

## 1997 Cadillac Catera

A/C-HEATER SYSTEM 1997 A/C-HEATER SYSTEMS General Motors Corp. - Automatic A/C-Heater System

### A/C-HEATER SYSTEM

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## A/C SYSTEM SPECIFICATIONS

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Application	Specification
Compressor Type	Harrison V5 5-Cyl.
Compressor Belt Tension	(1)
System Oil Capacity	9 ozs.
Refrigerant (R-134a) Capacity	(2) 32.1 ozs.
System Operating Pressures (3)	
High Side	145-261 psi (10.2-18.4 kg/cm <sup>2</sup> )
Low Side	28-30 psi (1.9-2.1 kg/cm <sup>2</sup> )
(1) Belt tension is adjusted by automatic belt tensioner.	
(2) Use PAG Refrigerant Oil (Part No. 12345923).	
(3) Measured at 2000 RPM with ambient temp at 68°F (20°C).	

## DESCRIPTION & OPERATION

**WARNING:** To avoid injury from accidental air bag deployment, read and carefully follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG article in the ACCESSORIES/SAFETY EQUIPMENT Section.

**CAUTION:** When discharging air conditioning system, use only approved refrigerant recovery/recycling equipment. Make every attempt to avoid discharging refrigerant into the atmosphere.

**CAUTION:** When battery is disconnected, radio will go into anti-theft protection mode. Obtain radio anti-theft protection code from owner prior to servicing vehicle.

### A/C-HEATER CONTROL PANEL

#### AUTO Mode

Press driver's side TEMP knob to set system in AUTO mode. Once system is set, sensors will provide input to the A/C-heater system to maintain the desired interior temperature.

#### A/C Off & Off

A/C off mode, deactivates the A/C compressor. Off mode deactivates the automatic A/C-heater system, but outside air temperature remains displayed. The system will attempt it maintain the previously set temperature without the use of A/C or blower motor.

#### Temperature Control

The driver and passenger temperature control knobs provide a dual-zone heating and cooling feature. The dual-zone feature may be changed to a single-zone mode by depressing passenger knob. In all cases the passenger's

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control is slave to the driver's control.

### Defrost Mode

Activating defrost mode by pushing DEFROST button will deactivate the AUTO function, the blower speed will go to 3rd speed and the recirculated air mode will deactivate if on. Pushing DEFROST button again will return system to the mode in which it was previously set.

### Fan Speed

Blower motor speed is controlled by A/C-heater system using a resistor installed in the duct (downstream of blower motor). The location of resistor promotes a cooling effect. A manual fan speed change will override the AUTO mode setting.

### Recirculated Air Mode

The recirculated air mode closes off most of the entrance of outside air and recirculates passenger compartment air.

### Defog Mode

In this mode, air will be split equally between defroster and floor outlets.

### Bi-Level Mode

This mode provides outside air flow to the instrument panel with a split to the floor outlet.

### Floor Mode

In this mode, all air flow is directed to the floor outlet ducts.

### Display Panel

The vacuum fluorescent display panel provides system operating information for the driver. The set temperature can be displayed in Fahrenheit or Celsius. To switch between Fahrenheit and Celsius, depress driver's TEMP button for at least 3 seconds.

Outside temperature reading is displayed in the same temperature value as the requested interior temperature setting. If OUTSIDE temperature displays "--", this indicates a failure of the outside temperature sensor. A freeze warning feature causes outside temperature display to flash. This feature indicates that the outside temperature is cold enough to encounter ice on the road surfaces.

When AUTO is displayed, it indicates that the system is in the automatic operating mode. When system is manually turned off, AC OFF will be displayed. The defrost and rear heated window functions are displayed with an appropriate icon and can be initiated by depressing the appropriate buttons.

Adjustment of fan speed is accomplished by depressing rocker button either up or down. The fan speed icon is not displayed in AUTO mode. In Manual mode, the fan speed is designated by the graduated bars.

The MODE rocker button will adjust the direction of the air flow as designated by the icon displayed on panel. The arrows show the direction of the air flow and the defog icon will appear in the grouping when set.

The recirculated air icon will be displayed when system is manually set to recirculate passenger compartment air. The recirculated air button controls the function in either the AUTO or manual mode.

### A/C COMPRESSOR CONTROLS

When A/C button on A/C-heater control panel is pressed, an A/C compressor request signal is sent through the refrigerant pressure switch and the Engine Control Module (ECM) to the coil of the A/C compressor relay (K60).

This enables A/C compressor relay to energize, allowing ignition voltage to energize A/C compressor clutch coil and fan control relay (K87). When fan control relay energizes, battery voltage is supplied to auxiliary cooling fan No. 1 and through the normally open contacts of fan control relay (K52), to auxiliary cooling fan No. 2. If coolant temperature reaches 248°F (120°C), temperature switch No. 2 contacts will open and the compressor clutch coil is disengaged causing the A/C system to turn off. Temperature switch No. 2 will not allow A/C system to turn back on until coolant temperature has reached 239°F (115°C) or less.

The A/C compressor clutch coil can also be turned off by refrigerant pressure switches (low pressure switch or high pressure switch). The low pressure switch will turn A/C compressor clutch off as soon as refrigerant pressure falls to about 26 psi (1.8 kg/cm<sup>2</sup>). This is done by opening the low pressure switch contacts and not allowing battery voltage to pass through A/C compressor relay (K60) to the compressor clutch coil. The low pressure switch activates the A/C compressor clutch when refrigerant pressure increases to about 36.3 psi (2.6 kg/cm<sup>2</sup>).

The high pressure switch will turn A/C compressor clutch off as soon as refrigerant pressure exceeds approximately 435 psi (30.6 kg/cm<sup>2</sup>). This is done by opening the high pressure switch contacts in refrigerant pressure switch and not allowing battery voltage to pass through A/C compressor relay (K60) to the A/C compressor clutch. The high pressure switch activates A/C compressor clutch when refrigerant pressure drops below about 290 psi (19.3 kg/cm<sup>2</sup>).

When refrigerant pressure exceeds approximately 159.4 psi (11.2 kg/cm<sup>2</sup>), the A/C control switch contacts will close and engine idle speed will increase to compensate for the RPM drop that occurs when A/C system is switched on. The A/C control switch is installed in the high pressure line, between A/C compressor and condenser. When refrigerant pressure drops below approximately 130.5 psi (9.2 kg/cm<sup>2</sup>), the A/C control switch contacts will close and allow engine idle speed to return to normal.

## **ACTUATORS**

The automatic A/C-heater system uses 5 electrically operated actuators (stepper motors) and 2 vacuum actuators. The electrically operated actuators control driver's and passenger's temperature doors, inside air (panel) valve door, and mode valve (floor) door. The vacuum actuators control the interior air recirculation valve and heater cut-off valve.

## **AIR DELIVERY & TEMPERATURE CONTROLS**

The outside (ambient) air temperature sensor is a thermistor that controls signal voltage to the A/C-heater control panel. The A/C-heater control panel applies voltage on the sensor's circuit. When the sensor is cold its resistance is high, and the A/C-heater control panel will see a high voltage signal. When sensor warms up its resistance is reduced and the signal voltage is pulled low through ground circuit. Signal voltage varies from 5 volts (open circuit) to zero volts (short circuit).

The headlight automatic control ambient light sensor is a photo diode that controls signal voltage to the A/C-heater control panel. The A/C-heater control panel monitors voltage on the circuit to this sensor. When sensor is exposed to direct light, the A/C-heater control panel reads a low voltage signal. As sensor becomes shaded, the signal voltage increases. Signal voltage varies from 5 volts (open circuit) to zero volts (short circuit). The light sensor influences the A/C-heater system by changing blower speed, air distribution, and the temperature depending on the sun's intensity (sunload sensor input).

The left and right duct temperature sensors are thermistors that control signal voltages to the A/C-heater control panel. When sensors are cold their resistance is high. When sensors warm up their resistance is reduced and the signal voltage is pulled low through ground circuit. Signal voltage varies from 5 volts (open circuit) to zero volts (short circuit).

## **BLOWER CONTROLS**

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Air flow is controlled by modulating commanded blower motor voltage and varying the blower motor speed. The blower motor speed is a function of the program number when it is under automatic control. Adjustments to blower motor speed are made based on vehicle speed, coolant temperature, and solar load (sunload sensor input). There are some instances which may override the normal operation of the blower motor in order to limit snow ingestion, purge air ducts, cooling of the instrument cluster, or to enhance heater warm-up performance.

### COLD AIR PURGE

During a start in cool weather with a still warm engine, the humid air which collects around the heater core could cause windshield fogging. To prevent this, a cold air purge routine is programmed into the A/C-heater control panel. With coolant temperature at least 60°F (16°C) and the blower motor and air distribution in the AUTO mode, the air valves will move to guide the airflow away from the windshield. During the first 5 seconds, while the air valves are moving into position, the blower motor will not run. Then for the next 30 seconds, a low blower motor speed purges the moist air from the system. After that, the system reverts to its normal operating mode.

### ELECTRIC COOLING FANS

The electric cooling fan circuits consist of one engine cooling fan, 2 auxiliary cooling fans, 2 temperature switches, the A/C compressor refrigerant pressure switch, the Engine Control Module (ECM) cooling blower, the timing control pump, the auxiliary water pump, 7 fan control relays, and one engine cooling fan resistor. The auxiliary water pump is provided with battery voltage at all times, enabling it to operate anytime the ignition switch is on.

At 212°F (100°C), temperature switch No. 1 stage one contacts will close, enabling ECM relay (K48) and cooling fan control relay (K26) to energize. When ECM relay energizes, ignition voltage will be applied to the ECM cooling blower allowing it to operate.

When cooling fan control relay (K26) energizes, battery voltage is applied to auxiliary cooling fan No. 1 and to auxiliary cooling fan No. 2 through the normally open contacts of fan control relay (K52). This will cause the auxiliary cooling fans to operate in series at half speed.

Fan control relay (K26) will also supply battery voltage to the engine cooling fan after it goes through the engine cooling fan resistor. The engine cooling fan resistor will cause the engine cooling fan to operate at half speed. Fan control relay (K26) will also supply battery voltage to the timing control pump through normally closed contacts of the auxiliary water pump relay (K22). This will allow the timing control pump to operate.

Temperature switch No. 1 stage one contacts will open when coolant temperature reaches 203°F (95°C). This will turn on all 3 fans, the ECM cooling blower and turn the timing control pump off, unless the A/C system is on.

If ignition switch is off and coolant temperature is above 212°F (100°C), both auxiliary cooling fans, the engine cooling fans and the timing control pump will remain on until the coolant temperature drops below 203°F (95°C).

If temperature reaches 221°F (105°C), temperature switch contacts will close enabling fan control relays (K52 and K28) to energize. When fan control relay (K52) energizes, auxiliary cooling fan No. 1 will go to full speed as it is no longer in series with auxiliary cooling fan No. 2. When fan control relay (K28) energizes, battery voltage is applied to auxiliary cooling fan No. 2 which operates at full speed.

With temperature switch No. 1 stage one contacts closed, the ECM cooling blower, the timing control pump and the engine cooling fan (half speed) will continue to operate. Temperature switch No. 2 contacts will open when coolant temperature reaches 212°F (100°C) and cause the operation of the auxiliary cooling fans to operate differently as designated by temperature switch No. 1.

If coolant temperature reaches 230°F (110°C), temperature switch No. 2 stage two contacts will close, enabling fan control relay (K67) to energize. When fan control relay (K67) energizes, battery voltage will be applied directly to engine cooling fan causing it to operate at full speed. All other operations that were taking place before the coolant temperature reached 230°F (110°C) will remain in effect. Temperature switch No. 1 stage two contacts

will open when coolant temperature reaches 221°F (105°C) and the engine cooling fan will return to half speed.

At coolant temperatures above approximately 230°F (110°C), all 3 cooling fans operate at full speed. The ECM cooling blower, the timing control pump and the auxiliary water pump are also operating. Only 6 of the 7 relays operate at this time, unless the A/C system is turned on. In this case, fan control relay (K87) and the A/C compressor relay (K60) will also operate.

To prevent excessively high refrigerant pressure, auxiliary cooling fans are switched from first speed to second speed at refrigerant pressures above approximately 276 psi (19.4 kg/cm<sup>2</sup>). When pressure drops below approximately 218 psi (15.3 kg/cm<sup>2</sup>), auxiliary cooling fans are switched back to first speed.

### **HOT AIR PURGE**

During a start in warm weather, warm moist air can accumulate around the evaporator. To divert this undesirable air, the A/C-heater control panel will disable the blower motor for 5 seconds while the mode valves move to divert the air to the floor outlets. After positioning the mode valves, the A/C-heater control panel will set blower motor on low for 30 seconds to purge the air from the A/C-heater module before returning to AUTO mode.

### **INSIDE AIR TEMPERATURE SENSOR**

The inside temperature sensor is located in A/C-heater control module, behind a small grille. Inside air temperature sensor input takes place only during initial start-up. In the case of an inside air temperature sensor failure, the A/C-heater system will default to a value of 75°F (24°C).

### **OUTSIDE AIR TEMPERATURE SENSOR**

The outside (ambient) temperature sensor is located on bottom of front bumper. The sensor is exposed to the airflow across the front of the vehicle and provides a sample of the outside air (ambient) temperature. In the case of an outside air temperature sensor failure, the A/C-heater system will default to a value of 60°F (15°C).

### **SUNLOAD SENSOR**

The sunload sensor is a photo-electric cell that provides 2 inputs to the A/C-heater system. One input is used by the A/C-heater system for temperature control compensation. The other input is used to determine the need for the twilight sentinel. This signal is sent from the A/C-heater system to the Body control Module (BCM).

The sunload sensor input to the A/C-heater system provides a means of determining the intensity of solar heat the passenger compartment is subjected to. In the case of a sunload sensor failure, the A/C-heater system will default to a value of zero (darkness).

## **TESTING**

### **A/C SYSTEM PERFORMANCE**

1. Connect manifold gauge set. High pressure service valve is located on A/C compressor-to-condenser hose. Low pressure service valve is located on accumulator. Place a high-volume fan in front of radiator grille.
2. Open hood and close all doors and windows. Set A/C-heater control panel to 60°F (16°C), AUTO mode and high blower motor speed. Start engine and allow it to idle for 5 minutes.
3. Increase engine speed to 2000 RPM and perform test. Measure ambient air temperature and the temperature of the air being discharged from center vent on instrument panel. Measure and record system pressures.
4. If discharged air temperature is at least 20°F (11°C) less than ambient temperature and pressures fall within normal range, system is operating properly.

## **TROUBLE SHOOTING**

**WARNING: To avoid injury from accidental air bag deployment, read and follow all SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM procedures in AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section.**

#### A/C COMPRESSOR INOPERATIVE

1. Turn ignition on. Locate test connector within the Engine Control Module (ECM) housing. Connect a test light between ground and terminal No. 3 (Brown wire) of test connector. If test light comes on, go to step 3 . If test light does not come on, go to next step.
2. Repair open circuit or high resistance in Brown wire between A/C compressor relay and fuse block. After repairing wire, go to next step.
3. Disconnect A/C compressor relay (K60). Connect a test light between ground and Red wire terminal of A/C compressor relay harness connector. If test light comes on, go to step 5 . If test light does not come on, go to next step.
4. Repair open circuit or high resistance in Red wire between A/C compressor relay and fuse block. After repairing wire, go to next step.
5. Using a DVOM, check continuity of Green wire and Brown/Black wire between A/C compressor diode and A/C compressor clutch coil. If continuity exists, go to step 7 . If no continuity exists, go to next step.
6. Repair open circuit or high resistance in Green wire or Brown/Black wire between A/C compressor diode and A/C compressor clutch coil. After repairing wire(s), go to next step.
7. Turn ignition off. Connect a fused jumper wire between terminal No. 4 (Green wire) and terminal No. 8 (Red wire) of A/C compressor relay wiring harness connector. Disconnect temperature switch No. 2. Connect a fused jumper wire between ground and Brown/Black wire terminal of temperature switch No. 2 wiring harness connector. If A/C compressor operates, go to step 9 . If A/C compressor does not operate, go to next step.
8. Check for open circuit or high resistance in Green wire or Brown/Black wire to A/C compressor clutch. If wires are okay, replace A/C compressor clutch coil. After repairing wire(s) or replacing clutch, go to next step.
9. Turn ignition off. Connect a fused jumper wire between Brown/Black wire terminal and Black wire terminal of temperature switch No. 2 wiring harness connector. Turn ignition on. If A/C compressor operates, go to step 11 . If A/C compressor does not operate, go to next step.
10. Replace temperature switch No. 2. After replacing switch, go to step 12 .
11. Repair open circuit or high resistance in Black (ground) wire to temperature switch No. 2. If repair is completed, go to step 13 . If repair is not complete, go to next step.
12. Turn ignition off. Remove both fused jumper wires. Connect a fused jumper wire between ground and terminal No. 6 (Brown/Purple wire) of A/C compressor relay (K60). Turn ignition on. If A/C compressor operates, go to step 14 . If A/C compressor does not operate, go to next step.
13. Replace A/C compressor relay. After replacing relay, go to next step.
14. Turn ignition off. Remove fused jumper wire between ground and A/C compressor relay. Disconnect A/C compressor refrigerant pressure switch. Measure resistance between terminal No. 1 and 2 (Black/White wires) of refrigerant pressure switch. If resistance is less than 2 ohms, go to next step. If resistance is not as specified, go to step 16 .
15. Replace A/C compressor refrigerant pressure switch. After replacing switch, go to next step.
16. Check continuity of Black/White wire between A/C-heater control panel and Engine Control Module (ECM). Also check continuity of Brown/Purple wire between A/C compressor relay and ECM. If continuity of wires is okay, go to next step. If continuity of wire(s) is not okay, go to step 18 .
17. Repair open circuit or high resistance in Black/White wire or Brown/Purple wire to ECM. After repairing wire(s), go to next step.

18. Disconnect ECM connector. Connect a fused jumper wire between terminal No. 15 (Black/White wire) and terminal No. 36 (Brown/Purple wire) of ECM wiring harness connector. Turn ignition on. Press A/C button on A/C-heater control panel. If A/C compressor does not operate, go to next step. If A/C compressor operates, reconnect wiring and components. Verify A/C compressor operates properly.
19. Replace A/C-heater control panel. After replacing A/C-heater control panel, reconnect wiring and components. Verify A/C compressor operates properly.

**AUXILIARY COOLING FAN NO. 1 DOES NOT OPERATE**

1. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 1 (Brown/Blue wire) of test connector to a known good ground. Disconnect auxiliary cooling fan No. 1. Using a DVOM, measure voltage between ground and Red/White wire terminal at auxiliary cooling fan wiring harness. If battery voltage is present, go to step 9 . If battery voltage is not present, go to next step.
2. Disconnect fan control relay (K26). Measure voltage between ground and terminal No. 3 (Red wire) at fan control relay (K26) wiring harness connector. If battery voltage is present, go to step 4 . If battery voltage is not present, go to next step.
3. Check fuse No. 50 (10-amp). If fuse is okay, repair open circuit or high resistance in Red wire between fan control relay and fuse. Also check Red wire circuit to battery. If fuse and circuits are okay, go to step 10 .
4. Measure voltage between ground and terminal No. 2 (Red wire) at fan control relay (K26). If battery voltage is present, go to step 6 . If battery voltage is not present, go to next step.
5. Check fuse No. 52 (30-amp). If fuse is okay, repair open circuit or high resistance in Red wire between fan control relay and fuse. Also check Red wire circuit to battery. If fuse and circuits are okay, go to step 10 .
6. Connect a fused jumper wire between terminal No. 2 (Red wire) and terminal No. 8 (Red/White wire) of fan control relay (K26) wiring harness connector. Measure voltage between ground and Red/White wire terminal of auxiliary cooling fan No. 1. If battery voltage is present, go to step 8 . If battery voltage is not present, go to next step.
7. Repair open circuit or high resistance in Red/White wire between auxiliary cooling fan and fan control relay. After repairing wire, go to step 10 .
8. Replace fan control relay (K26). After replacing relay, go to step 10 .
9. Check for open circuit or high resistance in Brown/White wire and Black wire to temperature switch No. 1. Repair if necessary. If wires are okay, replace temperature switch No. 1. After repairing wire(s) or replacing switch, go to next step.
10. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 5 (Brown/White wire) of test connector to a known good ground. Disconnect auxiliary cooling fan No. 1. Using a DVOM, measure resistance between ground and Brown/Green wire terminal at auxiliary cooling fan wiring harness. If resistance is less than 2 ohms, go to next step. If resistance is not as specified, go to step 12 .
11. Replace auxiliary cooling fan No. 1. After replacing fan, reconnect wiring and components. Verify cooling fan No. 1 operates properly.
12. Disconnect fan control relay (K52). Measure voltage between ground and terminal No. 4 (Brown wire) at fan control relay. If battery voltage is present, go to step 14 . If battery voltage is not present, go to next step.
13. Repair open circuit or high resistance in Brown wire to fan control relay. After repairing wire, reconnect wiring and components. Verify cooling fan No. 1 operates properly.
14. Measure resistance between ground and terminal No. 8 (Black wire) at fan control relay. If resistance is less than 2 ohms, go to step 16 . If resistance is not as specified, go to next step.
15. Repair open circuit or high resistance in Black (ground) wire to fan control relay. After repairing wire, reconnect wiring and components. Verify cooling fan No. 1 operates properly.
16. Measure resistance between terminal No. 2 (Brown/Green wire) of fan control relay (K52) and auxiliary cooling fan No. 1. If resistance is less than 2 ohms, go to step 18 . If resistance is not as specified, go to next

step.

17. Repair open circuit or high resistance in Brown/Green wire between fan control relay and auxiliary cooling fan No. 1. After repairing wire, reconnect wiring and components. Verify cooling fan No. 1 operates properly.
18. Check for open circuit or high resistance in Brown/White wires and Black wire to temperature switch No. 2. Repair if necessary. If wires are okay, replace temperature switch No. 2. After repairs, reconnect wiring and components. Verify cooling fan No. 1 operates properly.

#### **AUXILIARY COOLING FAN NO. 2 DOES NOT OPERATE**

1. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 5 (Brown/White wire) of test connector to a known good ground. If auxiliary cooling fan No. 2 comes on, go to next step. If auxiliary cooling fan No. 2 does not come on, go to step 3 .
2. Repair open circuit or high resistance in Brown/White wire and Black wire to temperature switch No. 2. Repair if necessary. If wires are okay, replace temperature switch No. 2. After repairs, reconnect wiring and components. Verify cooling fan No. 2 operates properly.
3. Disconnect fan control relay (K28). Using a DVOM, measure resistance between test terminal No. 5 and Brown/White wire at fan control relay. If resistance is less than 2 ohms, go to step 5 . If resistance is not as specified, go to next step.
4. Repair open circuit or high resistance in Brown/White wire between terminal No. 5 of test connector and fan control relay. After repairing wire, reconnect wiring and components. Verify cooling fan No. 2 operates properly.
5. Using a DVOM, measure voltage between ground and terminal No. 2 (Brown wire) of fan control relay. If battery voltage is present, go to step 7 . If battery voltage is not present, go to next step.
6. Repair open circuit or high resistance in Brown wire to fan control relay. After repairing wire, reconnect wiring and components. Verify cooling fan No. 2 operates properly.
7. Measure voltage between ground and terminal No. 4 (Red wire) of fan control relay. If battery voltage is present, go to step 9 . If battery voltage is not present, go to next step.
8. Check fuse No. 40 (30-amp). If fuse is okay, repair open circuit or high resistance in Red wire between fan control relay and fuse. Also check Red wire circuit to battery. After repairs, reconnect wiring and components. Verify cooling fan No. 2 operates properly.
9. Connect a fused jumper wire between terminal No. 4 (Red wire) and terminal No. 8 (Red/White wire) of fan control relay (K28) wiring harness connector. If auxiliary cooling fan No. 2 comes on, go to next step. If auxiliary cooling fan No. 2 does not come on, go to step 11 .
10. Replace fan control relay (K28). After replacing relay, reconnect wiring and components. Verify cooling fan No. 2 operates properly.
11. Disconnect auxiliary cooling fan No. 2. Measure voltage between ground and Red/White wire terminal of auxiliary cooling fan No. 2 wiring harness connector. If battery voltage is present, go to step 13 . If battery voltage is not present, go to next step.
12. Repair open circuit, high resistance, or short to ground in Red/White wire to auxiliary cooling fan No. 2. After repairing wire, reconnect wiring and components. Verify cooling fan No. 2 operates properly.
13. Replace auxiliary cooling fan No. 2. After replacing fan, reconnect wiring and components. Verify cooling fan No. 2 operates properly.

#### **AUXILIARY WATER PUMP DOES NOT OPERATE**

1. Disconnect auxiliary water pump. Turn ignition on. Using a DVOM, measure voltage between ground and Brown terminal of auxiliary water pump wiring harness connector. If battery voltage is present, go to step 3 . If battery voltage is not present, go to next step.
2. Repair open circuit or high resistance in Brown wire to auxiliary water pump. After repairing wire, reconnect



wiring and components. Verify auxiliary water pump operates properly.

3. Measure resistance between ground and Black (ground) wire terminal of auxiliary water pump wiring harness connector. If resistance is less than 2 ohms, go to step 5 . If resistance is not as specified, go to next step.
4. Repair open circuit or high resistance in Black wire to auxiliary water pump. After repairing wire, reconnect wiring and components. Verify auxiliary water pump operates properly.
5. Replace auxiliary water pump. After replacing auxiliary water pump, reconnect wiring and components. Verify auxiliary water pump operates properly.

#### **BLOWER MOTOR INOPERATIVE OR IMPROPER BLOWER MOTOR SPEED**

1. Disconnect A/C-heater control panel. Turn ignition on. Using a DVOM, measure voltage between ground and terminal No. 19 (Brown wire) of A/C-heater control panel wiring harness connector. If battery voltage is present, go to step 3 . If battery voltage is not present, go to next step.
2. Repair open circuit, high resistance, or short circuit to ground in Brown wire to A/C-heater control panel. After repairing wire, go to next step.
3. Measure voltage between ground and terminal No. 20 (Brown wire) of A/C-heater control panel wiring harness connector. If battery voltage is present, go to step 5 . If battery voltage is not present, go to next step.
4. Repair open circuit, high resistance, or short circuit to ground in Brown wire to A/C-heater control panel. After repairing wire, go to step 7 .
5. Turn ignition off. Disconnect blower motor connector. Measure voltage between ground and Red wire terminal of blower motor wiring harness connector. If battery voltage is present, go to step 7 . If battery voltage is not present, go to next step.
6. Repair open circuit, high resistance, or short circuit to ground in Red wire to blower motor. After repairing wire, go to next step.
7. Connect a test light between Red wire terminal and Black wire terminal of blower motor connector. If test light comes on, go to step 9 . If test light does not come on, go to next step.
8. Repair open circuit or high resistance in Black (ground) to blower motor. After repairing wire, go to next step.
9. Connect a fused jumper wire between terminal No. 19 (Brown wire) and terminal No. 11 (Black/Blue wire) of A/C-heater control panel wiring harness connector. Connect a test light between ground and Black/Blue wire terminal of blower motor connector. Turn ignition on. If test light comes on, go to step 11 . If test light does not come on, go to next step.
10. Repair open circuit or high resistance in Black/Blue wire to blower motor. After repairing wire, go to next step.
11. Turn ignition off. Connect a fused jumper wire between terminal No. 19 (Brown wire) and terminal No. 13 (Brown/White wire) of A/C-heater control panel wiring harness connector. Connect a test light between ground and Brown/White wire terminal of blower motor connector. Turn ignition on. If test light comes on, go to step 13 . If test light does not come on, go to next step.
12. Repair open circuit or high resistance in Brown/White wire to blower motor. After repairing wire, go to next step.
13. Turn ignition off. Reconnect A/C-heater control panel. Turn ignition on. Press fan button on A/C-heater control panel to cycle fan through all 5 speeds. Measure voltage between ground and Black/Blue wire terminal of blower motor connector. See **BLOWER MOTOR SPEED VOLTAGE SPECIFICATIONS** . If voltage is as specified, go to next step. If voltage is not as specified, go to step 15 .
14. Replace blower motor. After replacing blower motor, reconnect wiring and components. Verify blower motor operates properly.
15. Replace A/C-heater control panel. After replacing A/C-heater control panel, reconnect wiring and components. Verify blower motor operates properly.

#### **BLOWER MOTOR SPEED VOLTAGE SPECIFICATIONS**

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Speed	Voltage
1	1.5
2	2.1
3	2.8
4	3.4
5	4.5

**BLOWER MOTOR RUNS CONTINUOUSLY**

1. Disconnect A/C-heater control panel. Turn ignition on. If blower motor runs continuously, go to next step. If blower motor does not run continuously, go to step 3 .
2. Repair short to battery voltage in Black/Blue wire to blower motor. After repairing wire, go to next step.
3. Turn ignition off. Reconnect A/C-heater control panel. Disconnect blower motor connector. Turn ignition on. Press fan button on A/C-heater control panel to cycle fan through all 5 speeds. Measure voltage between ground and Black/Blue wire terminal of blower motor connector. See **BLOWER MOTOR SPEED VOLTAGE SPECIFICATIONS** . If voltage is as specified, go to step 5 . If voltage is not as specified, go to next step.
4. Replace A/C-heater control panel. After replacing A/C-heater control panel, reconnect wiring and components. Verify blower motor operates properly.
5. Replace blower motor. After replacing blower motor, reconnect wiring and components. Verify blower motor operates properly.

**ECM COOLING FAN DOES NOT OPERATE**

1. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 1 (Brown/Blue wire) of test connector to a known good ground. If ECM cooling fan comes on, go to next step. If ECM cooling fan does not come on, go to step 3 .
2. Check for open circuit or high resistance in Brown/Blue wire and Black wire to temperature switch No. 1. If wires are okay, replace temperature switch No. 1. After repairs, reconnect wiring and components. Verify ECM cooling fan operates properly.
3. Disconnect ECM relay (K48). Using a DVOM, measure voltage between ground and terminal No. 2 (Red wire) of ECM relay. If battery voltage is present, go to step 5 . If battery voltage is not present, go to next step.
4. Repair open circuit or high resistance in Red wire to ECM relay. After repairing wire, reconnect wiring and components. Verify ECM cooling fan operates properly.
5. Measure voltage between ground and terminal No. 4 (Brown wire) of ECM relay. If battery voltage is present, go to step 7 . If battery voltage is not present, go to next step.
6. Repair open circuit or high resistance in Brown wire to ECM relay. After repairing wire, reconnect wiring and components. Verify ECM cooling fan operates properly.
7. Connect a fused jumper wire between terminal No. 4 (Brown wire) and terminal No. 8 (Black/White wire) of ECM relay. If ECM cooling fan comes on, go to next step. If ECM cooling fan does not come on, go to step 9 .
8. Replace ECM relay. After replacing relay, reconnect wiring and components. Verify ECM cooling fan operates properly.
9. Disconnect ECM cooling fan. Measure voltage between ground and Black/White wire terminal of ECM cooling fan wiring harness connector. If battery voltage is present, go to step [11](#) . If battery voltage is not present, go to next step.
10. Repair open circuit or high resistance in Black/White wire between ECM relay and cooling fan. After repairing wire, reconnect wiring and components. Verify ECM cooling fan operates properly.
11. Measure resistance between ground and Black (ground) wire terminal of ECM cooling fan wiring harness

connector. If resistance is less than 2 ohms, go to step 13 . If resistance is not as specified, go to next step.

12. Repair open circuit or high resistance in Black wire to ECM cooling fan. After repairing wire, reconnect and wiring components. Verify ECM cooling fan operates properly.
13. Replace ECM cooling fan. After replacing fan, reconnect wiring and components. Verify ECM cooling fan operates properly.

#### **ENGINE COOLING FAN DOES NOT OPERATE**

1. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 4 (Brown/White wire) of test connector to a known good ground. If engine cooling fan comes on, go to next step. If engine cooling fan does not come on, go to step 3 .
2. Check for open or high resistance if Brown/White wire or Black (ground) wire to temperature switch No. 1. Repair if necessary. If wires are okay, replace temperature switch No. 1. After repairs, reconnect wiring and components. Verify engine cooling fan operates properly.
3. Disconnect fan control relay (K67). Using a DVOM, measure resistance between terminal No. 4 of test connector and Brown/White wire terminal of fan control relay. If resistance is less than 2 ohms, go to step 5 . If resistance is not as specified, go to next step.
4. Repair open circuit or high resistance in Brown/White wire between fan control relay and test connector. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
5. Using a DVOM, measure voltage between ground and terminal No. 2 (Red wire) to fan control relay (K67). If battery voltage is present, go to step 7 . If battery voltage is not present, go to next step.
6. Repair open circuit or high resistance in Red wire to fan control relay. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
7. Measure voltage between ground and terminal No. 4 (Red wire) at fan control relay (K67). If battery voltage is present, go to step 9 . If battery voltage is not present, go to next step.
8. Check fuse No. 42 (40-amp). If fuse is okay, repair open circuit or high resistance in Red wire between fan control relay and fuse. Also check Red wire circuit to battery. After repairs, reconnect wiring and components. Verify engine cooling fan operates properly.
9. Connect a fused jumper wire between terminal No. 4 (Red wire) and Red/White wire terminal of fan control relay (K67) wiring harness connector. If cooling fan comes on, go to next step. If cooling fan does not come on, go to step 11 .
10. Replace fan control relay (K67). After replacing relay, reconnect wiring and components. Verify engine cooling fan operates properly.
11. Disconnect engine cooling fan. Measure voltage between ground and Red/White wire terminal of cooling fan wiring harness connector. If battery voltage is present, go to step 13 . If battery voltage is not present, go to next step.
12. Repair open circuit, high resistance, or short to ground in Red/White wire between fan control relay and cooling fan. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
13. Measure resistance between ground and Black wire terminal of cooling fan wiring harness connector. If resistance is less than 2 ohms, go to step 15 . If resistance is not as specified, go to next step.
14. Repair open circuit or high resistance in Black (ground) wire to cooling fan. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
15. Replace engine cooling fan. After replacing fan, reconnect wiring and components. Verify engine cooling fan operates properly.

#### **ENGINE COOLING FAN DOES NOT OPERATE AT HALF SPEED**

1. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 1 (Brown/Blue wire) of test connector to a known good ground. If cooling fan comes on at half

## 1997 Cadillac Catera

A/C-HEATER SYSTEM 1997 A/C-HEATER SYSTEMS General Motors Corp. - Automatic A/C-Heater System

- speed, go to next step. If cooling fan does not come on at half speed, go to step 3 .
2. Repair open circuit or high resistance in Brown/Blue wire and Black wire to temperature switch No. 1. Repair if necessary. If wires are okay, replace temperature switch No. 1. After repairs, reconnect wiring and components. Verify engine cooling fan operates properly (at half speed).
  3. Disconnect fan control relay (K26). Using a DVOM, measure resistance between test terminal No. 1 and Brown/Blue wire at fan control relay. If resistance is less than 2 ohms, go to step 5 . If resistance is not as specified, go to next step.
  4. Repair open circuit or high resistance in Brown/Blue wire between terminal No. 1 of test connector and fan control relay. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
  5. Using a DVOM, measure voltage between ground and terminal No. 3 (Red wire) of fan control relay. If battery voltage is present, go to step 7 . If battery voltage is not present, go to next step.
  6. Check fuse No. 50 (10-amp). If fuse is okay, repair open circuit or high resistance in Red wire between fan control relay and fuse. Also check Red wire circuit to battery. After repairs, reconnect wiring and components. Verify engine cooling fan operates properly.
  7. Measure voltage between ground and terminal No. 4 (Red wire) of fan control relay. If battery voltage is present, go to step 9 . If battery voltage is not present, go to next step.
  8. Check fuse No. 52 (30-amp). If fuse is okay, repair open circuit or high resistance in Red wire between fan control relay and fuse. Also check Red wire circuit to battery. After repairs, reconnect wiring and components. Verify engine cooling fan operates properly.
  9. Connect a fused jumper wire between terminal No. 4 (Red wire) and terminal No. 5 (Red/Blue wire) of fan control relay (K26) wiring harness connector. If cooling fan comes on at half speed, go to next step. If cooling fan does not come on at half speed, go to step 11 .
  10. Replace fan control relay (K26). After replacing relay, reconnect wiring and components. Verify engine cooling fan operates properly.
  11. Disconnect engine cooling fan resistor. Measure voltage between ground and Red/Blue wire terminal of cooling fan resistor wiring harness connector. If battery voltage is present, go to step 13 . If battery voltage is not present, go to next step.
  12. Repair open circuit, high resistance, or short to ground in Red/Blue wire to cooling fan resistor. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
  13. Disconnect engine cooling fan. Measure resistance between ground and Red/White wire terminal of cooling fan resistor wiring harness connector. If resistance is less than 2 ohms, go to step 15 . If resistance is not as specified, go to next step.
  14. Repair open circuit or high resistance in Red/White wire to cooling fan resistor. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
  15. Measure resistance between ground and Black (ground) wire of cooling fan wiring harness connector. If resistance is less than 2 ohms, go to step 17 . If resistance is not as specified, go to next step.
  16. Repair open circuit or high resistance in Black (ground) wire of cooling fan wiring harness. After repairing wire, reconnect wiring and components. Verify engine cooling fan operates properly.
  17. Check cooling fan resistor. Replace resistor if necessary. If resistor is okay, replace engine cooling fan. After repairs, reconnect wiring and components. Verify engine cooling fan operates properly.

### ENGINE IDLE SPEED DOES NOT INCREASE WHEN A/C COMPRESSOR ENERGIZES

1. Disconnect A/C control switch. Connect a test light between ground and Brown wire terminal of A/C control switch wiring harness connector. Turn ignition on. Press A/C button on A/C-heater control panel. If test light comes on, go to step 3 . If test light does not come on, go to next step.
2. Repair open circuit or high resistance in Brown wire between A/C control switch and A/C compressor relay (K60). After repairing wire, go to next step.

3. Connect a test light between A/C control switch wiring harness connector terminals. Turn ignition on. Press A/C button on A/C-heater control panel. If test light comes on, go to step 5 . If test light does not come on, go to next step.
4. Replace A/C control switch. After replacing A/C control switch, go to next step.
5. Disconnect Engine Control Module (ECM). Reconnect A/C control switch. Connect a test light between ground and terminal No. 12 (Black/Blue wire) of ECM wiring harness connector. Turn ignition on. Press A/C button on A/C-heater control panel. If test light does not come on, go to next step. If test light comes on, reconnect wiring and components. Verify idle speed increase and A/C compressor operate properly.
6. Repair open circuit or high resistance in Black/Blue wire between A/C control switch and ECM. After repairing wire, reconnect wiring and components. Verify idle speed increase and A/C compressor operate properly.

**HEADLIGHT AUTOMATIC CONTROL AMBIENT LIGHT SENSOR IS INOPERATIVE**

1. Disconnect headlight automatic control ambient light sensor. Turn ignition on. Using a DVOM, measure voltage between ground and terminal No. 1 (Brown wire) of sensor. If 5 volts are present, go to step 3 . If 5 volts are not present, go to next step.
2. Repair open circuit or high resistance in Brown wire. After repairing wire, go to next step.
3. Measure resistance of Black wire, Black/White wire, and Blue wire to sensor. If resistance for each wire is 5 ohms or less, go to step 5 . If resistance is not as specified, go to next step.
4. Repair open circuit or high resistance in Black wire, Black/White wire, or Blue wire. After repairing wire(s), go to next step.
5. Turn ignition off. Disconnect A/C-heater control panel. Connect a fused jumper between terminal No. 7 (Brown wire) of A/C-heater control panel and terminal No. 1 of headlight automatic control ambient light sensor. Connect another jumper wire between ground and terminal No. 4 (Blue wire) of headlight automatic control ambient light sensor. Turn ignition on. Using a DVOM, measure voltage between ground and terminal No. 2 (Black wire) of headlight automatic control ambient light sensor. Alternately shade and shine a bright light on sensor. If voltage increases when light is blocked (decreases when light is shined), go to step 7 . If voltage does not vary as specified, go to next step.
6. Replace headlight automatic control ambient light sensor. After replacing sensor, reconnect wiring and components. Verify headlight automatic control ambient light sensor circuit operates properly.
7. Repair or replace A/C-heater control panel. After repairing/replacing A/C-heater control panel, reconnect wiring and components. Verify headlight automatic control ambient light sensor circuit operates properly.

**OUTSIDE (AMBIENT) AIR TEMPERATURE SENSOR IS INOPERATIVE**

1. Disconnect outside (ambient) air temperature sensor. Turn ignition on. Using a DVOM, measure voltage between ground and Blue/White wire at outside air temperature sensor. If 5 volts are present, go to step 3 . If 5 volts are not present, go to next step.
2. Repair open circuit, high resistance, or short circuit to ground in Blue/White wire to sensor. After repairing wire, go to next step.
3. Connect a test light between outside air temperature sensor terminals. If test light comes on, go to step 5 . If test light does not come on, go to next step.
4. Repair open circuit, high resistance, or short circuit to ground in Blue wire to sensor. After repairing wire, reconnect wiring and components. Verify outside temperature sensor circuit operates properly.
5. Replace outside air temperature sensor. After replacing sensor, reconnect wiring and components. Verify outside temperature sensor circuit operates properly.

**TIMING CONTROL PUMP DOES NOT OPERATE**

1. Disconnect auxiliary water pump relay (K22). Turn ignition on. Using a DVOM, measure voltage between

- ground and terminal No. 4 (Brown wire) of auxiliary water pump relay. If battery voltage is present, go to step 3 . If battery voltage is not present, go to next step.
2. Repair open circuit or high resistance in Brown wire to auxiliary water pump relay. After repairing wire, reconnect wiring and components. Verify timing control pump operates properly.
  3. Measure resistance between ground and terminal No. 6 (Black wire) of auxiliary water pump relay harness connector. If resistance is less than 2 ohms, go to step 5 . If resistance is not as specified, go to next step.
  4. Repair open circuit or high resistance in Black (ground) wire to auxiliary water pump relay. After repairing wire, reconnect wiring and components. Verify timing control pump operates properly.
  5. Locate test connector within the Engine Control Module (ECM) housing. Using a fused jumper wire, connect terminal No. 1 (Brown/Blue wire) of test connector to a known good ground. If engine cooling fan comes on at half speed, go to step 7 . If engine cooling fan does not come on at half speed, go to next step.
  6. Perform **ENGINE COOLING FAN DOES NOT OPERATE AT HALF SPEED** test.
  7. Measure voltage between ground and terminal No. 2 (Red/Blue wire) of auxiliary water pump relay (K22) wiring harness connector. If battery voltage is present, go to step 9 . If battery voltage is not present, go to next step.
  8. Repair open circuit or high resistance in Red/Blue wire to auxiliary water pump relay. After repairing wire, reconnect wiring and components. Verify timing control pump operates properly.
  9. Remove fused jumper wire (at test connector). Install auxiliary water pump relay. Disconnect timing control pump. Connect fused jumper wire again. Measure voltage between ground and Brown/Green wire at timing control pump wiring harness connector. If battery voltage is present, go to step 11 . If battery voltage is not present, go to next step.
  10. Check for open circuit or high resistance in Brown/Green wire between auxiliary water pump relay and timing control pump. If wire is okay, replace auxiliary water pump relay. After repairs, reconnect wiring and components. Verify timing control pump operates properly.
  11. Measure resistance between ground and Black (ground) wire terminal of timing control pump wiring harness connector. If resistance is less than 2 ohms, go to step 13 . If resistance is not as specified, go to next step.
  12. Repair open circuit or high resistance in Black wire to timing control pump. After repairing wire, reconnect wiring and components. Verify timing control pump operates properly.
  13. Replace timing control pump. After replacing pump, reconnect wiring and components. Verify timing control pump operates properly.

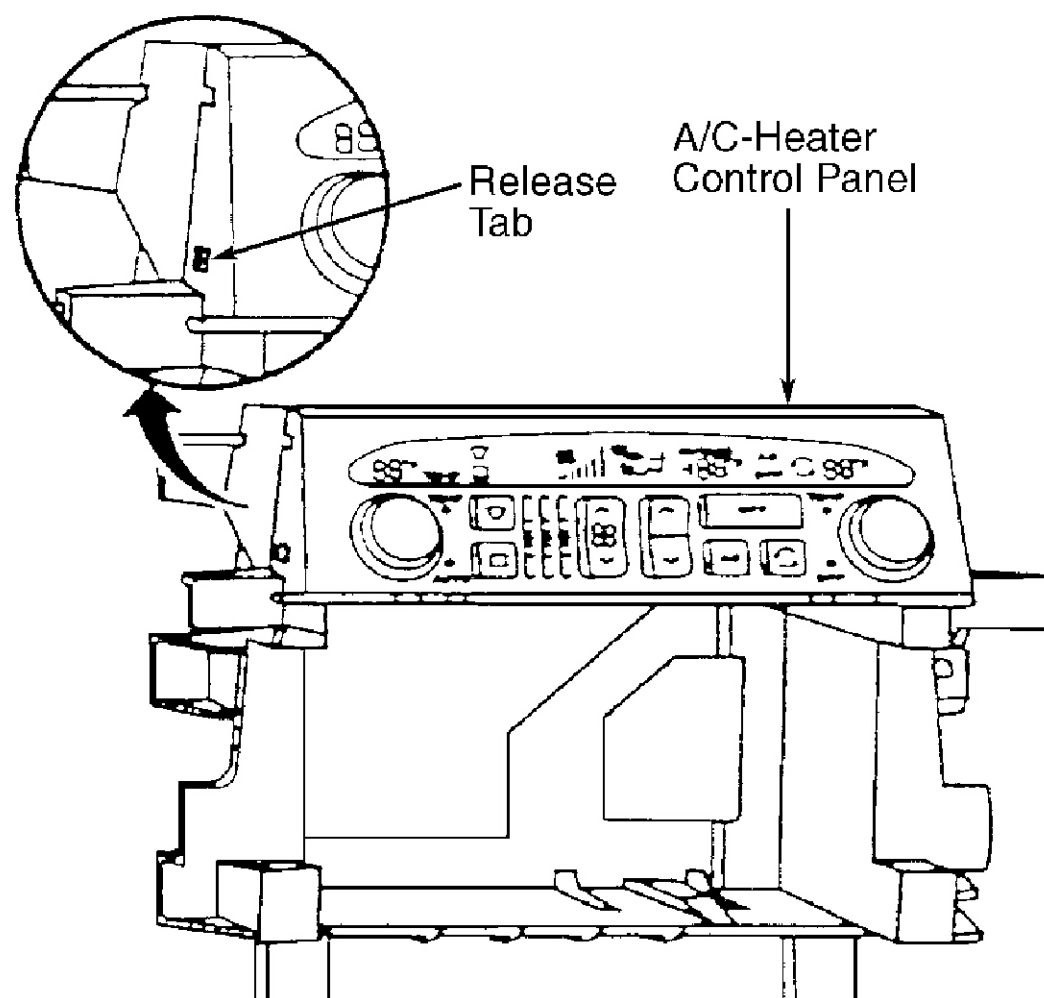
## REMOVAL & INSTALLATION

**WARNING:** To avoid injury from accidental air bag deployment, read and follow all **SERVICE PRECAUTIONS** and **DISABLING & ACTIVATING AIR BAG SYSTEM** procedures in **AIR BAG RESTRAINT SYSTEM** article in the **ACCESSORIES/SAFETY EQUIPMENT** section.

### A/C-HEATER CONTROL PANEL

#### Removal & Installation

1. Set parking brake. Place shift lever in 1st gear (rearmost position). Remove instrument panel center bezel. Remove radio mounting screws. Remove radio from A/C-heater control panel mounting bracket. Disconnect antenna and wiring harness from radio.
2. Remove 6 A/C-heater control panel screws. Disconnect wiring harness to A/C-heater control panel and remove A/C-heater control panel from vehicle.
3. If necessary, press release tabs on side of A/C-heater control panel to gain access to bulbs and printed circuit. See **Fig. 1** . To install, reverse removal procedure.



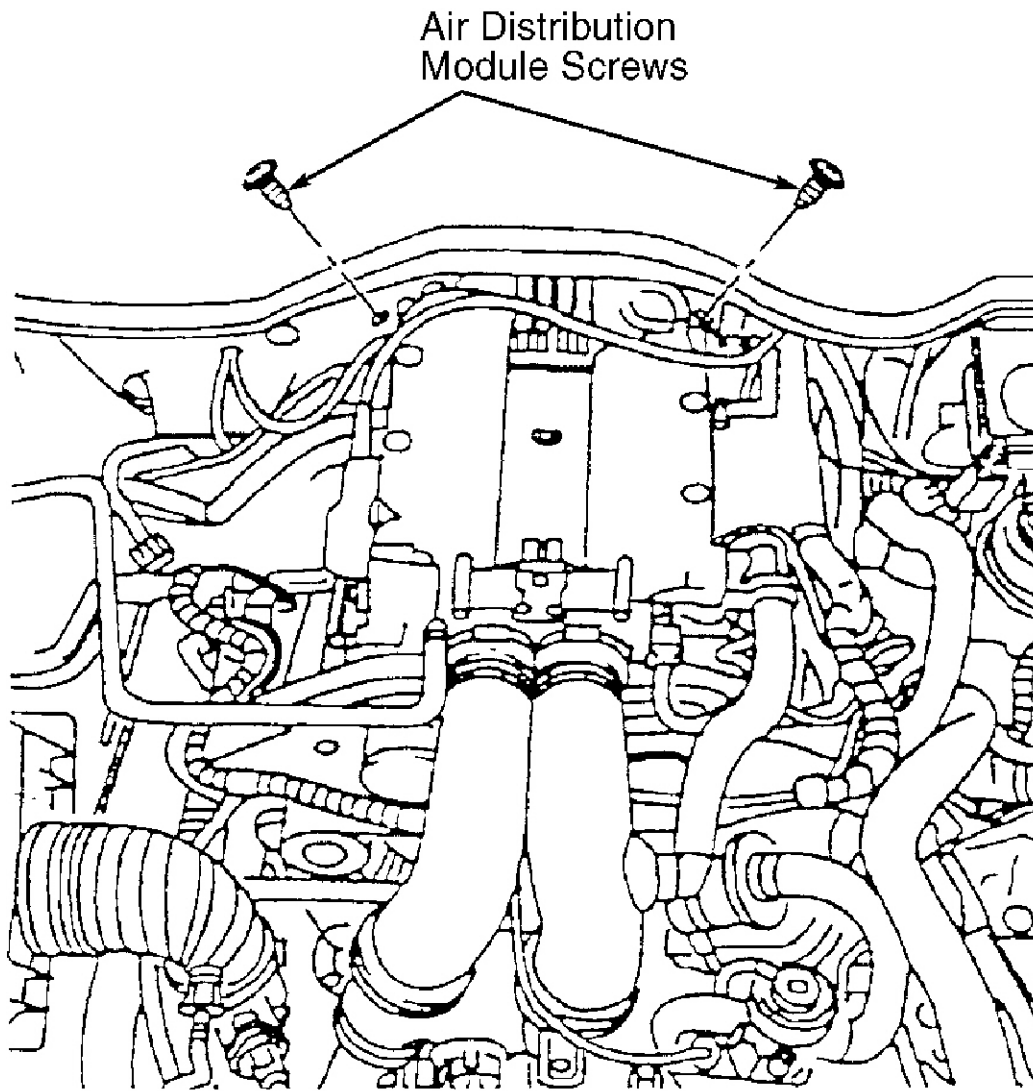
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**Fig. 1: Removing A/C-Heater Control Panel**  
 Courtesy of GENERAL MOTORS CORP.

## AIR DISTRIBUTION MODULE

### Removal & Installation

1. Disconnect negative battery cable. Drain cooling system. Discharge A/C system, using approved refrigerant recovery/recycling equipment.
2. Disconnect heater hose at quick-connect fittings. Use caution as tabs on quick-connect fittings break easily. Remove evaporator line extension bolt from cowl. Remove steering column and instrument panel carrier. See **INSTRUMENT PANEL**.
3. Disconnect vacuum hose connection at cowl. Disconnect wiring harness from electrically operated actuators. Remove heater core pipe bracket screws and bracket. Remove heater core pipe bracket screws and pipes. Remove instrument panel support brace.
4. Disconnect wiring harness and vacuum hoses from vacuum actuators. Remove 2 screws, at cowl, from engine compartment side of air distribution module. See **Fig. 2**. From inside passenger compartment, remove air distribution module nut.
5. Remove right/left side floor supply duct screws and ducts from air distribution module. Set wiring harness aside to allow for air distribution module removal.
6. Carefully pry upper vents from under rubber seal, and angle air distribution module out. Remove air distribution module from vehicle. To install, reverse removal procedure. Ensure wiring harness and vacuum hoses are not pinched during installation.



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**Fig. 2: Removing Air Distribution Module**  
 Courtesy of GENERAL MOTORS CORP.

**AMBIENT AIR TEMPERATURE SENSOR**

**Removal & Installation**

Raise and support vehicle. Locate ambient air temperature sensor on left side of front fascia. Remove sensor and disconnect wiring harness. To install, reverse removal procedure.

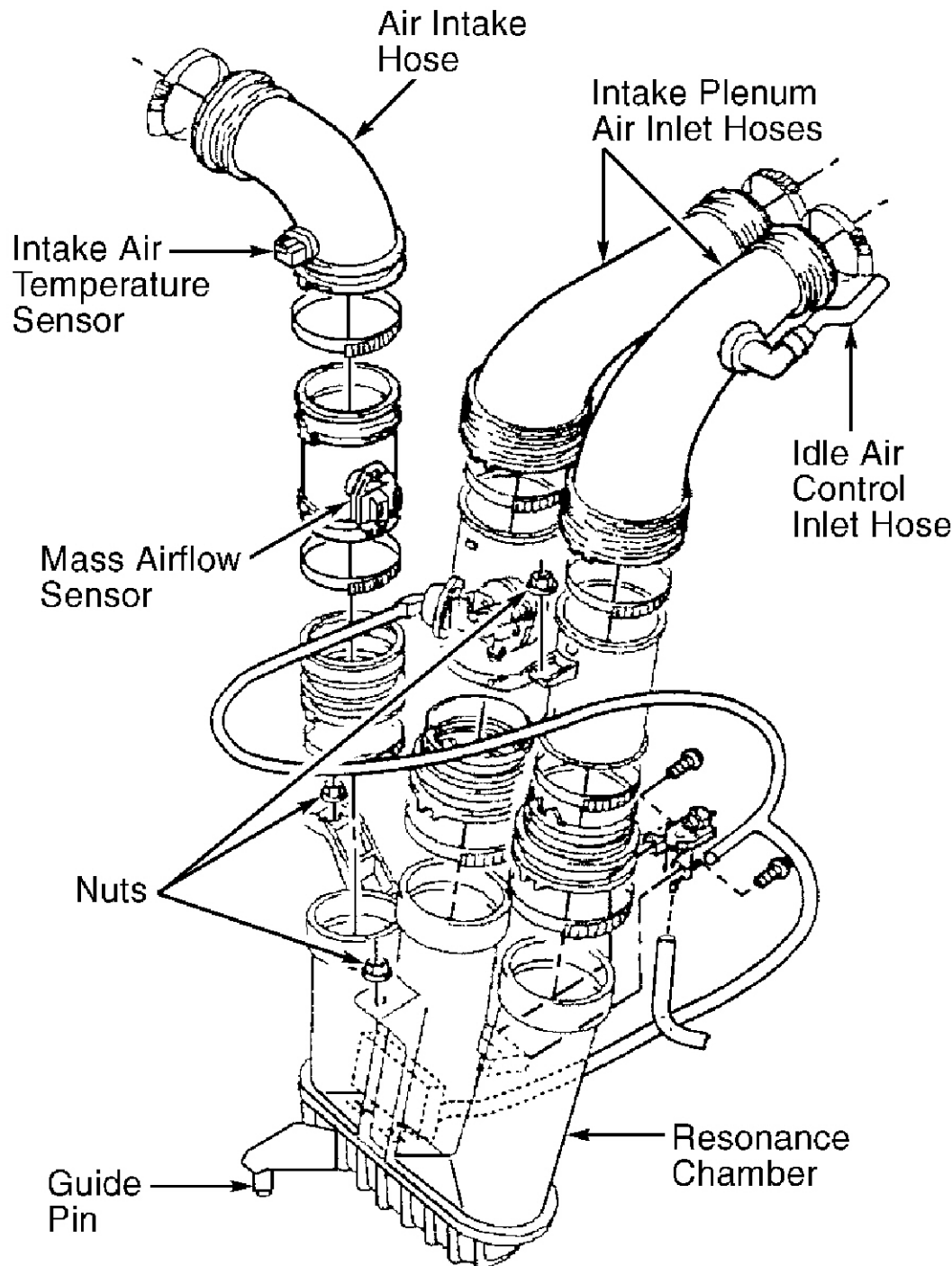
**A/C COMPRESSOR**

**Removal & Installation**

1. Disconnect negative battery cable. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Detach refrigerant hoses from top of compressor using an extension and swivel socket.
2. Disconnect mass airflow sensor and air intake temperature sensor. Disconnect air hoses from resonance chamber. See **Fig. 3** . Remove switchover valve and disconnect vacuum hoses. Remove resonance chamber.
3. Raise and support vehicle. Remove engine splash shield. Remove "O" rings from A/C compressor hoses. Remove bolt from compressor hose clamp to air pipe bracket.
4. Remove A/C compressor hose-to-oil panel bolt. Remove air injection cross over pipe bracket nut from generator bolt. Remove air injection bushing nut from bracket (located on left side of engine). Remove air injection crossover pipe from rubber hose connections. Remove serpentine belt. See **Fig. 4** .

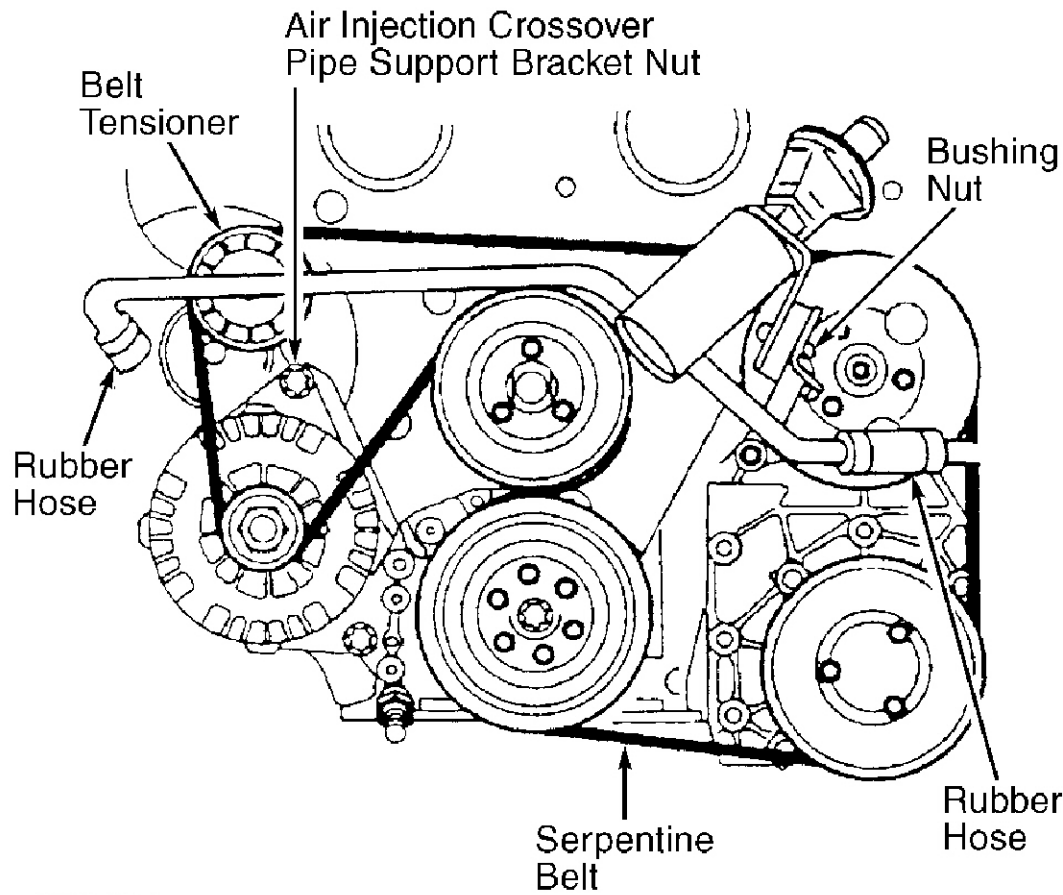


5. Remove A/C compressor mounting bolts (3 at front and 2 at rear). Disconnect A/C compressor from wiring harness. Lower vehicle. Remove A/C compressor through top of engine compartment.
6. To install, reverse removal procedure. Use a 15-mm wrench to rotate tensioner clockwise, install belt on water pump pulley last. Evacuate and charge A/C system.



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**Fig. 3: Removing Resonance Chamber**  
Courtesy of GENERAL MOTORS CORP.



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**Fig. 4: Serpentine Belt Routing**  
 Courtesy of GENERAL MOTORS CORP.

**A/C-HEATER VACUUM SOLENOIDS**

**Removal & Installation**

Detach sound insulator locking tabs and remove sound insulator from driver's side. Detach clip for driver's side front floor air outlet. Remove front floor air outlet. Disconnect wiring harness and vacuum hoses from solenoids. Remove screws and vacuum solenoids. To install, reverse removal procedure.

**BLOWER MOTOR**

**Removal & Installation**

1. Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from passenger's side. Detach clip for passenger's side front floor air outlet. Remove front floor air outlet.
2. Remove instrument panel compartment (glove box). Bend down accordion section of side air vent supply duct and remove. Remove blower motor housing. Remove blower motor from housing. To install, reverse removal procedure.

**CONDENSER**

**Removal & Installation**

1. Disconnect negative battery cable. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Remove resonance chamber.
2. Remove radiator. Remove bolt from condenser line connection (at condenser). Detach refrigerant line from condenser. Remove condenser from vehicle.

- To install, reverse removal procedure. Transfer receiver-drier and brackets to replacement condenser. Use NEW "O" rings lubricated with mineral oil. Evacuate and charge A/C system.

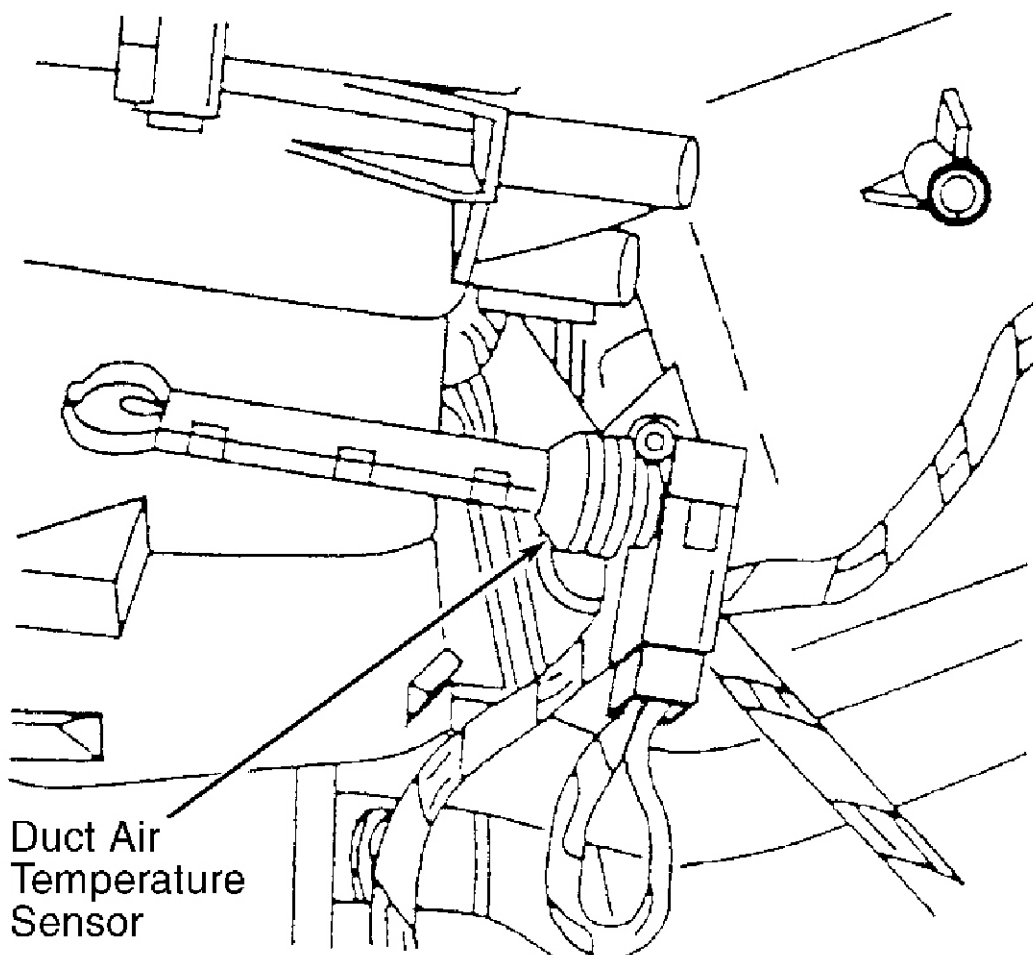
### DUCT TEMPERATURE SENSORS

#### Removal & Installation (Driver's Side)

- Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from driver's side.
- Detach clip for driver's side front floor air outlet. Remove front floor air outlet. Remove duct temperature sensor from air distribution module by rotating sensor 180 degrees. Disconnect wiring harness from sensor. To install, reverse removal procedure.

#### Removal & Installation (Passenger's Side)

- Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from passenger's side.
- Detach clip for passenger's side front floor air outlet. Remove front floor air outlet. Remove mode valve (floor) actuator. See **DEFROSTER VALVE ACTUATOR & MODE VALVE (FLOOR) ACTUATOR**.
- Remove duct temperature sensor from air distribution module by rotating sensor 180 degrees. See **Fig. 5**. Disconnect wiring harness from sensor.
- To install, reverse removal procedure. Turn ignition on. Simultaneously press and hold AUTO and OFF buttons on the A/C-heater control panel for at least 5 seconds to synchronize actuators.



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**Fig. 5: Removing Duct Air Temperature Sensor**

**Courtesy of GENERAL MOTORS CORP.****EVAPORATOR****Removal & Installation**

1. Disconnect negative battery cable. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Remove evaporator line extension bolt.
2. Detach sound insulator locking tabs and remove sound insulator. Detach driver's side front floor air outlet clip. Remove air outlet. Disconnect wiring harness from vacuum solenoid/cut-off valve actuator. Remove screws and position vacuum solenoid/cut-off valve actuator out of way.
3. Remove evaporator access panel screws and panel. Remove evaporator line screw. Remove thermostatic expansion valve screws and valve. Remove steering column and brake pedal bracket with brake pedal attached.
4. Plug evaporator openings to prevent oil from dripping on interior. Carefully pull evaporator out. To install, reverse removal procedure. Use NEW "O" rings lubricated with mineral oil. Evacuate and charge A/C system.

**HEATER CORE****Removal & Installation**

1. Disconnect negative battery cable. Drain cooling system. Disconnect heater hose at quick-connect fittings. Use caution as tabs on quick-connect fittings break easily.
2. Remove steering column and instrument panel carrier. See **INSTRUMENT PANEL** . Remove blower motor housing and blower motor. Remove heater core pipe bracket screws and bracket.
3. Remove heater core pipe bracket screws and pipes. Remove instrument panel support brace and bracket. Remove heater core retaining screw. Remove heater core and rubber seal. To install, reverse removal procedure.

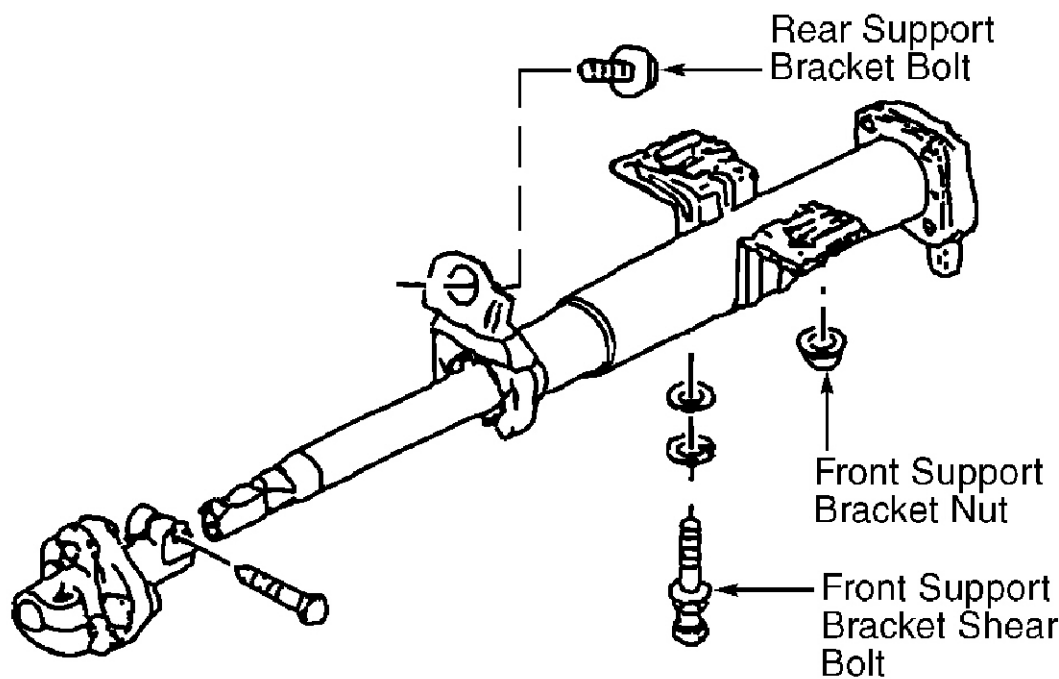
**HEATER CONTROL VALVE****Removal & Installation**

1. Drain cooling system. Remove access panel nut, near pollen filter, and remove access panel.
2. Disconnect vacuum hose from heater control valve. Clamp shut heater hoses and detach hoses from heater control valve. Remove heater control valve. To install, reverse removal procedure.

**INSTRUMENT PANEL****Removal & Installation**

1. Disable air bag system. See the AIR BAG RESTRAINT SYSTEM article in the ACCESSORIES/SAFETY EQUIPMENT section. Ensure front wheels are in straight-ahead position.
2. Remove Torx screws from back of steering wheel. Remove air bag module and disconnect wiring harness. Reposition locking tab on steering wheel nut. Remove steering wheel nut and locking tab. Using puller, remove steering wheel.
3. Remove upper and lower steering column covers. Remove driver's side knee bolster and sound insulator. Remove bolt from steering column shaft coupler. Using a chisel, rotate front support bracket shear bolt. See **Fig. 6** .
4. Remove front support bracket nut and rear support bracket nut. Disconnect wiring harness as necessary. Remove steering column, being careful not to damage adjacent wiring harness.
5. Remove assist handles above front doors. Remove windshield garnish moldings. Remove access panel from ends of instrument panel. Remove outer air deflector screws. Remove outer air deflectors.

6. Remove instrument panel compartment (glove box). Remove right side air ducts. Remove passenger's side air bag module trim cover. Disconnect air bag module 2-pin wiring harness connector. Remove passenger's side air bag module.
7. Remove center console and center console air duct. Remove radio and A/C-heater control panel. See **A/C-HEATER CONTROL PANEL** . Turn center air deflector completely downward. Carefully pry out center air deflector from its side.
8. Remove headlight switch by carefully prying switch from left its side. Remove driver's side vent bracket. Remove screw from right side of instrument cluster. Remove screw from upper column cover collar (screw also retains bottom of instrument panel).
9. Pull out right side of instrument cluster and disconnect wiring harness. Slide cluster to right, just enough to left side of cluster to clear left vent housing. Carefully remove instrument cluster.
10. Remove fuse/relay panel. Carefully pry out headlight automatic control ambient light sensor. Remove instrument panel bolts. Disconnect wiring harness(es) as necessary. With the aid of an assistant, remove instrument panel.
11. To install, reverse removal procedure. Ensure wiring harnesses are not pinched during installation.



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**Fig. 6: Removing Steering Column**  
 Courtesy of GENERAL MOTORS CORP.

#### INSTRUMENT PANEL AIR VALVE ACTUATOR

##### Removal & Installation

1. Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from passenger's side. Detach clip for passenger's side front floor air outlet. Remove front floor air outlet. Remove instrument panel compartment (glove box).
2. Bend down accordion section of side air vent supply duct and remove. Disconnect wiring harness from actuator. Remove 3 screw and detach actuator from linkage. It may be necessary to rotate actuator linkage to access screws. Remove actuator from vehicle.
3. To install, reverse removal procedure. Turn ignition on. Simultaneously press and hold AUTO and OFF buttons on the A/C-heater control panel for at least 5 seconds to synchronize actuators.

**DEFROSTER VALVE ACTUATOR & MODE VALVE (FLOOR) ACTUATOR****Removal & Installation**

1. Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from passenger's side. Detach clip for passenger's side front floor air outlet. Remove front floor air outlet. Remove instrument panel compartment (glove box).
2. Disconnect wiring harness from actuator. Remove screw and detach actuator from linkage. It may be necessary to rotate actuator linkage to access screws. Remove actuator from vehicle.
3. To install, reverse removal procedure. Turn ignition on. Simultaneously press and hold AUTO and OFF buttons on the A/C-heater control panel for at least 5 seconds to synchronize actuators.

**POLLEN FILTER****Removal & Installation**

Open hood. Pull back sealing strip on passenger's side of air inlet grille. Open air inlet grille flap. Release clips and pull pollen filter straight up. To install, reverse removal procedure.

**RECEIVER-DRIER****Removal & Installation**

1. Disconnect negative battery cable. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Remove front grille.
2. Pull windshield washer reservoir fill tube straight up to remove. Remove receiver-drier connection bolt through front grille opening. Remove receiver-drier bracket bolts and receiver-drier.
3. To install, reverse removal procedure. Use NEW "O" rings lubricated with mineral oil. Evacuate and charge A/C system.

**SUNLOAD SENSOR****Removal & Installation**

Located sunload sensor on top of instrument panel. Carefully pry sunload sensor out of instrument panel. Disconnect wiring harness from sensor. To install, reverse removal procedure.

**TEMPERATURE VALVE ACTUATORS****Removal & Installation (Driver's Side)**

1. Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from driver's side.
2. Detach clip for driver's side front floor air outlet. Remove front floor air outlet. Remove actuator cover. Disconnect wiring harness from actuator. Remove screw and detach actuator from linkage. Remove actuator from vehicle.
3. To install, reverse removal procedure. Turn ignition on. Simultaneously press and hold AUTO and OFF buttons on the A/C-heater control panel for at least 5 seconds to synchronize actuators.

**Removal & Installation (Passenger's Side)**

1. Disconnect negative battery cable. Detach sound insulator locking tabs and remove sound insulator from passenger's side.
2. Detach clip for passenger's side front floor air outlet. Remove front floor air outlet. Disconnect wiring harness from actuator. Remove screw and detach actuator from linkage. Remove actuator from vehicle.

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- To install, reverse removal procedure. Turn ignition on. Simultaneously press and hold AUTO and OFF buttons on the A/C-heater control panel for at least 5 seconds to synchronize actuators.

### THERMOSTATIC EXPANSION VALVE

#### Removal & Installation

- Disconnect negative battery cable. Discharge A/C system, using approved refrigerant recovery/recycling equipment. Remove evaporator line extension bolt from cowl.
- Detach sound insulator locking tabs and remove sound insulator. Detach driver's side front floor air outlet clip. Remove air outlet. Disconnect wiring harness from vacuum solenoid/cut-off valve actuator. Remove screws and position vacuum solenoid/cut-off valve actuator out of way.
- Remove evaporator access panel screws and panel. Remove evaporator line screw. Remove thermostatic expansion valve screws and valve. To install, reverse removal procedure. Use NEW "O" rings lubricated with mineral oil. Evacuate and charge A/C system.

### VACUUM TANK

#### Removal & Installation

Open hood. Remove air inlet grille. Remove vacuum tank nuts. Disconnect vacuum hoses from tank. Remove vacuum tank from vehicle. To install, reverse removal procedure.

### TORQUE SPECIFICATIONS

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Application	Ft. Lbs. (N.m)
A/C Compressor Mounting Bolts	30 (41)
A/C Compressor Hose Bolt	24 (33)
Air Injection Crossover Support Bracket Nut (Generator Bolt)	30 (41)
Condenser Line Bolt	20 (27)
Evaporator Line Extension Bolt	15 (20)
Receiver-Drier Connection Bolt	11 (15)
Instrument Panel Support Brace Bolts	16 (22)
Steering Column Support Bracket Bolts/Nut	(1) 16 (22)
	INCH lbs. (N.m)
Driver's Side Air Bag Module Bolts	25 (2.8)
A/C Compressor Hose-To-Oil Pan Bolt	71 (8)
Air Distribution Module Nut/Screws	35 (4)
Passenger's Side Air Bag Module Bolts	89 (10.1)
Resonance Chamber Nuts	27 (3)
Receiver-Drier Bracket Bolts	35 (4)
Thermostatic Expansion Valve Screws	71 (8)
(1) Tighten support bracket shear bolt until head breaks off.	

### WIRING DIAGRAMS

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**Fig. 7: Automatic A/C-Heater System Wiring Diagram (1 Of 2)**



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**Fig. 8: Automatic A/C-Heater System Wiring Diagram (2 Of 2)**

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