1998 AIR CONDITIONING & HEAT
General Motors Corp. - A/C-Heater System Trouble Shooting - Manual
Chevrolet, Buick, GMC, Oldsmobile, Pontiac;
All Models Cars, Trucks & Vans

BODY DESIGNATIONS TABLE

<table>
<thead>
<tr>
<th>Body Code (1)</th>
<th>Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;C&quot;</td>
<td>Park Avenue</td>
</tr>
<tr>
<td>&quot;E&quot;</td>
<td>(2) Eldorado</td>
</tr>
<tr>
<td>&quot;F&quot;</td>
<td>Camaro, Firebird</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>(2) Aurora, (2) Riviera</td>
</tr>
<tr>
<td>&quot;H&quot;</td>
<td>Boneville, Eighty Eight, LeSabre, LSS, Regency</td>
</tr>
<tr>
<td>&quot;J&quot;</td>
<td>Cavalier, Sunfire</td>
</tr>
<tr>
<td>&quot;K&quot;</td>
<td>(2) Concours, (2) DeVille, (2) Seville</td>
</tr>
<tr>
<td>&quot;N&quot;</td>
<td>Achieva, Cutlass, Grand Am, Malibu, Skylark</td>
</tr>
<tr>
<td>&quot;V&quot;</td>
<td>(2) Catera</td>
</tr>
<tr>
<td>&quot;W&quot;</td>
<td>Century, Cutlass Supreme, Grand Prix, Intrigue, Lumina, Monte Carlo, Regal</td>
</tr>
<tr>
<td>&quot;Y&quot;</td>
<td>Corvette</td>
</tr>
</tbody>
</table>

(1) - Body codes are determined by fourth character of VIN code.
(2) - Vehicle is equipped with automatic A/C-heater system.

MODEL IDENTIFICATION TABLE

<table>
<thead>
<tr>
<th>Series (1)</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;C&quot;</td>
<td>2WD Pickup, Sierra, Suburban, Tahoe &amp; Yukon</td>
</tr>
<tr>
<td>&quot;G&quot;</td>
<td>4WD Pickup, Sierra, Suburban, Tahoe &amp; Yukon</td>
</tr>
<tr>
<td>&quot;K&quot;</td>
<td>4WD Pickup, Sierra, Suburban, Tahoe &amp; Yukon</td>
</tr>
<tr>
<td>&quot;M&quot;</td>
<td>AWD Astro &amp; Safari</td>
</tr>
<tr>
<td>&quot;P&quot;</td>
<td>Commercial Van/Motorhome</td>
</tr>
<tr>
<td>&quot;S&quot;</td>
<td>2WD Blazer, Jimmy, Pickup &amp; Sonoma</td>
</tr>
<tr>
<td>&quot;T&quot;</td>
<td>4WD Blazer, (2) Bravada, Envoy, Jimmy, Pickup &amp; Sonoma</td>
</tr>
<tr>
<td>&quot;U&quot;</td>
<td>Silhouette, Trans Sport &amp; Venture</td>
</tr>
</tbody>
</table>

(1) - Vehicle series is fifth character of VIN code.
(2) - Vehicle is equipped with automatic A/C-heater system.

OPERATIONAL TESTING

When trouble shooting and diagnosing an air conditioning system, always refer to appropriate vacuum and wiring diagrams for the system involved. See A/C-HEATER SYSTEM article.
If blower operates at all speeds and compressor clutch engages, electrical circuits are functioning properly. If evaporator inlet pipe and accumulator surface appear to be the same temperature when felt by hand, system is properly charged with refrigerant. Ensure vacuum and diaphragm function properly when moving selector control.
ELECTRICAL TROUBLE SHOOTING

BLOWER MOTOR WILL NOT RUN

Check fuses. Turn ignition switch to RUN position. Check for voltage at function control switch. Place blower switch in HI position. Check for voltage at switch and at high-speed blower relay. Ground blower motor with ignition switch in RUN position. If blower operates, motor is okay.

BLOWER DOES NOT OPERATE IN HI

Check for voltage at high-speed blower relay with ignition switch in RUN position and blower switch in HI position. If voltage is not present, check for voltage at blower switch.

BLOWER OPERATES ONLY IN HI

Check blower resistors for open condition. Check blower switch for voltage at each position.

A/C DOES NOT WORK

With engine running and function control switch at NORM position, check for voltage at pressure cycling switch. Check for voltage between pressure cycling switch and compressor clutch. Ground compressor clutch circuit. If clutch engages, check wide-open throttle cut-out switch and A/C compressor cut-off switch.

REFRIGERANT SYSTEM DIAGNOSIS

INSUFFICIENT COOLING

NOTE: Quick check procedure may be used to check for proper refrigerant charge, provided ambient temperature is more than 70°F (21°C). On vehicles with Cycling Clutch Orifice Tube (CCOT) system, compressor will cycle on and off to meet system requirements.

Quick Check Procedure
1) Engine must be at normal operating temperature. Open vehicle doors and hood. Select MAX A/C or RECIRC mode. Move temperature lever to COLD position. Blower switch in HIGH position. Engine should be at normal idle speed.
2) While compressor is engaged, feel temperature of accumulator surface and evaporator inlet pipe. If temperature of both components is the same, system is normal. If evaporator inlet pipe is frosted or feels cooler than accumulator surface, refrigerant charge is low.
3) Add refrigerant in 4-ounce increments, allowing system to stabilize between additions, until accumulator and inlet pipe are the same temperature. Add an additional 14 ounces of refrigerant.

Thorough Check Procedure
Begin diagnosis at V5/TXV SYSTEM DIAGNOSIS (STEP 1) or V5/VDOT SYSTEM DIAGNOSIS (STEP 1). For further diagnosis, go to appropriate trouble shooting chart. See TROUBLE SHOOTING CHART DIRECTORY table.

V5/TXV SYSTEM DIAGNOSIS (STEP 1)
Preliminary Checks
Check and repair the following:

* Connect Tech 1 Scan Tool. Check for stored trouble codes. If codes are found, see G - TESTS W/CODES in ENGINE PERFORMANCE.
* Check A/C fuse.
* Check A/C blower operation.
* On vehicles with cable operated temperature door, move temperature lever rapidly from cold to hot. Listen for temperature door hitting travel stops at each end. Adjust as necessary.
* Check A/C compressor clutch coil connection.
* Check A/C pressure transducer connection.
* Check compressor belt condition. Adjust or replace as necessary.
* Check cooling fan operation.
* Check for restricted airflow across condenser.
* Check Technical Service Bulletins (TSBs) for A/C system updates.

If discharge air temperature with A/C on is normal after making repairs, system is operating properly. If further trouble shooting is required, go to appropriate trouble shooting chart. See TROUBLE SHOOTING CHART DIRECTORY table.

HEATER SYSTEM DIAGNOSIS

HEATER OUTPUT TEMPERATURE CHECK

1) Select heater (floor) mode, high temperature setting and high blower speed. Idle engine for about 20 minutes or until engine reaches normal operating temperature.

2) Drive vehicle at 30 MPH (48 km/h). Measure ambient air temperature and floor outlet air temperature. If floor outlet air temperature exceeds minimum specification, heater output temperature is considered sufficient. See HEATER OUTPUT TEMPERATURE MINIMUM SPECIFICATIONS table.

HEATER OUTPUT TEMPERATURE MINIMUM SPECIFICATIONS TABLE

| Ambient Air Temp. °F (°C) | Floor Outlet Air Temp. °F (°C) |
FUNCTIONAL TEST

1) Idle engine for about 20 minutes until warm or until thermostat opens. Ensure coolant temperature is about 194°F (90°C). Select bi-level mode. Move temperature lever to coldest temperature setting. Select high blower speed. Air should exit all outlets and should be about the same temperature as outside air.

2) Select vent mode. Air should exit vent outlets and should be about the same temperature as outside air. Air should not exit floor, defrost or window defogger outlets.

3) Select heater (floor) mode. Most air should exit floor outlets, with remaining air exiting defrost and window defogger outlets. Air should not exit vent outlets. Air should be about the same temperature as outside air.

4) Select blend (floor-defrost) mode. Equal volume of air should exit defrost and floor outlets, with some air exiting side window defogger outlets.

5) Select defrost mode. Most air should exit defrost outlets, with a low volume of air exiting floor outlets.

6) Select bi-level mode. Move temperature lever to maximum hot setting. Air should exit vent outlets and its temperature should rapidly increase to about 131°F (55°C) or greater. For more precise heater output temperature check, see HEATER OUTPUT TEMPERATURE CHECK. Defrost nozzle airflow volume should diminish and floor outlet airflow volume may increase slightly.

7) Move temperature lever to maximum cold setting. Air temperature should decrease to about the same temperature as outside air.

8) Slowly turn blower motor speed control knob toward OFF position. Stopping briefly at each intermediate position to check force of airflow exiting instrument panel center outlets to hear blower noise. Airflow and blower noise should decrease noticeably at each intermediate position.

TROUBLE SHOOTING CHART DIRECTORY

<table>
<thead>
<tr>
<th>Application</th>
<th>Figures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars, Light Trucks &amp; Vans (1)</td>
<td></td>
</tr>
<tr>
<td>CCOT System</td>
<td>1-5</td>
</tr>
<tr>
<td>V5/TXV System</td>
<td>6-12</td>
</tr>
<tr>
<td>V5/VDOT System</td>
<td>13-19</td>
</tr>
<tr>
<td>Heater System</td>
<td>20-24</td>
</tr>
</tbody>
</table>

(1) - Vehicles with Harrison V5 5-cylinder compressor use a Variable Displacement Orifice Tube (VDOT) or Thermal Expansion Valve (TXV) system, referred to as V5/VDOT and V5/TXV systems in this article. Vehicles with any other compressor use the Cycling Clutch Orifice Tube (CCOT) system.

INSUFFICIENT COOLING (CCOT SYSTEM)
Fig. 1: Insufficient Cooling Chart "A" (CCOT System)
Courtesy of General Motors Corp.
Fig. 2: Insufficient Cooling Chart "B" (CCOT System) 
Courtesy of General Motors Corp.
Fig. 3: Insufficient Cooling Chart "C" (CCOT System)
Courtesy of General Motors Corp.
Fig. 4: Insufficient Cooling Chart "D" (CCOT System)
Courtesy of General Motors Corp.
Fig. 5: Insufficient Cooling Chart "E" (CCOT System)
Courtesy of General Motors Corp.

CHECKING REFRIGERANT CHARGE - STEP 2 (V5/TXV SYSTEM)
CHECKING COMPRESSOR CLUTCH ENGAGEMENT - STEP 3 (V5/TXV SYSTEM)
Fig. 7: Checking Clutch Engagement - Step 3 (V5/TXV System)
Courtesy of General Motors Corp.

CHECKING SYSTEM PERFORMANCE - STEP 4 (V5/TXV SYSTEM)
Fig. 8: Checking System Performance - Step 4 (V5/TXV System)
Courtesy of General Motors Corp.

PERFORMANCE DIAGNOSTIC CHART - STEP 5 (V5/TXV SYSTEM)
1. USE THE CHART BELOW WHICH CORRESPONDS TO
THE PRESENT AMBIENT TEMPERATURE.
2. READ THE HIGH SIDE AND LOW SIDE Pressures
AND NOTE THE LETTER CODED AREA IN WHICH
THEY INTERSECT.
3. MATCH THE LETTER CODE WITH THE
CORRESPONDING LETTER CODE ON THE
FOLLOWING PAGE (STEP 6) AND CONTINUE WITH
THE DIAGNOSTIC CODE PROCEDURES.

Fig. 9: Performance Diagnostic Chart - Step 5 (V5/TXV System)
Courtesy of General Motors Corp.

DIAGNOSTIC CODE PROCEDURES - STEP 6 (V5/TXV SYSTEM)
Refer to appropriate diagnostic code chart (Step 5) for ambient garage conditions.

<table>
<thead>
<tr>
<th>IF you find...</th>
<th>THEN the problem may be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High and Low pressures intersect in area ‘A’</td>
<td>No Problem – Normal System</td>
</tr>
<tr>
<td></td>
<td>Rule of Thumb: Outlet temperature is typically</td>
</tr>
<tr>
<td></td>
<td>20°F less than outside air temperatures.</td>
</tr>
<tr>
<td>2. High and Low pressures intersect in area ‘B’</td>
<td>Low Charge OR Failed Closed TXV</td>
</tr>
<tr>
<td>– may also hear a “motorboat”-like noise inside the vehicle with windows up and with the blower motor on low speed</td>
<td></td>
</tr>
<tr>
<td>– may also see rapid fluctuation of low side gage</td>
<td>Evacuate system and weigh charge; if less than</td>
</tr>
<tr>
<td></td>
<td>0.8 kg (1.7 lbs.) is removed and there was no</td>
</tr>
<tr>
<td></td>
<td>rapid fluctuation of the low side gage, then</td>
</tr>
<tr>
<td></td>
<td>recharge the system to specifications.</td>
</tr>
<tr>
<td></td>
<td>If the charge removed is within specifications, and</td>
</tr>
<tr>
<td></td>
<td>rapid fluctuation of the low side gage was noted,</td>
</tr>
<tr>
<td></td>
<td>then replace TXV</td>
</tr>
<tr>
<td>3. High and Low pressures intersect in area ‘C’</td>
<td>Stuck Open TXV</td>
</tr>
<tr>
<td>– high and low side pressures equalize quickly upon turning A/C off.</td>
<td></td>
</tr>
<tr>
<td>– may also be accompanied with a “slugging” noise upon vehicle start-up</td>
<td>Replace TXV</td>
</tr>
<tr>
<td>4. High and Low pressures intersect in area ‘D’</td>
<td>Destroked Compressor OR No-Pump Compressor</td>
</tr>
<tr>
<td></td>
<td>Do Step 7 (Next Page) to confirm and follow</td>
</tr>
<tr>
<td></td>
<td>procedures listed in the diagnostic tree</td>
</tr>
<tr>
<td>5. High and Low pressures are higher than normal and the compressor cycles off due to high side pressure in excess of 425 psi. The compressor may re-engage after a period of time and then cycle off again</td>
<td>High Charge</td>
</tr>
<tr>
<td></td>
<td>Complete recovery per equipment manufacturer’s</td>
</tr>
<tr>
<td></td>
<td>instructions, evacuate and charge to system</td>
</tr>
<tr>
<td></td>
<td>specifications</td>
</tr>
<tr>
<td>6. An abrupt drop in temperature along the high side plumbing, condenser, or receiver/dryer. The high side should be warm/hot from the compressor discharge all the way to the TXV</td>
<td>High Side Restriction</td>
</tr>
<tr>
<td></td>
<td>Replace component where restriction is occurring</td>
</tr>
<tr>
<td>7. System appears to perform normally, but may go warm temporarily on extended drives and correct itself after vehicle shut-down at which time a large puddle of water will be noticed under the vehicle</td>
<td>Evaporator Core Freeze-Up</td>
</tr>
<tr>
<td></td>
<td>Do Step 8 (On page following the next page) to</td>
</tr>
<tr>
<td></td>
<td>confirm compressor control valve failed low</td>
</tr>
</tbody>
</table>
Fig. 11: Checking For No Stroke Compressor - Step 7 (V5/TXV System)
Courtesy of General Motors Corp.

CONTROL VALVE DIAGNOSIS - STEP 8 (V5/TXV SYSTEM)
**IMPORTANT**

FOLLOW THIS TEST PROCEDURE EXACTLY. IT IS DESIGNED TO CREATE A LOW COOLING LOAD TO CAUSE THE V5 COMPRESSOR TO OPERATE AT LESS THAN FULL STROKE. THIS IS ABSOLUTELY NECESSARY FOR ACCURATE TEST RESULTS.

**DISCONNECT BLOWER MOTOR. SET A/C MODE TO "MAX" OPEN HOOD, CLOSE WINDOWS AND DOORS. START ENGINE AND RUN AT FAST IDLE SPEED.**

**IS LOW SIDE PRESSURE BETWEEN 161 AND 238 kPa (23 AND 35 psi)?**

- **NO**
  - **RECOVER REFRIGERANT PER EQUIPMENT MANUFACTURER'S INSTRUCTIONS.**
  - **REPLACE CONTROL VALVE.**
  - **EVACUATE AND CHARGE SYSTEM PER EQUIPMENT MANUFACTURER'S INSTRUCTIONS.**

- **YES**
  - **DO STEP 4 TO CONFIRM NORMAL SYSTEM OPERATION. IF HIGH-SIDE PRESSURE IS STILL LOW WITH LOW-SIDE STILL HIGH, THEN REPLACE COMPRESSOR.**
  - **LEAK TEST.**
- PRESSURE GAUGES PROPERLY CALIBRATED
- AMBIENT AIR AT LEAST 16° C (60° F)
- ENGINE WARMED TO OPERATING TEMPERATURE
- IGNITION KEY IN OFF POSITION

CONNECT HIGH AND LOW SIDE PRESSURE GAUGES. PRESSURES SHOULD BE ABOUT EQUAL.

- BOTH PRESSURES ABOVE 345 kPa (50 psi) OK
- BOTH PRESSURES BELOW 69 kPa (10 psi). ADD .45 kg (1 LB) OF R-134a LEAK CHECK SYSTEM. REPAIR LEAK.
- BOTH PRESSURES BETWEEN 69 AND 345 kPa (10 AND 50 psi). LEAK CHECK SYSTEM. ADD R-134a IF NEEDED REPAIR LEAK.

EVACUATE AND CHARGE SYSTEM.

- BOTH PRESSURES ABOVE 345 kPa (50 psi) OK

DO STEP 3.
Fig. 14: Checking Clutch Engagement - Step 3 (V5/VDOT System)
Courtesy of General Motors Corp.

CHECKING SYSTEM PERFORMANCE - STEP 4 (V5/VDOT SYSTEM)
Fig. 15: System Performance - Step 4 (V5/VDOT System - 1 Of 2)
Courtesy of General Motors Corp.

CHECKING SYSTEM PERFORMANCE - STEP 4 (Cont.) (V5/VDOT SYSTEM)
Fig. 16: System Performance - Step 4 (V5/VDOT System - 2 Of 2)
Courtesy of General Motors Corp.

RIGHT AREA DIAGNOSIS & SERVICE - STEP 5 (V5/VDOT SYSTEM)
ENGINE STILL RUNNING. SET A/C CONTROLS TO: NORM A/C MODE, HIGH BLOWER AND TEMP. TO FULL COLD. CLOSE VEHICLE WINDOWS AND DOORS. OPEN HOOD. BOTH ENGINE COOLING FANS MUST BE OPERATING.

FEEL LIQUID LINE BETWEEN CONDENSER AND ORIFICE (EXPANSION) TUBE. IS IT COLD?

- **NO**
  - REFRIGERANT OVERCHARGE OR AIR IN SYSTEM.
  - RECOVER REFRIGERANT.

- **YES**
  - CHECK FOR RESTRICTED AIR FLOW AT CONDENSER AND/OR FAN OPERATION.
  - REPAIR FAN(S). REMOVE RESTRICTION.

- **EVACUATE AND CHARGE SYSTEM.**
  - LEAK TEST.
  - DO STEP 4.

Fig. 17: Right Area Diagnosis & Service - Step 5 (V5/VDOT System)
Courtesy of General Motors Corp.

LEFT AREA DIAGNOSIS & SERVICE - STEP 6 (V5/VDOT SYSTEM)
CONTROL VALVE DIAGNOSIS - STEP 7 (V5/VDOT SYSTEM)
Fig. 19: Control Valve Diagnosis - Step 7 (V5/VDOT System)
Courtesy of General Motors Corp.

INSUFFICIENT HEAT OR DEFROSTING

IMPORTANT
FOLLOW THIS TEST PROCEDURE EXACTLY. IT IS DESIGNED TO CREATE A LOW COOLING LOAD TO CAUSE THE V5 COMPRESSOR TO OPERATE AT LESS THAN FULL STROKE. THIS IS ABSOLUTELY NECESSARY FOR ACCURATE TEST RESULTS.

RUN ENGINE FOR 5 MINUTES AT 2,000 RPM. SET A/C CONTROLS TO: MAX A/C MODE, LOW BLOWER AND TEMP. TO FULL COLD. CLOSE VEHICLE WINDOWS AND DOORS. OPEN HOOD.

IS LOW SIDE PRESSURE 172-241 kPa (25 TO 35 psi)?

NO
RECOVER REFRIGERANT.

YES
REPLACE CONTROL VALVE.

EVACUATE AND CHARGE SYSTEM.

LEAK TEST.

DO STEP 4.
Fig. 20: Insufficient Heat or Defrosting (1 of 2)
Courtesy of General Motors Corp.
Figure 21: Insufficient Heat or Defrosting (2 of 2)
Courtesy of General Motors Corp.

TEMPERATURE CONTROL DIAGNOSIS
Fig. 22: Temperature Control Diagnosis
Courtesy of General Motors Corp.

BLOWER NOISE DIAGNOSIS

CHECK AFFECTED VALVE ACTUATOR FOR CORRECT INSTALLATION AND CONNECTION

OK

DISCONNECT ACTUATOR FROM VALVE AND CHECK VALVE FOR PROPER TRAVEL AND EFFORT

NOT OK

REPAIR AS NECESSARY

OK

CHECK VACUUM HOSE HARNESS FOR PROPER VACUUM DELIVERY OR ELECTRICAL HARNESS FOR CONTINUITY

OK

CHECK ACTUATOR FOR PROPER OPERATION. REPAIR AS NECESSARY

NOT OK

REPAIR AS NECESSARY

PERFORM FUNCTIONAL CHECK
Fig. 23: Blower Noise Diagnosis (1 of 2)  
Courtesy of General Motors Corp.
Fig. 24: Blower Noise Diagnosis (2 of 2)
Courtesy of General Motors Corp.