

2008 Ford Mustang
2008 ENGINE Supercharger Cooling - Mustang

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Supercharger Cooling - Mustang

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
Motorcraft Premium Gold Engine Coolant with Bittering Agent (US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1	3.75L (4.0 qt)
Premium Cooling System Flush VC-1	ESR-M14P7-A	-

GENERAL SPECIFICATIONS

Item	Specification
Cooling System Pressure Test Specifications	
Cap (relief opening pressure)	110 kPa (16 psi)
System (radiator)	138 kPa (20 psi)

TORQUE SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Coolant pump nuts	25	18	-
Degas bottle bolt	9	-	80
Lower splash shield bolts	5	-	44
Radiator bracket bolts	9	-	80

DESCRIPTION AND OPERATION

SUPERCHARGER COOLING

CAUTION: The supercharger (SC) cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

NOTE: The air charge that exits the supercharger (SC) is cooled by the SC cooling system.

The SC cooling system components include the:

- charge air cooler (CAC).
- radiator.

- pressure relief cap.
- degas bottle.
- electric coolant pump.

The degas bottle:

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

The coolant flows:

- from the CAC to the degas bottle.
- from the degas bottle to the coolant pump.
- from the coolant pump to the radiator.
- from the radiator to the CAC.

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

When adding coolant, use a 50/50 mixture of coolant and clean, drinkable 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, brine or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
- Do not mix with recycled coolant unless it meets the requirements of Ford specification or WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.

DIAGNOSTIC TESTS

SUPERCHARGER COOLING

Special Tools

Illustration	Tool Name	Tool Number

 ST1474-A	Pressure Test Kit	014-R1072 or equivalent
 ST1720-A	Battery/Antifreeze Tester	014-R1060 or equivalent

Material

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

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.

CAUTION: Check the coolant and engine oil levels. Top off the coolant level if needed. If there is engine coolant in the engine oil, the cause must be corrected and the oil changed or major component damage can occur.

CAUTION: The supercharger (SC) cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

1. Verify the customer's concern by operating the engine to duplicate the condition.
2. Inspect to determine if any of the following mechanical or electrical concerns apply.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Radiator attachments • Leaks	

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- | | |
|---|---|
| <ul style="list-style-type: none">• Damaged hoses• Hose clamps• Coolant pump• Radiator• Degas bottle• Coolant pump bracket | <ul style="list-style-type: none">• Damaged coolant pump wiring |
|---|---|

3. If the inspection reveals an obvious concern that can be readily identified, repair it as necessary.
4. Inspect the coolant condition.

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. Allow the engine to cool. Once pressure is released, remove the pressure relief cap.

CAUTION: The supercharger (SC) cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

2. Inspect the coolant color:
 - If Motorcraft Premium Gold Engine Coolant has a clear or pale yellow color, this indicates higher water content than required.
 - 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 water and coolant.
3. If the coolant appearance is acceptable, test the coolant freezing point range with the special tool. The freezing point should be in the range -45°C (-50°F) to -23°C (-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.
 - Maximum coolant concentration is 60/40.
 - Minimum coolant concentration is 40/60.
4. Check the coolant system conditions:
 - If the coolant level is low, add the specified coolant mixture only.
 - If the coolant tests weak, add straight coolant until the readings are within acceptable levels.
 - If the coolant tests strong, remove some of the coolant and add water until readings are within acceptable levels.

5. If the concern remains after the inspection, determine the symptom(s). Go to **Symptom Chart**.

6. Verify the cooling system is correctly filled and bled. Refer to **Supercharger Cooling System Draining, Filling and Bleeding.**

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
Loss of coolant	- Charge air cooler (CAC) - Radiator - Coolant pump - Coolant hoses - Degas bottle	Go to <u>Pinpoint Test A.</u>

Pinpoint Tests A: Loss of Coolant

Normal Operation - The supercharger (SC) cooling system is a closed system that provides for coolant expansion and contraction and also changes in pressure as coolant warms and cools with the 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.

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

This pinpoint test is intended to diagnose the following:

- Pressure relief cap
- Degas bottle
- Charge air cooler (CAC)
- Radiator
- Coolant pump
- Coolant hoses

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 CHECK THE COOLANT LEVEL

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NOTE: Allow the engine to cool before checking the coolant level. The engine must be off to check the coolant.

- Key in OFF position.
- Visually check the coolant level at the degas bottle.
- **Is the coolant level within specification?**

YES : Go to A2.

NO : REFILL the coolant as necessary. Go to A2 .

A2 CHECK THE DEGAS BOTTLE PRESSURE RELIEF CAP

- Remove the pressure relief cap.
- Inspect the pressure relief cap for foreign material between the sealing gasket and the diaphragm.
- **Is the pressure relief cap OK?**

YES : Go to A3.

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

A3 CHECK THE DEGAS BOTTLE

NOTE: The engine must be cool when coolant is added to the degas bottle.

- Add coolant to the degas bottle until fluid is between the coolant fill level marks.
- **Does the degas bottle leak?**

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

NO : CARRY OUT the supercharger cooling system pressure test. REFER to the **Component Tests**. REPAIR as necessary. TEST the system for normal operation.

Component Tests

Pressure Test

1. Turn the engine OFF.

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.

2. Check the coolant level. Refer to **Supercharger Cooling System Draining, Filling and Bleeding**.
3. Connect the Radiator/Heater Core Pressure Tester to the degas bottle nipple. Install a pressure test pump to the quick connect fitting of the test adapter.

NOTE: If the plunger of the pump is depressed too fast, an erroneous pressure

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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.
5. If the pressure relief cap does not hold pressure, remove and wash the pressure relief cap in clean water to dislodge all foreign particles from the gaskets. Check the sealing surface in the filler neck.
6. If 110 kPa (16 psi) cannot be reached, install a new pressure relief cap. If more than 165 kPa (24 psi) shows on the gauge, install a new pressure relief cap.

NOTE: If the pressure drops, check for leaks at the charger air cooler (CAC) hoses or other system components and connections. Any leaks which are found must be corrected and the system rechecked.

NOTE: The supercharger (SC) system is not connected to the main engine cooling system.

7. Pressurize the SC cooling system as described in Step 4 (using a pressure relief cap that operates within the specified upper and lower pressure limits). Observe the gauge reading for approximately 2 minutes; refer to General Specifications. Pressure should not drop during this time.
 - If the pressure drops and no external leak is found, the CAC may be the cause. Remove and inspect the CAC. Install a new CAC if necessary.
8. Release the system pressure by loosening the pressure relief cap. Check the coolant level and replenish, if necessary, with the correct coolant mixture. Refer to **Supercharger Cooling System Draining, Filling and Bleeding.**

Cap

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. Immerse the pressure relief cap in water and install it on the shallow filler neck of Radiator/Heater Core Pressure Tester and Radiator Cap Adapter, part of Radiator/Heater Core Pressure Tester.
2. Immerse the filler neck seal in water and install it in the filler neck adapter.
3. Install the filler neck adapter with the filler neck seal to the Radiator Cap Adapter.
4. Connect the female quick connect fitting of the pressure test pump to the male quick connect fitting of the filler neck adapter.

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

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5. Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.
6. Release the pressure by turning the relief screw counterclockwise.
7. Tighten the pressure relief screw and repeat Step 6 (at least twice) to make sure the reading is repeatable within the specifications of the pressure relief cap.
8. If the pressure test gauge readings are not within specifications, install a new pressure relief cap. If the pressure test gauge readings are within specifications, carry out the cooling system pressure test.

Radiator Leak Test, Removed From the Vehicle

CAUTION: Never leak test an aluminum radiator or charger air cooler (CAC) 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 components.

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

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

GENERAL PROCEDURES

SUPERCHARGER COOLING SYSTEM DRAINING, FILLING AND BLEEDING

Special Tools

Illustration	Tool Name	Tool Number
 ST2B18-A	RADKITPLUS	078-00497

Material

Item	Specification
Motorcraft Premium Gold Engine Coolant with Bittering Agent (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.

CAUTION: The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated, it must be recycled or disposed of correctly, using contaminated coolant may result in damage to the cooling system components.

CAUTION: The supercharger (SC) cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

NOTE: Dirty, rusty or contaminated coolant requires replacement.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the 6 bolts and the lower splash shield.

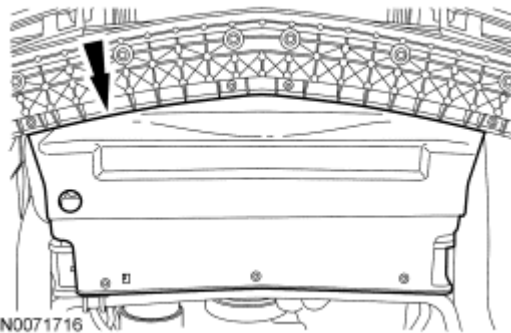


Fig. 1: Locating Lower Splash Shield & Bolts
Courtesy of FORD MOTOR CO.

3. Disconnect the radiator-to-charge air cooler (CAC) hose from the radiator and allow the coolant to drain in a suitable container.
 - Connect the hose.
4. Install the lower splash shield and the 6 bolts.
 - Tighten the bolts to 5 Nm (44 lb-in).

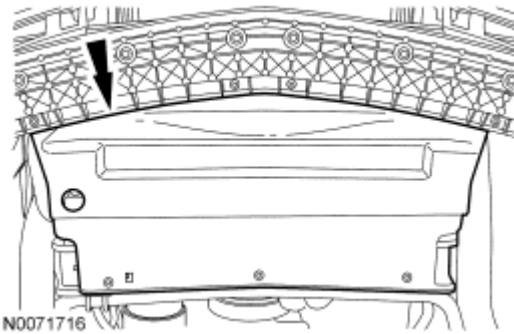


Fig. 2: Locating Lower Splash Shield & Bolts
Courtesy of FORD MOTOR CO.

Filling and Bleeding with RADKITPLUS

1. Using the special tool, install the RADKITPLUS and follow the manufacturer's instructions to fill and bleed the cooling system.

Filling and Bleeding without RADKITPLUS

CAUTION: 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.

CAUTION: The supercharger (SC) cooling system is filled with Motorcraft Premium Gold Engine Coolant. Mixing coolant types degrades the corrosion protection of Motorcraft Premium Gold Engine Coolant.

NOTE: When adding coolant, use a 50/50 mixture of coolant and clean, drinkable water.

1. To maintain the integrity of the coolant and the cooling system:
 1. 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.
 2. 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.
 3. Do not add alcohol, methanol, brine or any coolants mixed with alcohol or methanol antifreeze. These can cause damage from overheating or freezing.
 4. Do not mix with recycled coolant. Use of such coolants can harm the cooling system components.
2. Fill the degas bottle.
3. Start the engine and allow to run until coolant circulation is observed in the degas bottle. Absence of circulation indicates air is trapped in the system.

- Turn the engine off.
4. Add coolant as needed.
 5. Repeat the above procedure to make sure all entrapped air is released.

SUPERCHARGER COOLING SYSTEM FLUSHING

Material

Item	Specification
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.

1. Once pressure is released, remove the pressure relief cap.
2. Drain the cooling system. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding.

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

3. Using an appropriate cooling system flusher, flush the supercharger cooling system.

Use Premium Cooling System Flush VC-1 meeting Ford specification ESR-M14P7-A.

4. Fill the cooling system. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding.

REMOVAL AND INSTALLATION

COOLANT PUMP

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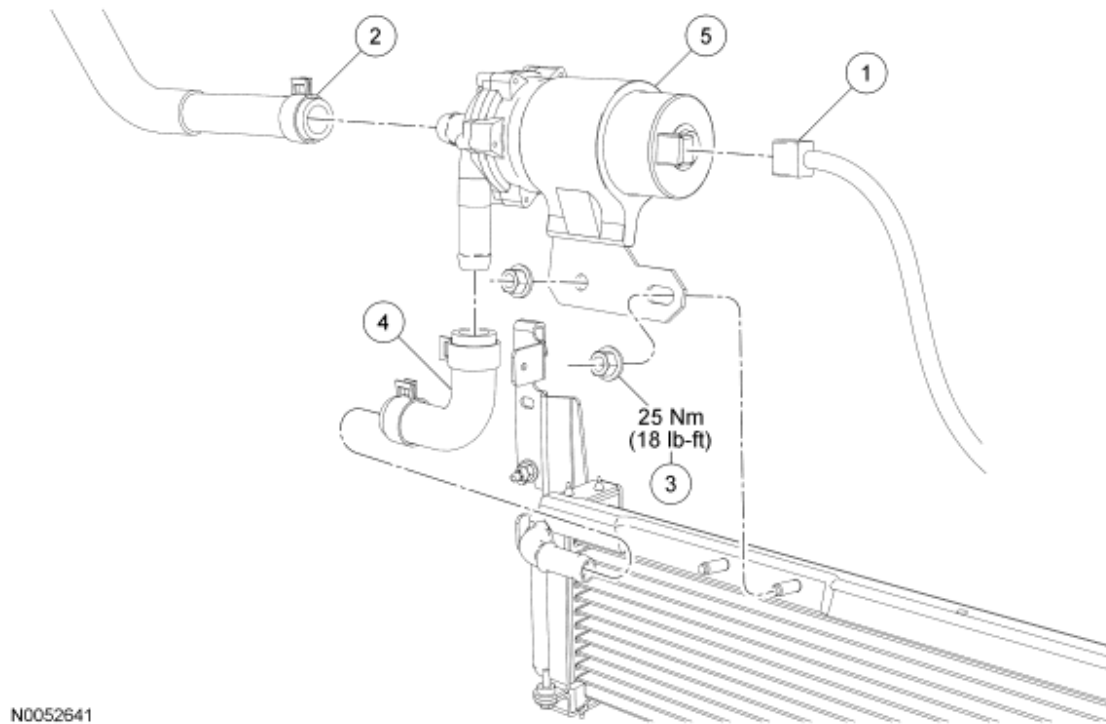


Fig. 3: Exploded View Of Coolant Pump With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Coolant pump electrical connector
2	8D029	Coolant pump-to-degas bottle hose
3	N621939	Coolant pump nut (2 required)
4	8K236	Coolant pump-to-radiator hose
5	8K232	Coolant pump

REMOVAL AND INSTALLATION

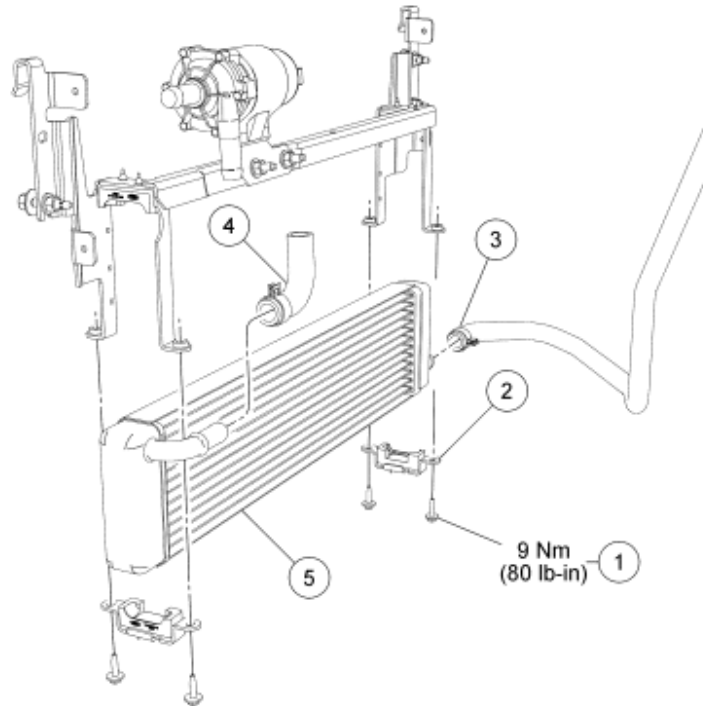
1. Drain the supercharger (SC) cooling system. For additional information, refer to **Supercharger Cooling System Draining, Filling and Bleeding**.
2. Remove the radiator grille. For additional information, refer to **EXTERIOR TRIM AND ORNAMENTATION** article.
3. Disconnect the coolant pump electrical connector.
4. Disconnect the coolant pump-to-degas bottle hose from the coolant pump and position aside.
5. Disconnect the coolant pump-to-radiator hose from the radiator.
6. Remove the 2 coolant pump nuts and the coolant pump.
 - To install, tighten to 25 Nm (18 lb-ft).
7. To install, reverse the removal procedure.
8. Fill and bleed the SC cooling system. For additional information, refer to **Supercharger Cooling System**

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Draining, Filling and Bleeding.

RADIATOR



N0052478

Fig. 4: Exploded View Of Radiator With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W505424	Radiator bracket bolt (4 required)
2	8K243	Radiator bracket (2 required)
3	8D030	Radiator-to-charge air cooler (CAC) hose
4	8K236	Radiator-to-coolant pump hose
5	8K229	Radiator

REMOVAL AND INSTALLATION

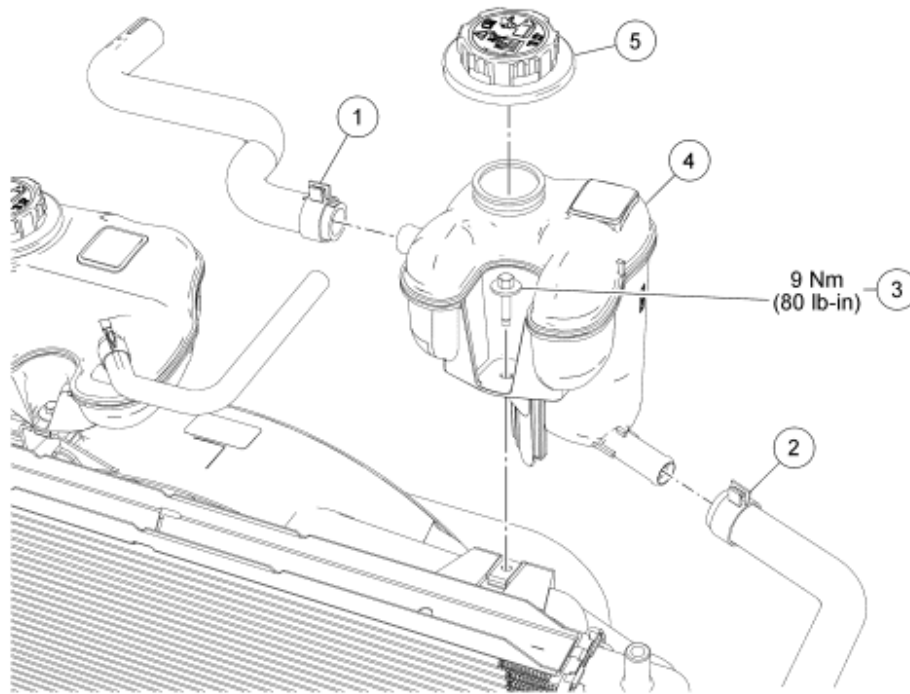
1. Drain the supercharger (SC) cooling system. For additional information, refer to **Supercharger Cooling System Draining, Filling and Bleeding.**
2. Disconnect the radiator-to-charge air cooler (CAC) hose from the radiator and position aside.
3. Disconnect the radiator-to-coolant pump hose from the radiator.
4. Remove the 4 radiator bracket bolts and the radiator.
 - To install, tighten to 9 Nm (80 lb-in).
5. To install, reverse the removal procedure.
6. Fill and bleed the SC cooling system. For additional information, refer to **Supercharger Cooling System**

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Draining, Filling and Bleeding.

DEGAS BOTTLE



N0071267

Fig. 5: Exploded View Of Degas Bottle With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	8D031	Upper degas bottle hose
2	8D029	Lower degas bottle hose
3	W503924	Degas bottle bolt
4	8D028	Degas bottle
5	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.

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2. Using hose clamp pliers, clamp the lower degas bottle hose.
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 degas bottle bolt and remove the degas bottle.
 - To install, tighten to 9 Nm (80 lb-in).
7. To install, reverse the removal procedure.
8. Fill the degas bottle. For additional information, refer to **Supercharger Cooling System Draining, Filling and Bleeding** for the recommended coolant mixture and fill level.