

2008 Ford Mustang
2008 ENGINE Engine Cooling - Mustang

2008 ENGINE

Engine Cooling - Mustang

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Motorcraft Metal Surface Prep ZC-31-A	-	-
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1	15.2L (4.0 gal)
Premium Cooling System Flush VC-1	ESR-M14P7-A	-

GENERAL SPECIFICATIONS

Item	Specification
Cooling System Pressure Specifications	
Cooling System Pressure Test Specifications	138 kPa (20 psi)
Radiator Cap Pressure Test Specifications	110 kPa (16 psi)
Thermostat Opening Temperatures	
Starts to open (4.0L)	90-94°C (194-201°F)
Fully open (4.0L)	106°C (223°F)
Starts to open (4.6L)	80-83°C (175-182°F)
Fully open (4.6L)	94.5°C (202°F)
Starts to open (5.4L)	80-84°C (176-184°F)
Fully open (5.4L)	95°C (203°F)

TORQUE SPECIFICATIONS

Description	Nm	lb-ft	lb-in
A/C condenser bolts	10	-	89
Block heater retaining screw	4	-	35
Coolant crossover assembly bolts - 4.6L (3V)	10	-	89
Coolant pump bolts - 4.0L (SOHC)	10	-	89
Coolant pump bolts - 4.6L (3V), 5.4L (4V)	25	18	-
Coolant pump pulley bolts - 4.0L (SOHC)	25	18	-
Coolant pump pulley bolts - 4.6L (3V), 5.4L (4V)	25	18	-
Cooling fan motor and shroud bolts	9	-	80
Degas bottle bolts	8	-	71
Generator nuts - 4.6L (3V)	25	18	-
Generator support bracket bolts - 4.6L (3V)	10	-	89

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

Lower splash shield bolts	5	-	44
Lower thermostat housing bolts - 4.0L (SOHC)	12	-	106
Power steering reservoir bolt - 4.0L (SOHC), 4.6L (3V)	8	-	71
Power steering tubes and A/C condenser nut	8	-	71
Radiator support brackets	10	-	89
Supercharger (SC) degas bottle bolt - 5.4L (4V)	8	-	71
Thermostat cover bolts - 4.6L (3V)	10	-	89
Thermostat housing cover bolts - 5.4L (4V)	10	-	89
Thermostat housing nuts - 5.4L (4V)	25	18	-
Transmission cooler bolts (if equipped)	10	-	89
Upper thermostat housing bolts - 4.0L (SOHC)	10	-	89

DESCRIPTION AND OPERATION

ENGINE COOLING

NOTE: The engine cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

The 4.0L (SOHC) cooling system components include the:

- block heater (if equipped).
- Engine Coolant Temperature (ECT) sensor.
- cooling fan motor and shroud assembly.
- radiator.
- heater tube assembly.
- pressure relief cap.
- thermostat housing assembly.
- radiator draincock.
- coolant pump.
- coolant thermostat.
- oil filter adapter.
- radiator overflow hose.
- degas bottle.
- upper radiator hose.
- lower radiator hose.

The coolant thermostat:

- controls the engine coolant temperature.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- allows for quicker engine warm-up.

The degas bottle:

- provides a location for service fill.
- contains coolant expansion and system pressurization.
- provides air separation during operation.
- replenishes the engine coolant to the system.

The engine coolant flows:

- from the lower radiator hose to the coolant pump.
- from the coolant pump to the engine block and the cylinder heads.

The 4.6L (3V) and 5.4L (4V) cooling system components include the:

- block heater (if equipped).
- Cylinder Head Temperature (CHT) sensor.
- fan motor and shroud assembly.
- radiator.
- radiator cap.
- radiator draincock.
- coolant pump.
- coolant thermostat.
- oil filter adapter.
- radiator overflow hose.
- degas bottle.
- upper radiator hose.
- lower radiator hose.
- ECT sensor (5.4L [4V] only).

The fan blade draws air through the radiator to help cool the engine coolant.

The fan motor:

- operates only when the ignition switch is in the RUN position.
- will not operate with the switch in the OFF position.

The engine coolant:

- flows from the thermostat through the radiator tubes and is cooled by passing air over the cooling fins.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- is then circulated from the radiator outlet tank through the oil adapter and into the cylinder block to complete the circuit.

A closed coolant thermostat returns the engine coolant to the coolant pump. An open coolant thermostat allows the engine coolant to flow to the radiator.

Engine coolant provides freeze protection, boil protection, cooling efficiency and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.

When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.

To maintain the integrity of the coolant and the cooling system:

- add Motorcraft Premium Gold Engine Coolant or equivalent (yellow color) meeting Ford specification WSS-M97B51-A1. Use the same coolant that is present in the cooling system. Do not mix coolant types.
- do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.
- do not add alcohol, methanol or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
- Ford Motor Company does NOT recommend the use of recycled engine coolant in vehicles originally equipped with Motorcraft Premium Gold Engine Coolant since a Ford-approved recycling process is not yet available.

The optional block heater:

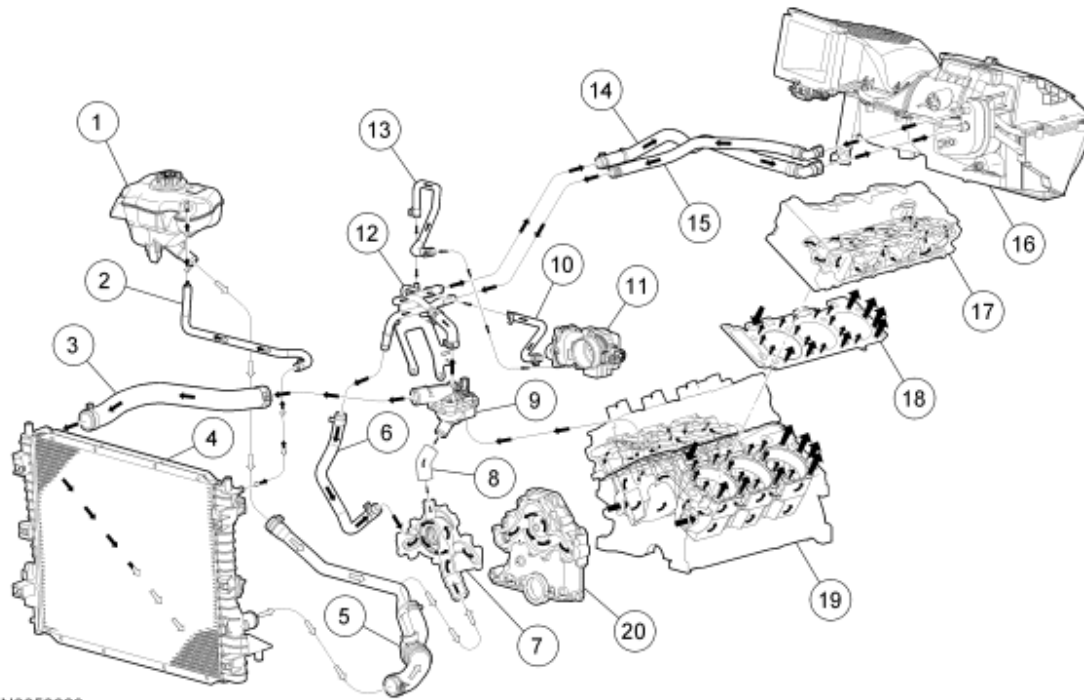
- electrical heating element is installed in the core plug opening.
- uses a standard 110V electrical supply
- keeps the engine coolant warm during cold weather.

Coolant Flow Diagram

NOTE: **Black arrows indicate hot, white arrows indicate cold.**

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang



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Fig. 1: Exploded View Of Coolant Flow Diagram - 4.0L
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	8A080	Degas bottle
2	8276	Upper degas bottle hose
3	8B274	Upper radiator hose
4	8005	Radiator
5	8B273	Lower radiator hose
6	18C266	Coolant inlet tube-to-coolant pump hose
7	8501	Coolant pump
8	8548	Coolant pump-to-thermostat housing hose
9	8A586	Thermostat housing
10	18465	Coolant inlet tube-to-Throttle Body (TB) hose
11	9F991	TB
12	18696	Coolant inlet tube
13	18465	Coolant inlet tube-to-TB hose
14	18K579	Heater inlet hose
15	18K580	Heater outlet hose
16	19B555	Heater assembly
17	6C064	Cylinder head

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

18	6083	Cylinder head gasket
19	6015	Engine block
20	6019	Engine front cover

NOTE: Black arrows indicate hot, white arrows indicate cold.

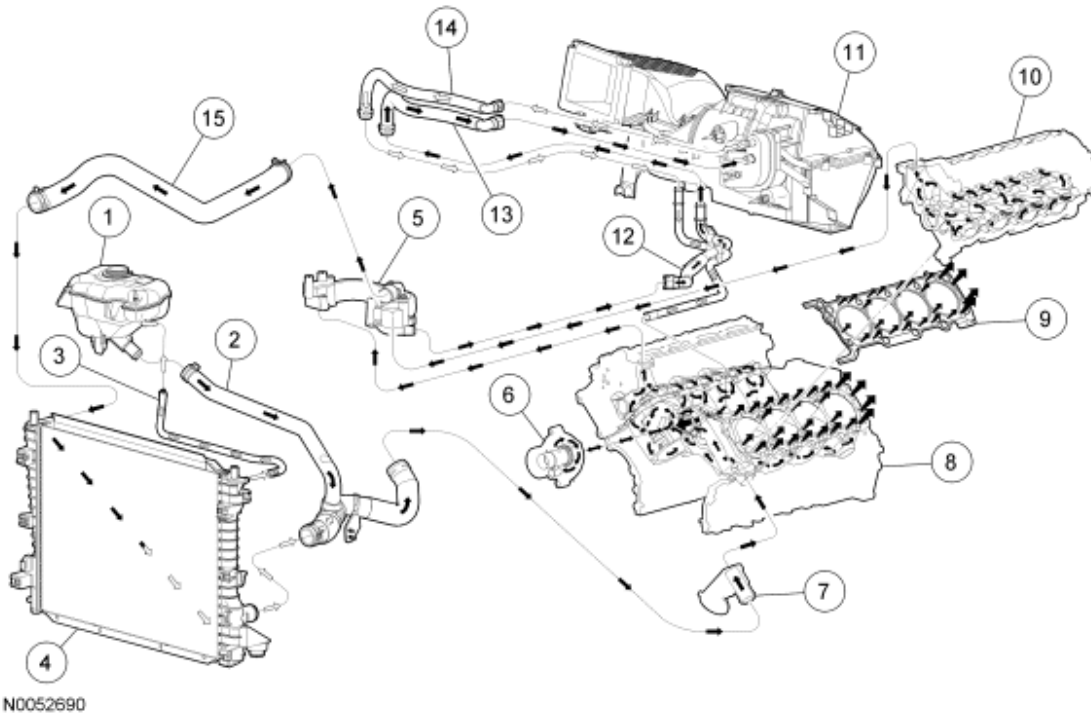


Fig. 2: Exploded View Of Coolant Flow Diagram - 4.6L
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	8A080	Degas bottle
2	8B273	Lower radiator hose
3	8276	Upper degas bottle hose
4	8005	Radiator
5	8C369	Coolant crossover manifold assembly
6	8501	Coolant pump
7	6881	Oil filter adapter
8	6015	Engine block
9	6083	Cylinder head gasket
10	6050	Cylinder head
11	19B555	Heater assembly
12	18B402	Coolant tube heater assembly
13	18K580	Heater inlet hose

14	18K579	Heater outlet hose
15	8B274	Upper radiator hose

DIAGNOSTIC TESTS

ENGINE COOLING

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent
 ST1720-A	Battery/Antifreeze Tester	014-R1060 or equivalent
 ST1474-A	Pressure Test Kit	014-R1072 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware or equivalent scan tool	

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1

Principles of Operation

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. From the coolant pump, coolant is sent through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. On most engines, the coolant pump is operated by engine rotation through a pulley which is driven by the accessory drive belt to circulate the coolant. Some engines use a belt

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

driven by a pulley attached to the camshaft and some engines use a sprocket driven by the timing chain to operate the coolant pump. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant is allowed to flow through the radiator circuit in order to transfer engine generated heat to the outside air.

NOTE: **The vehicle is equipped with either a degas bottle or an expansion tank.**

The degas bottle, if equipped, holds surplus coolant and removes air from the cooling system, which reduces hot spots. It also allows for coolant expansion and system pressurization, replenishes coolant to the cooling system and serves as the location for service fill.

The coolant expansion tank, if equipped, holds surplus coolant, allows for coolant expansion and replenishes coolant to the cooling system. It is equipped with a non-pressurized cap which allows coolant to be added to the tank to keep it filled to prescribed levels.

The cooling fan draws air through the radiator to help cool the system coolant as it passes through the radiator.

The thermostat monitor is a function of the PCM and is designed to verify correct thermostat operation. The monitor will be executed once per drive cycle and has a monitor run duration of 300-800 seconds. If a malfunction occurs, DTC P0125 or P0128 is set, and the malfunction indicator lamp (MIL) will be illuminated.

For vehicle/engine specific information, refer to **Engine Cooling**.

Inspection and Verification

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

NOTE: **The engine cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant. Do not mix coolant types. Failure to follow these instructions may result in engine or cooling system damage.**

NOTE: **Vehicles equipped with a degas bottle system have the pressure relief cap on the degas bottle and no radiator cap. Vehicles equipped with a coolant expansion tank system have the pressure relief cap on the radiator.**

1. Verify the customer concern.
2. Visually check the engine coolant level at the degas bottle or coolant expansion tank when the system is cold.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

3. Make sure the pressure relief cap is installed correctly.
4. Record any cooling system DTCs retrieved. Refer to the **PCM DTC CHART** for DTC descriptions.

NOTE: **Take note of any coolant odor or steam coming from cooling system components.**

5. If the system coolant is filled correctly and no DTCs associated with fail-safe cooling are retrieved, verify the customer's concern by operating the engine to duplicate the condition.

NOTE: **Refer to the coolant flow diagram in the Description and Operation Engine Cooling.**

6. Inspect to determine if any of the following mechanical or electrical concerns apply.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Leaks or weeps at: ○ Hoses ○ Tubes ○ Clamp joints ○ Quick connect couplings (if equipped) ○ Gaskets ○ O-rings ○ Thermostat housing ○ Radiator ○ Pressure relief cap ○ Coolant pump ○ Heater core (wet floor or coolant odor in vehicle) ○ Heater control valve ○ Heated throttle body (TB) or heated TB adapter (if equipped) ○ Coolant crossover manifold	• Inoperative or damaged: ○ Electric cooling fan (if equipped) ○ Electronically actuated fan clutch ○ Electronically actuated fan clutch controller ○ Wiring, connectors, relays or modules ○ Engine coolant temperature (ECT) sensor (if equipped)

- assembly (if equipped) ○ Oil cooler (if equipped) ○ Degas bottle (if equipped) ○ Coolant expansion tank (if equipped) ○ Heated PCV (if equipped) ○ Fuel pressure regulator coolant bowl (if equipped, natural gas engine) ○ Cylinder block core plugs (if equipped) ○ Cylinder head core plugs (if equipped) ○ Block heater (if equipped)	○ Cylinder head temperature (CHT) sensor (if equipped) ○ Intake air temperature (IAT) sensor (if equipped) ○ Mass air flow (MAF) sensor ○ Vehicle speed sensor (VSS)
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VISUAL INSPECTION CHART

Mechanical	Electrical
● Cracked or damaged: ○ Hoses ○ Tubes ○ Hose clamps ○ Heater control valve (if equipped) ○ Thermostat housing ○ Radiator ○ Pressure relief cap ○ Cooling fan ○ Fan clutch (if equipped) ○ Coolant pump	

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

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|--|--|
| <ul style="list-style-type: none">○ Degas bottle (if equipped)○ Coolant expansion tank (if equipped)○ Oil cooler (if equipped)○ Coolant crossover manifold assembly (if equipped)○ Cylinder block core plugs (if equipped)○ Cylinder head core plugs (if equipped)○ Block heater (if equipped)● Restricted airflow through the A/C condenser/radiator● Drive belt loose, worn or installed incorrectly● Broken or weak drive belt tensioner● Excessive white or light gray exhaust smoke (may have burnt coolant odor)● Coolant in engine oil● Engine oil in coolant● Coolant in automatic transmission fluid (if equipped)● Automatic transmission fluid (if equipped) in coolant | |
|--|--|

7. If the inspection reveals an obvious concern that can be readily identified, repair it as necessary. Test the system for normal operation.
8. Inspect the coolant condition in the following sequence:
 1. Inspect the coolant color.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- If Motorcraft Premium Gold Engine Coolant has a clear or pale yellow color, this indicates higher water content than required. Test the engine coolant freezing point range with the Battery/Antifreeze Tester. The freezing point should be in the range -45°C to -23°C (-50°F to -10°F). If the vehicle is driven in cold climates less than -36°C (-34°F), it may be necessary to increase the coolant concentration to get adequate freeze protection. Recommended coolant concentration is 50/50 ethylene glycol to distilled water.
- A pale green color indicates incorrect coolant (green in color) may have been added to the system. Use of incorrect (green in color) coolant degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant. Flush the system and refill with the correct mixture of distilled water and Motorcraft Premium Gold Engine Coolant.

NOTE: If Cooling System Stop Leak Pellets are used, darkening of the Motorcraft Premium Gold Engine Coolant from yellow to golden tan will occur.

- Dark brown could indicate a commercially available stop leak may have been used. Flush the system and refill with the correct mixture of distilled water and Motorcraft Premium Gold Engine Coolant.
 - A light or reddish brown color indicates that rust may be present in the cooling system. Flush the system and refill with the correct mixture of distilled water and Motorcraft Premium Gold Engine Coolant.
 - An iridescent sheen on top of the coolant could indicate a trace of oil is entering the system. For information on engine diagnosis, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
 - A milky brown color may indicate that engine oil is entering the cooling system. Pressure test the cooling system. Refer to **Component Tests**. If engine oil is suspected, the cause of the leak may be internal to the engine. Refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
 - A red, orange or light green colored sheen on top of the coolant may indicate that transmission fluid is entering the cooling system. The cause may be a leaky radiator. Pressure test the cooling system. Refer to **Component Tests**.
2. If the engine coolant appearance is acceptable, test the engine coolant freezing point range with the Battery/Antifreeze Tester. The freezing point should be in the range -45°C to -23°C (-50°F to -10°F). If the vehicle is driven in cold climates less than -36°C (-34°F), it may be necessary to increase the coolant concentration to get adequate freeze protection. Recommended coolant concentration is 50/50 ethylene glycol to distilled water.
 - Maximum coolant concentration is 60/40 for cold weather areas.
 - Minimum coolant concentration is 40/60 for warm weather areas.
 3. Adjust coolant range and level if necessary:
 - If coolant is low, add specified coolant mixture only.
 - If the engine coolant tests too weak, remove some of the engine coolant and add undiluted engine coolant until the readings are within acceptable levels.
 - If the engine coolant tests strong, remove some of the engine coolant and add distilled water until the readings are within acceptable levels.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

9. If an obvious cause for an observed or reported concern is found, correct the cause and test the system for normal operation before proceeding to the next step.

NOTE: **Make sure to use the latest scan tool software release.**

10. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: **The vehicle communication module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM.**

11. If the scan tool does not communicate with the VCM:
- check the VCM connection to the vehicle.
 - check the scan tool connection to the VCM.
 - refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.
12. If the scan tool does not communicate with the vehicle:
- verify the ignition key is in the ON position.
 - verify the scan tool operation with a known good vehicle.
 - refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.
13. Carry out the network test.
- If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
 - If the network test passes, retrieve and record continuous memory DTCs.
14. Clear the continuous DTCs and carry out the self-test diagnostics PCM.
15. If the DTCs recovered are related to the concern, go to the **PCM DTC CHART**. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.
16. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

PCM DTC CHART

DTC	Description	Action
P0217	Engine Coolant Overtemperature Condition	Go to <u>Pinpoint Test B.</u>
P1285	Cylinder Head Overtemperature Condition	Go to <u>Pinpoint Test B.</u>
P1299	Cylinder Head Overtemperature Protection Active	Go to <u>Pinpoint Test B.</u>
P0125	Insufficient Coolant Temp For Closed Loop Fuel Control	Go to <u>Pinpoint Test C.</u>
P0128	Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)	Go to <u>Pinpoint Test C.</u>
P0480 P0481	Fan 1, 2 or 3 Control Circuit, Respectively	REFER to the <u>Introduction - Gasoline Engines</u> article.

P0482		
All Other DTCs	-	REFER to the <u>Introduction - Gasoline Engines</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
Loss of coolant	- Coolant hoses or tubes - Hose clamps - Coolant pump O-ring seal or gasket - Thermostat O-ring seal or gasket - Thermostat housing - Radiator - Transmission fluid cooler (in radiator) (if equipped) (may leak internally or externally) - Degas bottle (if equipped) - Coolant expansion tank (if equipped) - Pressure relief cap - Coolant pump leaking from weep hole - Auxiliary coolant pump (if equipped) - Heater core - Heater control valve (if equipped) - Coolant crossover manifold assembly (if equipped) - Engine gaskets (may leak internally or externally) - Oil cooler (if equipped) (may leak internally or externally) - Heated throttle body (TB) or heated TB adapter (if equipped) - Heated PCV (if equipped) - Fuel pressure regulator coolant bowl (if equipped, natural gas engine) - Cylinder block core plugs (if equipped) - Cylinder head core plugs (if equipped) - Block heater (if equipped)	Go to <u>Pinpoint Test A.</u>
	Low coolant level	

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

• The engine overheats	• External engine coolant leak • Air lock in system • Pressure relief cap installation • Restricted airflow through the A/C condenser/radiator • Internal engine coolant leak • Coolant condition/concentration • Accessory drive components • Non-OEM engine enhancement components • Electric cooling fan (if equipped) • Mechanical cooling fan (if equipped) • Mechanical cooling fan clutch (if equipped) • Radiator • Thermostat • Engine coolant temperature (ECT) indicator system (gauge) • ECT sensor (if equipped) • Cylinder head temperature (CHT) sensor (if equipped) • Heater core • Coolant pump • Coolant flow restriction	• Go to <u>Pinpoint Test B.</u>
• The engine does not reach normal operating temperature	• Low coolant level • Thermostat • Mechanical fan clutch always engaged • Electric cooling fan always on • Engine coolant temperature indicator system (gauge) • ECT sensor (if equipped) • CHT sensor (if equipped)	• Go to <u>Pinpoint Test C.</u>
• The block heater does not operate correctly	• Block heater power cable	• CHECK continuity in all 3 power cable circuits. If any circuit measures greater than 5 ohms, INSTALL a new power cable. • CHECK the resistance

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

• The electric cooling fan(s) or electronically controlled fan clutch is inoperative in one or more speeds or does not operate correctly (if equipped)	• Block heater • Wiring • Relays • Fuses • Fan control module • Cooling fan motor(s) • Cooling fan resistor(s) • Electric fan clutch	of the block heater. If the resistance does not measure between 12.5 and 17 ohms, INSTALL a new block heater. • REFER to the <u>Introduction - Gasoline Engines</u> article.
• The electric cooling fan(s) stay(s) on all the time (if equipped)	• Wiring • Relays	• REFER to the <u>Introduction - Gasoline Engines</u> article.
• Noisy electric cooling fan operation (if equipped) • Noisy mechanical fan operation (if equipped)	• Foreign material contamination • Fan motor • Fan blade detached from fan motor • Fan clutch	• REMOVE the foreign material from the cooling fan and shroud. TEST the system for normal operation. If still noisy, INSTALL a new cooling fan assembly. • INSTALL a new cooling fan assembly. • CARRY OUT the Fan Clutch Test - Minimum Speed Requirement <u>Component Tests</u>.

Pinpoint Tests

Pinpoint Test A: Loss of Coolant

Normal Operation

The engine cooling system is a closed system that provides for coolant expansion and contraction and also changes in pressure as coolant warms and cools with engine operation. Various gaskets, seals, hoses and clamps are used to contain coolant within the cooling system and keep other fluids and contaminants from entering the cooling system.

Coolant loss can be attributed to either external or internal leaks anywhere within the cooling system.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

For vehicle/engine specific information, refer to **Engine Cooling**.

This pinpoint test is intended to diagnose the following:

- Coolant hoses or tubes
- Hose clamps
- Thermostat O-ring seal or gasket
- Coolant pump O-ring seal or gasket
- Thermostat housing
- Heater control valve (if equipped)
- Radiator
- Transmission fluid cooler (in radiator) (if equipped)
- Pressure relief cap
- Coolant pump leaking from weep hole
- Auxiliary coolant pump (if equipped)
- Heater core
- Heated throttle body (TB) or heated TB adapter (if equipped)
- Coolant crossover manifold assembly (if equipped)
- Engine gaskets
- Oil cooler (if equipped)
- Degas bottle (if equipped)
- Coolant expansion tank (if equipped)
- Heated PCV (if equipped)
- Fuel pressure regulator coolant bowl (if equipped, natural gas engine)
- Cylinder block core plugs (if equipped)
- Cylinder head core plugs (if equipped)
- Block heater (if equipped)
- Engine coolant temperature (ECT) sensor (if equipped)

PINPOINT TEST A: LOSS OF COOLANT

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

A1 CARRY OUT INSPECTION AND VERIFICATION

- Carry out the **Inspection and Verification**.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- **Were any concerns found?**

YES : REPAIR as needed. TEST the system for normal operation.

NO : Go to A2 .

A2 CHECK THE ENGINE COOLANT LEVEL

NOTE: **Allow the engine to cool before checking the engine coolant level.**

- Key in OFF position.
- Visually inspect the engine coolant level at the degas bottle or the coolant expansion tank.
- **Is the engine coolant level within specifications?**

YES : Go to A3.

NO : ADJUST the engine coolant level as necessary. Go to A3.

A3 PRESSURE TEST THE ENGINE COOLING SYSTEM

- Pressure test the engine cooling system. Refer to **Component Tests**, Cooling System Pressure Test.
- **Does the engine cooling system leak?**

YES : REPAIR or INSTALL new components. TEST the system for normal operation.

NO : If the vehicle is equipped with a coolant expansion tank, go to A4. If the vehicle is equipped with a degas bottle, go to A5.

A4 CHECK THE PRESSURE RELIEF CAP

- Carry out the pressure relief cap pressure test. Refer to **Component Tests**, Pressure Relief Cap Pressure Test.

- **Is the pressure relief cap OK?**

YES : Go to A5.

NO : INSTALL a new pressure relief cap. TEST the system for normal operation.

A5 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK

- Inspect the engine coolant in the degas bottle or coolant expansion tank for signs of engine oil or transmission fluid.

- **Is engine oil or transmission fluid evident in the coolant?**

YES : If engine oil is evident, go to **ENGINE SYSTEM - GENERAL INFORMATION** article for engine diagnosis. If transmission fluid is evident, INSTALL a new radiator. REPAIR the transmission as necessary. Refer to the appropriate Automatic Transmission article for the procedure. TEST the system for normal operation.

NO : Go to A6.

A6 CHECK THE ENGINE OIL AND TRANSMISSION FLUID FOR COOLANT

- Remove the oil level indicators from the engine and the transmission.
- **Is coolant evident in the oil or transmission fluid?**

YES : If coolant is in the engine oil, go to **ENGINE SYSTEM - GENERAL INFORMATION** article. If coolant is in the transmission fluid, INSTALL a new radiator. REPAIR the transmission as necessary. Refer to the appropriate Automatic Transmission article for the procedure.

NO : Go to A7.

A7 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES

NOTE: **Use U-View® Combustion Leak Tester part number 560000 or equivalent.**

- Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases.
- **Are combustion gases present?**

YES : Go to **ENGINE SYSTEM - GENERAL INFORMATION** article for engine diagnosis.

NO : The cooling system is operational.

Pinpoint Test B: The Engine Overheats

Normal Operation

The engine cooling system functions to maintain engine temperatures during operation. Correct coolant flow through the engine, radiator and remainder of cooling system passages and components is essential to maintaining a correct engine temperature.

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. From the coolant pump, coolant is sent through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. On most engines, the coolant pump is operated by engine rotation through a pulley which is driven by the accessory drive belt to circulate the coolant. Some engines use a belt driven by a pulley attached to the camshaft, and some engines use a sprocket driven by the timing chain to operate the coolant pump. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant is allowed to flow through the radiator circuit in order to transfer engine generated heat to the outside air.

Engine overheating generally occurs when there is a disruption in the ability to control either coolant flow at the correct rate, the inability to transfer heat from the engine through the coolant (including low coolant) or an inability to transfer engine generated heat to the outside air through the radiator.

For vehicle/engine specific information, refer to **Engine Cooling**.

- DTC P0217 Engine Coolant Overtemperature Condition
- DTC P1285 Cylinder Head Overtemperature Condition
- DTC P1299 Cylinder Head Overtemperature Protection Active

This pinpoint test is intended to diagnose the following:

- Low coolant level
- External engine coolant leak
- Air lock in system

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- Pressure relief cap installation
- Restricted airflow through the A/C condenser/radiator
- Internal engine coolant leak
- Coolant condition/concentration
- Accessory drive components
- Non-OEM engine enhancement components
- Electric cooling fan (if equipped)
- Mechanical cooling fan blade (if equipped)
- Mechanical cooling fan clutch (if equipped)
- Engine coolant temperature (ECT) indicator system (gauge)
- ECT sensor (if equipped)
- Cylinder head temperature (CHT) sensor (if equipped)
- Heater core
- Coolant pump
- Coolant flow restriction

PINPOINT TEST B: THE ENGINE OVERHEATS

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

B1 CARRY OUT INSPECTION AND VERIFICATION

- Carry out the **Inspection and Verification**.
- **Were any concerns found?**
YES : REPAIR as needed. TEST the system for normal operation.
NO : Go to B2 .

B2 CHECK FOR DTCs

NOTE: Refer to the **Introduction - Gasoline Engines** article for correct scan tool hook-up procedure.

- Check for DTC P0217, P1285 or P1299.
- **Is DTC P0217, P1285 or P1299 present?**

YES : Go to B3.

NO : Actual engine overheating has not been verified. CHECK the ECT gauge operation. REFER to **INSTRUMENT CLUSTER (IC), MESSAGE CENTER, AND WARNING CHIMES** article.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

If any other DTCs are retrieved, REFER to the **Introduction - Gasoline Engines** article.

B3 CHECK FOR AN AIRFLOW OBSTRUCTION

- Check the radiator or A/C condenser for an external obstruction such as leaves or cardboard.
- **Is an obstruction present?**
YES : REMOVE the obstruction. TEST the system for normal operation.
NO : Go to B4.

B4 CHECK THE ENGINE COOLANT LEVEL

NOTE: **Allow the engine to cool before checking the coolant level.**

- Key in OFF position.
- Visually check the engine coolant level in the degas bottle or coolant expansion tank.
- **Is the engine coolant level within specification?**
YES : Go to B5.
NO : ADJUST the engine coolant level as necessary. Go to B5.

B5 PRESSURE TEST THE ENGINE COOLING SYSTEM

- Pressure test the engine cooling system. Refer to **Component Tests**, Cooling System Pressure Test.
- **Does the engine cooling system leak?**
YES : REPAIR or INSTALL new components. TEST the system for normal operation.
NO : Vehicles equipped with an expansion tank, go to B6. Vehicles equipped with a degas bottle, go to B7.

B6 CHECK THE PRESSURE RELIEF CAP

- Carry out the pressure relief cap pressure test. Refer to **Component Tests**, Pressure Relief Cap Pressure Test.
- **Is the pressure relief cap OK?**
YES : Go to B7.
NO : INSTALL a new pressure relief cap. TEST the system for normal operation.

B7 CHECK THE ENGINE COOLANT FOR AN INTERNAL LEAK

- Inspect the engine coolant in the degas bottle or coolant expansion tank for signs of engine oil or transmission fluid.
- **Is engine oil or transmission fluid evident in the coolant?**
YES : If engine oil is evident, go to **ENGINE SYSTEM - GENERAL INFORMATION** article for engine diagnosis. If transmission fluid is evident, INSTALL a new radiator. REPAIR the transmission as necessary. Refer to the appropriate Automatic Transmission article for the procedure. TEST the system for normal operation.
NO : Go to B8.

B8 CHECK THE ENGINE OIL AND TRANSMISSION FLUID FOR COOLANT

- Remove the oil level indicators from the engine and the transmission.
- **Is coolant evident in the oil or transmission fluid?**

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

YES : If coolant is in the engine oil, go to **ENGINE SYSTEM - GENERAL INFORMATION** article. If coolant is in the transmission fluid, **INSTALL** a new radiator. **REPAIR** the transmission as necessary. Refer to the appropriate Automatic Transmission article for the procedure.

NO : Go to B9.

B9 CHECK THE COOLING SYSTEM FOR COMBUSTION GASES

NOTE: **Use U-View® Combustion Leak Tester part number 560000 or equivalent.**

- Using a cooling system combustion gas leak tester, following the instructions supplied with the tester, check the coolant for combustion gases.

- **Are combustion gases present?**

YES : Go to **ENGINE SYSTEM - GENERAL INFORMATION** article for engine diagnosis.

NO : Go to B10.

B10 CHECK COOLANT CONDITION

- Check the coolant for dirt, rust or contamination and check the coolant concentration.
- **Is the coolant condition OK?**

YES : Vehicles equipped with an electric cooling fan, go to B11 . Vehicles equipped with only a mechanical cooling fan, go to B12 .

NO : **FLUSH** the engine cooling system. **REFER** to **Cooling System Flushing**. **TEST** the system for normal operation.

B11 CHECK THE ELECTRIC COOLING FAN OPERATION

- Start the engine.
- Place the climate control function selector in the MAX A/C position and the blower motor switch in the HI position.
- **Did the electric cooling fan operate?**

YES : If the vehicle is also equipped with a mechanical cooling fan, go to B12 . Otherwise, go to B13 .

NO : **DIAGNOSE** the electric cooling fan operation. **REFER** to **Introduction - Gasoline Engines** article.

B12 CHECK THE MECHANICAL COOLING FAN OPERATION

- Key in OFF position.
- If the vehicle is equipped with a viscous fan clutch, carry out the Fan Clutch Tests in the **Component Tests**. If the vehicle is equipped with an electronically actuated fan clutch, refer to the **Introduction - Gasoline Engines** article.
- **Is the cooling fan operation OK?**

YES : Go to B13.

NO : **INSTALL** a new fan clutch. **TEST** the system for normal operation.

B13 CHECK THE COOLANT PUMP OPERATION

- Start the engine.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- Allow the engine to run for 10 minutes (hot side thermostat equipped vehicles) or 30 minutes (cold side thermostat equipped vehicles). Place the climate control function selector in the MAX HEAT position. Feel the heater outlet hose.

- **Is the heater outlet hose hot?**

YES : Go to B14.

NO : INSTALL a new coolant pump. TEST the system for normal operation.

B14 CHECK THE THERMOSTAT OPERATION

- Start the engine.
- Allow the engine to run for 10 minutes (hot side thermostat equipped vehicles) or 30 minutes (cold side thermostat equipped vehicles). Feel the upper radiator hose (hot side thermostat equipped vehicles) or the lower radiator hose (cold side thermostat equipped vehicles).
- **Is the upper (hot side thermostat equipped vehicles) or lower (cold side equipped vehicles) radiator hose hot?**

YES : CHECK the engine coolant temperature gauge operation. REFER to **INSTRUMENT CLUSTER (IC), MESSAGE CENTER, AND WARNING CHIMES** article.

NO : Go to B15.

B15 VISUALLY INSPECT THE THERMOSTAT

- Carry out the Thermostat Visual Inspection in the **Component Tests**.
- **Is the thermostat damaged?**

YES : INSTALL a new thermostat. TEST the system for normal operation.

NO : INSTALL a new thermostat. TEST the system for normal operation. If the engine still overheats, INSTALL a new radiator. TEST the system for normal operation.

Pinpoint Test C: The Engine Does Not Reach Normal Operating Temperature

Normal Operation

The engine cooling system functions to maintain engine temperatures during operation. Correct coolant flow through the engine, radiator and remainder of cooling system passages and components is essential to maintaining a correct engine temperature.

Engine coolant flows primarily from the engine to the radiator circuit and back to the coolant pump. From the coolant pump, coolant is sent through the engine block and cylinder heads. A separate circuit from the engine also feeds the heater core with coolant. On most engines, the coolant pump is operated by engine rotation through a pulley which is driven by the accessory drive belt to circulate the coolant. Some engines use a belt driven by a pulley attached to the camshaft, and some engines use a sprocket driven by the timing chain to operate the coolant pump. The coolant thermostat is a control valve actuated by coolant temperature. When the thermostat is closed, coolant flow bypasses the radiator circuit and returns to the coolant pump. When the thermostat is opened, coolant is allowed to flow through the radiator circuit in order to transfer engine generated heat to the outside air.

Concerns of engine inability to reach normal operating temperature typically occur when the rate of coolant flow through some coolant circuits (radiator, heater core) is more than expected given the conditions, or when the cooling fans operate all the time (electric fans) or the fan clutch is always engaged (engine driven fans).

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

Heat is not allowed to build in the engine because a heat exchanger is removing too much heat, including the radiator, heater core and oil cooler. In addition, perceived concerns that the engine does not reach normal operating temperature can be related to a low coolant level or trapped air which does not allow for hot coolant to be available at the heater core, an inoperative climate control system, or for concerns perceived or related to an incorrect engine temperature gauge indication.

For vehicle/engine specific information, refer to **Engine Cooling**.

- DTC P0125 Insufficient Coolant Temp for Closed Loop Fuel Control
- DTC P0128 Coolant Thermostat (Coolant Temp Below Thermostat Regulating Temperature)

This pinpoint test is intended to diagnose the following:

- Low coolant level
- Thermostat
- Engine coolant temperature (ECT) indicator system (gauge)
- Engine cooling fan

PINPOINT TEST C: THE ENGINE DOES NOT REACH NORMAL OPERATING TEMPERATURE

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

C1 CARRY OUT INSPECTION AND VERIFICATION

- Carry out the **Inspection and Verification**.
- **Were any concerns found?**
YES : REPAIR as needed. TEST the system for normal operation.
NO : Go to C2.

C2 CHECK FOR DTCs P0125 or P0128

NOTE: Refer to the **Introduction - Gasoline Engines** article for correct scan tool hook-up procedure.

- Check for DTC P0125 or P0128.
- **Is DTC P0125 or P0128 present?**
YES : If the vehicle is equipped with an electric cooling fan, go to C3. If the vehicle is equipped with only a mechanical cooling fan, go to C4.
NO : The cooling system is operational. If an inoperative engine coolant temperature gauge is suspected, CHECK the engine coolant temperature gauge operation. REFER to **INSTRUMENT**

CLUSTER (IC), MESSAGE CENTER, AND WARNING CHIMES article. If an inoperative climate control system is suspected, CHECK the climate control system operation. REFER to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article. If any other DTCs are retrieved, REFER to the **Introduction - Gasoline Engines** article.

C3 CHECK THE ELECTRIC COOLING FAN OPERATION

- Allow the engine to cool.
- Make sure the A/C switch is OFF (if equipped).
- Start the engine.
- Check the electric cooling fan.
- **Is the electric cooling fan on all the time?**

YES : DIAGNOSE the electric cooling fan operation. REFER to the **Introduction - Gasoline Engines** article.

NO : If the vehicle is also equipped with a mechanical cooling fan, go to C4. Otherwise, go to C5.

C4 CHECK THE MECHANICAL COOLING FAN OPERATION

- Carry out the Cooling Fan Clutch **Component Tests**. For a mechanical cooling fan clutch, refer to **Component Tests**. For an electronic cooling fan clutch, refer to the **Introduction - Gasoline Engines** article.
- **Is the cooling fan clutch OK?**

YES : Go to C5.

NO : INSTALL a new cooling fan clutch. TEST the system for normal operation.

C5 CHECK THE COOLANT LEVEL

NOTE: **Allow the engine to cool before checking the coolant level.**

- Visually check the engine coolant level in the degas bottle or coolant expansion tank.
- **Is the engine coolant level within specification?**

YES : INSTALL a new thermostat. TEST the system for normal operation.

NO : Go to **Pinpoint Test A** to diagnose a coolant leak.

Component Tests

Pressure Test - Degas Bottle Systems

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

NOTE: Vehicles equipped with a degas bottle system have the pressure relief cap on the degas bottle and no radiator cap. Vehicles equipped with a coolant

expansion tank system have the pressure relief cap on the radiator.

1. Turn the engine OFF.
2. Check the engine coolant level. Adjust the coolant level as necessary.
3. Attach the Radiator/Heater Core Pressure Tester to the degas bottle nipple and overflow hose. Install a pressure test pump to the quick connect fitting of the test adapter.

NOTE: Do not pressurize the cooling system beyond the maximum pressure listed in the SPECIFICATIONS or cooling system components may be damaged.

NOTE: If the plunger of the pressure tester is depressed too fast, an erroneous pressure reading will result.

4. Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained. If the pressure reading exceeds the maximum cap pressure listed in the specifications table, install a new pressure relief cap.
5. If the system does not hold pressure, remove the pressure relief cap and wash in clean water to dislodge all the foreign material from the gasket. Check the sealing surface in the filler neck of the degas bottle for nicks or cuts. Install the pressure relief cap.
6. Pressurize the engine cooling system as described in Step 4 above. Observe the gauge reading for approximately 2 minutes. Pressure should not drop during this time. If the pressure drops within this time, inspect for leaks and repair as necessary.
7. If no leaks are found and the pressure drops, the pressure relief cap may be leaking. Install a new pressure relief cap and retest the system.
8. If no leaks are found after a new pressure relief cap is installed, and the pressure drops, the leak may be internal to the radiator transmission cooler (if equipped). Inspect the coolant for transmission fluid and the transmission fluid for coolant. Repair as necessary.
9. If there is no contamination of the coolant or transmission fluid, the leak may be internal to the engine. Inspect the coolant for engine oil and the engine oil for coolant. Refer to ENGINE SYSTEM - GENERAL INFORMATION article to diagnose the engine.
10. Release the system pressure by loosening the pressure relief cap. Check the coolant level and adjust as necessary.

Pressure Test - Coolant Expansion Tank Systems

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

NOTE: Vehicles equipped with a degas bottle system have the pressure relief cap on the degas bottle and no radiator cap. Vehicles equipped with a coolant expansion tank system have the pressure relief cap on the radiator.

1. Turn the engine OFF.
2. Remove the pressure relief cap. Top off the radiator as needed. Fit the pressure tester to the radiator fill neck.

NOTE: Do not pressurize the cooling system beyond 138 kPa (20 psi) or cooling system components may be damaged.

NOTE: If the plunger of the pressure tester is depressed too fast, an incorrect pressure reading will result.

3. Pump the cooling system to a maximum of 138 kPa (20 psi) and hold for 2 minutes. If the pressure drops within this time, inspect for leaks and repair as necessary.
4. If no leaks are found and the pressure drops, the leak may be internal to the radiator transmission cooler (if equipped). Inspect the coolant for transmission fluid and the transmission fluid for coolant. Repair as necessary.
5. If there is no contamination of the coolant or transmission fluid, the leak may be internal to the engine. Inspect the coolant for engine oil and the engine oil for coolant. Refer to **ENGINE SYSTEM - GENERAL INFORMATION** article to diagnose the engine.

Cap

1. Inspect the pressure relief cap and seals for damage or deterioration. Install a new pressure relief cap if necessary.
2. Fit the pressure relief cap to the Radiator/Heater Core Pressure Tester Kit using the correct adapter.

NOTE: If the plunger of the pressure tester is depressed too fast, an incorrect pressure reading will result.

3. Slowly pump the pressure tester until the pressure gauge stops increasing and note the highest pressure reading. Release the pressure and repeat the test. Install a new pressure relief cap if the pressure is not within specification. Refer to **SPECIFICATIONS**.

Thermostat

A new thermostat should be installed only after the following tests and checks have been carried out:

- Pinpoint Test A, B or C
- Thermostat Visual Inspection

Thermostat Visual Inspection

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

1. Remove the thermostat.
2. Examine the thermostat for signs of damage including:
 - Valve not fully seated (light visible through the valve)
 - Foreign material lodged in the main valve
 - Bent or broken frame or flange
 - Bent or broken spring
 - Bent or broken valve or valve stem
 - Wax leaking from wax reservoir or a bulge in the reservoir
 - Any other damage or distortion

NOTE: If no damage is found during the inspection, do not attempt to open the thermostat using hot water or other heat sources. This method is not an accurate means to test the function of the thermostat and may damage the thermostat.

3. If damage is found during the inspection, remove any foreign material or broken pieces and install a new thermostat.
4. If no damage is found during the inspection, continue troubleshooting the system concern. Go to the Symptom Chart for further instructions.

Radiator Leak Test, Removed From Vehicle

NOTE: Never leak test an aluminum radiator in the same water that copper/brass radiators are tested in. Flux and caustic cleaners may be present in the cleaning tank and they will damage aluminum radiators.

NOTE: Always install plugs in the oil cooler fittings before leak testing or cleaning any radiator.

NOTE: Clean the radiator before leak testing to avoid contamination of tank.

1. Leak test the radiator in clean water with 138 kPa (20 psi) air pressure.

Fan Clutch Test

1. Turn the engine OFF and wait until the fan comes to a complete stop.
2. Spin the fan blade by hand. A light resistance should be felt. If there is no resistance or very high resistance, the minimum and maximum fan speeds must be checked. For an electronically actuated fan clutch, refer to the **Introduction - Gasoline Engines** article. For a viscous fan clutch, carry out the following:

Fan Clutch Test - Minimum Speed Requirement

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

1. Use a suitable marker to mark the coolant pump or fan pulley and one of the fan blades.
2. Make sure the A/C is OFF, if equipped.

WARNING: Do not operate the engine with the hood open until the fan blade has been examined for possible cracks and separation. A damaged fan can separate during operation. Failure to follow this instruction may result in serious personal injury.

3. Start the engine and run it at approximately 2,000 RPM for 5 minutes or until there is a noticeable reduction in fan noise to allow the fan clutch to go into disengaged mode.
4. Aim a laser photo tachometer at the coolant pump or fan pulley. Run the engine to achieve 3,000 RPM at the coolant pump or fan pulley.
5. With the coolant pump or fan pulley at 3,000 RPM, aim the laser photo tachometer at the fan blade. Monitor and record fan speed.
6. The fan blade speed must be less than the specified RPM at 3,000 RPM coolant pump or fan pulley RPM. Refer to the **SPECIFICATIONS** for correct fan speed.
7. Turn the engine off.
8. If the fan blade speed was greater than specified, install a new fan clutch.

Fan Clutch Test - Maximum Speed Requirement

1. Use a suitable marker to mark the coolant pump or fan pulley and one of the fan blades.
2. Block off areas on each side of the radiator in the engine compartment, the front of the radiator grille and the bumper. Close the hood. This will raise the temperature of the air striking the fan clutch and should cause the fan blade to operate at maximum speed.
3. Place the climate control function selector switch in the MAX A/C position and the blower motor switch in the HI position, if equipped.

WARNING: Do not operate the engine with the hood open until the fan blade has been examined for possible cracks and separation. A damaged fan can separate during operation. Failure to follow this instruction may result in serious personal injury.

NOTE: Do not open the hood to check the coolant pump or fan pulley temperature. This will lower the temperature of the air reaching the fan clutch and void the test. Aim the infrared thermometer through the wheel well or from under the vehicle.

4. Start the engine and run it at approximately 2,000 RPM until normal operating temperature has been achieved. Using an infrared thermometer, monitor the coolant pump or fan pulley. Run the engine until the coolant pump or fan pulley is at least 96°C (205°F).

NOTE: Do not open the hood to check the coolant pump or fan pulley or fan blade

speed. This will lower the temperature of the air reaching the fan clutch and void the test. Aim the laser photo tachometer through the wheel well or from under the vehicle.

- 5. Aim a laser photo tachometer at the coolant pump or fan pulley. Run the engine to achieve 3,000 RPM at the coolant pump or fan pulley.
- 6. With the coolant pump or fan pulley at 3,000 RPM, aim the laser photo tachometer at the fan blade. Monitor and record fan blade speed.
- 7. The fan blade speed must be greater than the specified RPM at 3,000 RPM coolant pump or fan pulley RPM. Refer to the **SPECIFICATIONS** for correct fan speed.
- 8. Open the hood and allow the engine to idle momentarily to lower engine temperature. Turn the engine off and remove the blocks from the radiator, grille and bumper.
- 9. If the fan blade speed is less than specified, install a new fan clutch.

GENERAL PROCEDURES

COOLING SYSTEM DRAINING, FILLING AND BLEEDING

Special Tools

Illustration	Tool Name	Tool Number
	RADKITPLUS	078-00497

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1

Draining

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

NOTE: The coolant must be recovered in a suitable, clean container for reuse. If the

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

coolant is contaminated, it must be recycled or disposed of correctly. Using contaminated coolant may result in damage to the engine or cooling system components.

NOTE: Less than 80% of coolant capacity can be recovered with the engine in the vehicle. Dirty, rusty or contaminated coolant should be drained and filled with new coolant.

1. Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise or the radiator cap counterclockwise to the first stop. When the pressure is released, remove the pressure relief cap/radiator cap.
2. Place a suitable container below the radiator draincock. Open the draincock and drain the engine coolant.
 - Close the radiator draincock.

Filling and Bleeding with RADKITPLUS

1. Install the RADKITPLUS and follow the RADKITPLUS manufacturer's instructions to fill and bleed the cooling system.

Filling and Bleeding without RADKITPLUS

NOTE: The engine cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

NOTE: Engine coolant provides freeze protection, boil protection, cooling efficiency, and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.

When adding engine coolant, use a 50/50 mixture of engine coolant and deionized water.

To maintain the integrity of the coolant and the cooling system:

- Add Motorcraft Premium Gold Engine Coolant or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.
- Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.
- Do not add alcohol, methanol, or brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- **Ford Motor Company does NOT recommend the use of recycled engine coolant in vehicles originally equipped with Motorcraft Premium Gold Engine Coolant since a Ford-approved recycling process is not yet available.**

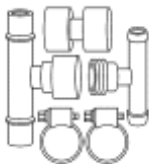
1. Fill the radiator through the degas bottle until the coolant level is between the COOLANT FILL LEVEL marks.
2. Select the maximum heater temperature and blower motor speed settings. Position the control to discharge air at A/C vents in instrument panel.
3. Start the engine and allow to idle. While engine is idling, feel for hot air at A/C vents.

NOTE: **If the air discharge remains cool and the engine coolant temperature gauge does not move, the engine coolant level is low and must be filled. Stop the engine, allow the engine to cool and fill cooling system. Failure to follow these instructions may result in damage to the engine.**

4. Start the engine and allow it to idle until normal operating temperature is reached. Hot air should discharge from A/C vents. The engine coolant temperature gauge should maintain a stabilized reading in the middle of the NORMAL range. The upper radiator hose should feel hot to the touch.
5. Shut the engine off and allow the engine to cool.
6. Check the engine for coolant leaks.
7. Check the engine coolant level in the degas bottle and fill as necessary.

COOLING SYSTEM FLUSHING

Special Tools

Illustration	Tool Name	Tool Number
 ST2421-A	Coolant System Drain/Flush/Fill	164-R3673 or equivalent
 ST1167-A	Drain Kit	164-R3662 or equivalent
 ST1168-A	Flush Kit	164-R3658 or equivalent

2008 Ford Mustang
2008 ENGINE Engine Cooling - Mustang

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Premium Cooling System Flush VC-1	ESR-M14P7-A

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

- Once pressure is released, remove the pressure relief cap/radiator cap.
- Drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding.
- Remove the coolant thermostat. For additional information, refer to Thermostat and Thermostat Housing - Exploded View, Thermostat - 4.0L SOHC, Thermostat - 4.6L (3V) or Thermostat - 5.4L (4V).
- Install the coolant hose connection without the thermostat.

NOTE: Refer to the cooling system flusher manufacturer's operating instructions for specific vehicle hook-up.

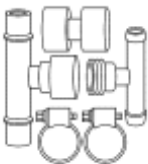
- Using an appropriate cooling system flusher, flush the engine and radiator.

Use Premium Cooling System Flush or equivalent meeting Ford specification ESR-M14P7-A. Always flush the cooling system with water thoroughly after using the VC-1 flush and prior to filling the cooling system with the same coolant that was present in the system. Do not mix coolant types.
- Install the thermostat. For additional information, refer to Thermostat and Thermostat Housing - Exploded View and Thermostat - 4.0L SOHC, Thermostat - 4.6L (3V) or Thermostat - 5.4L (4V).
- Backflush the heater core. For additional information, refer to Heater Core Backflushing.
- Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding.

HEATER CORE BACKFLUSHING

Special Tools

Illustration	Tool Name	Tool Number

 ST1167-A	Drain Kit	164-R3662 or equivalent
 ST1168-A	Flush Kit	164-R3658 or equivalent

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Premium Cooling System Flush VC-1	ESR-M14P7-A

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

- Once pressure is released, remove the pressure relief cap.
 - Partially drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
- NOTE:** For additional information, refer to the cooling system flusher manufacturer's operating instructions for particular vehicle hook-up.
- Use an appropriate cooling system flusher to backflush the heater core. Use Premium Cooling System Flush or equivalent meeting Ford specification ESR-M14P7-A. Flush with water thoroughly after using VC-1 or equivalent prior to refilling the cooling system
 - Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

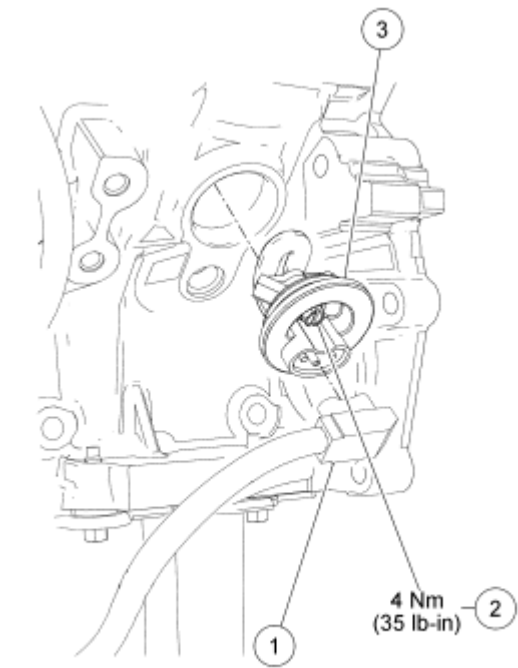
REMOVAL AND INSTALLATION

BLOCK HEATER

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1

NOTE: 4.0L shown, 4.6L (3V) and 5.4L similar.



N0081669

Fig. 3: Exploded View Of Block Heater With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6B019	Block heater electrical connector
2	6A051	Block heater retaining screw
3	6A051	Block heater

REMOVAL AND INSTALLATION

1. Drain the engine cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Disconnect the block heater electrical connector and position aside.

NOTE: Do not loosen the block heater retaining screw more than necessary for

removal.

3. Loosen the block heater retaining screw and remove the block heater.
 - To install, tighten to 4 Nm (35 lb-in).
4. To install, reverse the removal procedure.
 - Lubricate the block heater seal and the cylinder block hole with clean engine coolant to ease installation.
 - Make sure the block heater electrical connector is routed and secured away from rotating or hot components or damage to the cable can occur.
5. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

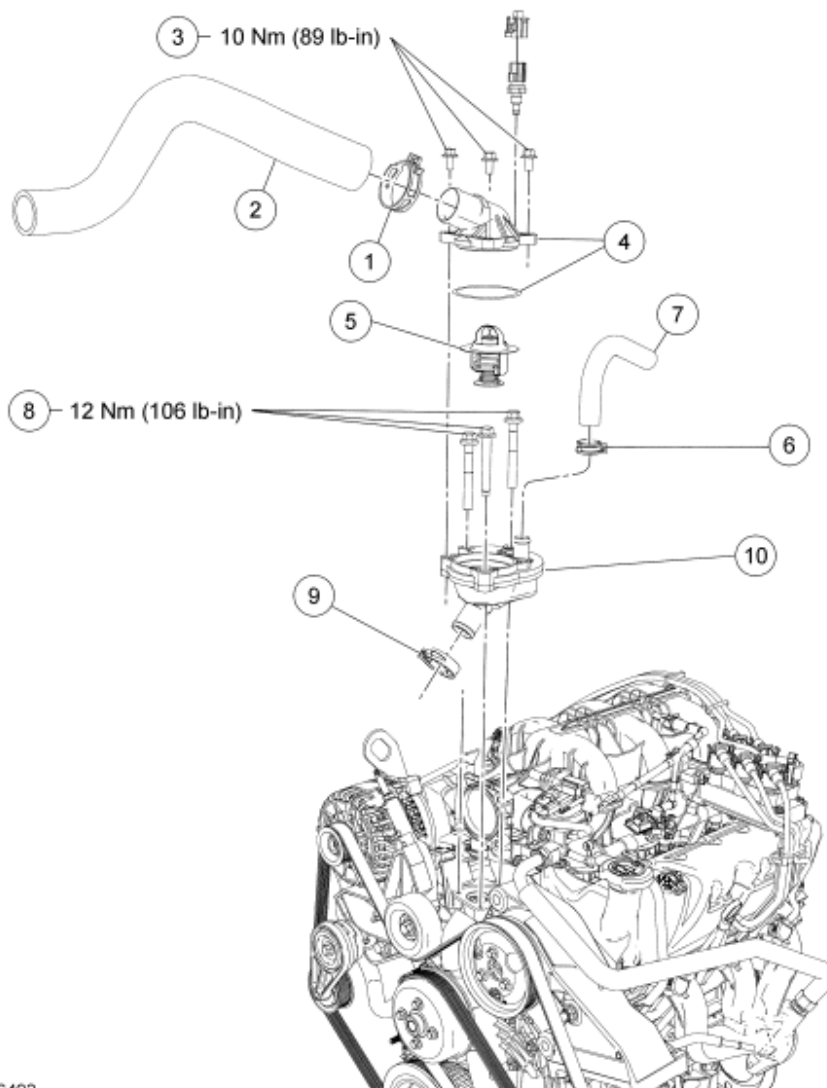
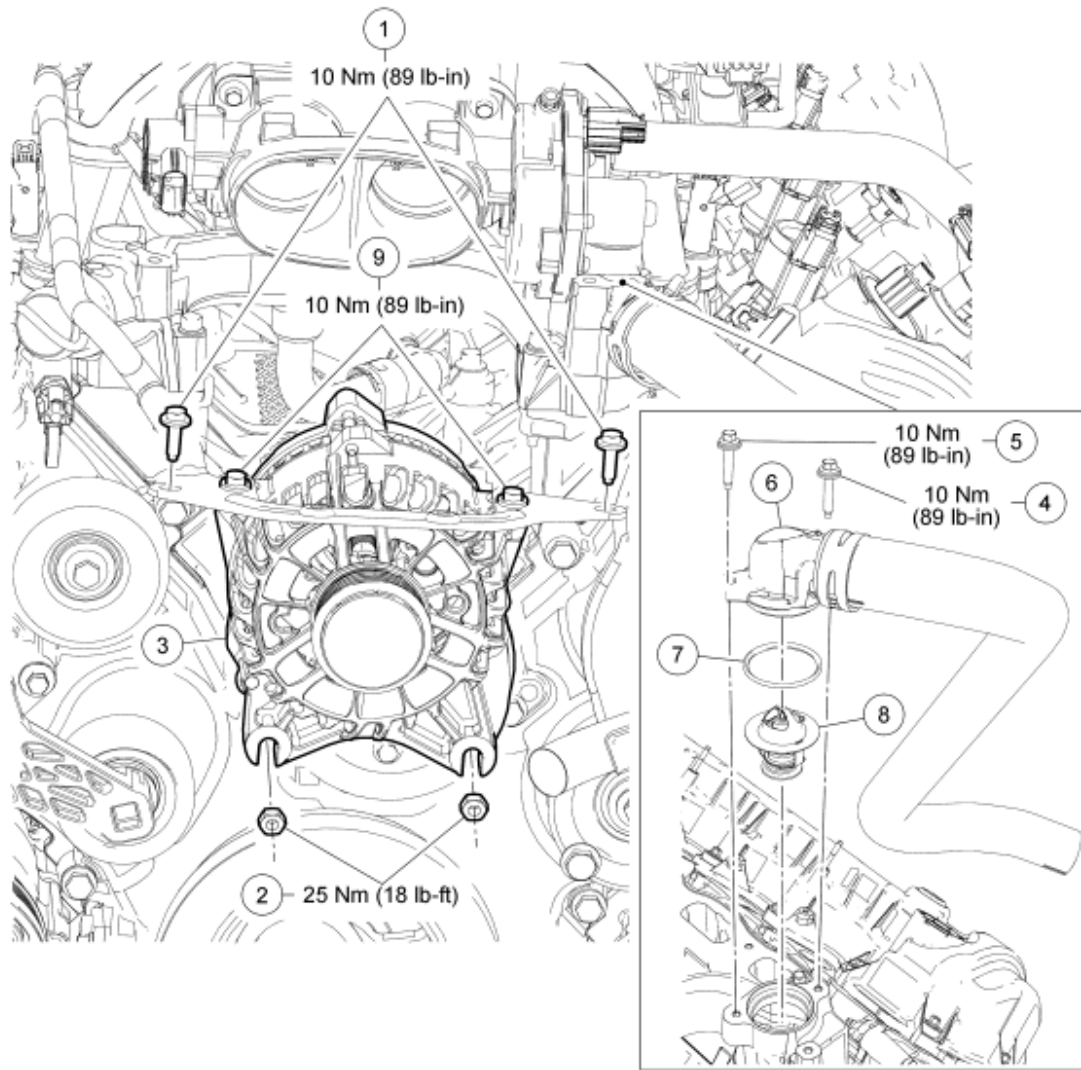
THERMOSTAT AND THERMOSTAT HOUSING - EXPLODED VIEW

Fig. 4: Exploded View Of Thermostat & Thermostat Housing With Torque Specifications - 4.0L (SOHC)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W525966	Upper radiator hose clamp
2	8260	Upper radiator hose
3	W500015	Upper thermostat housing bolts (3 required)
4	8A586	Thermostat housing cover and gasket
5	8575	Thermostat
6	-	Heater inlet hose clamp (part of 18472)
7	18472	Heater inlet hose
8	W702527	Lower thermostat housing bolts (3 required)
9	W525966	Bypass hose clamp
10	8A586	Thermostat housing

2008 Ford Mustang

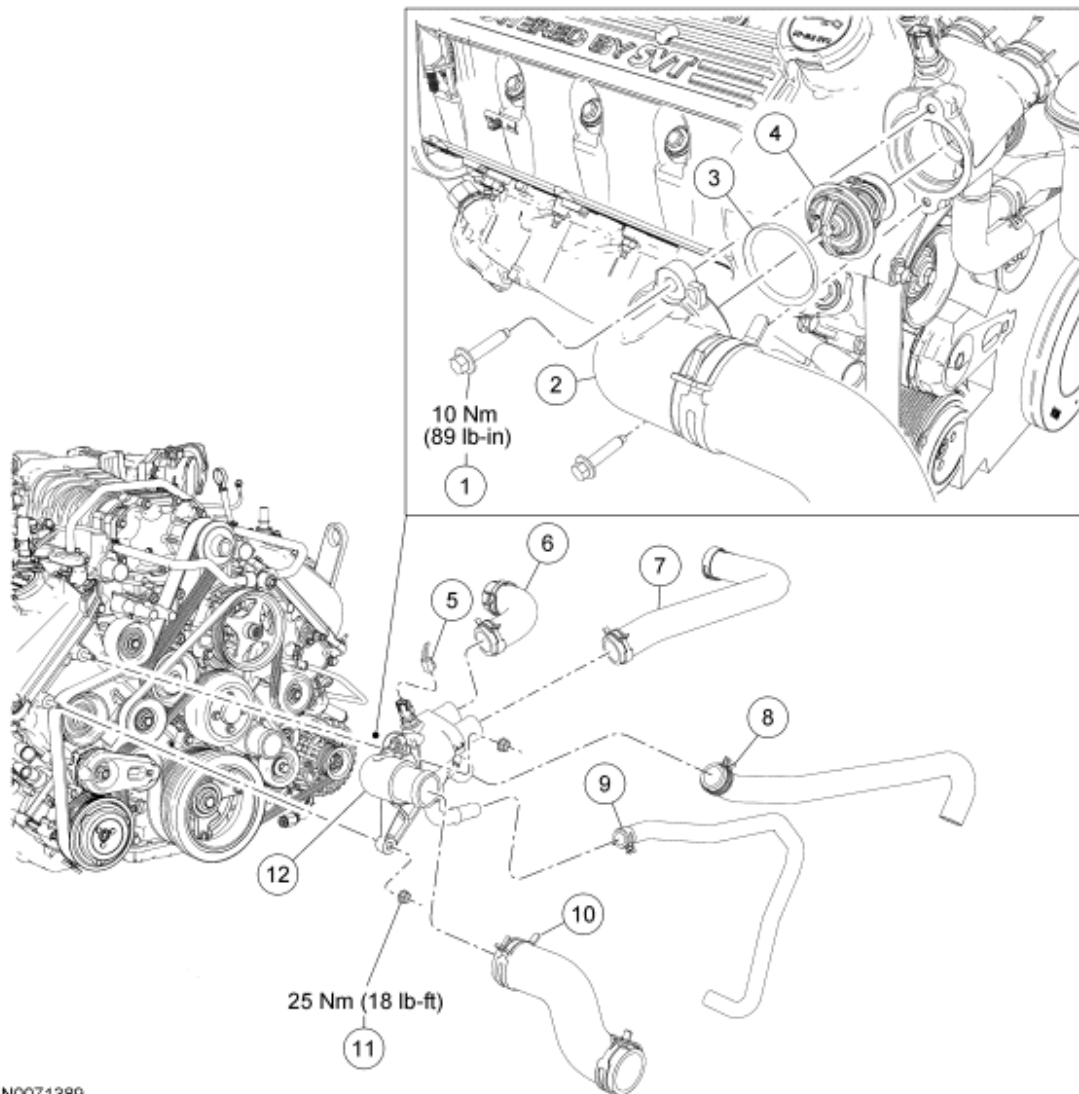
2008 ENGINE Engine Cooling - Mustang



N0080182

Fig. 5: Exploded View Of Thermostat & Thermostat Housing With Torque Specifications - 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	N807309	Generator support bracket outer bolts (2 required)
2	N804758	Generator nuts (2 required)
3	10300	Generator
4	W503279	LH thermostat cover bolt
5	W503279	RH thermostat cover bolt
6	8594	Thermostat cover
7	N806807	Thermostat O-ring seal
8	8575	Thermostat
		Generator support bracket inner bolts (2 required)



N0071389

Fig. 6: Exploded View Of Thermostat & Thermostat Housing With Torque Specifications - 5.4L (4V)
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	N605893	Thermostat housing cover bolt (2 required)
2	8594	Thermostat housing cover
3	-	O-ring seal
4	8575	Thermostat
5	14A464	Engine Coolant Temperature (ECT) sensor electrical connector
6	8A595	Thermostat housing-to-intake manifold hose
7	8A595	Thermostat housing-to-intake manifold hose

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

8	8A594	Thermostat housing-to-lower radiator hose assembly
9	6B851	Thermostat housing-to-oil filter adapter hose
10	8B274	Thermostat housing-to-radiator hose
11	W520413	Thermostat housing nut (2 required)
12	9K478	Thermostat housing

1. For additional information, refer to the procedures.

THERMOSTAT - 4.0L SOHC

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1

REMOVAL AND INSTALLATION

1. Drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING AND CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC)** article.
4. Remove the 3 upper thermostat housing bolts and position aside the thermostat housing.
 - Discard the thermostat O-ring seal.
 - To install, tighten to 10 Nm (89 lb-in).
5. Remove the thermostat.
6. To install, reverse the removal procedure.
 - Install a new thermostat O-ring seal and lubricate with clean engine coolant.
7. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

THERMOSTAT HOUSING - 4.0L SOHC

REMOVAL AND INSTALLATION

1. Drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING AND**

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC) article.

4. Disconnect the Engine Coolant Temperature (ECT) sensor electrical connector.
5. Disconnect the upper radiator hose from the thermostat housing and position aside.
6. Disconnect the heater inlet hose from the thermostat housing and position aside.
7. Disconnect the bypass hose from the thermostat housing and position aside.
8. Remove the 3 lower thermostat housing bolts and the thermostat housing.
 - To install, tighten to 12 Nm (106 lb-in).
9. To install, reverse the removal procedure.
10. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

THERMOSTAT - 4.6L (3V)

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1

REMOVAL

1. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
2. Drain the engine cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
3. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
4. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
5. Disconnect the crankcase vent tube from the intake manifold and position it aside.
6. Remove the 2 generator support bracket outer bolts.
7. Remove the 2 lower generator nuts and position the generator and wiring harness forward.
8. Loosen the 2 generator support bracket inner bolts and position aside the generator and wiring harness.

NOTE: RH thermostat cover bolt has a slotted flange.

9. Remove the LH thermostat cover bolt and loosen the RH bolt.
 - Position aside the thermostat cover and hose assembly.
10. Remove the thermostat O-ring seal and the thermostat.
 - Discard the thermostat O-ring seal.

INSTALLATION

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

NOTE: Lubricate the O-ring seal with clean engine coolant.

1. Install the thermostat with the smaller plate facing upward and a new O-ring seal.
2. Position the thermostat cover and install the LH bolt and RH bolt.
 - Tighten to 10 Nm (89 lb-in).
3. Position the generator and wiring harness.
4. Tighten the 2 generator support bracket inner bolts.
 - Tighten to 10 Nm (89 lb-in).
5. Install the 2 lower generator nuts.
 - Tighten to 25 Nm (18 lb-ft).
6. Install the 2 outer generator support bracket bolts.
 - Tighten to 10 Nm (89 lb-in).
7. Connect the crankcase vent tube to the intake manifold.
8. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
9. Install the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
10. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
11. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

THERMOSTAT - 5.4L (4V)

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1

REMOVAL AND INSTALLATION

1. Drain the engine cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Remove the 2 bolts and position aside the thermostat housing cover and hose assembly.
 - To install, tighten to 10 Nm (89 lb-in).
3. Remove the O-ring seal and the thermostat.
 - Discard the O-ring seal.
4. To install, reverse the removal procedure.
 - Lubricate the new O-ring seal with clean engine coolant.
5. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling**

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

and Bleeding.

THERMOSTAT HOUSING - 5.4L (4V)

REMOVAL AND INSTALLATION

1. Drain the engine cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding.**
2. Remove the degas bottle. For additional information, refer to **Degas Bottle.**
3. Disconnect the Engine Coolant Temperature (ECT) sensor electrical connector.
4. Disconnect the 2 thermostat housing-to-intake manifold hoses and position them aside.
5. Disconnect the thermostat housing-to-lower radiator hose assembly and position it aside.
6. Disconnect the thermostat housing-to-oil filter adapter hose and position it aside.
7. Disconnect the thermostat housing-to-radiator hose and position it aside.
8. Remove the 2 nuts and the thermostat housing.
 - To install, tighten to 25 Nm (18 lb-ft).

NOTE: **Upon installation, make sure all the hoses are fully seated against the stops.**

9. To install, reverse the removal procedure.
10. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding.**

COOLANT CROSSOVER MANIFOLD ASSEMBLY - 4.6L (3V)

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

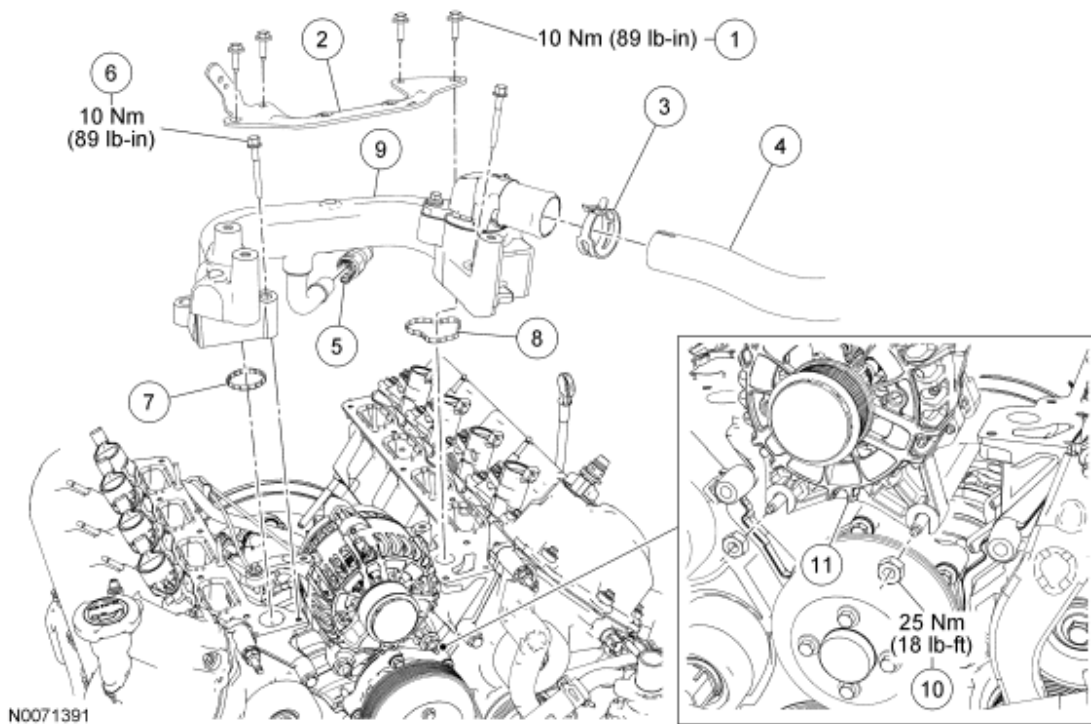


Fig. 7: Exploded View Of Coolant Crossover Manifold Assembly With Torque Specifications - 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	N807309	Generator support bracket bolt (4 required)
2	10153	Generator support bracket
3	15161	Hose clamp
4	8A594	Coolant crossover assembly-to-radiator hose
5	18B402	Heater return and supply hose
6	W710925	Coolant crossover assembly bolt (2 required)
7	8C387	Gasket
8	8C388	Gasket
9	8C369	Coolant crossover assembly
10	N804758	Generator nut (2 required)
11	10300	Generator

REMOVAL AND INSTALLATION

1. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
2. Drain the engine cooling system. For additional information, refer to **Cooling System Draining, Filling**

and Bleeding.

3. Remove the intake manifold. For additional information, refer to **ENGINE - 4.6L (3V)** article.
4. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
5. Remove the 4 bolts and position aside the generator support bracket.
 - To install, tighten to 10 Nm (89 lb-in).
6. Remove the 2 nuts and position aside the generator and wiring harness.
 - To install, tighten to 25 Nm (18 lb-ft).

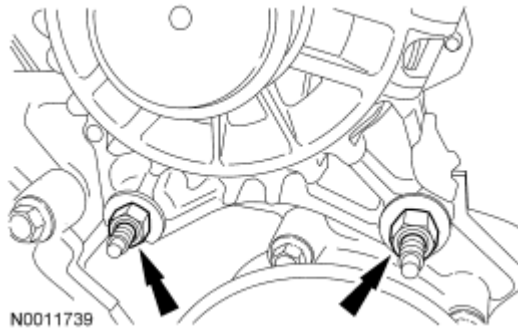


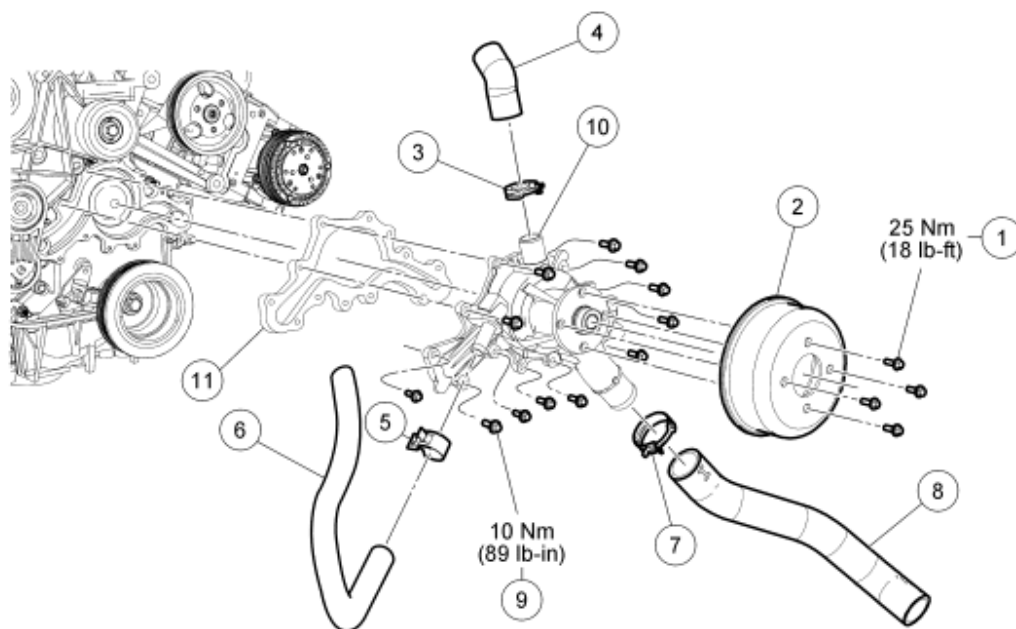
Fig. 8: Locating Generator Nuts
Courtesy of FORD MOTOR CO.

7. Disconnect the coolant crossover assembly-to-radiator hose and position aside.
8. Disconnect the quick connect fitting for the heater return and supply hose and position aside.
9. Remove the 2 coolant crossover assembly bolts and the coolant crossover assembly.
 - Remove and discard the coolant crossover assembly gaskets.
 - To install, tighten to 10 Nm (89 lb-in).
10. To install, reverse the removal procedure.
 - Clean the sealing surfaces and install new coolant crossover assembly gaskets.
11. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding.**

COOLANT PUMP - 4.0L SOHC**Material**

Item	Specification
Motorcraft Metal Surface Prep ZC-31-A	-

2008 ENGINE Engine Cooling - Mustang



N0073921

Item	Part Number	Description
1	N807938	Coolant pump pulley bolt (4 required)
2	8509	Coolant pump pulley
3	W525966	Hose clamp
4	8548	Thermostat housing-to-coolant pump hose
5	8287	Hose clamp
6	18C266	Heater hose
7	8287	Hose clamp
8	8286	Radiator-to-coolant pump hose
9	500014	Coolant pump bolt (12 required)
10	8501	Coolant pump
11	8507	Coolant pump gasket

1. Drain the engine coolant. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
3. Loosen the 4 coolant pump pulley bolts.

2008 Ford Mustang

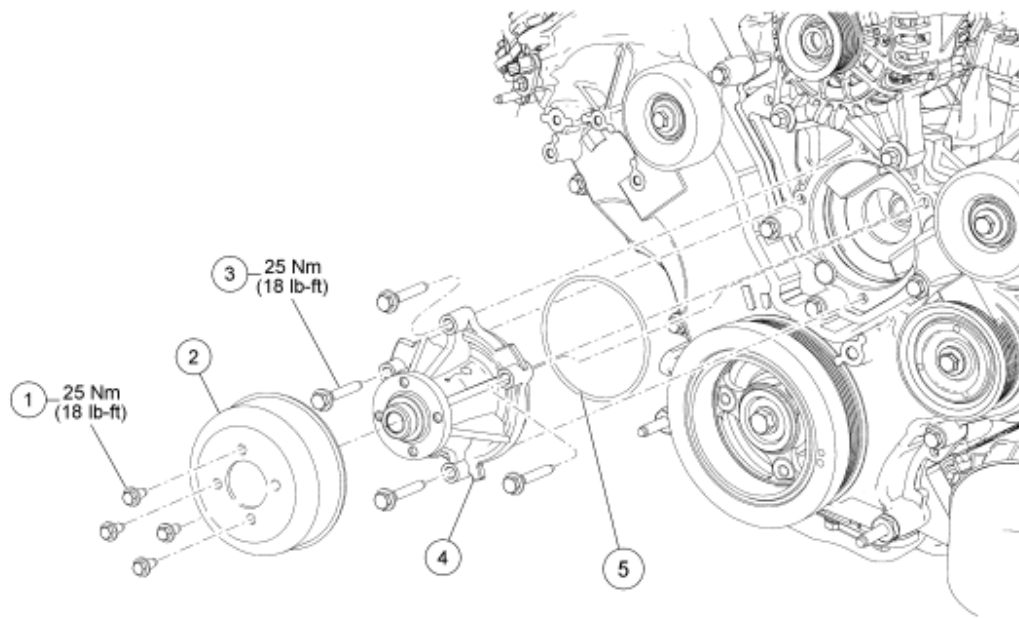
2008 ENGINE Engine Cooling - Mustang

4. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
5. Remove the 4 coolant pump pulley bolts and the coolant pump pulley.
 - To install, tighten to 25 Nm (18 lb-ft).
6. Disconnect the thermostat housing-to-coolant pump hose.
7. Disconnect the heater hose and position aside.
8. Disconnect the radiator-to-coolant pump hose and position aside.
9. Remove the 12 coolant pump bolts and the coolant pump.
 - Discard the coolant pump gasket.
 - Use metal surface cleaner and a suitable plastic or wooden scraper to clean the sealing surfaces.
 - To install, tighten to 10 Nm (89 lb-in).
10. To install, reverse the removal procedure.
 - Install a new coolant pump gasket.
11. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

COOLANT PUMP - 4.6L (3V)

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1



N0004032

Fig. 10: Exploded View Of Coolant Pump With Torque Specifications - 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	N80628	Coolant pump pulley bolt (4 required)
2	A8528	Coolant pump pulley
3	N806177	Coolant pump bolt (4 required)
4	8501	Coolant pump
5	-	Coolant pump O-ring seal

REMOVAL AND INSTALLATION

1. Drain the engine cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
3. Loosen the 4 coolant pump pulley bolts.
4. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
5. Remove the 4 coolant pump pulley bolts and the coolant pump pulley.
 - To install, tighten to 25 Nm (18 lb-ft).
6. Remove the 4 coolant pump bolts and the coolant pump.
 - Discard the coolant pump O-ring seal.
 - To install, tighten to 25 Nm (18 lb-ft).

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

7. To install, reverse the removal procedure.
 - Install a new coolant pump O-ring seal and lubricate with clean engine coolant.
8. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

COOLANT PUMP - 5.4L (4V)

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only)	WSS-M97B51-A1
VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	

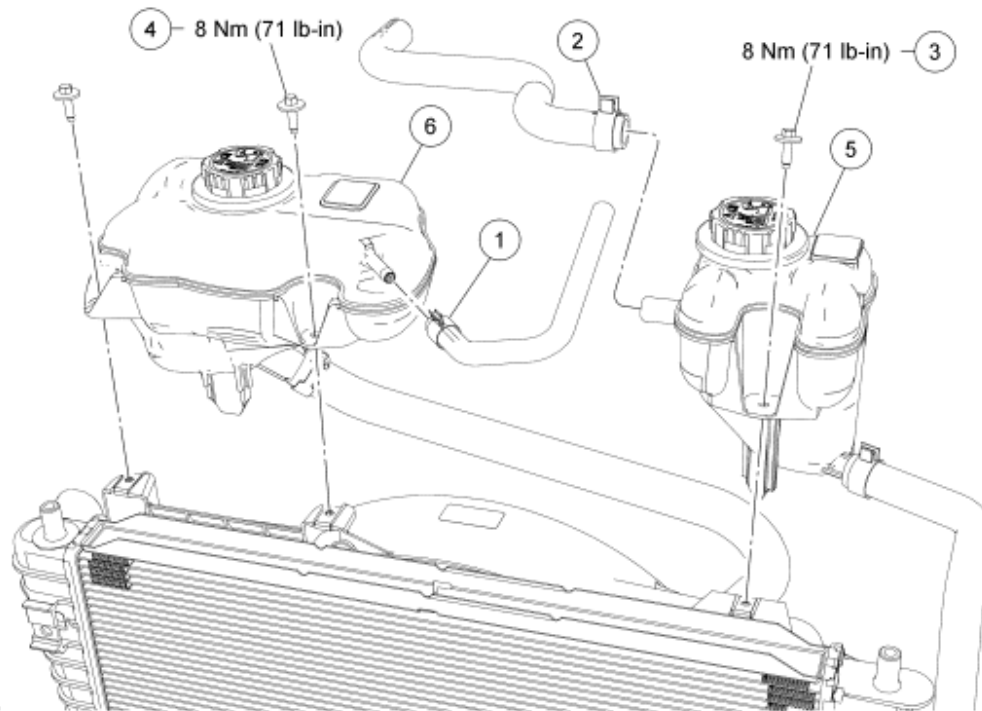


Fig. 11: Exploded View Of Degas Bottle With Torque Specifications - 5.4L (4V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	8276	Upper degas bottle hose
2	8D031	Upper Supercharger (SC) degas bottle hose
3	W503924	SC degas bottle bolt
4	W503924	Degas bottle bolt (2 required)
5	8D028	SC degas bottle
6	8A080	Degas bottle

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

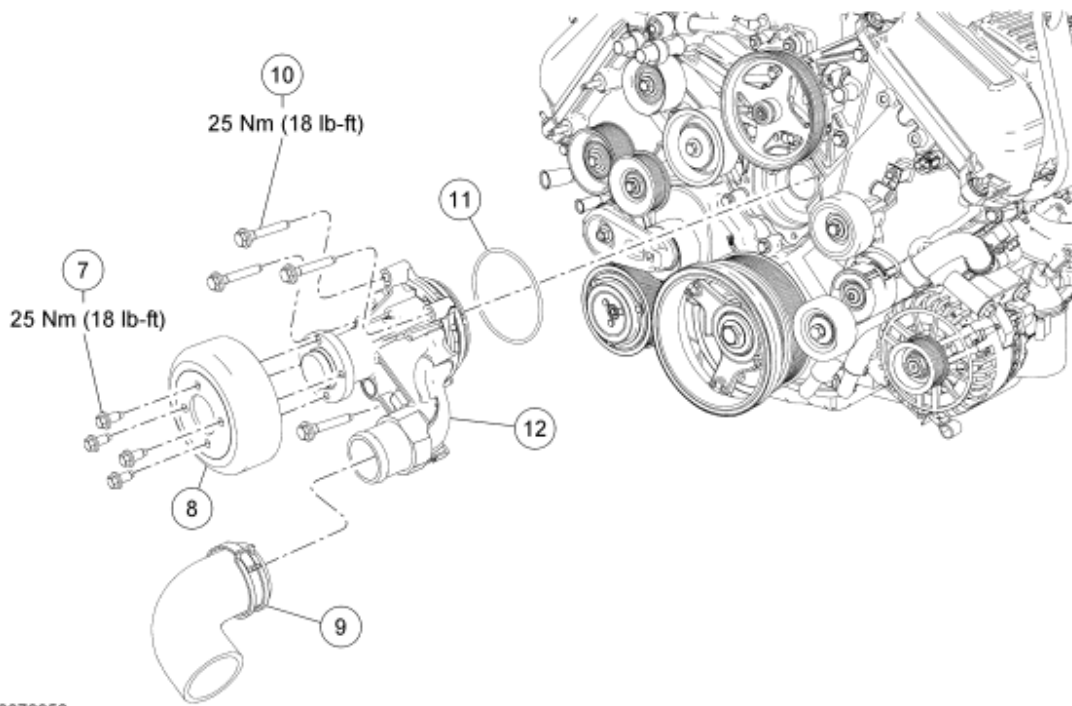


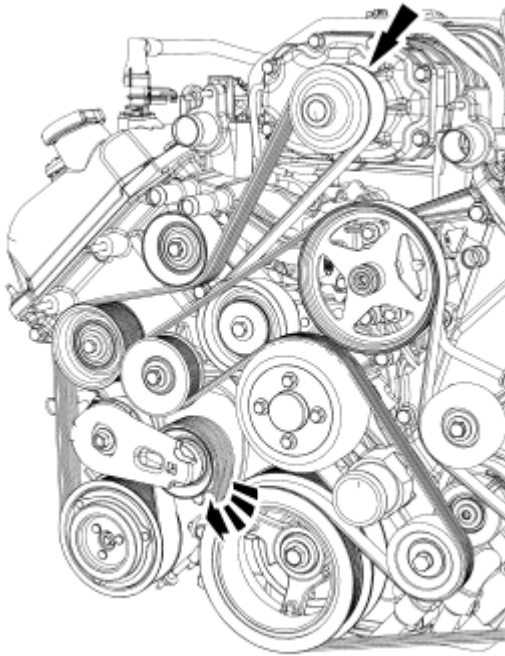
Fig. 12: Exploded View Of Coolant Pump & Pulley With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
7	N806282	Coolant pump pulley bolt (4 required)
8	8A528	Coolant pump pulley
9	8B550	Coolant pump-to-lower radiator hose assembly
10	N806177	Coolant pump bolt (4 required)
11	-	Coolant pump O-ring seal
12	8501	Coolant pump

REMOVAL AND INSTALLATION

1. Drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Drain the Supercharger (SC) cooling system. For additional information, refer to **SUPERCHARGER COOLING** article.
3. Disconnect the upper degas bottle hose, remove the 2 bolts and position aside the degas bottle.
 - To install, tighten to 8 Nm (71 lb-in).
4. Disconnect the upper SC degas bottle hose, remove the bolt and position aside the SC degas bottle.
 - To install, tighten to 8 Nm (71 lb-in).
5. Loosen the 4 coolant pump pulley bolts.

6. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
7. Rotate the SC belt tensioner clockwise and remove the SC belt off the SC.



N0071530

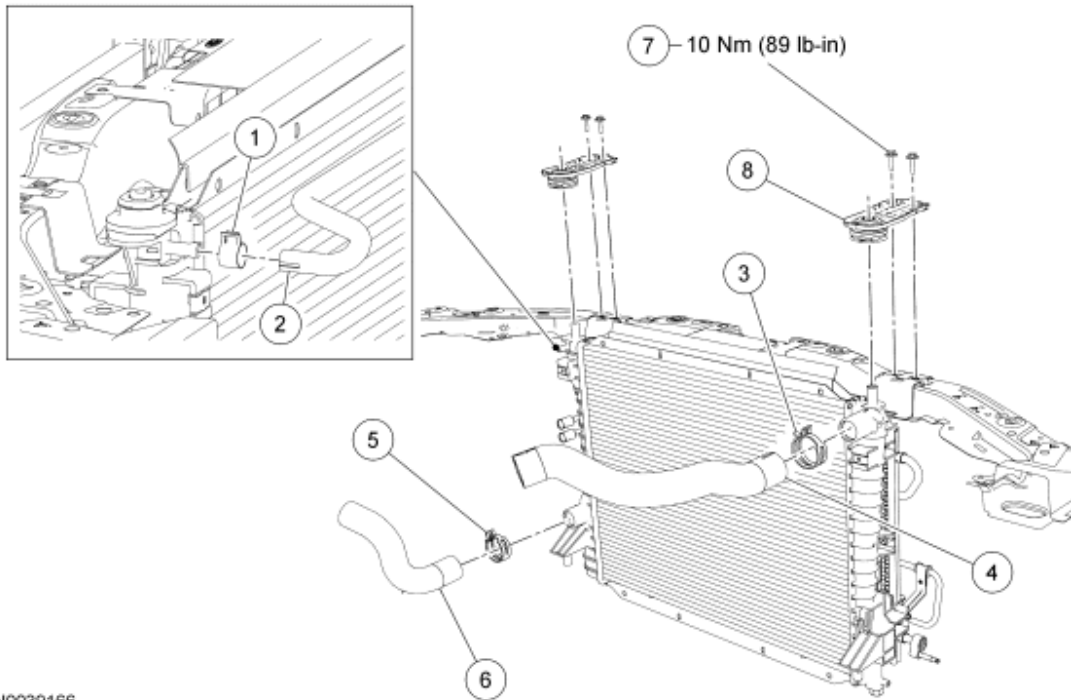
Fig. 13: Rotating SC Belt Tensioner Clockwise & Remove SC Belt Off SC
Courtesy of FORD MOTOR CO.

8. Remove the 4 coolant pump pulley bolts and the coolant pump pulley.
 - To install, tighten to 25 Nm (18 lb-ft).
9. Disconnect the coolant pump-to-lower radiator hose assembly.
10. Remove the 4 bolts and the coolant pump.
 - Discard the coolant pump O-ring seal.
 - To install, tighten to 25 Nm (18 lb-ft).
11. To install, reverse the removal procedure.
 - Install a new coolant pump O-ring seal and lubricate with clean engine coolant.
12. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
13. Fill and bleed the SC cooling system. For additional information, refer to **SUPERCHARGER COOLING** article.

RADIATOR

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang



N0039166

Fig. 14: Exploded View Of Radiator With Torque Specifications (1 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W527383	Hose clamp
2	8C633	Degas bottle-to-radiator hose
3	8287	Hose clamp
4	8260	Upper radiator hose
5	8287	Hose clamp
6	8286	Lower radiator hose
7	W505424	Radiator support bracket bolt (4 required)
8	8226	Radiator support bracket (2 required)

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

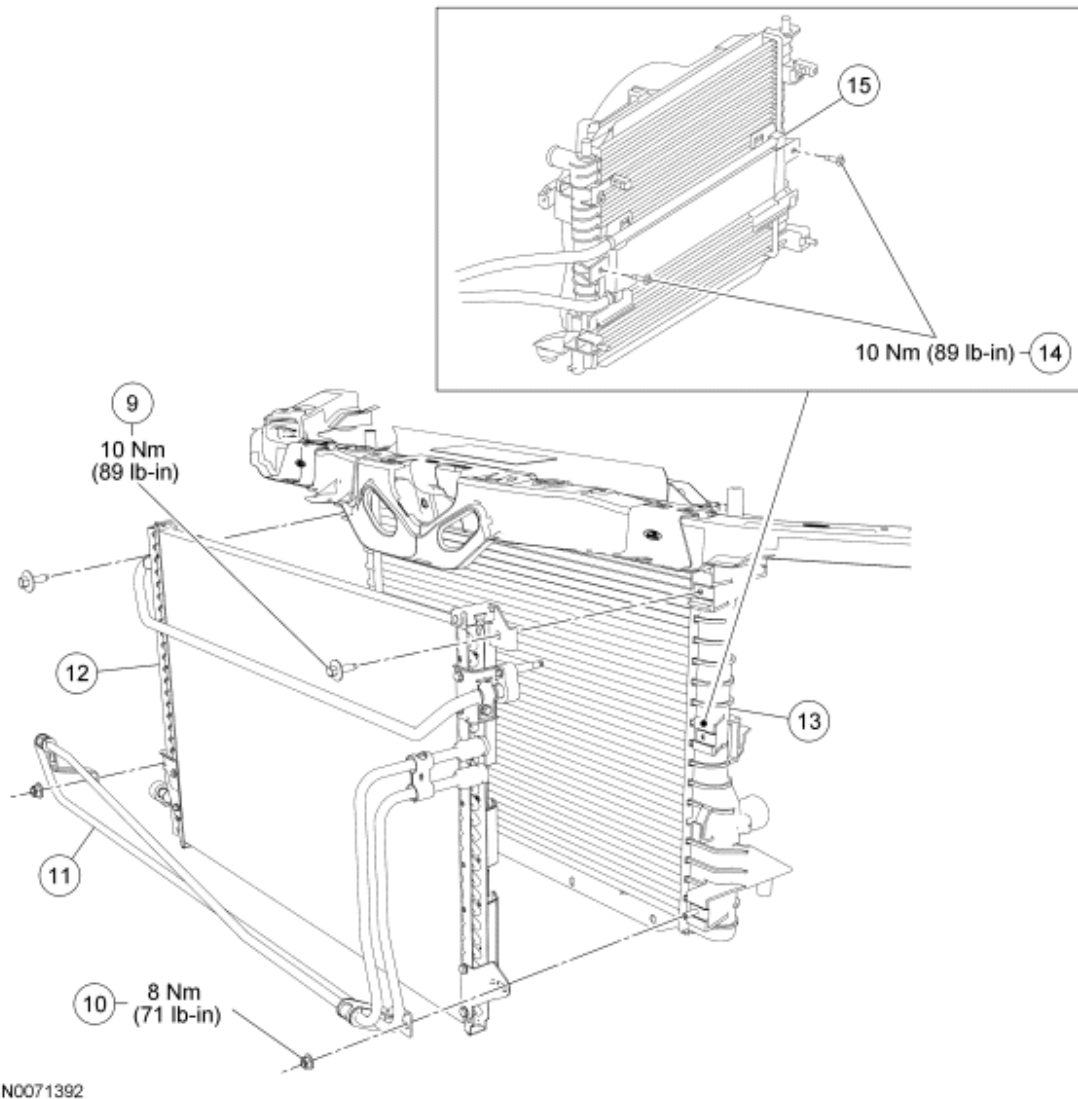


Fig. 15: Exploded View Of Radiator With Torque Specifications (2 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
9	N606676	A/C condenser bolt (2 required)
10	-	A/C condenser retaining nut (2 required)
11	3F780	Power steering tubes
12	19710	A/C condenser
13	8005	Radiator
14	-	Transmission cooler bolts (if equipped)
15	7A095	Transmission cooler (if equipped)

REMOVAL AND INSTALLATION

1. Drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Remove the 7 bolts and the lower splash shield.
 - To install, tighten to 5 Nm (44 lb-in).

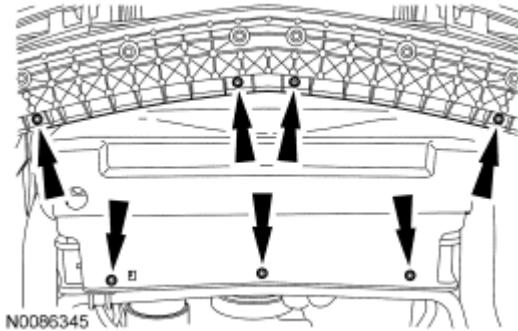


Fig. 16: Locating Lower Splash Shield Bolts
Courtesy of FORD MOTOR CO.

3. Remove the 6 push pin retainers and the air deflector.

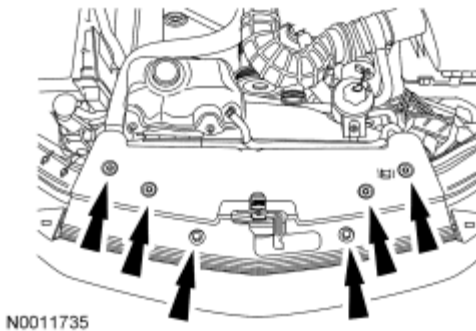


Fig. 17: Locating Pin-Type Retainers And Radiator Sight Shield
Courtesy of FORD MOTOR CO.

4. Remove the cooling fan motor and shroud. For additional information, refer to **Cooling Fan Motor and Shroud**.
5. Disconnect the degas bottle-to-radiator hose and position aside.
6. Disconnect the upper radiator hose from the radiator and position aside.
7. Disconnect the lower radiator hose from the radiator and position aside.
8. Remove the 4 bolts and the radiator support brackets.
 - To install, tighten to 10 Nm (89 lb-in).
9. Remove the 2 power steering tubes and A/C condenser retaining nuts and position aside the power steering tubes.
 - To install, tighten to 8 Nm (71 lb-in).
10. Remove the 2 A/C condenser bolts.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

- To install, tighten to 10 Nm (89 lb-in).
11. If equipped, remove the 2 bolts and the transmission cooler and position aside.
 - To install, tighten to 10 Nm (89 lb-in).
 12. Remove the radiator.
 13. To install, reverse the removal procedure.
 14. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.

COOLING FAN MOTOR AND SHROUD

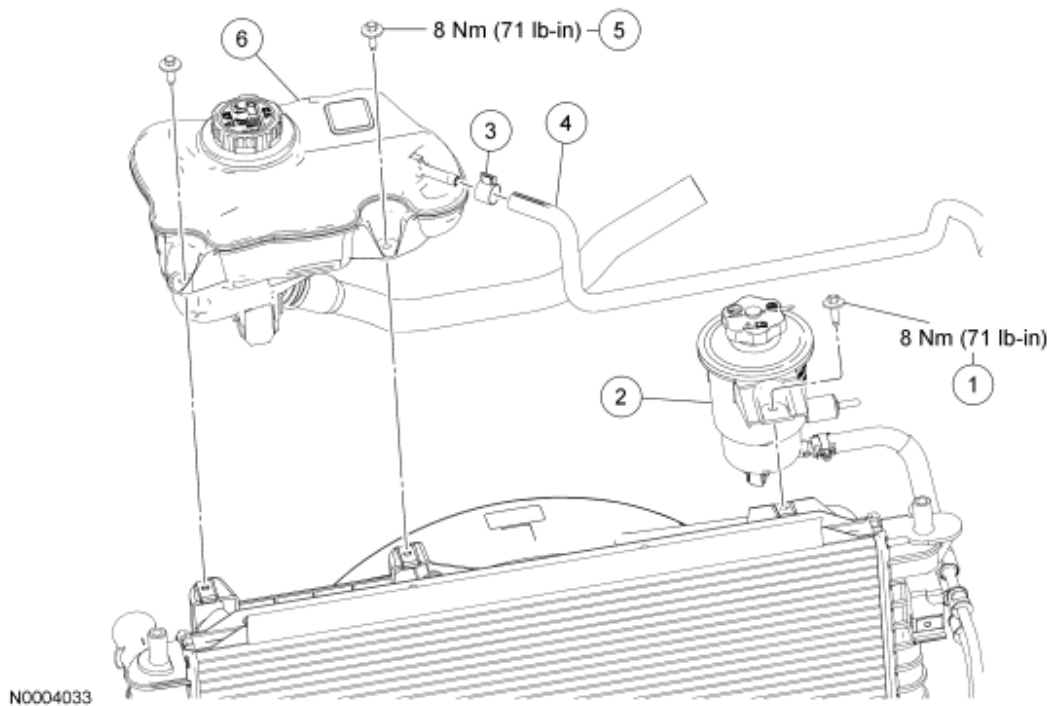


Fig. 18: Exploded View Of Cooling Fan Motor & Shroud With Torque Specifications - 4.0L & 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W503924	Power steering reservoir bolt
2	3R700	Power steering reservoir
3	W527383	Upper degas bottle hose clamp
4	8C633	Upper degas bottle hose
5	W503924	Degas bottle bolt (2 required)
6	8A080	Degas bottle

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

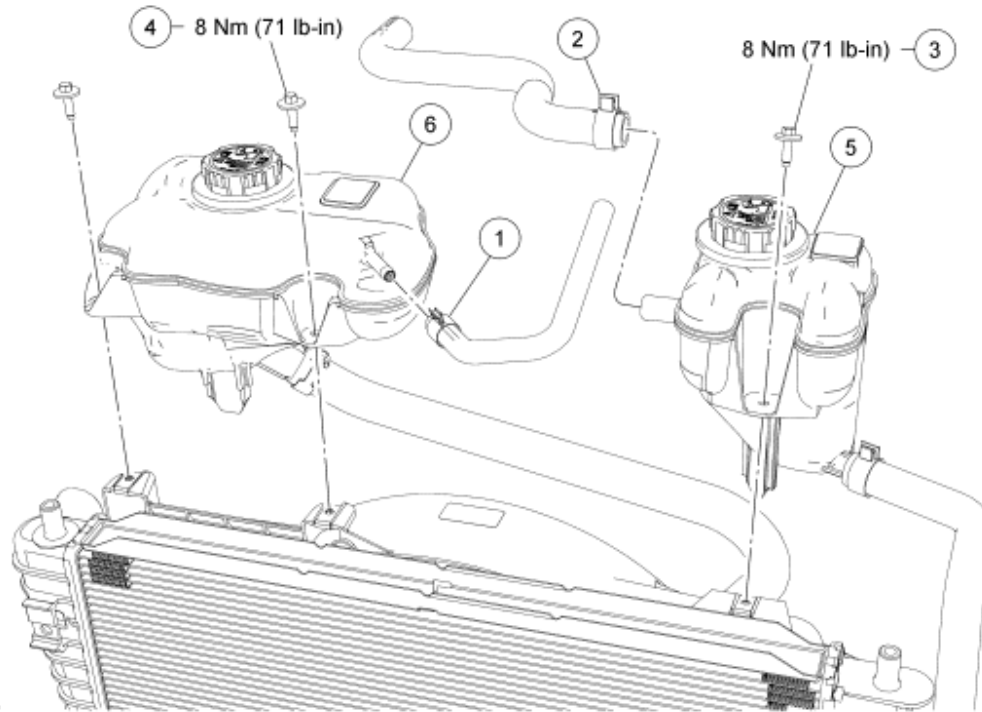


Fig. 19: Exploded View Of Cooling Fan Motor & Shroud With Torque Specifications - 5.4L (4V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	8276	Upper degas bottle hose
2	8D031	Upper Supercharger (SC) degas bottle hose
3	W503924	SC degas bottle bolt
4	W503924	Degas bottle bolt (2 required)
5	8D028	SC degas bottle
6	8A080	Degas bottle

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

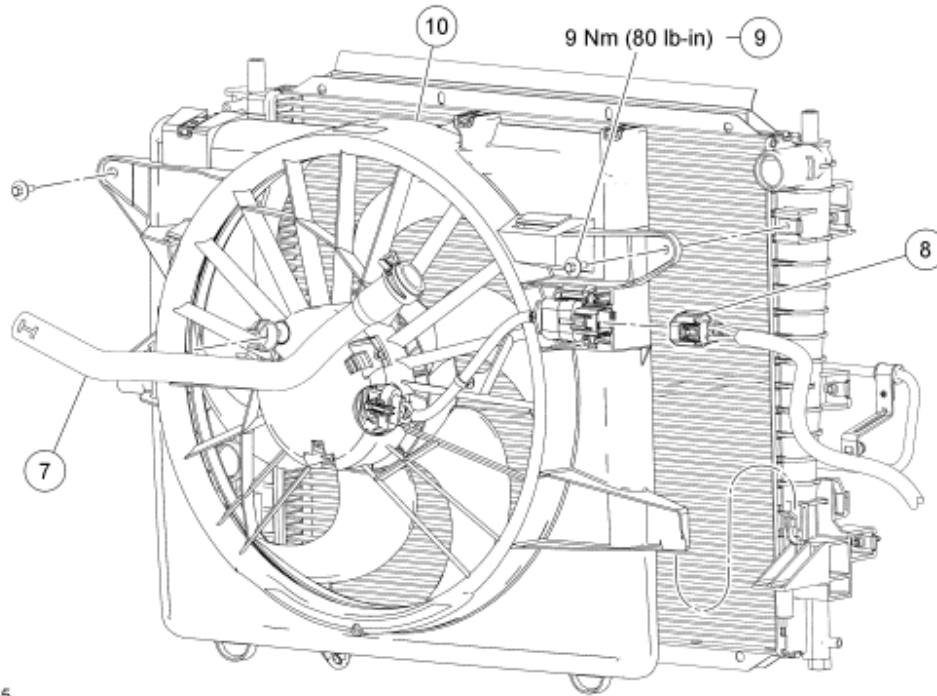


Fig. 20: Exploded View Of Cooling Fan Motor & Shroud With Torque Specification - All Engines
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
7	8C350	Lower degas bottle hose (4.0L and 4.6L [3V] only)
8	14A464	Cooling fan motor and shroud electrical connector
9	N606676	Cooling fan motor and shroud bolt (2 required)
10	8C607	Cooling fan motor and shroud

5.4L (4V) engines

1. Drain the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
2. Drain the Supercharger (SC) cooling system. For additional information, refer to **SUPERCHARGER COOLING** article.

4.0L and GT 4.6L (3V) engines

3. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

Bullitt 4.6L (3V) engines

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

4. Remove the ACL assembly and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

All engines except 5.4L (4V) engines

5. Remove the bolt and position aside the power steering reservoir.
 - To install, tighten to 8 Nm (71 lb-in).
6. Detach the lower degas bottle hose and position it aside.

5.4L (4V) engines

7. Disconnect the upper SC degas bottle hose and position it aside.
8. Remove the bolt and position aside the SC degas bottle.
 - To install, tighten to 8 Nm (71 lb-in).
9. Disconnect the upper degas bottle hose and position it aside.

All engines

10. Remove the 2 bolts and position aside the degas bottle.
 - To install, tighten to 8 Nm (71 lb-in).
11. Disconnect the cooling fan motor and shroud electrical connector.
12. Remove the 2 bolts and the cooling fan motor and shroud.
 - To install, tighten to 9 Nm (80 lb-in).
13. To install, reverse the removal procedure.

5.4L (4V) engines

14. Fill and bleed the cooling system. For additional information, refer to **Cooling System Draining, Filling and Bleeding**.
15. Fill and bleed the SC cooling system. For additional information, refer to **SUPERCHARGER COOLING** article.

DEGAS BOTTLE

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

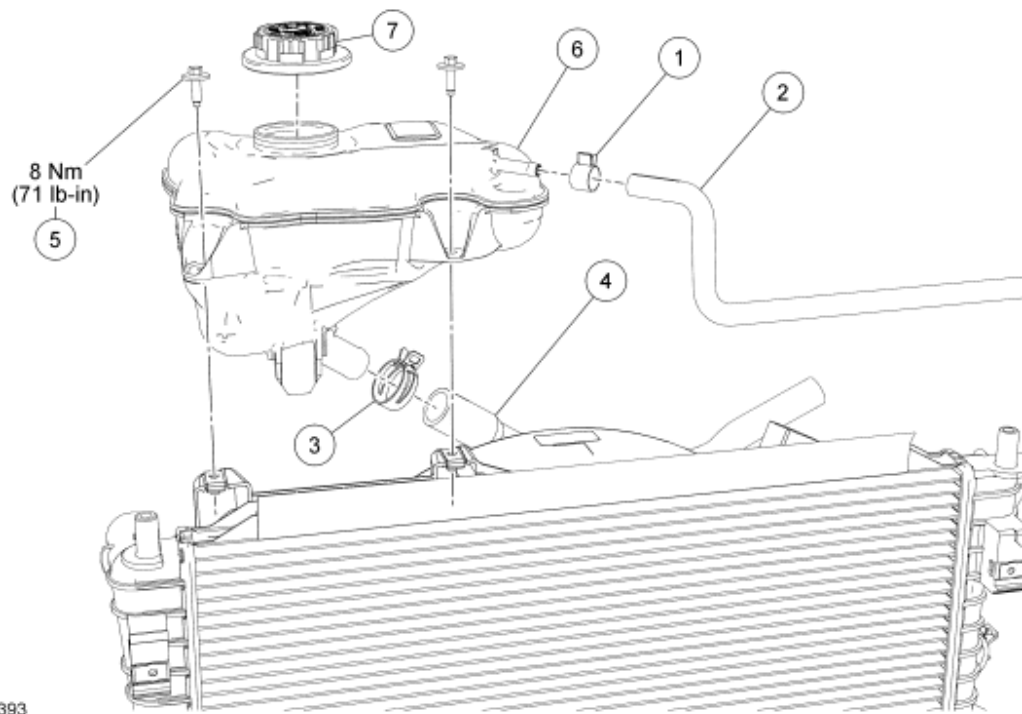


Fig. 21: Exploded View Of Degas Bottle With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W527383	Upper degas bottle hose clamp
2	8C633	Upper degas bottle hose
3	15161	Lower degas bottle hose clamp
4	8C350	Lower degas bottle hose
5	W503924	Degas bottle bolt (2 required)
6	8A080	Degas bottle
7	8100	Pressure relief cap

REMOVAL AND INSTALLATION

WARNING: Always allow the engine to cool before opening the cooling system. Do not unscrew the coolant pressure relief cap when the engine is operating or the cooling system is hot. The cooling system is under pressure; steam and hot liquid can come out forcefully when the cap is loosened slightly. Failure to follow these instructions may result in serious personal injury.

1. Release the pressure in the cooling system by slowly turning the pressure relief cap one half turn counterclockwise. When the pressure is released, remove the pressure relief cap.
2. Using hose clamp pliers, clamp the lower degas bottle hose.

2008 Ford Mustang

2008 ENGINE Engine Cooling - Mustang

3. Using a suitable suction device, siphon the coolant from the degas bottle.
4. Disconnect the upper degas bottle hose and position aside.
5. Disconnect the lower degas bottle hose and position aside.
6. Remove the 2 degas bottle bolts and the degas bottle.
 - To install, tighten to 8 Nm (71 lb-in).
7. To install, reverse the removal procedure.
8. Fill the degas bottle. Refer to **Cooling System Draining, Filling and Bleeding** for the recommended coolant mixture and fill level.