blower speed switch. Blower speed switch-to-heater resistor block. Heater resistor block-to-blower motor. Blower speed switch-to-blower HI relay. Repair any short. Replace any blown fuse. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
7	1. Turn the ignition ON. 2. Set the blower motor switch on 4. 3. Check the blower motor ground. Is ground OK?		Go to <i>Step 9</i>	Go to <i>Step 8</i>
8	Repair the blower motor ground. Is the repair complete?		System OK	
9	Check the motor connector with a 12-volt test light. Does the test light come on?		Go to <i>Step 10</i>	Go to <i>Step 11</i>
10	Repair the open in the feed wire from the resistor block to the blower motor. Is the repair complete?		System OK	
11	Use the 12-volt test light to check the power feed terminal on the blower speed switch. Does the light come on?		Go to <i>Step 12</i>	Go to <i>Step 13</i>
12	Replace the blower speed switch. Is the repair complete?		System OK	
13	Repair the open in the power wire from the blower speed switch to the fuse panel. Is the repair complete?		System OK	
14	Set the blower motor switch on 4. Does the blower fail to operate at speed 4?		Go to <i>Step 15</i>	Go to <i>Step 21</i>
15	Check fuse EF2 in the engine fuse block. Is the fuse blown?		Go to <i>Step 16</i>	Go to <i>Step 17</i>
16	1. Turn the ignition ON. 2. Set the blower motor switch on 4. 3. Use a short detector to locate a possible short in the following locations: <ul style="list-style-type: none"> • Engine fuse panel-to-blower HI relay. • Blower HI relay-to-blower motor. 4. Repair any short. 5. Replace the EF2 fuse. Is the repair complete?		System OK	
17	1. Turn the ignition switch ON. 2. Set the blower switch on 4. 3. Check for 12 volts on the blower HI relay coil terminal from the blower speed switch terminal A2. Is the voltage equal to the specified value?	11–14 v	Go to <i>Step 18</i>	Go to <i>Step 19</i>
18	Replace the blower speed switch. Is the repair complete?		System OK	
19	1. Turn the ignition OFF. 2. Check for opens in the following locations: <ul style="list-style-type: none"> • EF2 fuse-to-blower HI relay. • Blower speed switch-to-blower HI relay. • Blower HI relay-to-ground. • Blower HI relay-to-blower motor. 3. Repair any opens. Are the repairs complete?		System OK	Go to <i>Step 20</i>
20	Replace the blower HI relay. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
21	1. Disconnect the resistor block connector. 2. Connect one lead of a self-powered test light to any single lead on the resistor block. Use the other lead to probe each of the other two terminals. Does the test light illuminate on all terminals?		Go to Step 23	Go to Step 22
22	Replace the resistor block. Is the repair complete?		System OK	
23	1. Turn the ignition to LOCK. 2. Disconnect the connector from the resistor block. 3. Connect a jumper lead from the positive terminal on the battery to any wire terminal in the connector. 4. Use a 12-volt test light to check for voltage from the corresponding wire on the blower speed switch. 5. Repeat the same test on the other wires. Does the lamp light on all three wires?		Go to Step 25	Go to Step 24
24	Replace the blower speed switch. Is the repair complete?		System OK	
25	Repair the open in the affected wire. Is the repair complete?		System OK	

IMPROPER AIR DELIVERY OR NO MODE SHIFT

This procedure provides a test of all functions of the heater/defroster unit.

1. Warm up the vehicle.
2. Keep the engine running.
3. Perform the tests outlined in the table below and look for the results indicated.

CONTROL SETTINGS			CORRECT RESULTS				
MODE KNOB	TEMP. CONTROL	BLOWER MOTOR SWITCH	BLOWER SPEED	POWER VENT OUTLET	FLOOR OUTLET	DEFROST OUTLET	SIDE WINDOW OUTLET
Vent	Cold	Off	Off	No Airflow	No Airflow	No Airflow	No Airflow
Vent	Cold	4	High	Ambient Airflow	No Airflow	No Airflow	No Airflow
Floor	Cold to Hot	4	High	No Airflow	Cold to Hot Airflow	Minimum Cold to Hot Airflow	Minimum Cold to Hot Airflow
Defroster	Cold to Hot	4	High	No Airflow	Minimum Cold to Hot Airflow	Cold to Hot Airflow	Minimum Cold to Hot Airflow

If any of these settings does not produce the correct results, perform the following diagnostic procedure:

Improper Air Delivery or No Mode Shift

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?		Go to <i>Step 2</i>	System OK
2	1. Examine the affected door in the unit for proper attachment to the vacuum actuator. 2. Check the actuator connection to the door. 3. Check that the vacuum hose is properly connected. Is everything connected properly?		Go to <i>Step 4</i>	Go to <i>Step 3</i>
3	Repair, as necessary. Is the repair complete?		System OK	
4	1. Disconnect the actuator at the door. 2. Check the range of the door travel and the effort required to move it. Does the doormove freely through its entire range of travel so that it can close at both ends of the range?		Go to <i>Step 5</i>	Go to <i>Step 3</i>
5	Check the travel of the actuator by turning the control knob with the engine running. Is the actuator travel OK?		Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	1. Reinstall the actuator. 2. Recheck the system using the "Control Settings/Correct Results" tests in this procedure. Does the system perform properly?		System OK	Go to <i>Step 9</i>
7	1. Check the vacuum hose at the control. 2. Check for a broken control. Is there a problem with the vacuum hose or the control?		Go to <i>Step 8</i>	Go to <i>Step 9</i>
8	Repair the vacuum hose or the control, as necessary. Is the repair complete?		System OK	Go to <i>Step 9</i>
9	Recheck the system using the "Control Settings/Correct Results" tests in this procedure. Is the repair complete?		System OK	Go to <i>Step 10</i>
10	Check for airflow from the defroster or the vent outlets. Is there high airflow from the defroster or the vent outlets?		Go to <i>Step 11</i>	Go to <i>Step 12</i>
11	Adjust the heater door at the floor and the vent door to get the proper airflow. Is the repair complete?		System OK	
12	Switch the mode knob to defrost. Is the defroster airflow OK?		Go to <i>Step 13</i>	Go to <i>Step 14</i>
13	1. Remove the heater outlet. 2. Check the heater outlet for obstructions. 3. Remove any obstructions in the heater outlet. Is the repair complete?		System OK	
14	Check the blower speeds for a change in the airflow. Does the blower speed increase as the control is turned from 1 to 4?		Go to <i>Step 15</i>	Go to "Blower Electrical"

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Step	Action	Value(s)	Yes	No
15	1. Check for obstructions in the system at the blower inlet and check the air filter, if equipped. 2. Remove any obstructions at the blower inlet and replace the filter if it is clogged. Is the repair complete?		System OK	Go to <i>Step 16</i>
16	1. Set the blower motor switch on 4. 2. Rotate the temperature control from full hot to full cold. 3. Listen for an airflow change. Does the airflow change?		Go to <i>Step 17</i>	Go to <i>Step 18</i>
17	1. Check the temperature door, the cable, the linkage, and the control. 2. Adjust the temperature control to full hot. Is the repair complete?		System OK	
18	1. Check the system for any obstruction between the blower and the system outlets. 2. Remove any obstruction between the blower and the system outlets. Is the repair complete?		System OK	

TOO MUCH HEAT

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?		Go to <i>Step 2</i>	System OK
2	Is there too much heat when the mode switch is in the floor position?		Go to <i>Step 3</i>	Go to <i>Step 9</i>
3	Is there objectionable defroster bleed?		Go to <i>Step 4</i>	Go to <i>Step 5</i>
4	1. Check the door travel, the cable, the vacuum actuators, and the linkage for the heater and the defroster. 2. Adjust or repair, as required. Is the repair complete?		System OK	
5	1. Turn the A/C switch OFF. 2. Set the blower speed to maximum. 3. Turn the temperature control knob to full hot. 4. Turn the ignition ON. 5. Start the engine. 6. Check for airflow from the floor outlets. 7. Check the floor outlet attachment. Is the airflow high?		Go to <i>Step 6</i>	Go to <i>Step 8</i>
6	Check for a change in the airflow at different blower speeds. Does the airflow change as the setting for the blower-speed switch is changed?		Go to <i>Step 7</i>	Go to "Blower Electrical"
7	1. Check the temperature door travel, the cable, and the linkage. 2. Set the temperature control knob to full cold. 3. Check for full hot. Is the repair complete?		System OK	

Step	Action	Value(s)	Yes	No
8	Adjust or repair the floor/defroster and/or the vent/floor mode. Is the repair complete?		System OK	
9	In the vent position, is the problem objectionable bleed?		Go to <i>Step 10</i>	Go to <i>Step 15</i>
10	1. Check the system case for leaks. 2. Check the floor outlet attachment. Are there problems?		Go to <i>Step 11</i>	Go to <i>Step 12</i>
11	Repair the system case or the floor outlet attachment as required. Is the repair complete?		System OK	Go to <i>Step 12</i>
12	1. Turn the ignition OFF. 2. Turn the temperature control knob to full hot, then to full cold. Did the door slam just before reaching the end of the control travel?		Go to <i>Step 13</i>	Go to <i>Step 14</i>
13	Adjust the vent door to vent more. Is the repair complete?		System OK	
14	1. Check the temperature door travel, the cable, and the linkage. 2. Verify that the temperature door goes to full cold. 3. Check the temperature door for full hot. Is the temperature door travel correct?		System OK	
15	1. Set the fresh air/recirculating air control to fresh air (indicator lamp off). 2. Set the temperature control knob to full cold. 3. Start the vehicle and allow the engine to warm up. 4. Measure the air temperature at the blower inlet, or cowl, and at the vent air outlet inside the vehicle. Is the outlet air more than 5°C (41°F) warmer than the inlet air?		Go to <i>Step 16</i>	System OK
16	1. Check for hot air leaks from the engine compartment to the blower inlet. 2. Repair, as needed. Is the repair complete?		System OK	

CONTROLS

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?		Go to <i>Step 2</i>	System OK
2	Move controls other than the temperature adjustment. Is an excessive effort required to move the controls?		Go to <i>Step 15</i>	Go to <i>Step 3</i>
3	Move the temperature control knob. Is an excessive effort required to move the control knob?		Go to <i>Step 6</i>	Go to <i>Step 4</i>
4	Move the blower control to maximum. Does the temperature door move too easily?		Go to <i>Step 5</i>	System OK
5	Remove the cable from the controller. Does the control knob turn freely, without the click stops?		Go to <i>Step 15</i>	
6	Check the cables for improper routing, kinks, wiring interference, or other instrument panel interference. Is there a problem?		Go to <i>Step 7</i>	Go to <i>Step 8</i>
7	Repair, as needed. Is the repair complete?		System OK	
8	1. Remove the cable from the temperature door. 2. Cycle the door manually. 3. Check for door binding. Is there any door binding?		Go to <i>Step 9</i>	Go to <i>Step 12</i>
9	Check the door seal for proper installation. Is the door seal OK?		Go to <i>Step 10</i>	Go to <i>Step 11</i>
10	1. Check a binding door for shaft alignment, a bent shaft, a bent door, or a warped case. 2. Repair, as needed. Is the repair complete?		System OK	
11	Repair the door seal, as needed. Is the repair complete?		System OK	
12	Check for control binding. Does the control bind?		Go to <i>Step 14</i>	Go to <i>Step 13</i>
13	1. Reinstall the cable to the door. 2. Check the clearance for the cable-to-dash components. 3. Repair any interference. Is the repair complete?		System OK	
14	1. Remove the cable from the control. 2. Check the control for binding. Does the control bind?		Go to <i>Step 15</i>	Go to <i>Step 16</i>
15	Replace the control. Is the repair complete?		System OK	
16	Replace the cable. Is the repair complete?		System OK	

BLOWER NOISE

Step	Action	Value(s)	Yes	No
1	Verify the customer's complaint. Are the customer's concerns verified?		Go to <i>Step 2</i>	System OK
2	1. Sit inside the vehicle. 2. Close the doors and the windows. 3. Turn the ignition ON. 4. Start the engine. 5. Set the temperature control knob to full cold. 6. Cycle through the blower speeds, the modes, and the temperature settings to find the noise. Is the blower noise constant at high blower speeds or certain modes, but absent at lower speeds or in other modes?		Go to <i>Step 11</i>	Go to <i>Step 3</i>
3	Check for vibrations from the blower motor and the fan assembly at each blower speed by feeling the blower motor housing. Is excessive vibration found?		Go to <i>Step 6</i>	Go to <i>Step 4</i>
4	1. Remove the blower motor and the fan assembly. Refer to "Blower Motor" in this section. 2. Check for foreign material at the opening of the blower inlet. Is any foreign material at the blower inlet found?		Go to <i>Step 5</i>	Go to <i>Step 6</i>
5	Remove all foreign material. Is the repair complete?		System OK	Go to <i>Step 6</i>
6	1. Examine the blower fan for wear spots, cracked blades, a cracked hub, a loose fan retaining nut, or bad alignment. 2. Examine the blower case for wear spots. Is there a problem?		Go to <i>Step 7</i>	Go to <i>Step 9</i>
7	Repair, as required. Is the repair complete?		System OK	Go to <i>Step 8</i>
8	Replace the motor and the fan assembly. Is the repair complete?		System OK	Go to <i>Step 9</i>
9	If the noise is a click/tick or whine, replace the motor. Is the repair complete?		System OK	Go to <i>Step 10</i>
10	Reinstall the original motor. Is the problem still present?		Go to <i>Step 11</i>	System OK
11	1. Set the blower speed on maximum. 2. Check full-hot to full-cold temperature positions in the defrost, floor, and vent modes. Is the noise present in the defrost mode only?		Go to <i>Step 12</i>	Go to <i>Step 13</i>
12	1. Check the ducts for obstructions or foreign materials. 2. Remove any obstructions or foreign materials. 3. Check the floor/defroster door seals. 4. Repair or replace the door seals, as needed. Is the repair complete?		System OK	
13	Is the noise present in the floor mode only?		Go to <i>Step 12</i>	Go to <i>Step 14</i>
14	Is the noise present in the vent mode only?		Go to <i>Step 15</i>	Go to <i>Step 16</i>

Step	Action	Value(s)	Yes	No
15	1. Check the ducts for obstructions or foreign materials. 2. Remove any obstructions or foreign materials. 3. Check the vent door seals. 4. Repair or replace as needed. Is the repair complete?		System OK	
16	Is the noise present in all modes, but not all temperature positions?		Go to <i>Step 17</i>	Go to <i>Step 18</i>
17	1. Check the temperature door seals. 2. Repair or replace, as needed. Is the repair complete?		System OK	
18	1. Check the system for obstructions or foreign materials between the fan and the temperature door. 2. Repair or replace, as needed. Is the repair complete?		System OK	Go to <i>Step 2</i>

A/C SYSTEM

TESTING THE REFRIGERANT SYSTEM

If a problem in the refrigerant system is suspected, check for the following conditions:

1. Check the outer surfaces of the radiator and the condenser cores to be sure that the airflow is not blocked by dirt, leaves, or other foreign material. Check between the condenser and the radiator, as well as all outer surfaces.
2. Check for restrictions or kinks in the condenser core, the hoses, and the tubes.
3. Check the operation of the blower fan.
4. Check all the air ducts for leaks or restrictions. Low airflow rate may indicate a restricted evaporator core.
5. Check for slippage of the compressor clutch.
6. Check the drive belt tension.

INSUFFICIENT COOLING "QUICK CHECK" PROCEDURE

Perform the following "hand-feel" procedure to get a quick

idea of whether the A/C system has the proper charge of Refrigerant-134a. The air temperature must be above 21°C (70°F) for most models.

1. Warm up the engine. Run the engine at idle.
2. Open the hood and all the doors.
3. Turn the A/C ON.
4. Set the temperature control knob to the full cold.
5. Set the blower speed switch on the maximum speed setting.
6. "Hand-feel" the temperature of the evaporator outlet pipe. The pipe should be cold.
7. Check for other problems. Refer to "Testing the Refrigerant System" in this section.
8. Leak check the system. Refer to "Leak Testing the Refrigerant System" in this section. If a leak is found, discharge the system and repair the leak as required. After completing the repair, evacuate the system and charge it.
9. If no leak is found, refer to "Insufficient Cooling Diagnosis" in this section.

A/C PERFORMANCE TEST

RELATIVE HUMIDITY (%)	AMBIENT AIR TEMPERATURE °C °F	LOW SIDE PRESSURE kPa psig	ENGINE SPEED (RPM)	CENTER DUCT AIR TEMPERATURE °C °F	HIGH SIDE PRESSURE kPa psig
20	21 70 27 80 32 90 38 100	200 29 200 29 207 30 214 31	2000	4 40 7 45 9 48 14 57	1034 150 1310 190 1689 245 2103 305
30	21 70 27 80 32 90 38 100	200 29 207 30 214 31 221 32	2000	6 42 8 47 11 51 16 61	1034 150 1413 205 1827 265 2241 325
40	21 70 27 80 32 90 38 100	200 29 207 30 221 32 269 39	2000	7 45 9 48 13 55 18 65	1138 165 1482 215 1931 280 2379 345
50	21 70 27 80 32 90 38 100	207 30 221 32 234 34 276 40	2000	8 47 12 53 15 59 21 69	1241 180 1620 235 2034 295 2413 350
60	21 70 27 80 32 90 38 100	207 30 228 33 248 36 296 43	2000	9 48 13 56 17 63 23 73	1241 180 1655 240 2068 300 2482 360
70	21 70 27 80 32 90 38 100	207 30 234 34 262 38 303 44	2000	10 50 14 58 18 65 24 75	1276 185 1689 245 2103 305 2517 365
80	21 70 27 80 32 90	207 30 234 34 269 39	2000	10 50 15 59 19 67	1310 190 1724 250 2137 310
90	21 70 27 80 32 90	207 30 248 36 290 42	2000	10 50 17 62 22 71	1379 200 1827 265 2275 330

PRESSURE–TEMPERATURE RELATIONSHIP OF R–134a

Temperature °C (°F)*	Pressure kPa (psig)*	Temperature °C (°F)*	Pressure kPa (psig)*
–8 (17.6)	113.1 (16.4)	9 (48.2)	296.2 (43.0)
–7 (19.4)	121.5 (17.6)	10 (50.0)	309.6 (44.9)
–6 (21.2)	130.2 (18.9)	15 (59.0)	383.7 (55.7)
–5 (23.0)	139.1 (20.2)	20 (68.0)	467.7 (67.8)
–4 (24.8)	148.4 (21.5)	25 (77.0)	567.5 (82.3)
–3 (26.6)	157.9 (22.9)	30 (86.0)	667.8 (96.9)
–2 (28.4)	167.6 (24.3)	35 (95.0)	785.6 (113.9)
–1 (30.2)	177.8 (25.8)	40 (104.0)	916.4 (133.0)
0 (32.0)	188.2 (27.3)	45 (113.0)	1 062.2 (154.0)
1 (33.8)	198.8 (28.8)	50 (122.0)	1 222.1 (177.2)
2 (35.6)	209.9 (30.4)	55 (131.0)	1 398.2 (202.8)
3 (37.4)	221.2 (32.1)	60 (140.0)	1 589.6 (230.5)
4 (39.2)	232.9 (33.8)	65 (149.0)	1 799.0 (260.9)
5 (41.0)	245.0 (35.5)	70 (158.0)	2 026.6 (293.9)
6 (42.8)	257.4 (37.3)	75 (167.0)	2 272.2 (329.5)
7 (44.6)	269.8 (39.1)	80 (176.0)	2 544.0 (369.0)
8 (46.4)	282.9 (41.0)	–	–

* All calculated values are rounded to one decimal place.

Evaporator Range: From –7 to 7°C (19.4 to 44.6°F), the temperatures represent the gas temperatures inside the coil and not on the coil surfaces. Add 2 to 6°C (4 to 11°F) to the coil and air–off temperatures.

Condenser Range: From 45 to 70°C (113° to 158°F), the temperatures are not ambient. Add 19 to 22°C (34 to 40°F) to the ambient temperatures for proper heat transfer. Refer to the pressure chart.

Example:

32°C (90°F) Ambient temperature

+ 22°C + (40°F)

54°C (130°F) Condenser temperature, which yields 1 379 kPa (200 psig), based on 50 km/h (31 mph) airflow.

LEAK TESTING THE REFRIGERANT SYSTEM

Test for leaks whenever a refrigerant leak in the system is suspected. Also, test for leaks whenever performing a service operation which results in disturbing the lines or the connections. Leaks are commonly found at the refrigerant fittings or at the connections. Leaks are commonly caused by the following problems:

- Improper torque.
- Damaged O-ring seals.
- Dirt or lint on the O-ring seals.

Liquid Leak Detectors

Use a liquid leak detector solution on locations such as fittings. Apply the solution to the area in question with the swab that is supplied with the solution. Look for bubbles to appear. This will indicate the existence and the location of any leak.

For areas where this is not practical, such as sections of the evaporator and the condenser, an electronic leak detector is more useful.

Electronic Leak Detectors

Follow the manufacturer's instructions for calibration, operation, and maintenance of an electronic leak detector. Battery condition is especially important to the accuracy of a portable model. Set the detector to R-134a before beginning the test.

Notice : Electronic leak detectors are sensitive to wind shield washing solutions, solvents and cleaners, and certain vehicle adhesives. Surfaces must be clean to prevent false readings. Make sure that all surfaces are dry to prevent damage to the detector.

General Testing Instructions

1. Follow the entire path of the refrigerant system.
2. Completely circle each joint at 25 to 50 mm (1 to 2 inches) per second.
3. Hold the probe tip within 6 mm (1/4 inch) of the surface.

4. Do not block the air intake.
5. The audible tone changes from 1 to 2 clicks per second into a solid alarm if there is a leak. Adjust the balance control to maintain 1 to 2 clicks per second.
6. Test all of the following areas, even after one leak has been confirmed:
 - Evaporator inlet and outlet.
 - Receiver-drier inlet and outlet.
 - Condenser inlet and outlet.
 - Brazed and welded areas.
 - Damaged areas.
 - Hose couplings.
 - Compressor rear head.
 - All fittings and joints.

Testing Service Ports/Access Valves

The sealing caps provide protection for the service ports. Make sure that these caps are not missing or loose. Always use the correct cap for each port.

Testing the Evaporator Core

Leaks in the evaporator core are difficult to find. Test the evaporator core using the following procedure:

1. Run the blower fan at the maximum speed setting for at least 15 minutes.
2. Turn the blower OFF.
3. Wait for 10 minutes.
4. Remove the blower motor resistor. Refer to "Blower Resistor" in this section.
5. Insert the leak detector probe as closely as possible to the evaporator core. The detector will indicate a leak with a solid alarm.
6. Use a flashlight to search for refrigerant oil on the core surface.

Testing the Compressor Shaft Seal

1. Blow shop air behind and in front of the compressor clutch/pulley for at least 15 seconds.
2. Wait 1 to 2 minutes.
3. Probe the area in front of the pulley. If the detector emits a solid alarm, there is a leak.

V5 SYSTEM AIR CONDITIONING DIAGNOSIS

INSUFFICIENT COOLING DIAGNOSIS

Test Description

The numbers below refer to steps on the diagnostic table.

13. See the Important below.

Important : Perform this test under garage conditions with

the air temperature at 21–32°C (70–90°F), and no sun load. Follow this test carefully for accurate results.

32. See the Important below.

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

Insufficient Cooling Diagnosis

Step	Action	Value(s)	Yes	No
1	Record the customer's complaint. Are the customer's complaints verified?		Go to <i>Step 2</i>	System OK
2	1. Check the A/C fuse. 2. Check the blower fan operation. 3. Check the engine cooling fan operation. 4. Check the A/C compressor belt. 5. Check the A/C condenser for restricted airflow. 6. Check the clutch coil connection. 7. Repair or replace any components as needed. 8. Check the discharge air temperature with the A/C turned ON. Is the discharge air temperature normal?	At least 7°C (12°F) below ambient air temperature	System OK	Go to <i>Step 3</i>
3	1. Turn the ignition to LOCK. 2. Connect the high- and the low-pressure gauges. Are pressures within the specified value?	69–345 kPa (10–50 psi)	Go to <i>Step 4</i>	Go to <i>Step 5</i>
4	1. Check the A/C system for leaks. 2. Repair any refrigerant leaks, as needed. 3. Recover, evacuate, and recharge the A/C system. 4. Observe the two pressure gauges. Are both pressures above the specified value?	345 kPa (50 psi)	Go to <i>Step 7</i>	
5	Observe the two pressure gauges. Are both pressures below the specified value?	69 kPa (10 psi)	Go to <i>Step 6</i>	Go to <i>Step 7</i>
6	1. Add 0.45 kg (1 pound) of refrigerant R-134a. 2. Check the A/C system for leaks. 3. Repair any refrigerant leaks, as needed. 4. Recover, evacuate, and recharge the A/C system. 5. Observe the two pressure gauges. Are both pressures above the specified value?	345 kPa (50 psi)	Go to <i>Step 7</i>	
7	1. Start the engine and allow it to run at idle. 2. Set the A/C controls to the following positions: <ul style="list-style-type: none"> • The A/C to ON. • The fresh air control switch to fresh air (indicator lamp OFF). • The blower motor to 4. • The temperature to full cold. Does the A/C compressor clutch engage?		Go to <i>Step 8</i>	Go to <i>Step 10</i>

Step	Action	Value(s)	Yes	No
8	1. Check for a knocking noise from the A/C compressor. 2. Cycle the A/C compressor ON and OFF to verify the source of the noise. Is a loud knocking noise heard?		Go to <i>Step 9</i>	Go to <i>Step 13</i>
9	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the compressor running normally?		Go to <i>Step 13</i>	
10	1. Turn the ignition to LOCK. 2. Disconnect the A/C compressor clutch connector. 3. Connect a jumper wire from ground to one A/C compressor clutch terminal. 4. Connect a fused jumper wire from the positive battery terminal to the other A/C compressor clutch terminal. Does the A/C clutch engage?		Go to <i>Step 11</i>	Go to <i>Step 12</i>
11	Repair the electrical circuit to the A/C compressor clutch. Does the A/C clutch engage?		Go to <i>Step 8</i>	
12	Replace the A/C compressor clutch. Does the A/C clutch engage?		Go to <i>Step 8</i>	
13	1. Close all of the vehicle's windows and doors. 2. Set the A/C controls to the following positions: <ul style="list-style-type: none"> • The A/C to ON. • The fresh air control switch to fresh air. • The blower motor to 4. • The temperature to full cold. 3. Start the engine and allow it to run at idle for 5 minutes. 4. Feel the evaporator inlet and outlet pipes. Is there a noticeable difference in the temperature of the evaporator inlet and outlet pipes?		Go to <i>Step 15</i>	Go to <i>Step 14</i>
14	1. Turn the ignition to LOCK. 2. Recover the A/C system refrigerant. 3. Examine the high-pressure pipe for an obstruction. 4. Examine the expansion valve for an obstruction or a malfunction. 5. Repair the obstruction or replace the expansion valve as needed. 6. Evacuate and recharge the A/C system. 7. Check the A/C system for leaks. 8. Note the discharge air temperature with the A/C ON. Is the discharge temperature normal?	At least 7°C (12°F) below ambient air temperature	Go to <i>Step 15</i>	Go to <i>Step 13</i>

7B – 28 MANUAL CONTROL HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM

Step	Action	Value(s)	Yes	No
15	<ol style="list-style-type: none"> Record the low– and high–side pressures after the A/C system has been operating for 5 minutes or more with the engine cooling fan ON. Locate the intersection of the low– and high–side pressures. Refer to "Low– and High–Side Pressure Relationship Chart" in this section. <p>Do the low– and high–side pressures intersect in the white area of the chart?</p>		System OK	Go to <i>Step 16</i>
16	<p>Check the high– and low–side pressures.</p> <p>Do the low– and high–side pressures intersect in the gray area of the chart?</p>		Go to <i>Step 17</i>	Go to <i>Step 20</i>
17	<p>Feel the liquid pipe between the condenser and the expansion valve.</p> <p>Is the pipe cold?</p>		Go to <i>Step 18</i>	Go to <i>Step 19</i>
18	<ol style="list-style-type: none"> Examine the condenser for any restriction of the airflow. Check the cooling fans for proper operation. Remove the restriction or repair the fans, as required. <p>Is the pipe temperature normal now?</p>	At least 7°C (12°F) below ambient air temperature	Go to <i>Step 13</i>	
19	<ol style="list-style-type: none"> Recover, evacuate, and recharge the A/C system. Check the A/C system for leaks. <p>Is the system free from leaks?</p>		Go to <i>Step 13</i>	
20	<p>Observe the readings on the pressure gauges.</p> <p>Are the A/C compressor high– and low–side pressures within the specified value of each other?</p>	207 kPa (30 psi)	Go to <i>Step 21</i>	Go to <i>Step 26</i>
21	<ol style="list-style-type: none"> Run the engine at 3,000 rpm. Set the A/C controls to the following positions: <ul style="list-style-type: none"> The A/C to ON. The fresh air control switch to fresh air. The blower motor to 4. The temperature to full cold. Close all of the vehicle's windows and doors. Turn the A/C ON and OFF every 20 seconds for 3 minutes. <p>Are the A/C compressor high– and low–side pressures within the specified value of each other?</p>	207 kPa (30 psi)	Go to <i>Step 22</i>	Go to <i>Step 13</i>
22	<p>Observe the pressure rise on both gauges and the temperatures of both the compressor suction pipe and the discharge pipe.</p> <p>Is the pressure rise on both gauges slow and the suction pipe warm with the discharge pipe very hot?</p>		Go to <i>Step 25</i>	Go to <i>Step 23</i>
23	<ol style="list-style-type: none"> Turn the ignition to LOCK. Make sure the compressor clutch is disengaged. Attempt to turn the clutch driver (not the pulley). <p>Does the clutch driver turn freely by hand?</p>		Go to <i>Step 25</i>	Go to <i>Step 24</i>

Step	Action	Value(s)	Yes	No
24	1. Start the engine. 2. Observe the low-side pressure gauge while running the engine between 3,000 and 3,800 rpm. Does the low-side pressure rise rapidly?		Go to <i>Step 32</i>	Go to <i>Step 25</i>
25	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor. 3. Evacuate and recharge the A/C system. Is the compressor functioning normally?		Go to <i>Step 13</i>	
26	Check the low-side pressure. Is the low-side pressure within the specified value?	172–241 kPa (27–38 psi)	Go to <i>Step 27</i>	Go to <i>Step 32</i>
27	Feel the high-side pipe leading up to the expansion valve connecting block. Is the pipe cold before the connecting block?		Go to <i>Step 28</i>	Go to <i>Step 29</i>
28	1. Check for a restriction in the high-side pipe before the expansion valve. 2. Repair or replace the high-side pipe. Is the pipe performing normally?		Go to <i>Step 13</i>	
29	Add the specified amount of refrigerant to the A/C system. Does the cooling performance improve?	0.40 kg (14 oz)	Go to <i>Step 30</i>	Go to <i>Step 31</i>
30	1. Check the A/C system for leaks. 2. Repair any refrigerant leaks, as needed. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the system free from leaks?		Go to <i>Step 13</i>	
31	1. Recover the refrigerant. 2. Check the expansion valve for obstructions. 3. Repair or replace the expansion valve, as required. 4. Evacuate and recharge the system. 5. Check the A/C system for leaks. Is the system free from leaks?		Go to <i>Step 13</i>	
32	1. Run the engine for 5 minutes at 2,000 rpm. 2. Set the A/C controls to the following positions: <ul style="list-style-type: none"> • The A/C to ON. • The fresh air control switch to recirculate (indicator lamp ON). • The blower motor to 1. • The temperature to full cold. 3. Close all of the vehicle's windows and doors. 4. Open the vehicle hood. Is the low-side pressure within the specified value?	172–241 kPa (25–35 psi)	Go to <i>Step 13</i>	Go to <i>Step 33</i>
33	1. Recover the A/C system refrigerant. 2. Replace the A/C compressor control valve. 3. Evacuate and recharge the A/C system. 4. Check the A/C system for leaks. Is the system free from leaks?		Go to <i>Step 13</i>	

SYMPTOM DIAGNOSIS

PRESSURE TEST CHART (R-134a SYSTEM)

TEST RESULTS	RELATED SYMPTOMS	PROBABLE CAUSE	REMEDY
Discharge pressure abnormally high	After stopping the compressor, the pressure drops approximately 299 kPa (28 psi) quickly, then falls gradually.	There is air in the system.	Recover, evacuate and recharge the system with the specified amount of refrigerant.
	The condenser is excessively hot.	There is excessive refrigerant in the system.	Recover, evacuate and recharge the system with the specified amount of refrigerant.
	Reduced or no airflow through the condenser.	The condenser or the radiator fins are clogged.	Clean the condenser or the radiator fins.
		The condenser or the radiator fan is not working properly.	<ul style="list-style-type: none"> • Check the voltage and the fan rpm. • Check the fan direction.
	The line to the condenser is excessively hot.	Restricted flow of refrigerant in the system	Locate and repair the restriction.
Discharge pressure abnormally low	The condenser is not hot.	Insufficient refrigerant in the system.	<ul style="list-style-type: none"> • Check the system for a leak. • Charge the system.
	The high and low pressures are balanced soon after stopping the compressor. Low side pressure is higher than normal.	Faulty compressor pressure relief valve.	Repair or replace the compressor.
		Faulty compressor seal.	
	The outlet of the expansion valve is not frosted, low pressure gauge indicates vacuum.	Faulty expansion valve.	Replace the expansion valve.
		Moisture in the system.	Recover, evacuate, and recharge the system.
Suction pressure abnormally low	The condenser is not hot.	Insufficient refrigerant in the system.	Repair the leaks. Recover, evacuate, and recharge the system.
	The expansion valve is not frosted and the low pressure line is not cold. Low pressure gauge indicates a vacuum.	Frozen expansion valve.	Replace the expansion valve.
		Faulty expansion valve.	
	The discharge temperature is low and the airflow from the vents is restricted.	The evaporator is frozen.	Clear the restricted evaporator case drain.
	The expansion valve is frosted.	The expansion valve is clogged.	Clean or replace the expansion valve.
	The receiver/drier outlet is cool and the inlet is warm.	The receiver/drier is clogged.	Replace the receiver/drier.

TEST RESULTS	RELATED SYMPTOMS	PROBABLE CAUSE	REMEDY
Suction pressure abnormally high	The low pressure hose and check joint are cooler than the temperature around the evaporator.	The expansion valve is opened for too long.	Replace the expansion valve.
	A capillary tube is loose.		
Suction pressure abnormally high	Suction pressure is lowered when the condenser is cooled by water.	There is excessive refrigerant in the system.	Recover, evacuate, and recharge the system.
	High and low pressure are equalized as soon as the compressor is stopped and both gauges fluctuate while the compressor is running.	A gasket is faulty.	Repair or replace the compressor.
		The high pressure valve is faulty.	
		Foreign particles are stuck in the high pressure valve.	
Suction and discharge pressure abnormally high	Reduced airflow through the condenser.	The condenser or the radiator fins are clogged.	Clean the condenser and the radiator.
		The radiator cooling fans are not working properly.	<ul style="list-style-type: none"> • Check the voltage and the radiator cooling fan rpm. • Check the fan direction.
	Condenser is excessively hot.	There is excessive refrigerant in the system.	Recover, evacuate, and recharge the system.
Suction and discharge pressure abnormally low	Low pressure hose and metal end areas are cooler than the evaporator.	Clogged or kinked low pressure hose.	Repair or replace the low pressure hose.
	Temperature around the expansion valve is low compared to that around the receiver/drier.	The high pressure line is clogged.	Repair or replace the high pressure line.
Refrigerant leaks	The compressor clutch is dirty.	The compressor shaft seal is leaking.	Repair or replace the compressor.
	The compressor bolts are dirty.	Leaking around a compressor housing bolt.	Tighten the bolt(s) or replace the compressor.
	The compressor gasket is wet with oil.	The compressor gasket is leaking.	Repair or replace the compressor.

LOW AND HIGH SIDE PRESSURE RELATIONSHIP CHART

