2004 ENGINE COOLING

Electric Cooling Fans - Ascender

DESCRIPTION & OPERATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See appropriate COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

COOLING FAN CONTROL

The purpose of the Electro-Viscous (EV) fan clutch is to maintain powertrain cooling requirements. The Powertrain Control Module (PCM) monitors the following sensors to regulate the fan speed:

- Engine coolant temperature sensor
- A/C refrigerant pressure sensor
- Vehicle speed sensor
- Intake air temperature sensor
- Transmission fluid temperature sensor
- Ambient air temperature sensor

The PCM controls the electro-viscous fan clutch engagement. The PCM regulates a 12-volt Pulse Width Modulated (PWM) signal to the cooling fan relay. The PWM signal determines the ON time of the relay. As the commanded state of the fan clutch increases, so does the ON time of the relay. This ON time directly effects the amount of time the solenoid, which is internal to the fan clutch, is energized. When the solenoid in the fan clutch is energized, it opens the spring loaded valve and allows fluid to flow from the storage chamber to the fluid coupling of the cooling fan clutch, increasing the fan speed. When the solenoid is de-energized, the spring loaded valve closes, and blocks the path of the fluid to the fluid coupling of the fan clutch, reducing fan speed.

The fan has the ability to create a feedback signal, so the PCM has an actual fan speed input. This is done with a hall effect sensor internal to the fan clutch. The PCM supplies a 5-volt reference and a low reference to the hall effect sensor. The hall effect sensor returns a signal pulse through the cooling fan speed signal circuit in response to the reluctor track passing by the magnetic field of the hall effect sensor.

The PCM commands the cooling fan to 100 percent under the following conditions:

- Engine coolant temperature exceeds approximately 264°F (129°C).
- The transmission oil temperature exceeds approximately 304°F (151°C).
- A/C refrigerant pressure exceeds 240 psi (1655 kPa).
- When certain DTC's set. These include P0116, P0117, P0118, P0125, P1481, P1482, and P1484.

The scan tool can engage the cooling fan clutch. This is done with the engine controls special function menu screen. To engage the cooling fan, It can take up to 2 minutes for a 100 percent command with the engine at 2000 RPM. The lower the engine speed, the longer it will take the fan to engage. To disengage the cooling fan, it can take up to 2 minutes with the engine at 2000 RPM. The lower the engine speed, the longer it will take to disengage. In lower ambient air temperatures the cooling fan will engage in less time, however, it will take longer to disengage due to the properties of the fluid vs. temperature.

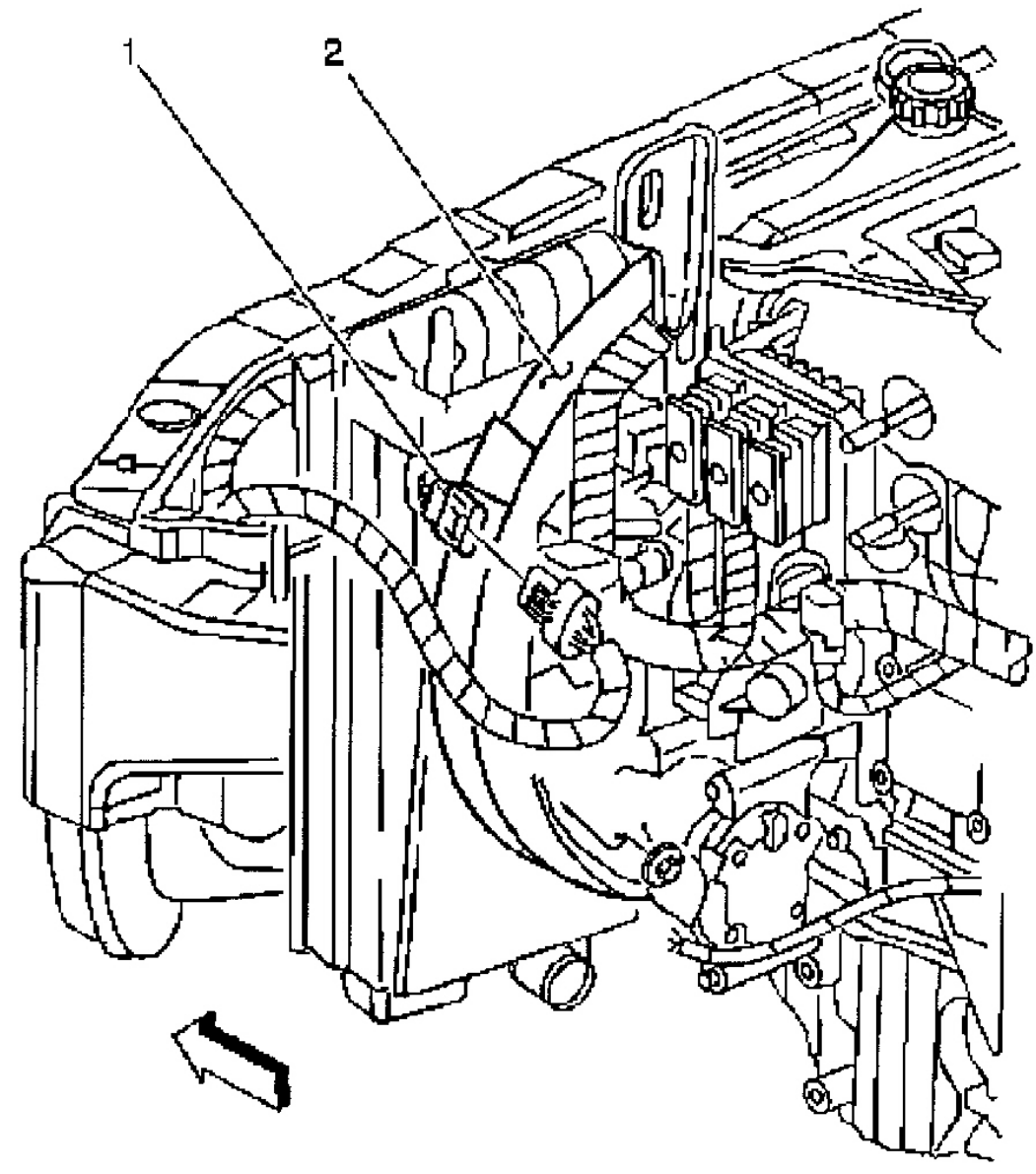
Under certain conditions the cooling fan may be engaged at engine restart. They are as follows:

- The cooling fan was engaged at the time the engine was turned off
- The fluid may bleed from the storage chamber into the fluid coupling of the cooling fan

Although the fan is commanded off at this time due to a cold start condition. This is the most likely time a vehicle driver will notice that the fan noise is excessive compared to normal engine starts with out cooling fan engaged. As the engine speed is increased the fan noise will be louder than before. These are normal conditions that can be very intermittent.

COMPONENT LOCATIONS

For engine cooling fan location, see **Fig. 1** .



1- Engine Fan Tether
2- Engine Fan

G00351557

Fig. 1: Identifying Engine Cooling Fan Location
Courtesy of ISUZU MOTOR CO.

TROUBLE SHOOTING

INTERMITTENT OR POOR CONNECTIONS

NOTE: Tools Required: GM-Approved Terminal Test Kit (J 35616-C) Terminal Repair Kit (J 38125-D) Flat-Wire Probe Adapter (J 42675).

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Wiring broken inside the insulation.
- Poor connection between the male and female terminal at a connector.
- Poor terminal to wire connection. Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself and corrosion in the wire to terminal contact area, etc.
- Wire insulation which is rubbed through. This causes an intermittent short as the bare area touches other wiring or parts of the vehicle.

SELF-DIAGNOSTIC SYSTEM

DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING

1. Did you review DIAGNOSTIC STARTING POINT-ENGINE COOLING? If yes, go to next step. If no, go to **DIAGNOSTIC STARTING POINT - ENGINE COOLING** under TROUBLE SHOOTING.
2. Install a scan tool. Does the scan tool power up? If yes, go to next step. If no, see SCAN TOOL DOES NOT POWER UP under SYSTEM TESTS in appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT.
3. Turn ON the ignition, with the engine OFF. Attempt to establish communication with the Powertrain Control Module (PCM). Does the scan tool communicate with the PCM. If yes, go to next step. If no, see SCAN TOOL DOES NOT COMMUNICATE WITH CLASS 2 DEVICE under SYSTEM TESTS in appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT.
4. Select the PCM display DTCs function on the scan tool. Does the scan tool display ant DTCs? If yes, go to next step. If no, go to **SYMPTOMS - ENGINE COOLING** under TROUBLE SHOOTING.
5. Does the scan tool display any DTCs which begin with a "U". If yes, see SCAN TOOL DOES NOT COMMUNICATE WITH CLASS 2 DEVICE under SYSTEM TESTS in appropriate BODY CONTROL MODULES article in ACCESSORIES & EQUIPMENT. If no, go to next step.
6. Does the scan tool display DTC P0112 or P0113? If yes, diagnose those DTCs first. See appropriate SELF-DIAGNOSTICS article in FAULT ISOLATION in ENGINE PERFORMANCE. If no, go to **DIAGNOSTIC TROUBLE CODE DEFINITIONS** .

DIAGNOSTIC STARTING POINT - ENGINE COOLING

Begin the system diagnosis with **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM. The Diagnostic System Check will provide the following information: The identification of the control modules which command the system. The ability of the control modules to communicate through the serial data circuit. The identification of any stored diagnostic trouble codes (DTCs)

and their status. The use of the Diagnostic System Check will identify the correct procedure for diagnosing the system and where the procedure is located.

DIAGNOSTIC TROUBLE CODE DEFINITIONS

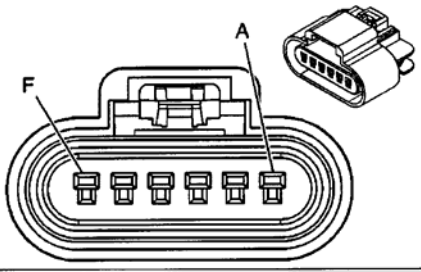
DIAGNOSTIC TROUBLE CODE DEFINITIONS

DTC (1)	Description
P0116	ETC Sensor Performance
P0117	ETC Sensor Circuit - Low Voltage
P0118	ETC Sensor Circuit - High Voltage
P0125	Excessive Time To Enter Closed Loop Fuel Control
DTC P0128	ETC Less Than Thermostat Regulating Temperature
P0480	Cooling Fan Clutch Control Circuit Malfunction
P0483	Commanded Cooling Fan Speed Different Than Actual Cooling Fan Speed
P0493	Cooling Fan Clutch Over Speed Condition
P0495	Cooling Fan RPM Too High
P0526	Cooling Fan Speed Signal Loss
P1258	Cooling Fan Over Temperature Condition
P1481	Cooling Fan Speed Signal Loss
P1482	Cooling Fan Clutch Control Circuit Improper Voltage
P1484	Cooling Fan Clutch Speed Not As Expected

(1) Perform appropriate test under **DIAGNOSTIC TESTS** . Codes listed in this table are only for testing covered in this article.

CONNECTOR IDENTIFICATION

Cooling Fan



Connector Part Information	• 15326829 • 6-Way F Metri-Pack 150 Series (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK	250	Ground
B	WHT	2368	Cooling Fan Clutch Supply Voltage
C	GRY/WHT	2365	Low Reference
D	DK BLU	2364	Cooling Fan Speed Signal
E	GRY	597	5V Reference
F	--	--	Not Used

G00305213

Fig. 2: Identifying Cooling Fan Clutch Connector
Courtesy of GENERAL MOTORS CORP.

DIAGNOSTIC TESTS

DTC P0116: ETC SENSOR PERFORMANCE

For DTC P0116, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS - 5.3L article in ENGINE PERFORMANCE.

DTC P0117: ETC SENSOR CIRCUIT - LOW VOLTAGE

4.2L

For DTC P0117, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

5.3L

For DTC P0117, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

DTC P0118: ETC SENSOR CIRCUIT - HIGH VOLTAGE

4.2L

For DTC P0118, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS

article in ENGINE PERFORMANCE.

5.3L

For DTC P0118, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

DTC P0125: EXCESSIVE TIME TO ENTER CLOSED LOOP FUEL CONTROL

4.2L

For DTC P0125, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

5.3L

For DTC P0125, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

DTC P0128: ETC LESS THAN THERMOSTAT REGULATING TEMPERATURE

4.2L

For DTC P0128, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

5.3L

For DTC P0128, see appropriate DIAGNOSTIC TROUBLE CODE DEFINITIONS in SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

DTC P0480: COOLING FAN CLUTCH CONTROL CIRCUIT MALFUNCTION

Circuit Description

The Powertrain Control Module (PCM) sends a Pulse Width Modulation (PWM) signal of 0-12 volts via the cooling fan clutch control circuit to the cooling fan relay. The PCM monitors the cooling fan clutch control circuit during vehicle operation. When the cooling fan clutch is commanded on by the PCM, the control circuit is at a low voltage. When the cooling fan clutch is commanded off, the control circuit is near battery voltage. The PCM uses this PWM to control the position of the oil control valve located inside the cooling fan clutch. If during operation, the PCM detects an improper circuit condition on the cooling fan clutch control circuit DTC P0480 will set.

Conditions for Running the DTC

The engine speed is greater than 400 RPM. The ignition voltage is greater than 10 volts and less than 18 volts.

Conditions for Setting the DTC

The PCM detects that the commanded state of the relay and the actual state of the control circuit do not match. The above condition is present for at least 5 seconds.

Action Taken When the DTC Sets

The PCM will illuminate the MIL during the second consecutive trip in which the diagnostic test has been run and failed. The PCM stores the conditions present when the DTC sets as Freeze Frame/Failure Records data. The PCM commands the cooling fan clutch to 100 percent.

Conditions for Clearing the MIL/DTC

The PCM turns OFF the MIL after the third consecutive trip the diagnostic has run and passed. The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction. The DTC can be cleared by using the scan tool Clear DTC Information function.

Diagnostic Aids

An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Disconnect the harness connector of the cooling fan from the shroud. Inspect the exposed wires between the harness connector and the tubing.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2)

Tests for the ability of the PCM to control fan speed. If answer to question is Yes, see **DIAGNOSTIC AIDS**

3)

Verifies the ignition 1 voltage circuit of the cooling fan relay.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. Install a scan tool. Start the engine. Observe the Fan Speed parameter in the PCM output controls. With a scan tool, command the fan speed to increase. Does the Fan Speed parameter increase? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
3. Turn OFF the ignition. Disconnect the coolant fan relay. Turn ON the ignition with the engine OFF. Probe the ignition 1 voltage circuit of the cooling fan relay with a test lamp connected a good ground. Does the test lamp illuminate? If yes, go to next step. If no, go to step 10 .
4. Test the cooling fan clutches control circuit of the cooling fan relay for a short voltage or an open. Did you find and correct the condition? If yes, go to step 13 . If no, go to next step.

5. Test the cooling fan clutch control circuit of the cooling fan relay for a short to ground. Did you find and correct the condition? If yes, go to step 13 . If no, go to next step.
6. Connect a test lamp to the cooling fan clutch control circuit of the cooling fan relay and ground. Connect a digital multimeter (DMM) to the test lamp probe and ground. Set the DMM to A/C range and select frequency. Start the engine. Verify that the fan control is commanded to 0 percent. Is the frequency less than the specified value (The specified value of the frequency is OL)? If yes, go to step 9 . If no, go to next step.
7. Command the fan control to 100 percent. Does the frequency fluctuate? f yes, go to next step. If no, go to step 9 .
8. Inspect for poor connections at the cooling fan relay. See **INTERMITTENT** in SYMPTOMS - ENGINE COOLING. Did you find and correct the condition? If yes, go to step 13 . If no, go to step 11 .
9. Inspect for poor connections at the harness connector of the PCM. See **INTERMITTENT** in SYMPTOMS - ENGINE COOLING. Did you find and correct the condition? If yes, go to step 13 . If no, go to step12 .
10. Repair the ignition 1 voltage circuit of the cooling fan relay. Did you complete the repair? If yes, go to step 13 .
11. Replace the cooling fan relay. Did you complete the replacement? If yes, go to step 13 .
12. Replace the PCM. See appropriate POWERTRAIN CONTROL MODULE in REMOVAL & INSTALLATION article in ENGINE PERFORMANCE.

NOTE: Perform the programming procedure for the PCM.

13. Use the scan tool in order to clear the DTCs. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** as specified in the supporting text. Does the DTC reset? If yes, go to step 2 . If no, system is OK.

DTC P0483/ P0493: COMMANDED COOLING FAN SPEED DIFFERENT THAN ACTUAL COOLING FAN SPEED/ COOLING FAN CLUTCH OVER SPEED CONDITION

Circuit Description

The following DTCs are for the cooling fan clutch. P0483 is for the difference of the commanded cooling fan speed compared to actual cooling fan speed is greater than 1,000 RPM. P0493 is for a cooling fan clutch over speed condition, approximately 6,800 RPM. The cooling fan relay sends a Pulse Width Modulation (PWM) signal of 12-14 volts to the cooling fan clutch through the cooling fan clutch supply voltage circuit. The Powertrain Control Module (PCM) uses this PWM signal in order to control the speed of the cooling fan clutch. The signal controls the position of the oil control valve inside the cooling fan clutch. If the cooling fan RPM is different than the PCM is expecting, DTC P0483 will set. The actual cooling fan RPM vs the desired cooling fan RPM is not always exactly the same. There can be up to an 800 RPM difference. If the PCM detects that the cooling fan speed is over 6,800 RPM then DTC P0493 will set.

Conditions for Running the DTC

- For DTC P0483: The engine is running. The system voltage is greater than 8.5 volts. The intake air temperature (IAT) is greater than 19°F (-7°C). DTCs P0480 and P0526 are not set. The engine speed is

less than 3,200 RPM. The engine speed is not changing more than 250 RPM for 5 seconds. Fan command is greater than zero percent.

- For DTC P0493 is that the engine is running.

Conditions for Setting the DTC

- For DTC P0483, the difference between commanded and actual cooling fan speed is greater than 1,000 RPM for 100 seconds.
- For DTC P0493, the cooling fan RPM is greater than 6,800 RPM.

Action Taken When the DTC Sets

- For DTC P0483: The PCM illuminates the MIL during the second consecutive trip in which the diagnostic test has been run and failed. The PCM will store the conditions as Freeze Frame/Failure Records data. The PCM commands the cooling fan clutch to 100 percent.
- For DTC P0493: The Reduced Engine Power indicator illuminates. The PCM will store the conditions as Freeze Frame/Failure Records data.

Conditions for Clearing the MIL/DTC

The PCM turns OFF the MIL after the third consecutive trip that the diagnostic test has run and passed.

Diagnostic Aids

An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Disconnect the harness connector of the cooling fan clutch from the shroud. Inspect the exposed wires between the harness connector and the tubing.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2)

This step ensures that the DTC has failed this ignition cycle. If the scan tool displays Passed, then the answer is No.

3)

The cooling fan noise should increase as the cooling fan clutch engages. It can take up to 2 minutes for full cooling fan clutch engagement. If cooling fan clutch is previously fully engaged, then there will not be a noticeable change in cooling fan noise. Compare noise to a known good vehicle. If fan noise is louder than the known good vehicle, then answer Yes.

4)

In the previous step the cooling fan clutch was fully engaged. This step tests to ensure that the cooling fan clutch will disengage. A noticeable noise difference should be heard between a fully engaged cooling fan clutch and a disengaged cooling fan. The cooling fan clutch is completely disengaged when the excessive fan noise is not heard.

5)

Tests the PCM's ability to control the cooling fan clutch. If answer to question is Yes, see **DIAGNOSTIC AIDS** .

6)

Inspect for a mechanical condition which causes the DTC to set.

7)

Tests for voltage on the cooling fan clutch supply voltage circuit of the cooling fan clutch. The cooling fan connector is a seal connector. You must use jumper wires for testing or damage to wiring or connector could happen.

8)

Tests the cooling fan relay for a PWM signal on the cooling fan clutch supply voltage circuit of the cooling fan.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. With a scan tool, observe the Powertrain DTC list. Start the engine. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the scan tool indicate the DTC Failed this ignition cycle? If yes, go to step 5 . If no, go to next step.
3. Turn OFF the ignition. Disconnect the coolant fan relay. Connect a 10-amp fused jumper wire between the cooling fan clutch supply voltage circuit of the cooling fan and the ignition 3 voltage circuit of the cooling fan relay. Start the engine. Raise engine speed to 2,000 RPM for 2 minutes. Does the cooling fan clutch engage? If yes, go to next step. If no, go to step 5 .

   NOTE: P0480 (on 5.3L) will set when the cooling fan relay is disconnected.

4. Turn OFF the ignition. Remove the 10-amp fused jumper wire. Install cooling fan relay. Disconnect the cooling fan clutch connector. Start the engine. Raise engine speed to 2,000 RPM for 2 minutes. Does the cooling fan clutch disengage? If yes, go to next step. If no, go to step 18 .

   NOTE: Continuously excessive fan noise is due to the PCM commanding the cooling fan clutch to 100 percent engaged or a mechanical failure. If the fan noise decreases during this step, then this DTC is due to an electrical

malfunction. Replacing the cooling fan clutch will not correct the condition.

5. Install a scan tool. Start the engine. With a scan tool, observe the Fan Speed and the Desired Fan Speed parameters in the powertrain control module Output Controls. Command the cooling fan clutch to 100 percent. Operate the engine at 2,000 RPM for 2 minutes. Is the Desired Fan Speed within 1000 RPM (4.2L) or 2000 RPM (5.3L) of the actual Fan Speed? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
6. Turn OFF the ignition. Inspect the cooling fan and the drive belt for the following conditions:
   - A cracked drive belt
   - A loose or a worn drive belt
   - A misrouted drive belt
   - Oil leaks at the cooling fan clutch
   - A free-spinning cooling fan
   - A seized cooling fan clutch
   - A broken cooling fan

   If any of the conditions exist, repair as necessary. Did you find and correct the condition? If yes, go to step 20 . If no, go to next step.
7. Disconnect the cooling fan clutch connector at the fan shroud. Connect a jumper wire between each of the cooling fan clutch circuits. Connect a digital multimeter (DMM) between the clutch supply voltage circuit of the cooling fan clutch and ground. Start the engine. Command the Fan Control to zero percent. Does the voltage measure greater 0.16 volt? If yes, go to step 10 . If no, go to next step.
8. Command the Fan Control to 100 percent. Does the voltage fluctuate? If yes, go to step 11 . If no, go to next step.
9. Turn OFF the ignition. Disconnect the cooling fan relay. Turn ON the ignition, with the engine OFF. Probe the ignition 1 voltage circuit of the cooling fan relay with a test lamp connected to a good ground. Does the test lamp illuminate? If yes, go to step 12 . If no, go to step 17 .
10. Disconnect the cooling fan relay. Does the voltage measure greater than 0.16 volt? If yes, go to step 14 . If no, go to next step.
11. Test the cooling fan ground for an open. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 16 .
12. Test the ground circuit of the cooling fan relay for an open or a high resistance. Did you find and correct the condition? If yes, go to step 20 . If no, go to next step. If no, go to next step.
13. Test the clutch supply voltage circuit of the cooling fan clutch for an open or a short to ground. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 15 .
14. Test the clutch supply voltage circuit of the cooling fan clutch for a short to voltage. Did you find and correct the condition? If yes, go to step 20 .
15. Inspect for poor connections at the cooling fan relay. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 19 .
16. Inspect for poor connections at the harness connector of the cooling fan clutch. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If

yes, go to step 20 . If no, go to step 18 .

17. Repair the ignition 1 voltage circuit of the cooling fan relay. Did you find and correct the condition? If yes, go to step 20 .
18. Replace the cooling fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 20 .
19. Replace the cooling fan relay. Did you complete the replacement? If yes, go to step 20 .
20. Follow this procedure in order to clear DTC P0483 or DTC P0493 after making a repair. Use the Clear DTC Information function of the scan tool. Perform an ignition key cycle. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the DTC reset? If yes, go to step 2 . If no, system is OK.

DTC P0495: COOLING FAN RPM TOO HIGH

Circuit Description

The cooling fan relay sends a Pulse Width Modulation (PWM) signal (12-14 volts) to the cooling fan by the cooling fan clutch supply voltage circuit. The Powertrain Control Module (PCM) uses the PWM signal, which controls the speed of the cooling fan by controlling the position of the oil control valve inside the clutch. If the cooling fan RPM is too high when the PCM is commanding zero percent, DTC P0495 will set.

Conditions for Running the DTC

- The engine is running.
- The system voltage is greater than 8.5 volts.
- The Intake Air Temperature (IAT) is greater than 19°F (-7°C).
- Zero percent duty cycle is commanded, and the engine RPM has been over 1800 RPM for at least 120 seconds.

Conditions for Setting the DTC

Cooling fan RPM exceeds 1600 RPM for 81 seconds.

Action Taken When the DTC Sets

- The PCM illuminates the MIL during the second consecutive trip in which the diagnostic test has been run and failed.
- The PCM will store the conditions as Freeze Frame/Failure Records data.

Conditions for Clearing the MIL/DTC

- The PCM turns the MIL OFF after the third consecutive trip that the diagnostic procedure has run and passed.
- Clear the DTC using the Clear DTC Information function of the scan tool.

Diagnostic Aids

- An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. See **WIRING DIAGRAMS** for connector and locations.
- If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING.
- If DTCs P0495 and P0113 are set and the weather is cold, the cooling fan code may be false. Clear DTC P0495, and after an IAT repair, check if the DTC will reset.

Test Description

The numbers below refer to the test step numbers.

2)

This step ensures that the DTC has failed this ignition cycle. If the scan tool displays Passed, then the answer is No.

3)

The cooling fan noise should increase as the cooling fan engages. It can take up to 2 minutes for full cooling fan engagement. If cooling fan is previously fully engaged, then there will not be a noticeable change in cooling fan noise. Compare noise to a known good vehicle. If fan noise is louder than the known good vehicle, then answer Yes.

4)

In the previous step the cooling fan was fully engaged. This step tests to ensure that the cooling fan will disengage. A noticeable noise difference should be heard between a fully engaged cooling fan and a disengaged cooling fan. The cooling fan is completely disengaged when the excessive fan noise is not heard.

5)

Tests the ability of the PCM to control the cooling fan speed. If answer to question is Yes, see **DIAGNOSTIC AIDS** .

6)

Disconnecting the cooling fan and running the engine ensure that the cooling fan is not engaged. When rotating the cooling fan it should spin freely. If not then the cooling fan will not disengage.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. With a scan tool, observe the Powertrain DTC list. Start the engine. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the scan tool indicate the DTC Failed this ignition

cycle? If yes, go to step 5 . If no, go to next step.

3. Turn OFF the ignition. Disconnect the coolant fan relay. Connect a 10-amp fused jumper wire between the cooling fan clutch supply voltage circuit of the cooling fan and the ignition 3 voltage circuit of the cooling fan relay. Start the engine. Raise engine speed to 2000 RPM for 2 minutes. Does the cooling fan engage? If yes, go to next step. If no, go to step 5 .

NOTE: DTC P1482 (on 4.2L) or P0480 (on 5.3L) will set when the cooling fan relay is disconnected.

4. Turn OFF the ignition. Remove the 10-amp fused jumper wire. Install cooling fan relay. Disconnect the cooling fan connector. Start the engine. Raise engine speed to 2000 RPM for 2 minutes. Does the cooling fan disengage? If yes, go to next step. If no, go to step 11 .

NOTE: Continuously excessive fan noise is due to the PCM commanding the cooling fan to 100 percent engaged or a mechanical failure. If the fan noise decreases during this step, then this DTC is due to an electrical malfunction. Replacing the cooling fan will not correct the condition.

5. Install a scan tool. Start the engine. With a scan tool, observe the Fan Speed parameter in the PCM ENG 2 data list. Operate the engine at 2000 RPM for 2 minutes. Is the cooling fan speed less than 1600 RPM? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
6. Turn OFF the ignition. Disconnect the cooling fan connector. Start the engine. Run the engine at 2000 RPM for 2 minutes. Turn OFF the engine. Rotate the cooling fan 2 revolutions. Does the cooling fan rotate freely? If yes, go to next step. If no, go to step 13 .
7. Disconnect the harness connector at the shroud. Turn ON the ignition. Connect a test lamp between the cooling fan clutch supply voltage circuit of the cooling fan and ground. Does the test lamp illuminate? If yes, go to next step. If no, go to step 11 .
8. Disconnect the cooling fan relay. Does the test lamp remain illuminated? If yes, go to next step. If no, go to step 10 .
9. Repair the cooling fan clutch supply voltage circuit of the cooling fan for a short to voltage. Did you complete the repair? If yes, go to step 14 .
10. Inspect for poor connections at the cooling fan relay. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 14 . If no, go to step 12 .
11. Inspect for poor connections at the cooling fan. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 14 . If no, go to step 13 .
12. Replace the cooling fan relay. See **COOLING FAN RELAY** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 14 .
13. Replace the cooling fan. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to next step.
14. Use the scan tool in order to clear the DTCs. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the DTC reset? If yes, go to step 2 . If no, system is OK.

DTC P0526: COOLING FAN SPEED SIGNAL LOSS

Circuit Description

The Powertrain Control Module (PCM) uses the cooling fan speed signal in order to determine the actual fan speed in relation to the desired fan speed. The PCM uses the cooling fan speed signal in order to reduce the cooling fan noise and in order to maintain the powertrain cooling requirements. The PCM supplies power and ground to the clutch hall effect sensor of the cooling fan clutch. The hall effect sensor returns a signal pulse through the speed signal circuit in response to the reluctor track, which is located inside the fan clutch. If during operation, the PCM detects a loss of the cooling fan speed signal, DTC P0526 will set.

Conditions for Running the DTC

The engine is running. System voltage is greater than 8.5 volts.

Conditions for Setting the DTC

The PCM has detected a loss of cooling fan speed signal. The condition is present for at least 11 seconds.

Action Taken When the DTC Sets

The PCM will illuminate the MIL during the second consecutive trip in which the diagnostic test has been run and failed. The PCM will store the condition as Freeze Frame/Failure Records data. The PCM commands the cooling fan to 100 percent.

Conditions for Clearing the MIL/DTC

The PCM turns OFF the MIL after the third consecutive trip that the diagnostic test has run and passed. Clear the DTC by using the Clear DTC Information function of the scan tool.

Diagnostic Aids

An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Disconnect the harness connector of the cooling fan clutch from the shroud. Inspect the exposed wires between the harness connector and the tubing. Inspect the cooling fan clutch harness in order to ensure that the clutch supply voltage circuit is not shorted to the following circuits: The 5-volt reference circuit. The cooling fan speed signal circuit. The low reference circuit. DTC P0526 will set if the engine is started without the drive belt ON.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2)

Tests that the PCM receives a cooling fan speed signal through the cooling fan speed signal circuit. If answer to question is Yes, see **DIAGNOSTIC AIDS** .

3)

Tests for the proper operation of the cooling fan clutch hall effect sensor. The voltage should fluctuate between 0 and 5 volts. If the voltage stays at zero volts, the signal circuit is shorted to ground.

4)

Tests for the proper operation of the 5-volt reference circuit and of the low reference circuit of the cooling fan clutch.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. Install a scan tool. Start the engine. With the scan tool, observe the Fan Speed parameter in the PCM ENG 2 data list. Does the scan tool indicate that the Fan Speed parameter approximately 800 RPM? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
3. Turn OFF the ignition. Disconnect the cooling fan clutch harness connector at the shroud. Connect a jumper wire between each of the following circuits:
   - The 5-volt reference circuit
   - The cooling fan speed signal circuit
   - The low reference circuit

   Measure the voltage of the cooling fan speed sensor circuit and a good ground. Turn ON the ignition, with the engine OFF. Manually rotate the cooling fan clutch. Does the voltage change from 0 to 5 volts? If yes, go to step 10 . If no, go to next step.
4. Disconnect the jumper wires. Measure the voltage between the 5-volt reference circuit and the low reference circuit of the cooling fan clutch. Is the voltage measurement approximately 5 volts? If yes, go to step 7 . If no, go to next step.
5. Turn OFF the ignition. Probe the low reference circuit of the cooling fan clutch with a test lamp connected to battery positive voltage. Does the test lamp illuminate? If yes, go to next step. If no, go to step 9 .
6. Test the 5-volt reference circuit of the cooling fan clutch for a high resistance, or for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to next step.
7. Test the cooling fan speed signal circuit of the cooling fan clutch for a short to ground, for a high resistance, or for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to next step.
8. Test the cooling fan speed signal circuit of the cooling fan clutch for a short to voltage. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 11 .
9. Disconnect the PCM. Test the low reference circuit of the cooling fan clutch for a high resistance or for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 12 .
10. Disconnect the jumper wires. Test the cooling fan speed signal circuit of the cooling fan clutch for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 12 .
11. Inspect for a poor connection at the harness connector of the cooling fan clutch. See **INTERMITTENT**

OR POOR CONNECTIONS under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 13 .

12. Inspect for poor connections at the harness connector of the PCM. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 14 .
13. Replace the cooling fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 15 .
14. Replace and program the PCM. See appropriate REMOVAL & INSTALLATION article in ENGINE PERFORMANCE. Did you complete the replacement? If yes, go to next step.
15. Use the scan tool in order to clear the DTCs. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the DTC reset? If yes, go to step 2 . If no, system is OK.

DTC P1258: COOLING FAN OVER TEMPERATURE CONDITION

Circuit Description

The PCM uses the ECT sensor to monitor the engine for an over temperature condition. This condition occurs when the coolant temperature is above 270°F (132°C). When an over temperature condition is present, DTC P1258 will set. The PCM will disable two groups of four cylinders by turning OFF the fuel injectors. By switching between the two groups of cylinders, the PCM is able to reduce the temperature of the coolant.

Conditions for Running the DTC

DTCS P0117, P0118, P1114, and P1115 are not active. The engine is running.

Conditions for Setting the DTC

The engine coolant temperature is above 270°F (132°C) for 10 seconds or more.

Action Taken When the DTC Sets

1. The PCM will illuminate the MIL during the second consecutive trip in which the diagnostic test has been run and failed.
2. The PCM will signal the IPC to turn ON the Service Engine Soon indicator.
3. The PCM will alternately disable two groups of four cylinders by turning OFF the fuel injectors.
4. The PCM will store conditions which were present when the DTC set as Freeze Frame and File Records data.

Conditions for Clearing the MIL/DTC

1. The PCM will turn the MIL OFF after 3 consecutive trips that the diagnostic has been run and passed.
2. The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.
3. The DTC can be cleared by using the scan tool Clear DTC Information function.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. Check the engine cooling fans for proper operation. Are the engine cooling fans operative? If yes, DIAGNOSE ENGINE OVERHEATING. Repair as needed.

DTC P1481: COOLING FAN SPEED SIGNAL LOSS

Circuit Description

The Powertrain Control Module (PCM) uses the cooling fan speed signal in order to determine the actual fan speed in relation to the desired fan speed. The PCM uses the cooling fan speed signal in order to reduce the cooling fan noise and in order to maintain the powertrain cooling requirements. The PCM supplies power and ground to the clutch hall effect sensor of the cooling fan clutch. The hall effect sensor returns a signal pulse through the speed signal circuit in response to the reluctor track, which is located inside the fan clutch. If during operation, the PCM detects a loss of the cooling fan speed signal, DTC P1481 will set.

Conditions for Running the DTC

The engine is running and system voltage is greater than 8.5 volts.

Conditions for Setting the DTC

The PCM has detected a loss of cooling fan speed signal. The condition is present for at least 11 seconds.

Action Taken When the DTC Sets

- The PCM will illuminate the MIL during the second consecutive trip in which the diagnostic test has been run and failed.
- The PCM will store the condition as Freeze Frame/Failure Records data.
- The PCM commands the cooling fan clutch to 100 percent.

Conditions for Clearing the MIL/DTC

- The PCM turns OFF the MIL after the third consecutive trip that the diagnostic test has run and passed.
- The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.
- Clear the DTC by using the Clear DTC Information function of the scan tool.

Diagnostic Aids

- An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors.
- If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING.
- Disconnect the harness connector of the cooling fan clutch from the shroud.
- Inspect the exposed wires between the harness connector and the tubing.

- Inspect the cooling fan clutch harness in order to ensure that the clutch supply voltage circuit is not shorted to the 5-volt reference circuit or the cooling fan speed signal circuit or the low reference circuit.
- DTC P1481 will set if the engine is started without the drive belt on.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2)

Tests that the PCM receives a cooling fan speed signal through the cooling fan speed signal circuit. If answer to question is Yes, see **DIAGNOSTIC AIDS** .

3)

Tests for the proper operation of the clutch hall effect sensor.

4)

Tests for the proper operation of the 5-volt reference circuit and of the low reference circuit of the cooling fan.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. Install a scan tool. Start the engine. With the scan tool, observe the Fan Speed parameter in the PCM ENG 3 data list. Does the scan tool indicate that the Fan Speed parameter is 550-800 RPM? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
3. Turn OFF the ignition. Disconnect the cooling fan clutch harness connector at the shroud. Connect a jumper wire between each of the following circuits:
   - The 5-volt reference circuit
   - The cooling fan speed signal circuit
   - The low reference circuit

   Connect a digital multimeter (DMM) to the cooling fan speed signal circuit and ground. Turn ON the ignition with the engine OFF. Manually rotate the cooling fan. Does the DMM voltage change from 0-5 volts? If yes, go to step 10 . If no, go to next step.

4. Disconnect the jumper wires. Measure the voltage between the 5-volt reference circuit and the low reference circuit of the cooling fan. Is the voltage measurement about 5 volts? If yes, go to next step. If no, go to step 7 .
5. Turn OFF the ignition. Probe the low reference circuit of the cooling fan clutch with a test lamp connected to battery positive voltage. Does the test lamp illuminate? If yes, go to next step. If no, go to step 9 .

6. Test the 5-volt reference circuit of the cooling fan clutch for a high resistance, or for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to next step.
7. Test the cooling fan speed signal circuit of the cooling fan clutch for a short to ground, for a high resistance, or for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to next step.
8. Test the cooling fan speed signal circuit of the cooling fan clutch for a short to voltage. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 11 .
9. Disconnect the PCM. Test the low reference circuit of the cooling fan for a high resistance or for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 12 .
10. Disconnect the jumper wires. Test the cooling fan speed signal circuit of the cooling fan clutch for an open. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 12 .
11. Inspect for a poor connection at the harness connector of the cooling fan clutch. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 13 .
12. Inspect for poor connections at the harness connector of the PCM. Did you find and correct the condition? If yes, go to step 15 . If no, go to step 14 .
13. Replace the cooling fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 15 .
14. Replace and program the PCM. See appropriate REMOVAL & INSTALLATION article in ENGINE PERFORMANCE. Did you complete the replacement? If yes, go to next step.
15. Use the scan tool in order to clear the DTCs. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the DTC reset? If yes, go to step 2 . If no, system is okay.

DTC P1482: COOLING FAN CLUTCH CONTROL CIRCUIT IMPROPER VOLTAGE

Circuit Description

The Powertrain Control Module (PCM) sends a Pulse Width Modulation (PWM) signal of 0-12 volts via the cooling fan clutch control circuit to the cooling fan relay. The PCM uses this PWM to control the position of the oil control valve located inside the cooling fan clutch. If during operation, the PCM detects an improper circuit condition on the cooling fan clutch control circuit DTC P1482 will set.

Conditions for Running the DTC

System voltage is greater than 8.5 volts.

Conditions for Setting the DTC

An improper voltage level has been detected on the cooling fan clutch control circuit. The condition is present for at least 6 seconds.

Action Taken When the DTC Sets

1. The PCM will illuminate the MIL during the second consecutive trip in which the diagnostic test has been run and failed.
2. The PCM stores the conditions present when the DTC sets as Freeze Frame/Failure Records data.

3. The PCM commands the cooling fan clutch to 100 percent.

Conditions for Clearing the MIL/DTC

The PCM turns OFF the MIL after the third consecutive trip the diagnostic has run and passed. The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction. The DTC can be cleared by using the scan tool Clear DTC Information function.

Diagnostic Aids

An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Disconnect the harness connector of the cooling fan clutch from the shroud. Inspect the exposed wires between the harness connector and the tubing.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2)

This step ensures that the DTC has failed this ignition cycle. If the scan tool displays Passed, then the answer is No.

3)

The cooling fan noise should increase as the cooling fan clutch engages. It can take up to 2 minutes for full cooling fan clutch engagement. If cooling fan clutch is previously fully engaged, then there will not be a noticeable change in cooling fan noise. Compare noise to a known good vehicle. If fan noise is louder than the known good vehicle, then answer Yes.

4)

In the previous step the cooling fan clutch was fully engaged. This step tests to ensure that the cooling fan clutch will disengage. A noticeable noise difference should be heard between a fully engaged cooling fan clutch and a disengaged cooling fan clutch. The cooling fan clutch is completely disengaged when the excessive fan noise is not heard.

5)

Tests for the ability of the PCM to control cooling fan clutch speed. If answer to question is Yes, see **DIAGNOSTIC AIDS** .

6)

Verifies the ignition 1 voltage circuit of the cooling fan relay.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. With a scan tool, observe the Powertrain DTC list. Start the engine. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the scan tool indicate the DTC Failed this ignition cycle? If yes, go to step 5 . If no, go to next step.
3. Turn OFF the ignition. Disconnect the coolant fan relay. Connect a 10-amp fused jumper wire between the cooling fan clutch supply voltage circuit of the cooling fan and the ignition 3 voltage circuit of the cooling fan relay. Start the engine. Raise engine speed to 2000 RPM for 2 minutes. Does the cooling fan engage? If yes, go to next step. If no, go to step 5 .

   NOTE: DTC P1482 (with 4.2L) will set when the cooling fan relay is disconnected.

4. Turn OFF the ignition. Remove the 10-amp fused jumper wire. Install cooling fan relay. Disconnect the cooling fan clutch connector. Start the engine. Raise engine speed to 2000 RPM for 2 minutes. Does the cooling fan clutch disengage? If yes, go to next step. If no, go to step 17 .

   NOTE: Continuously excessive fan noise is due to the PCM commanding the cooling fan to 100 percent engaged or a mechanical failure. If the fan noise decreases during this step, then this DTC is due to an electrical malfunction. Replacing the cooling fan will not correct the condition.

5. Install a scan tool. Start the engine. Observe the Fan Speed parameter in the powertrain control module Output Controls. With a scan tool, command the fan speed to increase. Does the Fan Speed increase? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
6. Turn OFF the ignition. Disconnect the cooling fan relay. Turn ON the ignition, with the engine OFF. Probe the ignition 1 voltage circuit of the cooling fan relay with a test lamp connected a good ground. Does the test lamp illuminate? If yes, go to next step. If no, go to step 11 .
7. Test the cooling fan clutch control circuit of the cooling fan relay for a short to voltage or an open. Did you find and correct the condition? If yes, go to step 19 . If no, go to next step.
8. Test the cooling fan clutch control circuit of the cooling fan relay for a short to ground. Did you find and correct the condition? If yes, go to step 19 . If no, go to next step.
9. Connect a test lamp to the cooling fan clutch control circuit of the cooling fan relay and ground. Connect a digital multimeter (DMM) to the test lamp probe and ground. Set the DMM to A/C range and select frequency. Start the engine. Verify that the Fan Control is commanded to zero percent. Is the frequency less than out of limits? If yes, go to step 14 . If no, go to next step.
10. Command the Fan Control to 100 percent. Does the frequency fluctuate? If yes, go to step 13 . If no, go to step 14 .
11. Inspect the Eng Fan fuse. Is the fuse open? If yes, go to next step. If no, go to step 15 .
12. Test the cooling fan clutch control circuit of the cooling fan relay for a short to ground. Did you find and correct the condition? If yes, go to step 19 . If no, go to step 15 .
13. Inspect for poor connections at the cooling fan relay. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to

step 19 . If no, go to step 16 .

14. Inspect for poor connections at the harness connector of the PCM. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 19 . If no, go to step 18 .
15. Repair the ignition 1 voltage circuit of the cooling fan relay. Did you complete the repair? If yes, go to step 19 .
16. Replace the cooling fan relay. See **COOLING FAN RELAY** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 19 .
17. Replace the cooling fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 19 .
18. Replace and program the PCM. See appropriate POWERTRAIN CONTROL MODULE in REMOVAL & INSTALLATION article in ENGINE PERFORMANCE. Did you complete the replacement? If yes, go to next step.
19. Use the scan tool in order to clear the DTCs. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the DTC reset? If yes, go to step 2 . If no, system is OK.

DTC P1484: COOLING FAN CLUTCH SPEED NOT AS EXPECTED

Circuit Description

The cooling fan relay sends a Pulse Width Modulation (PWM) signal of 12-14 volts to the cooling fan clutch through the cooling fan clutch supply voltage circuit. The Powertrain Control Module (PCM) uses this PWM signal in order to control the speed of the cooling fan clutch. The signal controls the position of the oil control valve inside the cooling fan clutch. If the cooling fan RPM is different than the PCM is expecting, DTC P1484 will set. The actual cooling fan RPM vs the desired cooling fan RPM is not always exactly the same. There can be up to an 800 RPM difference.

Conditions for Running the DTC

- The engine is running.
- The system voltage is greater than 8.5 volts.
- The intake air temperature (IAT) is greater than 19°F (-7°C).
- DTCs P1481 and P1482 are not set.
- The engine speed is less than 3200 RPM.
- The engine speed is not changing more than 250 RPM for 5 seconds.
- Fan command is greater than zero percent.

Conditions for Setting the DTC

The maximum allowable error of 1000 RPM in the cooling fan speed occurs for 100 seconds. The PCM detects that the cooling fan clutch is locked up.

Action Taken When the DTC Sets

The Reduced Engine Power indicator illuminates only if the PCM detects that the cooling fan clutch is locked up. The PCM illuminates the MIL during the second consecutive trip in which the diagnostic test has been run and failed. The PCM will store the conditions as Freeze Frame/Failure Records data. A history DTC is stored. The PCM commands the cooling fan clutch to 100 percent.

Conditions for Clearing the MIL/DTC

Follow this procedure in order to clear DTC P1484 after completing a repair. Use the clear DTC information function on the scan tool. Perform an ignition key cycle. The PCM turns OFF the MIL after the third consecutive trip that the diagnostic test has run and passed. The history DTC will clear after 40 consecutive warm-up cycles have occurred without a malfunction.

Diagnostic Aids

An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. If the condition is not present, see **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Disconnect the harness connector of the cooling fan clutch from the shroud. Inspect the exposed wires between the harness connector and the tubing. If DTCs P1484 and P0113 are set, and the weather conditions are cold, the cooling fan code may be false. Clear DTC P1484, and after an IAT sensor check, allow the DTC to reset.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2)

This step ensures that the DTC has failed this ignition cycle. If the scan tool displays Passed, then the answer is No.

3)

The cooling fan noise should increase as the cooling fan clutch engages. It can take up to 2 minutes for full cooling fan clutch engagement. If cooling fan clutch is previously fully engaged, then there will not be a noticeable change in cooling fan noise. Compare noise to a known good vehicle. If fan noise is louder than the known good vehicle, then answer Yes.

4)

In the previous step the cooling fan clutch was fully engaged. This step tests to ensure that the cooling fan clutch will disengage. A noticeable noise difference should be heard between a fully engaged cooling fan clutch and a disengaged cooling fan clutch. The cooling fan clutch is completely disengaged when the excessive fan noise is not heard.

5)

Tests the PCM's ability to control the cooling fan. If answer to question is Yes, see **DIAGNOSTIC AIDS** .

6)

Inspect for a mechanical condition which causes the DTC to set.

7)

Tests for voltage on the cooling fan clutch supply voltage circuit of the cooling fan clutch. The cooling fan clutch connector is a seal connector. You must use jumper wires for testing or damage to wiring or connector could happen.

8)

Tests the cooling fan relay for a PWM signal on the cooling fan clutch supply voltage circuit of the cooling fan clutch.

Test

1. Did you perform the Engine Cooling Diagnostic System Check? If yes, go to next step. If no, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. With a scan tool, observe the Powertrain DTC list. Start the engine. Operate the vehicle within the **CONDITIONS FOR SETTING THE DTC** . Does the scan tool indicate the DTC Failed this ignition cycle? If yes, go to step 5 . If no, go to next step.
3. Turn OFF the ignition. Disconnect the coolant fan relay. Connect a 10-amp fused jumper wire between the cooling fan clutch supply voltage circuit of the cooling fan and the ignition 3 voltage circuit of the cooling fan relay. Start the engine. Raise engine speed to 2000 RPM for 2 minutes. Does the cooling fan engage? If yes, go to next step. If no, go to step 5 .

   NOTE: DTC P1482 (on 4.2L) will set when the cooling fan relay is disconnected.

4. Turn OFF the ignition. Remove the 10-amp fused jumper wire. Install cooling fan relay. Disconnect the cooling fan clutch connector. Start the engine. Raise engine speed to 2000 RPM for 2 minutes. Does the cooling fan clutch disengage? If yes, go to next step. If no, go to step 18 .

   NOTE: Continuously excessive fan noise is due to the PCM commanding the cooling fan to 100 percent engaged or a mechanical failure. If the fan noise decreases during this step, then this DTC is due to an electrical malfunction. Replacing the cooling fan clutch will not correct the condition.

5. Install a scan tool. Start the engine. With a scan tool, observe the Fan Speed and the Desired Fan Speed parameters in the powertrain control module Output Controls. Command the cooling fan clutch to 100 percent. Operate the engine at 2000 RPM for 2 minutes. Is the Desired Fan Speed within 1000 RPM of the Fan Speed? If yes, go to **DIAGNOSTIC AIDS** . If no, go to next step.
6. Turn OFF the ignition. Inspect the cooling fan and the drive belt for the following conditions:
   - A cracked drive belt

- A loose or a worn drive belt
- A misrouted drive belt
- Oil leaks at the cooling fan clutch
- A free-spinning cooling fan
- A seized cooling fan clutch
- A broken cooling fan

If any of the conditions exist, repair as necessary. Did you find and correct the condition? If yes, go to step 20 . If no, go to next step.

7. Disconnect the cooling fan clutch connector at the fan shroud. Connect a jumper wire between each of the cooling fan clutch circuits. Connect a digital multimeter (DMM) between the clutch supply voltage circuit of the cooling fan clutch and ground. Start the engine. Command the Fan Control to zero percent. Does the voltage measure greater than 0.16 volt? If yes, go to step 10 . If no, go to next step.
8. Command the fan control to 100 percent. Does the voltage fluctuate? If yes, go to step 11 . If no, go to next step.
9. Turn OFF the ignition. Disconnect the cooling fan relay. Turn ON the ignition, with the engine OFF. Probe the ignition 1 voltage circuit of the cooling fan relay with a test lamp connected to a good ground. Does the test lamp illuminate? If yes, go to step 12 . If no, go to step 17 .
10. Disconnect the cooling fan relay. Does the voltage measure greater than 0.16 volt? If yes, go to step 14 . If no, go to next step.
11. Test the cooling fan clutch ground for an open. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 16 .
12. Test the ground circuit of the cooling fan relay for an open or a high resistance. Did you find and correct the condition? If yes, go to step 20 . If no, go to next step.
13. Test the clutch supply voltage circuit of the cooling fan clutch for an open or a short to ground. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 15 .
14. Test the clutch supply voltage circuit of the cooling fan clutch for a short to voltage. Did you find and correct the condition? If yes, go to step 20 .
15. Inspect for poor connections at the cooling fan relay. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 19 .
16. Inspect for poor connections at the harness connector of the cooling fan clutch. Did you find and correct the condition? If yes, go to step 20 . If no, go to step 18 .
17. Repair the ignition 1 voltage circuit of the cooling fan relay. Did you find and correct the condition? If yes, go to step 20 .
18. Replace the cooling fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to step 20 .
19. Replace the cooling fan relay. See **COOLING FAN RELAY** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to next step.
20. Use the Clear DTC Information function of the scan tool. Perform an ignition key cycle. Operate the vehicle within the **CONDITIONS FOR RUNNING THE DTC** . Does the DTC reset? If yes, go to step 2 . If no, system is OK.

NOTE: Follow this procedure in order to clear DTC P1484 after making a repair.

SYMPTOM TEST

INTRODUCTION

Review the system operation in order to familiarize yourself with the system functions. See **DESCRIPTION & OPERATION**

Visual/Physical Inspection

Inspect for aftermarket devices which could affect the operation of the Cooling System. Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. See **INTERMITTENT OR POOR CONNECTIONS** .

SYSTEM TESTS

EXCESSIVE FAN NOISE

Circuit Description

The electro-viscous clutch is controlled by the PCM. The PCM controls a solenoid that regulates a fluid pressure that controls slip of the fan clutch. Internal to the fan is a centrifugal fluid pump, solenoid, hall effect sensor, valve lever and a hydraulic fluid. There is two chambers for the fluid, these two chambers are separated by a valve lever. The first chamber is the storage chamber, which holds excess fluid. The second chamber is the working chamber. As the pressure of the fluid is increased in the working chamber the amount of slip the fan has is decreased. The position of the valve lever is controlled by an electric solenoid.

Diagnostic Aids

Turning off the engine when the cooling fan clutch is engaged, the cooling fan clutch will be engaged at engine restart. This may cause an excessive noise concern. This is a normal condition. If the engine is turned off for an extended period of time, usually over night, the hydraulic fluid may fill working chamber and cause limited slip at engine restart. This may cause the excessive noise condition. This is a normal condition. To engage the cooling fan clutch, it can take up to 2 minutes for a 100 percent command with the engine at 2000 RPM. The lower the engine speed, the longer it will take the cooling fan clutch to engage. To disengage the cooling fan clutch, it can take up to 2 minutes with the engine at 2000 RPM. The lower the engine speed, the longer it will take to disengage. In lower ambient air temperatures the cooling fan clutch will engage in less time, however it will take longer to disengage. An inline connector could cause an intermittent DTC. Ensure to test for poor connections and pin retention at all inline connectors. If the condition is not present, refer to **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING.

Test Description

The numbers below refer to the step numbers in the diagnostic table.

2)

There should be no binding or increased resistance as the cooling fan clutch is rotated.

4)

The cooling fan noise should increase as the cooling fan clutch engages. It can take up to 2 minutes for full cooling fan clutch engagement. If cooling fan clutch is previously fully engaged, then there will not be a noticeable change in cooling fan noise. Compare noise to a known good vehicle. If fan noise is louder than the known good vehicle, then answer Yes.

5)

In the previous step the cooling fan clutch was fully engaged. This step tests to ensure that the cooling fan clutch will disengage. A noticeable noise difference should be heard between a fully engaged cooling fan clutch and a disengaged cooling fan. The cooling fan clutch is completely disengaged when the excessive fan noise is not heard.

6)

This step clears DTC that were set during previous steps. Test driving the vehicle will attempt to set DTC not previous found in the Engine Cooling Diagnostic Check. If no DTC is set the condition is normal operation of the cooling fan.

Test

1. If the Engine Cooling Diagnostic System Check was performed, go to next step. If the Engine Cooling Diagnostic System Check was not performed, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. Rotate the cooling fan 3 complete revolutions. Is the resistance of the cooling fan clutch even through out each rotation? If yes, go to step 4 . If no, go to next step.
3. Inspect the cooling fan clutch for proper installation. Did you find and correct the condition? If yes, go to step 9 . If no, go to step 7 .
4. Turn OFF the ignition. Disconnect the coolant fan relay. Connect a 10-amp fused jumper wire between the cooling fan clutch supply voltage circuit of the cooling fan and the ignition 3 voltage circuit of the cooling fan relay. Start the engine. Raise engine speed to 2,000 RPM for 2 minutes. Does the cooling fan clutch engage? If yes, go to next step. If no, go to step 7 .

   NOTE: DTC P1482 (on 4.2L), or P0480, (on 5.3L) will set when the cooling fan relay is disconnected.

5. Turn OFF the ignition. Remove the 10-amp fused jumper wire. Install cooling fan relay. Disconnect the cooling fan clutch connector. Start the engine. Raise engine speed to 2,000 RPM for 2 minutes. Does the cooling fan disengage? If yes, system is OK. If no, go to next step.

NOTE: Continuous excessive fan noise is due to a mechanical failure. If the fan noise decreases during this step, then there is an electrical malfunction. Replacing the cooling fan clutch will not correct the condition.

6. Turn OFF the ignition. Connect the cooling fan clutch connector. Turn ON the ignition, with the engine OFF. With a scan tool, clear all DTCs. Start the engine. Test drive vehicle. With a scan tool, observe the DTC list. Does the scan tool display any cooling system DTCs? If yes, go to **DIAGNOSTIC TROUBLE CODE DEFINITIONS** . If no, system is okay.
7. Inspect for poor connections at the harness connector of the cooling fan clutch. See **INTERMITTENT OR POOR CONNECTIONS** under TROUBLE SHOOTING. Did you find and correct the condition? If yes, go to step 9 . If no, go to next step.
8. Replace the cooling fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Did you complete the replacement? If yes, go to next step.
9. Operate the system in order to verify the repair. Did you correct the condition? If yes, system is okay. If no, go to step 3 .

FAN CLUTCH DIAGNOSIS

1. If the Engine Cooling Diagnostic System Check was performed, go to next step. If the Engine Cooling Diagnostic System Check was not performed, go to **DIAGNOSTIC SYSTEM CHECK - ENGINE COOLING** under SELF-DIAGNOSTIC SYSTEM.
2. Is there excessive fan air noise? If yes, go to next step. If no, go to **TEST A: EXCESSIVE FAN NOISE** .
3. Fan air noise is normal during cold engine start up. Does the fan noise go away at normal engine operating temperature? If yes, go to step 13 . If no, go to **EXCESSIVE FAN NOISE** .
4. The engine must be turned off and the engine temperature should be cold. Rotate the fan clutch. Does the fan clutch rotate? If yes, go to next step. If no, go to step 14 .
5. Visually inspect the fan blades for cracks, looseness or damage. Are the fan blades in good condition? If yes, go to next step. If no, go to step 15 .
6. Visually inspect the fan clutch for signs of silicone leakage. Slight silicone leakage may not effect the fan clutch engagement. Excessive leakage will prevent the fan clutch from engaging. Is the silicone fluid leakage excessive? If yes, go to step 14 . If no, go to next step.
7. Inspect the fan clutch for proper installation. Move the fan blade back and forth in a lateral motion. Inspect for fan blade-to-fan clutch movement. Is the fan blade loose at the fan clutch? If yes, go to step 10 . If no, go to next step.
8. Inspect the fan clutch for wear. Move the fan blade back and forth in a lateral motion. Approximately 6.5 mm (1/4 in) movement at the tip of the fan blade is normal. Inspect for fan clutch lateral movement. Is the fan clutch lateral movement excessive? If yes, go to step 14 . If no, go to next step.
9. The fan clutch should have more turning resistance when the engine is at or above normal operating temperature. Does the fan clutch have more resistance when the engine temperature is raised? If yes, go to step 11 . If no, go to step 14 .
10. Tighten the fan. Is the action complete? If yes, go to step 16 .

CAUTION: Do not allow engine temperature to exceed 121°C (250°F).

11. Perform a fan clutch engagement test. Ensure the engine coolant level is full. Ensure the cooling fan drive belt tension is correct and not slipping. Position and secure a thermometer between the fan clutch and the radiator. Ensure the cooling fan is disengaged before starting this test. Sufficiently cover the radiator grille to restrict the air flow. Start the engine. Turn the A/C ON, if equipped. Operate the engine at approximately 2,000 RPM. Inspect the thermometer reading when the fan clutch engages. Do not continue this test if the fan clutch does not engage between 185-205°F (85-96°C). Fan clutch engagement will be indicated by an increase in fan air noise, fan speed, and a drop of about 5-15°F (3-10°C) on the thermometer reading. Did the fan clutch engage between 185-205°F (85-96°C)? If yes, go to next step. If no, go to step 14 .
12. Once the fan clutch engages, uncover the radiator grille. Turn the A/C OFF, if equipped. Operate the engine at approximately 2,500 RPM to reduce the engine operating temperature. Remove the thermometer. Did the engine return to normal operating temperature? If yes, go to next step.
13. As the engine temperature returns to normal, the fan clutch will disengage, indicated by a reduction in fan air noise and fan speed. Did the fan clutch disengage? If yes, go to step 16 . If no, go to next step.
14. Replace the fan clutch. See **FAN CLUTCH** under REMOVAL & INSTALLATION. Is the repair complete? If yes, go to step 16 .
15. Replace the fan blades. See **COOLING FAN & SHROUD** under REMOVAL & INSTALLATION. Is the repair complete? If yes, go to next step.
16. Operate the fan clutch to verify proper operation. Did you find and correct the condition? If yes, system is okay. If no, go to step 2 .

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See appropriate COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

FAN CLUTCH

Removal

1. Remove the cooling fan and shroud. See **COOLING FAN & SHROUD** .
2. Remove the bolts retaining the fan blade to the fan clutch.
3. Separate the fan blade from the fan clutch.

Installation

1. Assemble the fan to the fan clutch.
2. Install the 4 bolts to the fan blade and tighten. See **TORQUE SPECIFICATIONS** .
3. Install the cooling fan and shroud. See **COOLING FAN & SHROUD** .

COOLING FAN & SHROUD

NOTE: Tools Required: Fan Clutch Remover & Installer (J 41240) Hose Clamp Pliers (J 38185) Fan Clutch Remover & Installer (J 46406). See SPECIAL TOOLS .

Removal

1. Remove the air intake baffle.
2. Remove the hood latch support. See **Fig. 3** .
3. Disconnect the transmission cooler lines at the engine and release the lines from the fan shroud.
4. Remove the 2 upper bolts on the fan shroud.
5. Reposition the upper inlet radiator hose clamp using Hose Clamp Pliers.
6. Remove the upper inlet radiator hose from the radiator.
7. Remove the electrical connector from the shroud. See **Fig. 4** .
8. Position the water pump so the bolts are aligned in the vertical.
9. Remove the fan hub nut from the water pump shaft in a counterclockwise rotation. Using the Fan Clutch Remover & Installer in order to secure the water pump pulley, loosen the cooling fan hub nut from the water pump shaft. See **Fig. 5** .
10. Unclip the fan shroud from the radiator at the side panels.
11. Tilt the radiator and the condenser forward.
12. Lift the fan and the shroud up and out towards the engine to release the fan from the radiator to clear the radiator inlet. See **Fig. 6** .

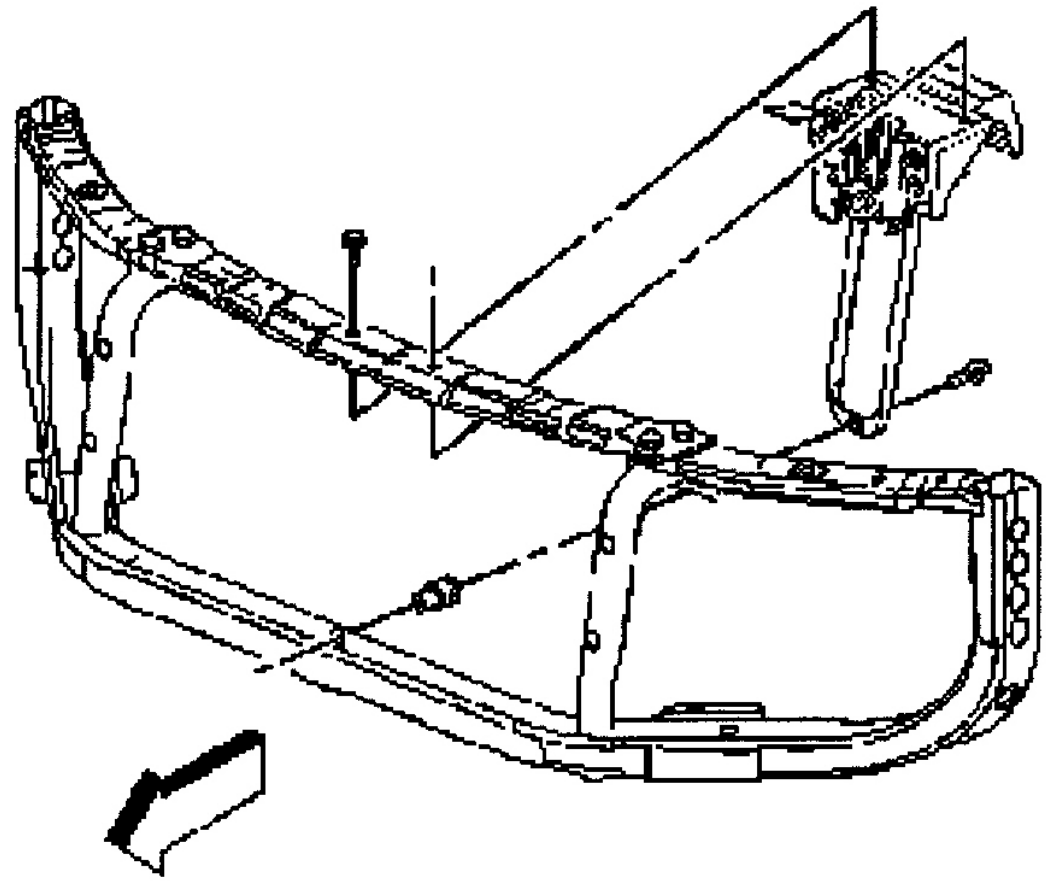


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Fig. 3: Removing Hood Latch Support
Courtesy of ISUZU MOTOR CO.

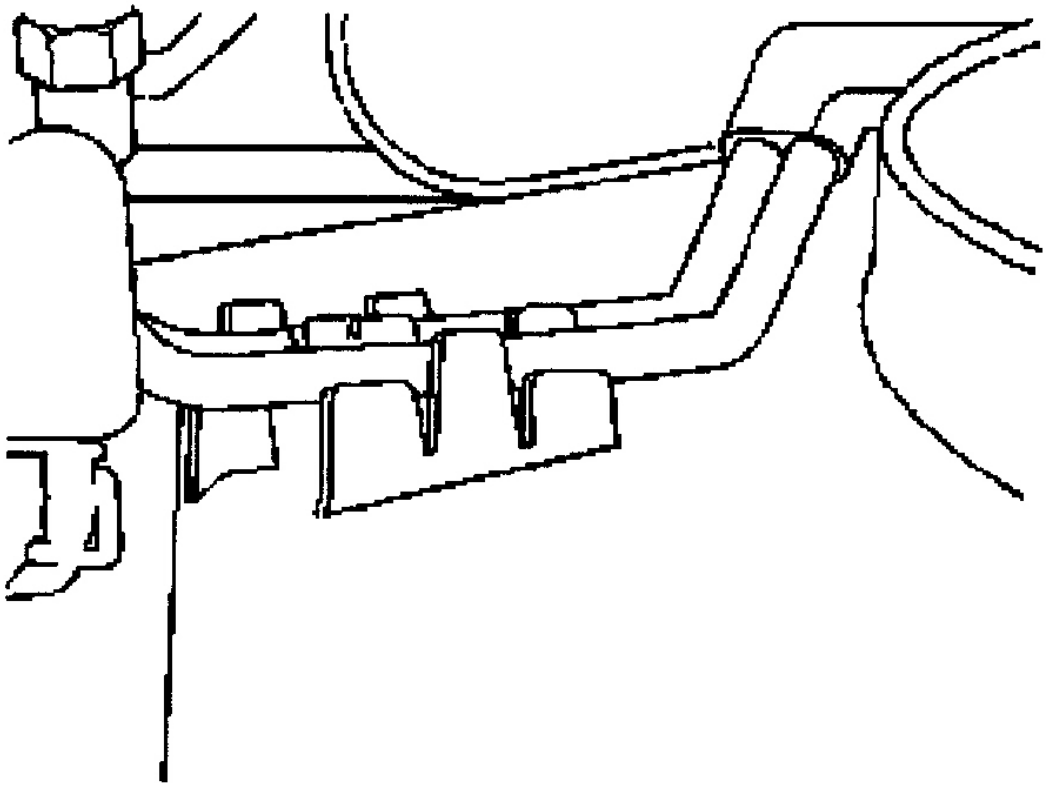

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Fig. 4: Removing Electrical Connector From Shroud
Courtesy of ISUZU MOTOR CO.

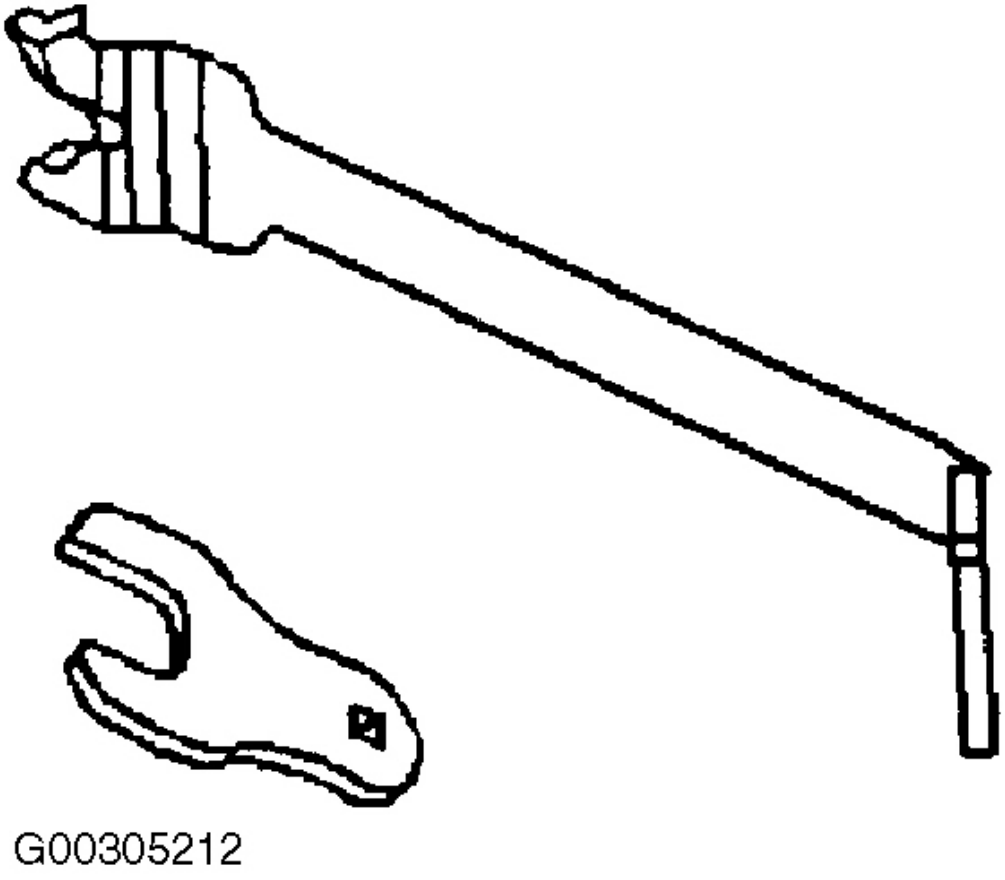

Fig. 5: Identifying Cooling Fan Location
Courtesy of ISUZU MOTOR CO.

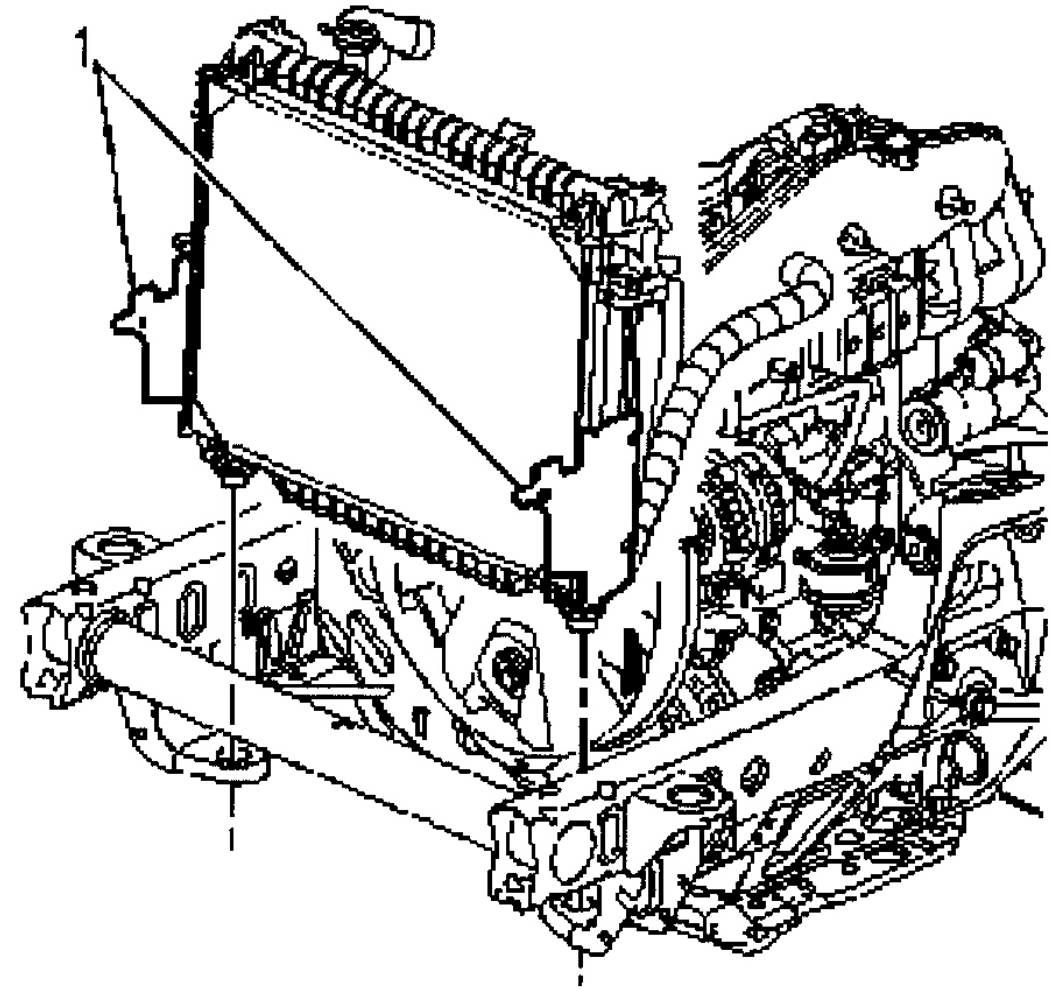

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Fig. 6: Removing Fan Shroud From Radiator
Courtesy of ISUZU MOTOR CO.

Installation

1. Install the fan and the shroud onto the lip of the radiator bottom.
2. Install the 2 bolts into the upper fan shroud and tighten. See **TORQUE SPECIFICATIONS** .
3. Connect the electrical connector.
4. Clip the fan shroud to the radiator at the side panels. See **Fig. 6** .
5. Using the Fan Clutch Remover & Installer, secure the water pump pulley, install the fan nut to the water pump shaft in a clockwise rotation. Tighten to specifications. See **TORQUE SPECIFICATIONS** .
6. Install the transmission cooler lines to the engine and clip into the fan shroud.

7. Install the hood latch support.
8. Install the upper inlet radiator hose to the radiator.
9. Reposition the upper inlet radiator hose clamp using Hose Clamp Pliers.
10. Install the air intake baffle. See **Fig. 4** .

COOLING FAN RELAY

NOTE: Installation of the proper relay is critical. If an enhanced relay (equipped with a diode) is installed into a position requiring a standard relay (not equipped with a diode), excessive current will damage any components associated with the relay or its associated circuits.

NOTE: Tools Required: Relay Puller Pliers (J 43244).

Removal & Installation

1. Remove the underhood electrical center cover.
2. Using the Relay Puller Pliers, remove the cooling fan relay. See **Fig. 7** .
3. Install the cooling fan relay.
4. Install the underhood electrical center cover.

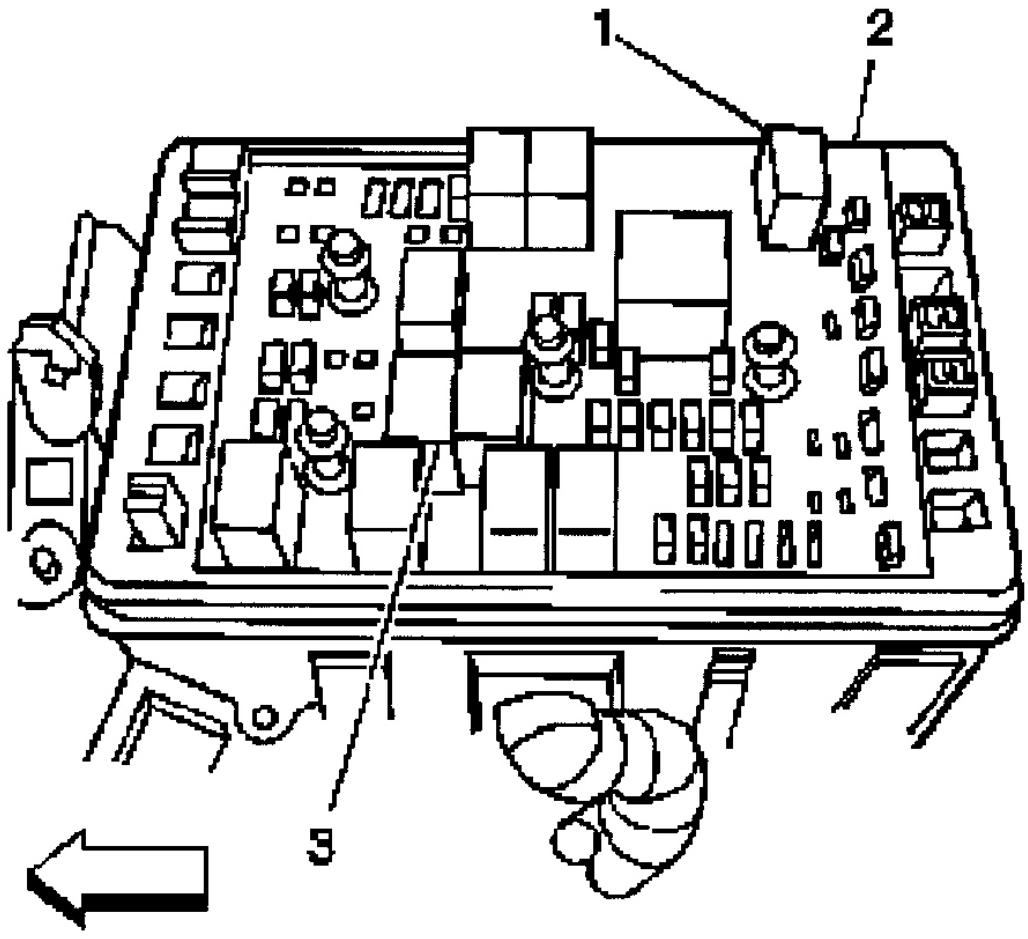

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Fig. 7: Removing/Installing Fan Relay
Courtesy of ISUZU MOTOR CO.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Fan Blade Bolt	20 (27)
Fan Shroud Bolt	21 (28)
Cooling Fan Nut	41 (56)

WIRING DIAGRAMS

For wiring diagrams, see **COOLING FAN** in SYSTEM WIRING DIAGRAMS article in ENGINE ELECTRICAL.

SPECIAL TOOLS

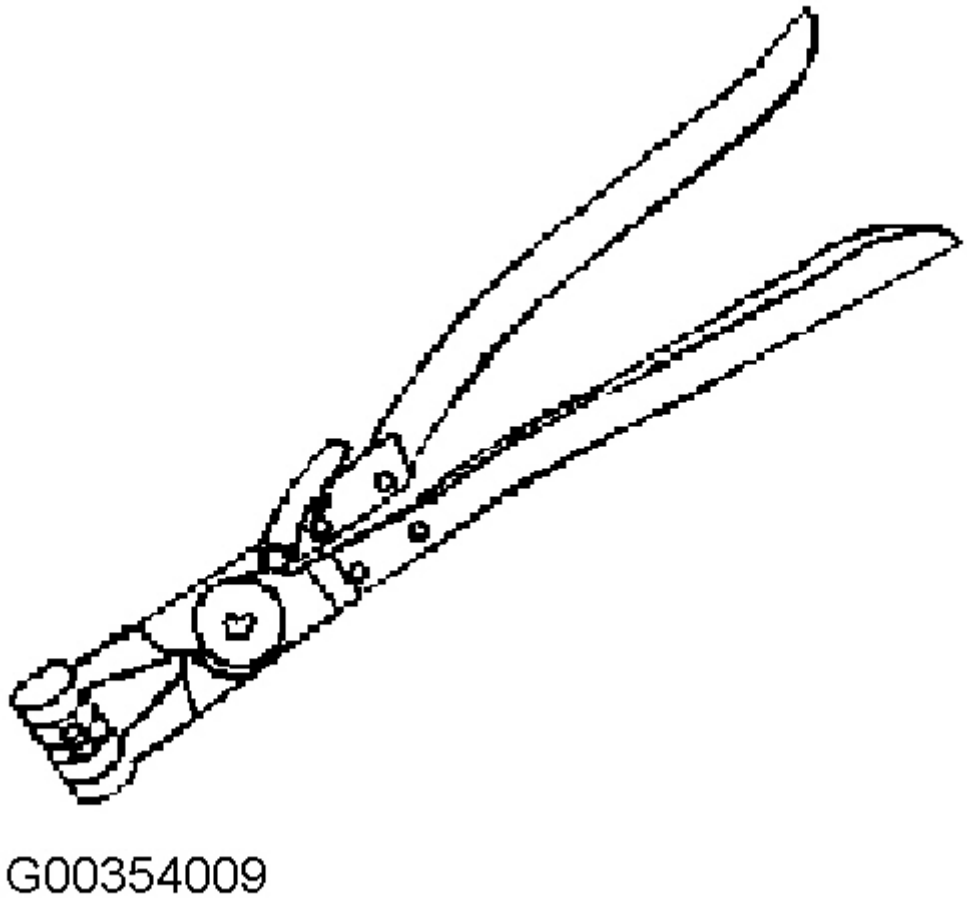

Fig. 8: Hose Clamp Pliers (J-38185)
Courtesy of GENERAL MOTORS CORP.

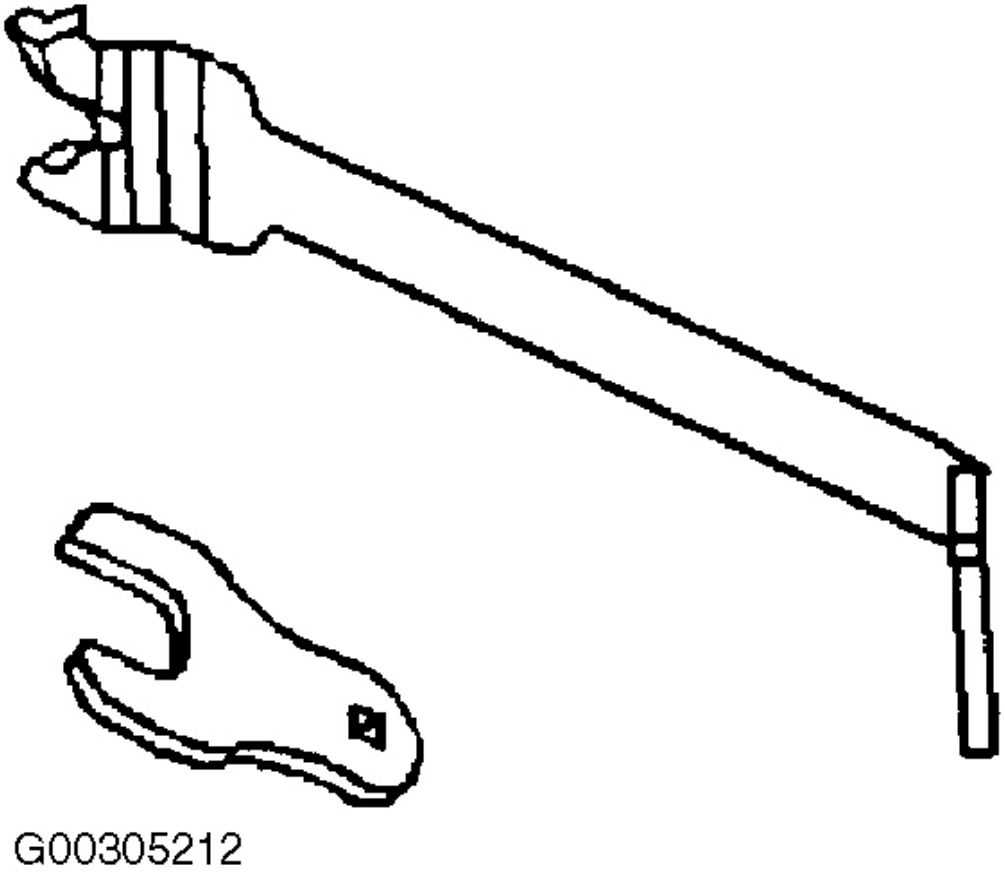

Fig. 9: Fan Clutch Remover & Installer (J 41240) Or (J 46406)
Courtesy of GENERAL MOTORS CORP.