Cooling System Draining, Filling and Bleeding

Special Tool(s)	
 ST2618-A	Air lift Cooling System Tester UVU550000 or equivalent

Material	
Item	**Specification**
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D
Motorcraft® Orange Antifreeze/Coolant Prediluted VC-3DIL-B (US); CVC-3DIL-B (Canada)	WSS-M97B44-D2

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.

NOTICE: **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 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 the system filled with new coolant.

NOTE: During normal vehicle operation, Motorcraft® Orange Antifreeze/Coolant may change color from orange to pink or light red. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

2. 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.

3. Place a suitable container below the radiator draincock. Open the draincock and drain the engine coolant.
   - Close the radiator draincock when finished.

Filling and Bleeding with a Vacuum Cooling System Filler

NOTICE: **The engine cooling system is filled with Motorcraft® Orange Antifreeze/Coolant. Always fill the cooling system with the manufacturer's specified coolant. Chemically flush the cooling system if a non-specified coolant has been used. Refer to Cooling System Flushing. Failure to follow these instructions may damage the engine or cooling system.**

NOTICE: **The engine cooling system is filled with Motorcraft® Orange Antifreeze/Coolant. Do not mix cooling types. Mixing coolant types degrades the corrosion protection of Motorcraft® Orange Antifreeze/Coolant.**

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

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

- **Add Motorcraft® Orange Antifreeze/Coolant. Do not mix coolant types.**
- **Do not add or mix with any other type of engine coolant. 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® Orange Antifreeze/Coolant since a Ford-approved recycling process is not yet available.**

NOTICE: **Stop-leak style pellets/products must not be used as an additive in this engine cooling system. The addition of stop-leak style pellets/products can clog or damage the cooling system resulting in degraded cooling system performance and/or failure.**

1. Install the vacuum cooling system filler and follow the manufacturer's instructions to fill and bleed the cooling system. When adding or topping off the engine coolant:
    1. Measure the coolant concentration in the vehicle using Coolant/Battery Refractometer 300-ROB75240 or equivalent.

    2. Determine the concentration desired based on the vehicle duty cycle of extreme hot or cold operating conditions.

    3. Add/top off or adjust the coolant as follows:
        - For concentrations measured 48/52 to 50/50 (equates to a freeze point between -34°C (-30°F) and -37°C (-34°F)), use Motorcraft® Orange Antifreeze/Coolant Prediluted to maintain a coolant concentration in this same range (freeze protection down to -37°C (-34°F).
        - For all other concentrations, use Motorcraft® Orange Antifreeze/Coolant Concentrated and/or distilled water to get to the desired concentration.
        - When refilling the engine coolant after a flush procedure, use a mixture of Motorcraft® Orange Antifreeze/Coolant Concentrated and distilled water to get to the desired concentration.

    4. Recommended coolant concentration is 48/52 to 50/50 (freeze protection -34°C (-30°F) and -37°C (-34°F)) engine coolant to distilled water.

    5. For extremely cold climates (less than -37°C (-34°F):
        - It may be necessary to increase the coolant concentration above 50%.
        - NEVER increase the coolant concentration above 60%.
        - Maximum coolant concentration is 60/40 for cold weather areas.
        - A coolant concentration of 60% provides freeze point protection down to -50°C (-58°F).
        - Engine coolant concentration above 60% will decrease the overheat protection characteristics of the engine coolant and may damage the engine.

    6. For extremely hot climates:
        - It is still necessary to maintain the coolant concentration above 40%.
        - NEVER decrease the coolant concentration below 40%.
        - Minimum coolant concentration is 40/60 for warm weather areas.
        - A coolant concentration of 40% provides freeze point protection down to -34°C (-30°F).
        - Engine coolant concentration below 40% will decrease the corrosion and freeze protection characteristics of the engine coolant and may damage the engine.

    7. Vehicles driven year-round in non-extreme climates should use a 48/52 to 50/50 (freeze protection -34°C (-30°F) and -37°C (-34°F)) mixture of engine coolant and distilled water for optimum cooling system and engine protection.

Filling and Bleeding without a Vacuum Cooling System Filler

NOTICE: **The engine cooling system is filled with Motorcraft® Orange Antifreeze/Coolant. Always fill the cooling system with the manufacturer's specified coolant. Chemically flush the cooling system if a non-specified coolant has been used. Refer to Cooling System Flushing. Failure to follow these instructions may damage the engine or cooling system.**

NOTICE: **The engine cooling system is filled with Motorcraft® Orange Antifreeze/Coolant. Do not mix cooling types. Mixing coolant types degrades the corrosion protection of Motorcraft® Orange Antifreeze/Coolant.**

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

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

- **Add Motorcraft® Orange Antifreeze/Coolant or equivalent. Do not mix coolant types.**
- **Do not add or mix with any other type of engine coolant. 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® Orange Antifreeze/Coolant since a Ford-approved recycling process is not yet available.**

NOTICE: **Do not use stop-leak style pellets/products as an additive in this engine cooling system. The addition of stop-leak style pellets/products can clog or damage the cooling system resulting in degraded cooling system performance and/or failure.**

1. Fill the radiator through the degas bottle until the coolant level is between the COOLANT FILL LEVEL marks. When adding or topping off the engine coolant:
    1. Measure the coolant concentration in the vehicle using Coolant/Battery Refractometer 300-ROB75240 or equivalent.

    2. Determine the concentration desired based on the vehicle duty cycle of extreme hot or cold operating conditions.

    3. Add/top off or adjust the coolant as follows:
        - For concentrations measured 48/52 to 50/50 (equates to a freeze point between -34°C (-30°F) and -37°C (-34°F)), use Motorcraft® Orange Antifreeze/Coolant Prediluted to maintain a coolant concentration in this same range.
        - For all other concentrations, use Motorcraft® Orange Antifreeze/Coolant Concentrated and/or distilled water to get to the desired concentration.
        - When refilling the engine coolant after a flush procedure, use a mixture of Motorcraft® Orange Antifreeze/Coolant Concentrated and distilled water to get to the desired concentration.

    4. Recommended coolant concentration is 48/52 to 50/50 (freeze protection -34°C (-30°F) and -37°C (-34°F)) engine coolant to distilled water.

    5. For extremely cold climates (less than -37°C (-34°F):
        - It may be necessary to increase the coolant concentration above 50%.
        - NEVER increase the coolant concentration above 60%.
        - Maximum coolant concentration is 60/40 for cold weather areas.

- A coolant concentration of 60% provides freeze point protection down to -50°C (-58°F).
- Engine coolant concentration above 60% will decrease the overheat protection characteristics of the engine coolant and may damage the engine.

6. For extremely hot climates:
   - It is still necessary to maintain the coolant concentration above 40%.
   - NEVER decrease the coolant concentration below 40%.
   - Minimum coolant concentration is 40/60 for warm weather areas.
   - A coolant concentration of 40% provides freeze point protection down to -34°C (-30°F).
   - Engine coolant concentration below 40% will decrease the corrosion and freeze protection characteristics of the engine coolant and may damage the engine.

7. Vehicles driven year-round in non-extreme climates should use a 48/52 to 50/50 (freeze protection -34°C (-30°F) and -37°C (-34°F)) mixture of engine coolant and distilled water for optimum cooling system and engine protection.

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.

4. ***NOTICE:*** **If the air discharge remains cool and the engine 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.**

   Start the engine and allow it to idle until normal operating temperature is reached. Hot air should discharge from A/C vents. The engine 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 Tool(s)	
 ST2421-A	Coolant System Drain/Flush/Fill 164-R3673 or equivalent
 ST1167-A	Drain Kit 164-R3662 or equivalent

	Flush Kit 164-R3658 or equivalent

Material	
Item	**Specification**
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A

1. **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.

2. Drain the cooling system. Refer to Cooling System Draining, Filling and Bleeding.

3. Remove the coolant thermostat. Refer to Thermostat — 3.7L , Thermostat — 5.0L or Thermostat — 5.8L (4V).

4. Install the coolant hose connection without the thermostat.

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

   Using a cooling system flusher, flush the engine and radiator. Use Motorcraft® Premium Cooling System Flush and follow the directions on the packaging.

6. Install the thermostat. Refer to Thermostat and Thermostat Housing — Exploded View and Thermostat — 3.7L , Thermostat — 5.0L or Thermostat — 5.8L (4V).

7. Backflush the heater core. Refer to Heater Core Backflushing.

8. Fill and bleed the cooling system. Refer to Cooling System Draining, Filling and Bleeding.

Thermostat — 5.8L (4V)

Material	
Item	**Specification**
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D
Motorcraft® Orange Antifreeze/Coolant Prediluted VC-3DIL-B (US); CVC-3DIL-B (Canada)	WSS-M97B44-D2

Removal and Installation

1. Drain the engine cooling system. Refer to Cooling System Draining, Filling and Bleeding.

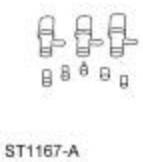
2. Remove the 2 bolts and position aside the thermostat housing cover and hose assembly.
   - To install, tighten to 10 Nm (89 lb-in).

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. Refer to Cooling System Draining, Filling and Bleeding.

Heater Core Backflushing

Special Tool(s)	
 ST1167-A	Drain Kit 164-R3662 or equivalent
 ST1168-A	Flush Kit 164-R3658 or equivalent

Material	
Item	**Specification**
Motorcraft® Premium Cooling System Flush VC-1	ESR-M14P7-A

1. **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.

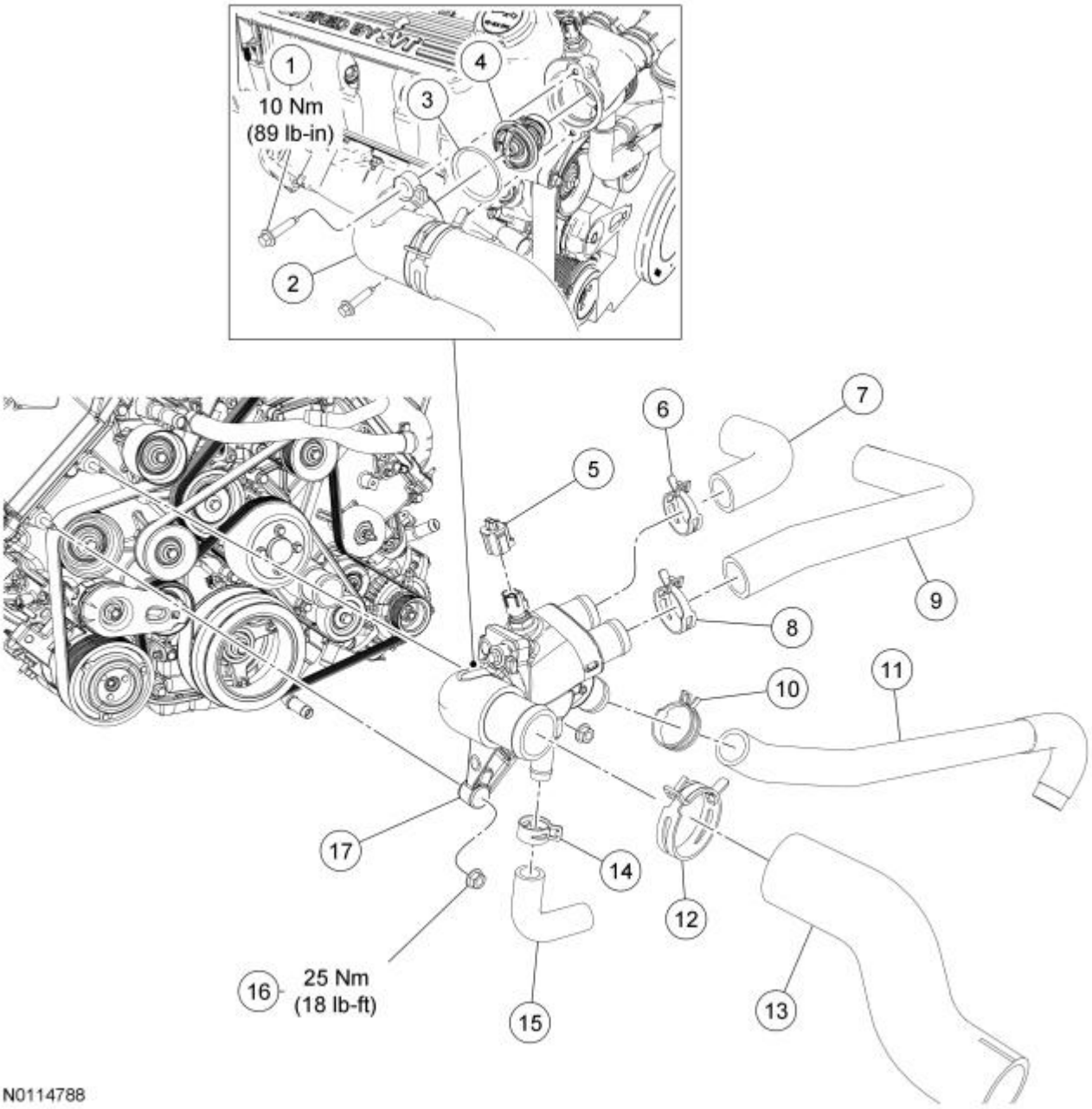
2. Partially drain the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

3. **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 Motorcraft® 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.

4. Fill and bleed the cooling system. For additional information, refer to Cooling System Draining, Filling and Bleeding in this section.

Thermostat and Thermostat Housing - 5.8L (4V)



Item	Part Number	Description
1	N605893	Coolant outlet connector bolt (2 required)
2	8594	Coolant outlet connector
3	8255	Thermostat O-ring seal
4	8575	Thermostat
5	—	ECT sensor electrical connector (part of 12C508)
6	8A586	RH thermostat housing-to-intake manifold hose clamp
7	8A595	RH thermostat housing-to-intake manifold hose
8	8A586	LH thermostat housing-to-intake manifold hose clamp
9	8A595	LH thermostat housing-to-intake manifold hose
10	15161	Lower radiator hose clamp
11	8B273	Lower radiator hose
12	8287	Upper radiator hose clamp

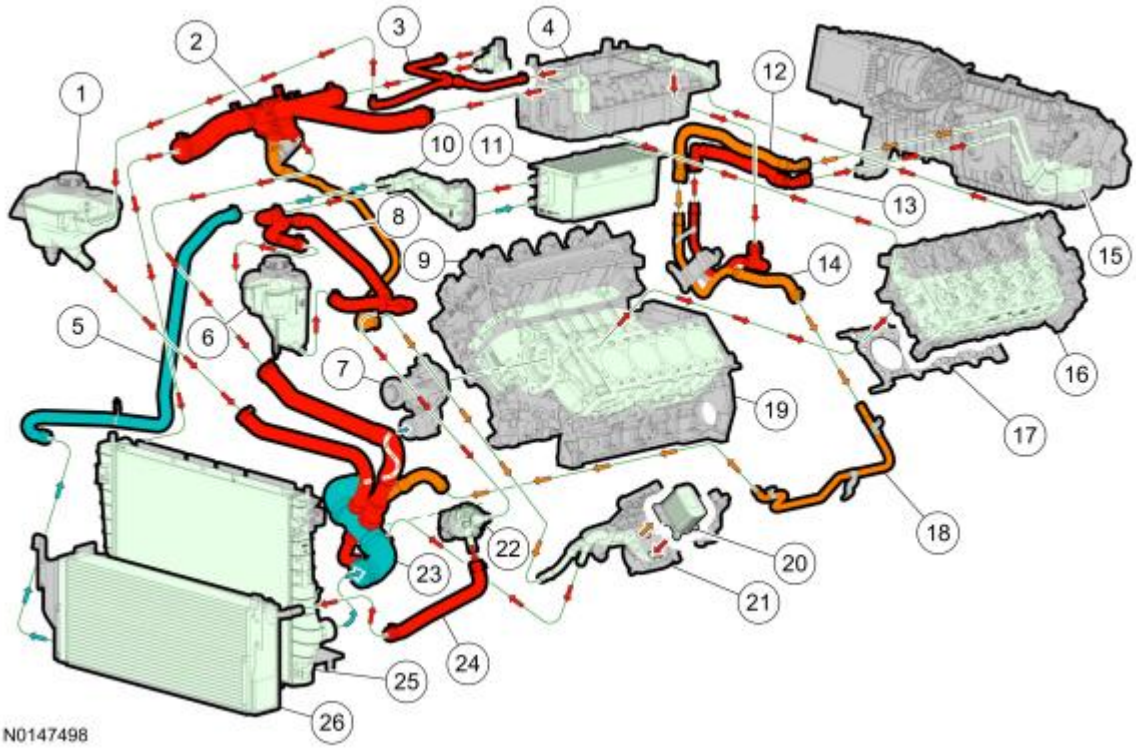
13	8B274	Upper radiator hose
14	8287	Thermostat housing-to-oil filter adapter hose clamp
15	6B851	Thermostat housing-to-oil filter adapter hose
16	W520413	Thermostat housing nut (2 required)
17	9K478	Thermostat housing

1. Refer to the procedures and/or exploded views in this section for any Warnings, Notices, Notes, Materials, Specifications, and Special Tools. Items in the exploded views may not be listed in order of removal.

Coolant Flow Diagram

5.8L with Coolant-Cooled Oil Cooler

NOTE: At 38°C (100°F) ambient temperature, green arrows indicate coolant temperature below 90°C (194°F), amber arrows indicate coolant temperature approximately 90°C (194°F), red arrows indicate coolant temperature above 90°C (194°F),

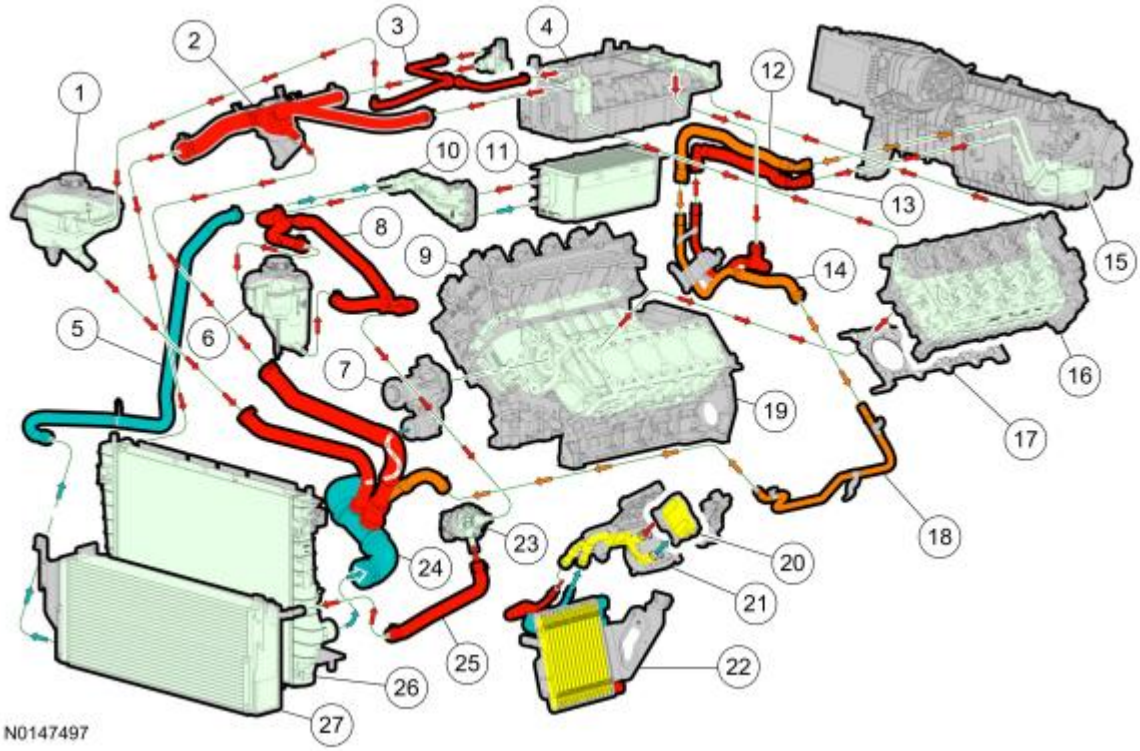


Item	Part Number	Description
1	8A080	Engine cooling system degas bottle
2	8A586	Thermostat housing and hose assembly
3	8276	Upper intake manifold-to-engine system degas bottle hose
4	9424	Upper intake manifold
5	8D030	Supercharger cooling radiator-to-supercharger cooler hose
6	8D028	Supercharger cooling degas bottle
7	8501	Engine cooling system coolant pump
8	8D029	Supercharger cooling degas bottle-to-supercharger coolant pump hose
9	6049	RH cylinder head
10	9N491	Supercharger tube assembly
11	6K775	Supercharger cooler
12	18K580	Heater core outlet hose
13	18K579	Heater core inlet hose
14	18C553	Heater core hose and tube assembly
15	19B555	Heater core and evaporator housing
16	8050	LH cylinder head
17	6083	LH cylinder head gasket
18	18663	Heater outlet tube
19	6010	Engine block
20	6L635	Oil temperature control thermostat
21	6881	Oil filter adapter
22	6A642	Oil Cooler
23	8K232	Supercharger cooling system coolant pump
24	8B273	Lower radiator hose assembly
25	8K236	Supercharger cooling system coolant pump-to-radiator hose
26	8005	Engine cooling system radiator
27	8009	Supercharging cooling system radiator

Coolant Flow Diagram

5.8L with Air-Cooled Oil Cooler

NOTE: At 38°C (100°F) ambient temperature, green arrows indicate coolant temperature below 90°C (194°F), amber arrows indicate coolant temperature approximately 90°C (194°F), red arrows indicate coolant temperature above 90°C (194°F),



Item	Part Number	Description
1	8A080	Engine cooling system degas bottle
2	8A586	Thermostat housing and hose assembly
3	8276	Upper intake manifold-to-engine system degas bottle hose
4	9424	Upper intake manifold
5	8D030	Supercharger cooling radiator-to-supercharger cooler hose
6	8D028	Supercharger cooling degas bottle
7	8501	Engine cooling system coolant pump
8	8D029	Supercharger cooling degas bottle-to-supercharger coolant pump hose
9	6049	RH cylinder head
10	9N491	Supercharger tube assembly
11	6K775	Supercharger cooler
12	18K580	Heater core outlet hose
13	18K579	Heater core inlet hose
14	18C553	Heater core hose and tube assembly
15	19B555	Heater core and evaporator housing
16	8050	LH cylinder head
17	6083	LH cylinder head gasket
18	18663	Heater outlet tube
19	6010	Engine block
20	6A642	Engine oil cooler
21	6881	Oil filter adapter
22	8K232	Supercharger cooling system coolant pump
23	8B273	Lower radiator hose assembly
24	8K236	Supercharger cooling system coolant pump-to-radiator hose
25	8005	Engine cooling system radiator
26	8009	Supercharging cooling system radiator