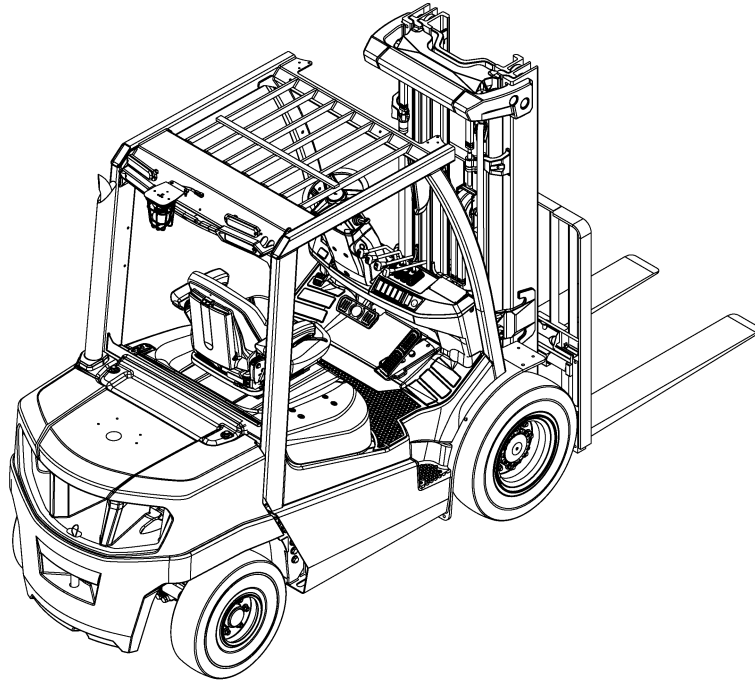


COOLING SYSTEM

H2.0A, H2.5A6, H2.5A, H3.0A, H3.5A (H40A, H50A6,
H60A, H70A) [R177]



HYSTER

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- **DISCONNECT THE BATTERY** before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See **HOW TO PUT THE LIFT TRUCK ON BLOCKS** in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER® APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a **DO NOT OPERATE** tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the WARNING symbol (and word, if present) are on orange background. The CAUTION symbol (and word, if present) are on yellow background.



WARNING

Installing improper electrical accessories or installing an electrical accessory incorrectly can increase the risk of equipment damage, personal injury and fire. DO NOT install electrical accessories to the truck unless you have been trained and authorized to do so. Personnel installing the electrical accessories must document the changes made to the truck. DO NOT install accessories which affect the truck's compliance with standard ANSI/ITSDF B56.1, UL 558, or UL 583, or which otherwise affect the safe operation of the truck.



WARNING

Installing improper electrical accessories or installing an electrical accessory incorrectly can increase the risk of equipment damage, personal injury and fire. DO NOT install electrical accessories to the truck unless you have been trained and authorized to do so. Personnel installing the electrical accessories must document the changes made to the truck. DO NOT install accessories which affect the truck's compliance with standard EN 1175:2020.



WARNING

California Proposition 65 - Operating, servicing and maintaining a powered industrial truck can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

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**"THE
QUALITY
KEEPERS"**

**HYSTER
APPROVED
PARTS**

Introduction

GENERAL 202001-001

NOTE: For any fasteners in this manual that feature standard torque specifications, please refer to **Metric and Inch (SAE) Fasteners 8000SRM0231** for correct specifications.

Cooling system repair

FAN REPAIR

202001-044

REMOVE



WARNING

During engine operation, be careful not to touch the fan, pulleys, or drive belts. Contact with these parts can cause serious injury.



WARNING

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury. Wait for 30 minutes for the radiator to cool. Check the temperature of the radiator using a touchless infrared thermometer (see Figure 1). If the radiator is still hot (37.8°C (100°F) or above), wait for the radiator to cool before attempting to check or fix any part of the cooling system.



Figure 1. Touchless infrared thermometer

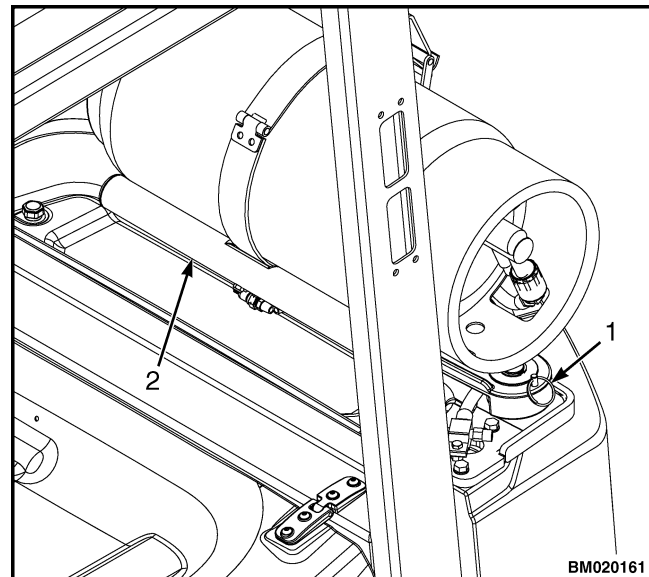


WARNING

The radiator fins on the radiator are very sharp and can cause serious injury. Wear gloves while removing the fan assembly.

NOTE: If the fan that is used on this lift truck must be replaced, only use the approved replacement fan as shown in the **Parts Manual** for this lift truck.

1. Turn the key switch of the lift truck to the OFF position.
2. If your truck is equipped with an LPG tank, turn the LPG tank valve to the OFF position.
3. If equipped, pull the pin from the tank bracket and swing the tank to the side, off the counterweight. See Figure 2.



1. PIN
2. LPG TANK BRACKET

Figure 2. LPG tank bracket

4. Release the steering column tilt lever and move the steering wheel forward. See Figure 3.

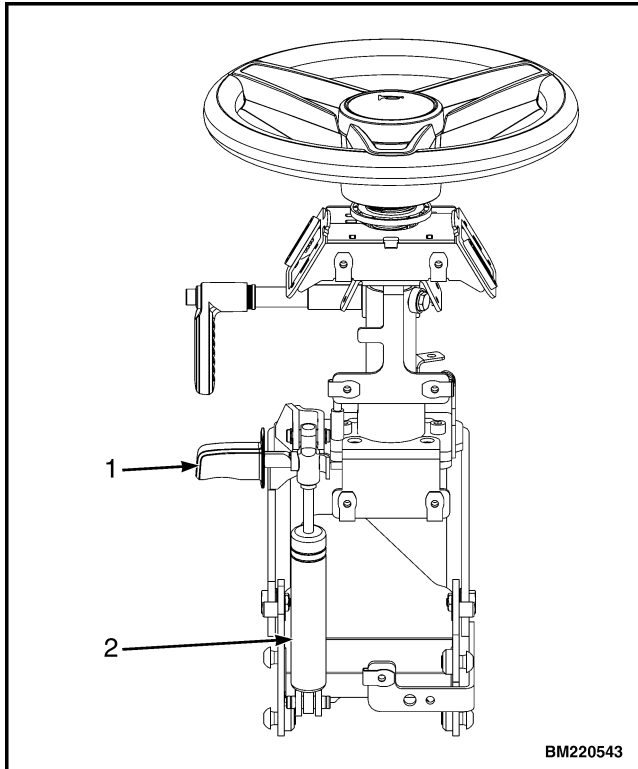


Figure 3. Steering column tilt

5. Release the seat latch and move the seat forward to the position closest to the steering column. See Figure 4.

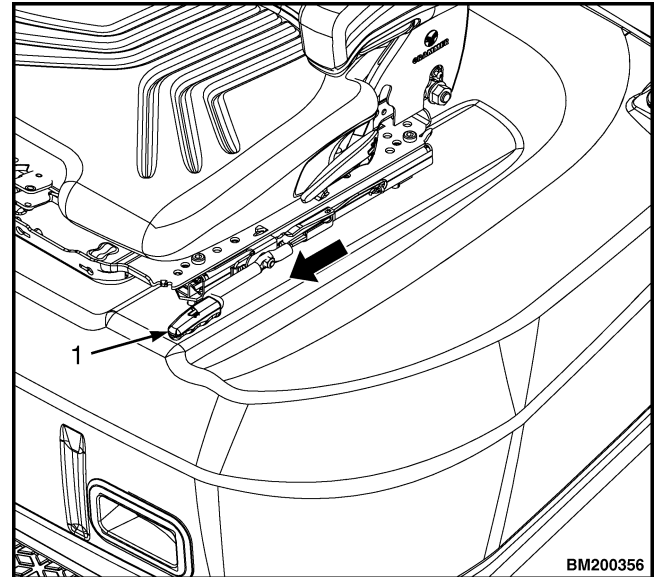


Figure 4. Slide seat

6. Release the hood latch and raise the hood to open position. See Figure 5.

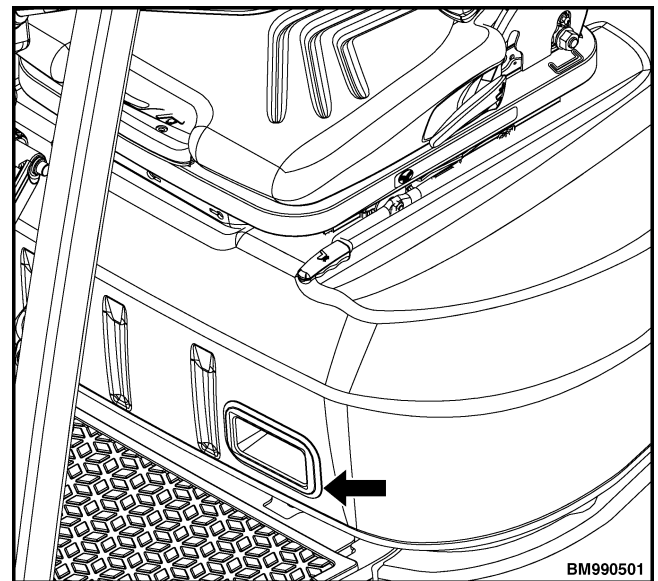
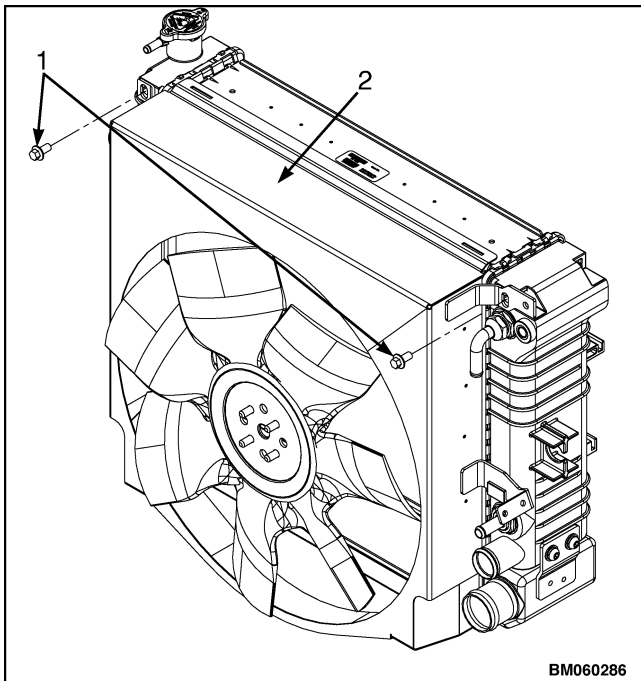


Figure 5. Hood latch

7. Disconnect the negative battery cable from the negative battery terminal. See Battery service in **Electrical, software, and controls** 2200SRM2304.

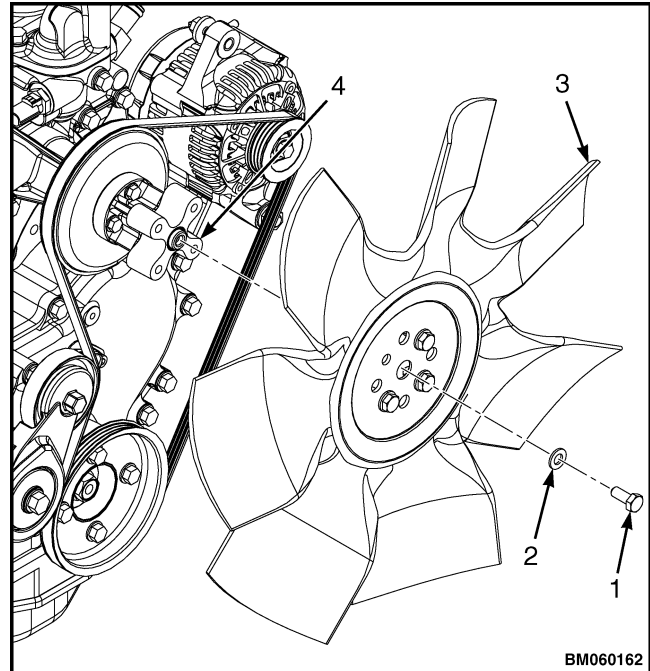
8. Disconnect the positive battery cable from the positive battery terminal. See Battery service in **Electrical, software, and controls** 2200SRM2304.
9. Place a radiator guard shield between the radiator and the fan, to prevent damage to the radiator during fan removal.
10. Remove the two capscrews from the radiator shroud. Lift and tilt the fan shroud toward the engine to access the fan mounting capscrews. See Figure 7.



1. CAPSCREW
2. FAN SHROUD

Figure 6. Fan shroud

11. Remove the four fan mounting capscrews and washers. See Figure 7.
12. Remove the fan. See Figure 7.



1. FAN MOUNTING CAPSCREW
2. WASHER
3. FAN
4. FAN PULLEY SPACER

Figure 7. Fan mounting

INSPECT



WARNING

DO NOT try to repair a damaged fan. If a fan has a bent blade or is cracked, install a new fan. A damaged fan can break during use and cause damage or serious injury.

1. Inspect the fan for any damage.
2. If the fan is damaged, replace the entire fan.

INSTALL



WARNING

The radiator fins on the radiator are very sharp and can cause serious injury. Wear gloves while removing the fan assembly.

1. Tilt the fan shroud toward the engine.

2. Insert the washers and fan mounting capscrews into the fan and install the fan onto the fan pulley spacer. See Figure 7. Tighten the fan mounting capscrews to 26 N·m (19 lbf ft).
 3. Tilt the fan shroud back toward the radiator, making sure the shroud mounting tabs are properly installed into the grooves on the radiator. Insert the screws to install the fan shroud to the radiator. See Figure 6. Tighten to 14.7 ± 1.96 N·m (10.8 ± 1.4 lbf ft).
 4. Inspect the clearance from the fan tip to the shroud in all directions. Clearance must be 10 mm (0.4 in.).
- NOTE:** A large discrepancy in the clearance reading may indicate a missing isolator.
5. Inspect isolators to confirm they are in tact.
 6. Adjust the shroud position as necessary to achieve clearance.
 7. Connect the positive battery cable to the positive terminal of the battery. See Battery service.
 8. Connect the negative battery cable to the negative terminal of the battery. See Battery service.
 9. Lower the hood and confirm that the hood latches. See Figure 5.
 10. Move the seat back to position. See Figure 4.
 11. Release the steering column tilt lever and move the steering wheel back to position. See Figure 3.
 12. If equipped, swing the LPG tank bracket back toward the lift truck and install the pin. See Figure 2.
 13. If equipped, turn the LPG tank valve to the ON position.

FAN REPAIR (WITH HYDRAULIC FAN DRIVE) 202001-242

REMOVE



WARNING

During engine operation, be careful not to touch the fan, pulleys, or drive belts. Contact with these parts can cause serious injury.



WARNING

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury. Wait for 30 minutes for the radiator to cool. Check the temperature of the radiator using a touchless infrared thermometer (see Figure 8). If the radiator is still hot (37.8°C (100°F) or above), wait for the radiator to cool before attempting to check or fix any part of the cooling system.



BM091472

Figure 8. Touchless infrared thermometer

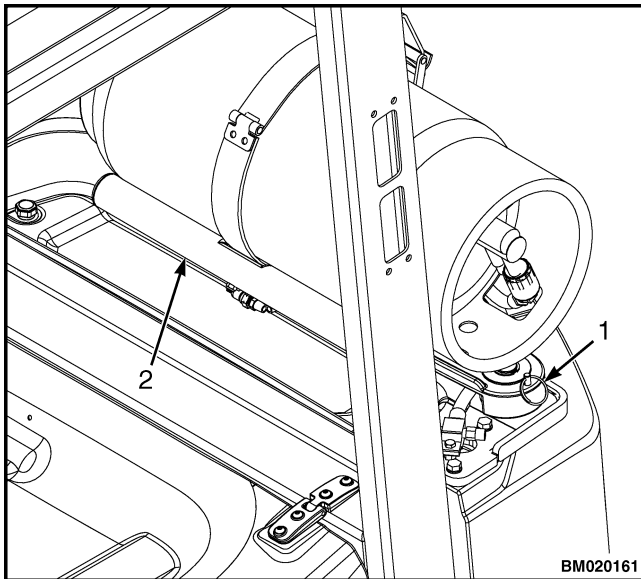


WARNING

The radiator fins on the radiator are very sharp and can cause serious injury. Wear gloves while removing the fan assembly.

NOTE: If the fan that is used on this lift truck must be replaced, only use the approved replacement fan as shown in the **Parts Manual** for this lift truck.

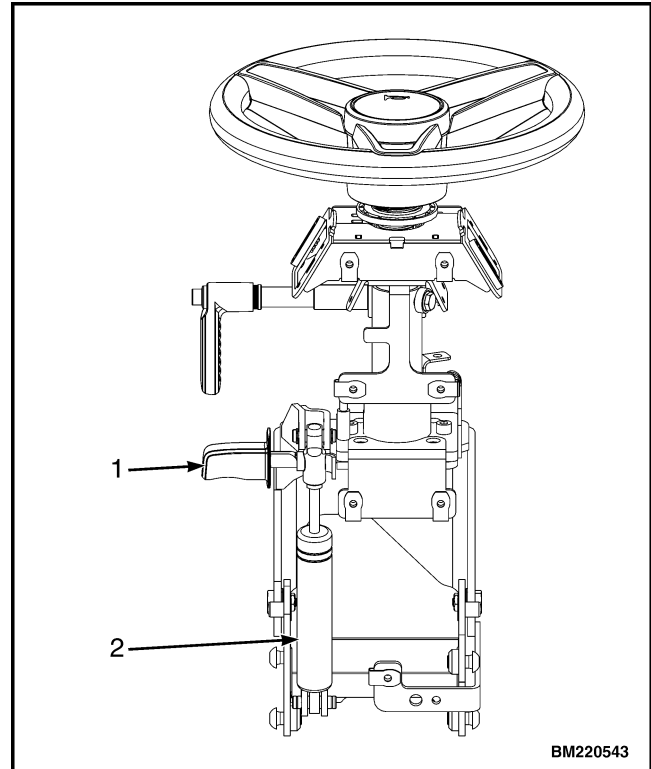
1. Turn the key switch of the lift truck to the OFF position.
2. If your truck is equipped with an LPG tank, turn the LPG tank valve to the OFF position.
3. If equipped, pull the pin from the tank bracket and swing the tank to the side, off the counterweight. See Figure 9.



1. PIN
2. LPG TANK BRACKET

Figure 9. LPG tank bracket

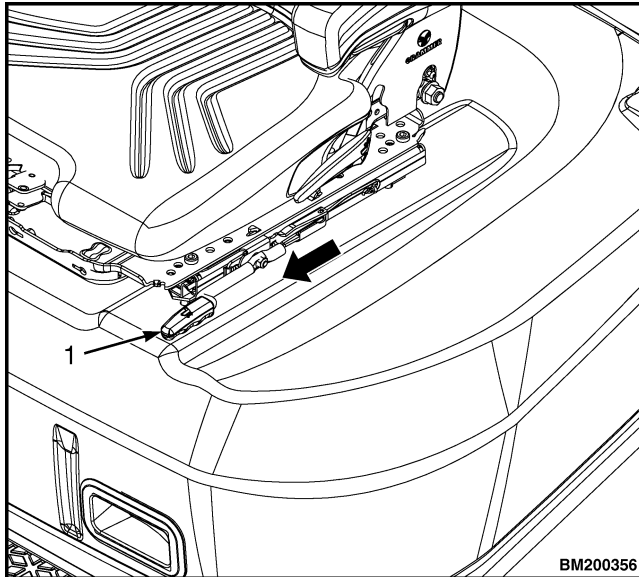
4. Release the steering column tilt lever and move the steering wheel forward. See Figure 10.



1. STEERING COLUMN TILT LEVER
2. GAS CYLINDER

Figure 10. Steering column tilt

5. Release the seat latch and move the seat forward to the position closest to the steering column. See Figure 11.



1. SEAT LATCH

Figure 11. Slide seat

6. Release the hood latch and raise the hood to open position. See Figure 12.

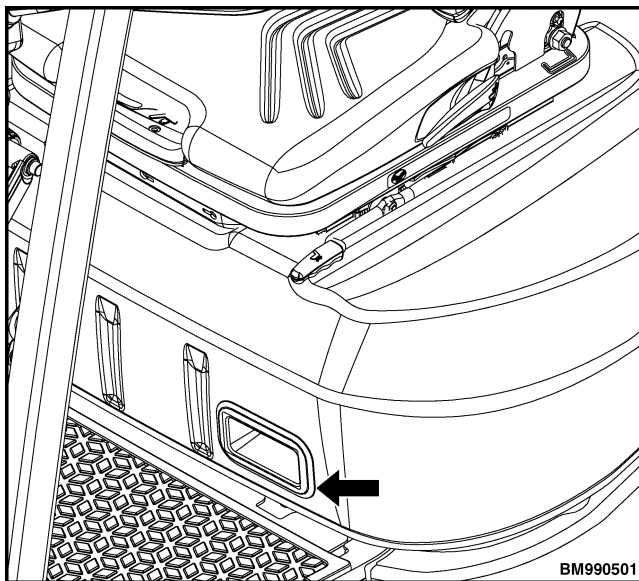
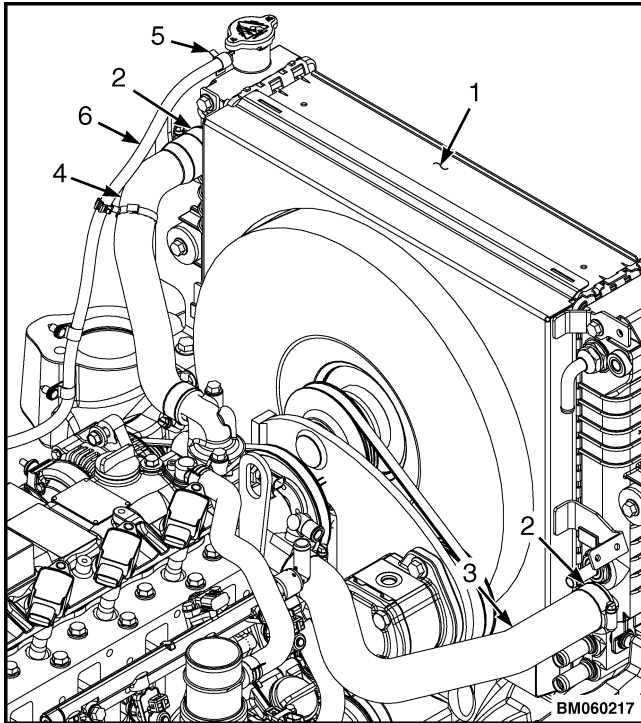


Figure 12. Hood latch

7. Disconnect the negative battery cable from the negative battery terminal. See Battery service in **Electrical, software, and controls** 2200SRM2304.

8. Disconnect the positive battery cable from the positive battery terminal. See Battery service in **Electrical, software, and controls** 2200SRM2304.
 9. Place a radiator guard shield between the radiator and the fan, to prevent damage to the radiator during fan removal.
 10. If equipped, remove the LPG converter and bracket to provide enough clearance to remove the hydraulic fan drive assembly. See **Yanmar Engines** 0600SRM2299.
 11. Drain all fluid from the radiator. See Radiator repair (with hydraulic fan drive).
- NOTE:** Tag hydraulic hoses prior to disconnecting them to ensure they are properly connected during installation.
12. Disconnect upper and lower cooling hoses from the radiator and engine. See Figure 13. Plug all open ports.



- 1. RADIATOR
- 2. HOSE CLAMP
- 3. LOWER COOLING HOSE
- 4. UPPER COOLING HOSE
- 5. RESERVOIR HOSE CLAMP
- 6. RESERVOIR HOSE

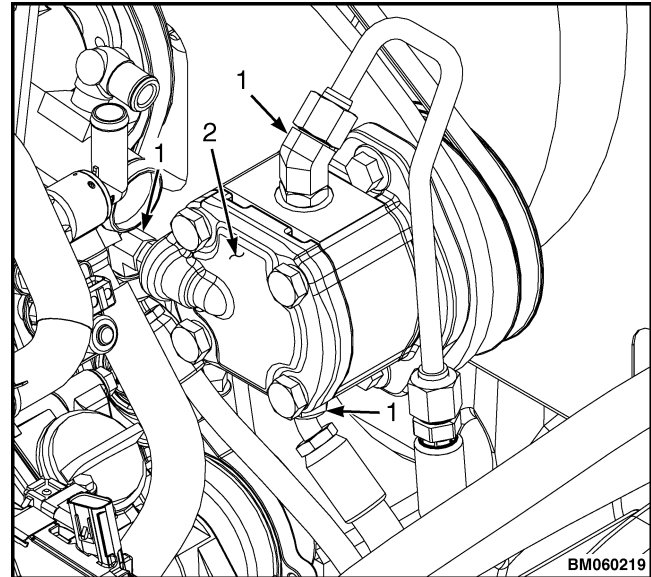
Figure 13. Cooling hoses



CAUTION

Hydraulic fluid may leak from the fittings when hoses are disconnected. Place a drip pan or rags under the work area before disconnecting hydraulic lines.

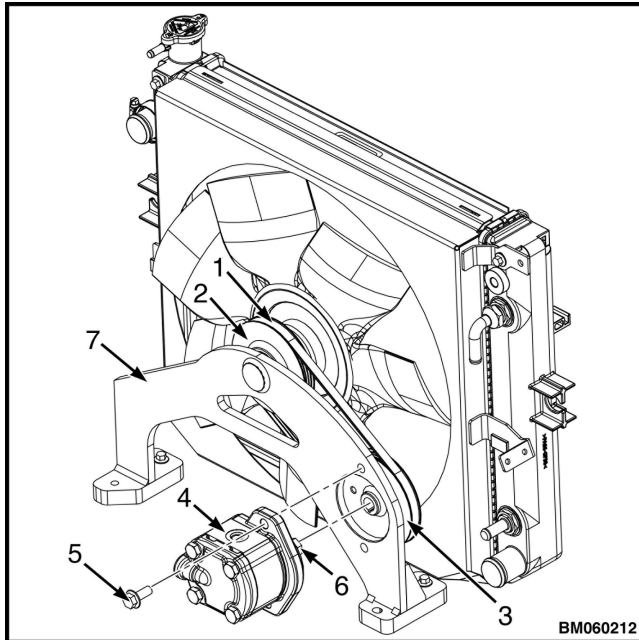
- 13. Disconnect hydraulic hoses and fittings from hydraulic motor. See Figure 14. Plug all open ports.



- 1. FITTINGS
- 2. FAN MOTOR

Figure 14. Fan motor hoses

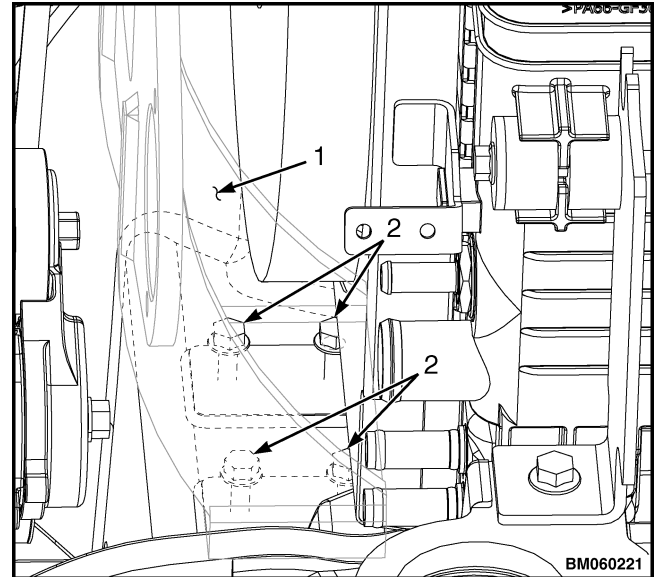
- 14. Remove the drive belt from the sheave (item 3, Figure 15).



1. DRIVE BELT
2. FAN HUB
3. SHEAVE
4. FAN MOTOR
5. CAPSCREW
6. FAN MOTOR SHAFT
7. FAN MOTOR MOUNT

Figure 15. Fan motor

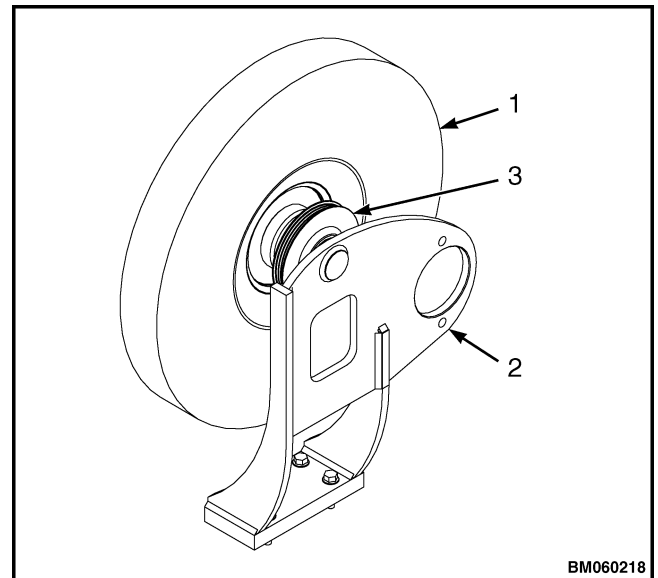
15. Remove the two cap screws (item 5, Figure 15) retaining the fan motor to one side of the fan motor mount (item 7), while on the other side of the fan motor mount, remove the sheave from the shaft of the motor (item 6).
16. Remove the four cap screws retaining the fan motor mount to the rear frame. See Figure 16.



1. FAN MOTOR MOUNT
2. CAPSCREW

Figure 16. Fan motor mount

17. Remove the fan, hub and mount as an assembly. See Figure 17.

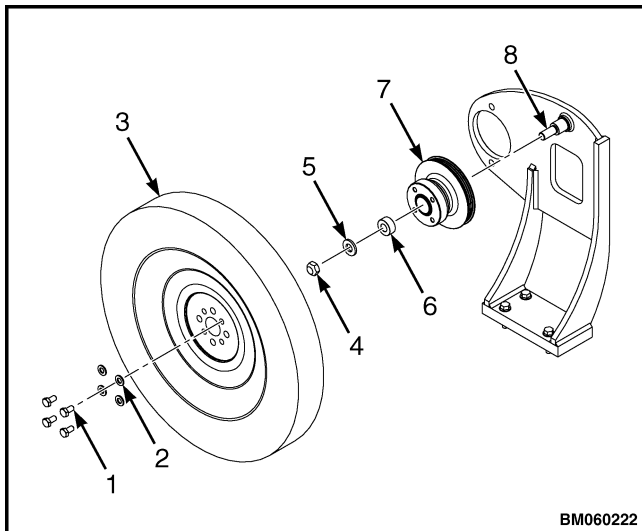


1. FAN
2. FAN MOUNT
3. HUB

Figure 17. Fan and mount

18. Remove the four cap screws and washers retaining the fan to the hub. See Figure 18.

19. Remove the fan.
20. Remove the drive belt from the hub.
21. If replacing the hub, remove the hardware retaining the hub to the shaft on the fan mounting bracket. See Figure 18.



1. CAPSCREW
2. WASHER
3. FAN
4. LOCKNUT
5. WASHER
6. SPACER
7. HUB
8. SHAFT

Figure 18. Fan mounting

INSPECT

WARNING

DO NOT try to repair a damaged fan. If a fan has a bent blade or is cracked, install a new fan. A damaged fan can break during use and cause damage or serious injury.

1. Clean fan hub of any dirt or debris. Inspect hub for wear or damage.
2. Inspect drive belt for cracks, splits, or missing pieces. Replace with new belt if worn or damaged.

3. Clean hydraulic motor and sheave of any dirt or debris. Inspect motor and sheave to ensure they are in good shape and not worn or damaged.
4. Clean fan drive mounting bracket of any dirt or debris. Replace if worn or damaged.

INSTALL

WARNING

The radiator fins on the radiator are very sharp and can cause serious injury. Wear gloves while removing the fan assembly.

1. If the hub was replaced, install the new hub on the shaft of the fan mount. Install the spacer, washer and locknut to secure the hub on the fan mount. Tighten the locknut to 95 N·m (70 lbf ft).
2. Install the drive belt onto the fan hub first and leave until the sheave is installed. See Figure 15.
3. Insert the washers and fan mounting cap screws into the fan and install the fan onto the hub. See Figure 18. Tighten the fan mounting cap screws to standard torque.
4. Inspect the clearance from the fan tip to the shroud in all directions. Clearance must be 10 mm (0.4 in.).

NOTE: A large discrepancy in the clearance reading may indicate a missing isolator.

5. Inspect isolators to confirm they are in tact.
6. Adjust the shroud position as necessary to achieve clearance.
7. Install the fan motor mount to the frame. See Figure 16. Tighten to standard torque.
8. Install the fan motor on the fan motor mount and install the sheave onto the shaft of the fan motor. See Figure 15.
9. With the drive belt secure on the fan hub, stretch the other end of the drive belt to fit around the sheave. See Figure 15.

10. Insert the two capscrews to retain the fan motor to the fan motor mount. See Figure 15. Tighten to standard torque.
11. Connect the hydraulic hoses and fittings to the hydraulic motor. See Figure 14.
12. Connect upper and lower cooling hoses to the radiator and engine. See Figure 13.
13. Add coolant to the radiator. See Radiator repair (with hydraulic fan drive).
14. Install the LPG converter and bracket. See **Yanmar Engines** 0600SRM2299.
15. Connect the positive battery cable to the positive terminal of the battery. See Battery service in **Electrical, software, and controls** 2200SRM2304.
16. Connect the negative battery cable to the negative terminal of the battery. See Battery service in **Electrical, software, and controls** 2200SRM2304.
17. Lower the hood and confirm that the hood latches. See Figure 12.
18. Move the seat back to position. See Figure 11.
19. Release the steering wheel tilt latch and move the steering wheel back to position. See Figure 10.
20. If equipped, swing the LPG tank bracket back toward the lift truck and install the pin. See Figure 9.
21. If equipped, turn the LPG tank valve to the ON position.

WATER PUMP REPAIR

202001-045

REMOVE

Before removing, visually inspect the water pump for damage. Check the shaft bearing of the water pump for abnormal noise, sticking, excessive play and water leakage.



WARNING

PINCH HAZARD

Use caution when loosening the V-belt. Rotate the alternator carefully toward the cylinder block to prevent being pinched.

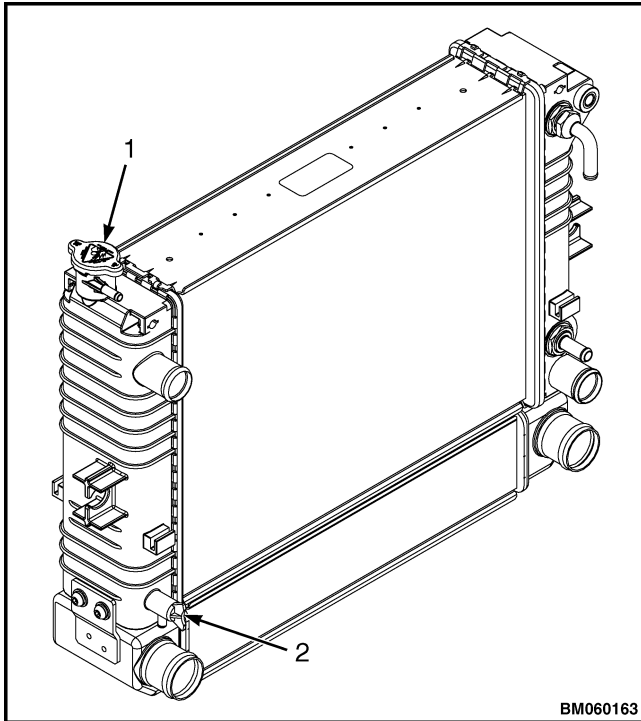
NOTE: The water pump may only be replaced as a single assembly. DO NOT attempt to repair the water pump or replace individual components.



WARNING

To reduce the risk of heat injury, make sure the engine and coolant have cooled completely before servicing.

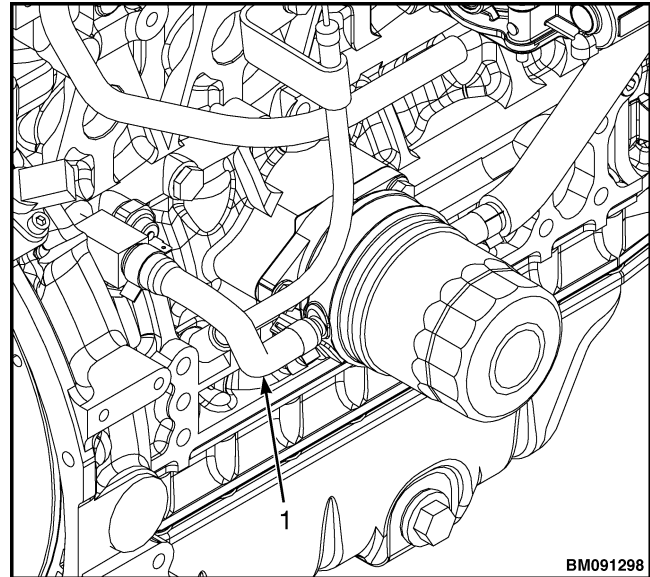
1. To drain the coolant from radiator:
 - a. Place a drain pan with a capacity greater than the capacity of the cooling system, under the radiator.
 - b. Turn the handle on the drain valve counterclockwise to drain the coolant from the radiator.
 - c. Remove the radiator cap. See Figure 19.
 - d. Remove the drain plug at the bottom of the radiator and drain the coolant into the container. See Figure 19.



1. RADIATOR CAP
2. DRAIN PLUG

Figure 19. Radiator drain

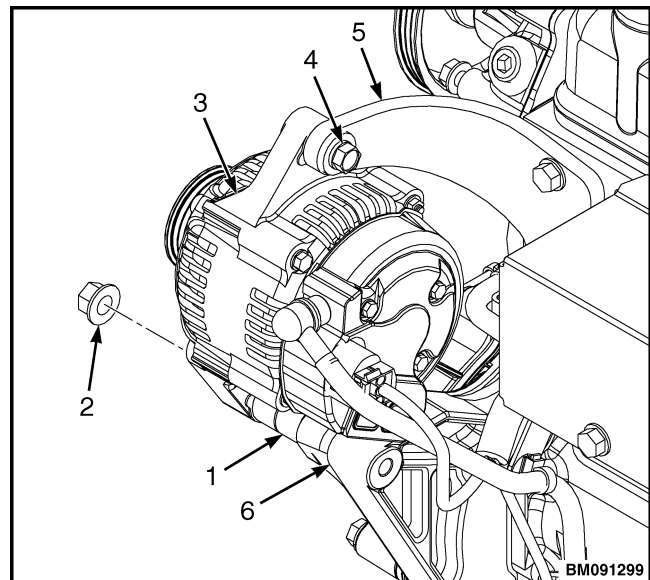
2. For 2.2L engines, Drain the coolant from the engine block by removing the coolant hose at the oil cooler and allowing the coolant hose to drain into the container. See Figure 20.



1. COOLANT HOSE

Figure 20. Oil cooler hose

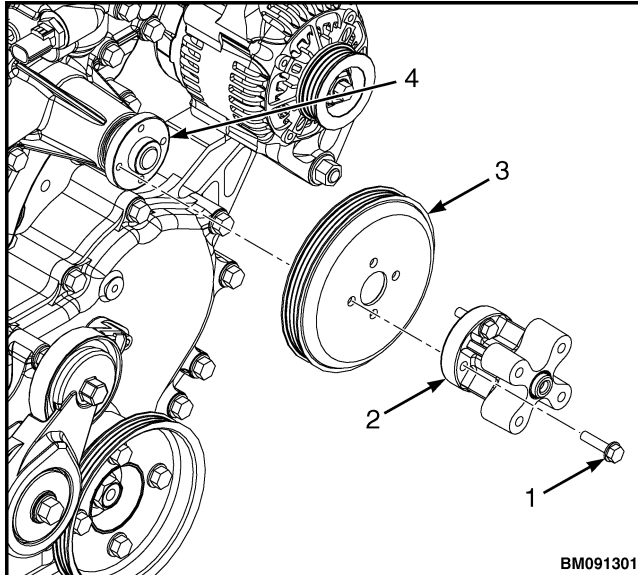
3. Loosen, but do not remove the V-belt adjuster bolt and alternator mounting bolt. See Figure 21.



1. SPACER AND STUD
2. ALTERNATOR MOUNTING NUT
3. ALTERNATOR
4. MOUNTING BOLT
5. ADJUSTER MOUNTING BRACKET
6. TIMING GEAR CASE

Figure 21. Alternator mounting

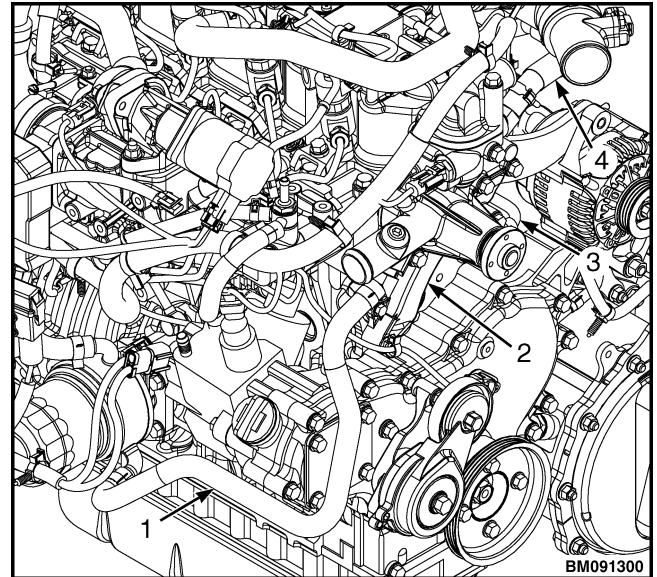
4. Remove the V-belt and rotate the alternator away from the engine and out of the way.
5. Remove the fan guard (if equipped) and fan. See Fan repair for procedure.
6. Remove the four bolts retaining the fan spacer to the water pump V-pulley. Remove the fan spacer and water pump V-pulley. See Figure 22. Refer to Fan repair for procedure.



1. BOLT
2. FAN SPACER
3. WATER PUMP V-PULLEY
4. WATER PUMP

Figure 22. Water pump V-pulley

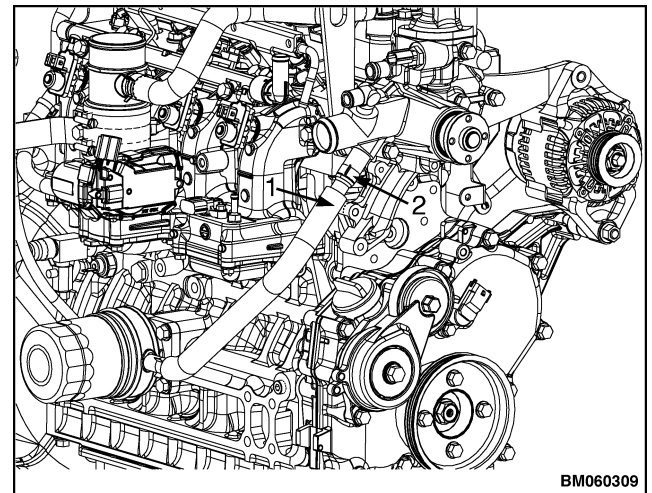
7. Disconnect the three cooling hoses from the water pump. See Figure 23.



1. COOLING HOSE (WATER PUMP TO OIL COOLER)
2. WATER PUMP
3. COOLING HOSE (WATER PUMP TO EXHAUST THROTTLE)
4. COOLING HOSE (WATER PUMP TO EXHAUST GAS RECIRCULATION HOSE)

Figure 23. Water pump and hoses

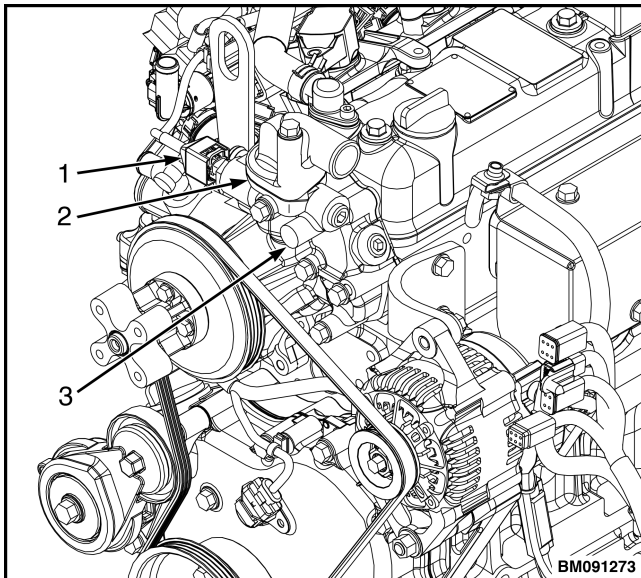
8. For 2.2L engines, Remove hose clamp and cooling hose from water pump. See Figure 24.



1. COOLING HOSE (WATER PUMP TO OIL COOLER)
2. HOSE CLAMP

Figure 24. Cooling hose

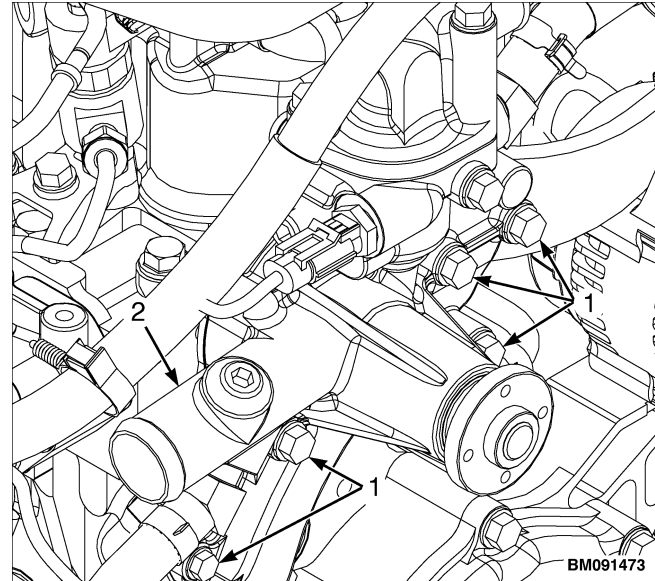
9. Disconnect the engine harness electrical connector from the temperature sensor. See Figure 25.



1. COOLANT TEMPERATURE SWITCH ELECTRICAL CONNECTOR
2. CAM SENSOR
3. WATER PUMP

Figure 25. Water pump temp sensor

10. Loosen the five mounting bolts that retain the water pump. Remove the water pump. See Figure 26.

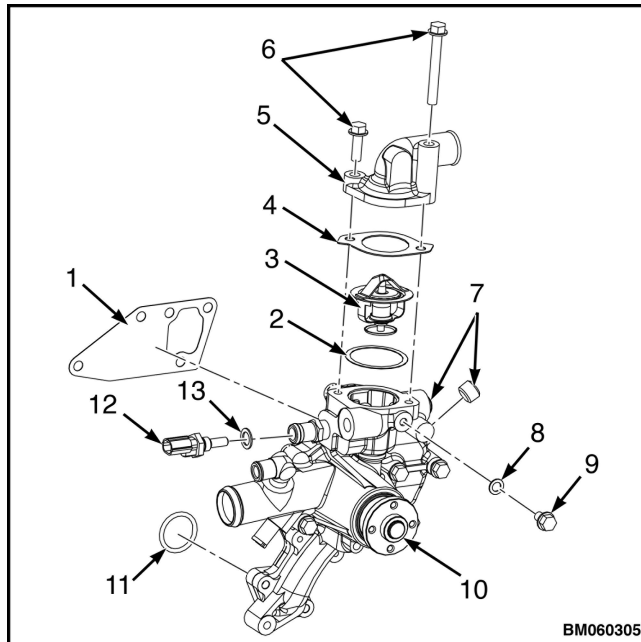


1. MOUNTING BOLTS
2. WATER PUMP

Figure 26. Water pump mounting bolts

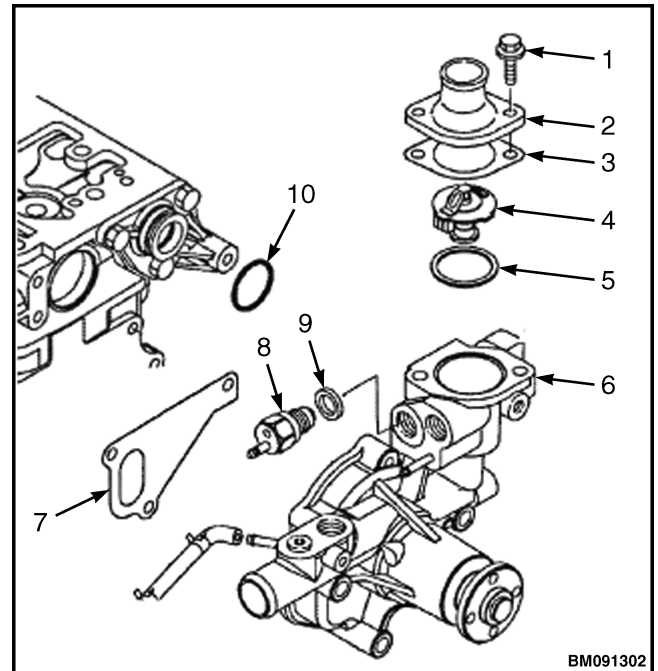
DISASSEMBLE

1. Remove the thermostat cover and discard the thermostat cover gasket. See Figure 28 or Figure 27 (depending on engine).
2. Remove the thermostat cover and discard the thermostat cover gasket. See .



1. WATER PUMP GASKET
2. THERMOSTAT O-RING
3. THERMOSTAT
4. THERMOSTAT COVER GASKET
5. THERMOSTAT COVER
6. BOLT
7. PLUG
8. WASHER
9. BOLT
10. WATER PUMP
11. O-RING
12. COOLANT TEMPERATURE SENSOR
13. COOLANT TEMPERATURE SENSOR GASKET

Figure 27. Water pump assembly (2.2L engine)



1. THERMOSTAT COVER BOLT
2. THERMOSTAT COVER
3. THERMOSTAT COVER GASKET
4. THERMOSTAT
5. THERMOSTAT O-RING
6. WATER PUMP
7. WATER PUMP GASKET
8. TEMPERATURE SWITCH
9. TEMPERATURE SWITCH GASKET
10. WATER PUMP O-RING

Figure 28. Water pump assembly

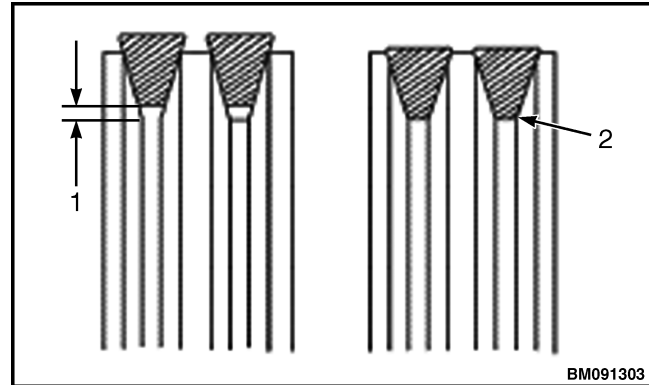
3. Remove the thermostat and discard the thermostat O-ring.
4. Remove the coolant temperature sensor and discard the coolant temperature sensor gasket.

INSTALL

1. Add a new O-ring to the thermostat and install the thermostat.
2. Install new thermostat cover gasket and install the thermostat cover.
3. Tighten the thermostat cover bolts to standard torque specification.
4. Install a new temperature switch gasket and install the temperature switch.

NOTE: When replacing the water pump O-ring, make sure you have the correct part number for the replacement O-ring. See **Parts manual**. The water pump O-ring is unique to each engine model, and although the dimensions may be the same as a commercially available O-ring, the material will be different.

5. Position the water pump with a new water pump gasket and water pump O-ring, in place on the engine block.
6. Install the five mounting bolts to secure the water pump to the engine block. See Figure 26. Tighten the bolts to standard torque specification.
7. For 2.1L engines, inspect the three cooling hoses. Attach the cooling hoses to the water pump. See Figure 23.
8. For 2.2L engines, Install cooling hose and hose clamp to water pump. See Figure 24.
9. Connect the engine harness electrical connector to the temperature sensor. See Figure 25.
10. Install the water pump V-pulley and fan spacer. See Figure 22.
11. Install the fan guard (if equipped) and fan. See Fan repair for procedure.
12. Inspect the condition of the V-belt and check for clearance between the V-belt and the bottom of the pulley groove (1, Figure 29). If there is no clearance (2, Figure 29), remove the V-belt and replace.



1. CLEARANCE
2. NO CLEARANCE

Figure 29. V-belt clearance

13. Tighten the V-belt adjuster bolt and alternator mounting bolt. See Figure 21. Torque each to 1.7-2.3 N•m (15-20 lbf ft).
14. Install the V-belt. Tighten the V-belt to the proper tension as specified in the **Periodic Maintenance** 8000SRM2305 manual.
15. Install the V-belt. See manual.
16. Install the drain plug back onto the radiator and tighten. See Figure 19.
17. Attach the coolant hose to the oil cooler. See Figure 20.
18. Fill the engine and radiator with engine coolant. See **Periodic Maintenance** 8000SRM2305 manual.

RADIATOR REPAIR

202001-046

REMOVE



WARNING

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury. Wait for 30 minutes for the radiator to cool. Check the temperature of the radiator using a touchless infrared thermometer (see Figure 30). If the radiator is still hot (37.8°C (100°F) or above), wait for the radiator to cool before attempting to check or fix any part of the cooling system.



Figure 30. Touchless infrared thermometer

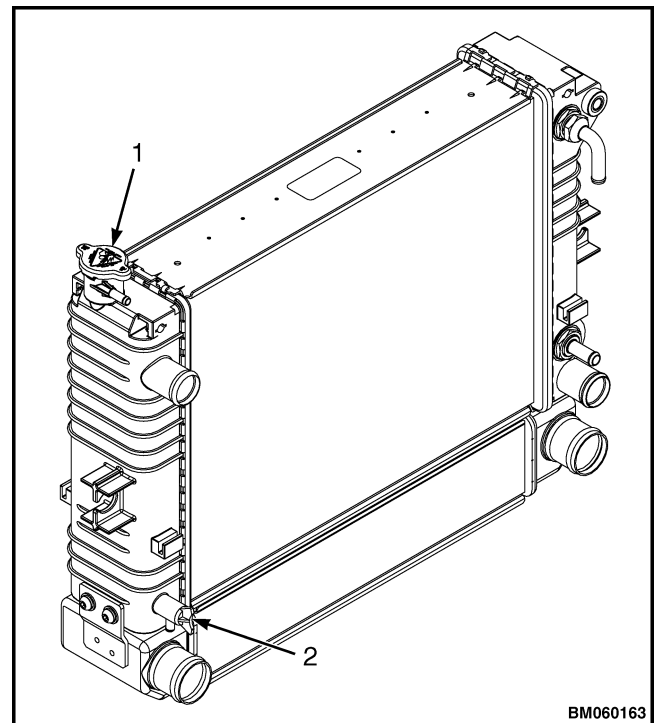
1. Turn the keyswitch of the lift truck to the OFF position.
2. Remove the seat and hood. See **Operator's Cab** 0100SRM2298.
3. Disconnect the negative battery cable from the battery. See Battery service.
4. Disconnect the positive battery cable from the battery. See Battery service.



WARNING

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns.

5. Let the coolant cool to ambient temperature.
6. Attach an 8 mm (0.31 in.) drain hose to the drain valve on the radiator. See Figure 31.
7. Place a drain pan with a capacity greater than the capacity of the cooling system, under the radiator.
 - a. Turn the handle on the drain valve clockwise to drain the coolant from the radiator.
 - b. Remove the radiator cap. See Figure 31 .
 - c. Remove the drain plug (item 2, Figure 31) at the bottom of the radiator and drain the coolant into the container.

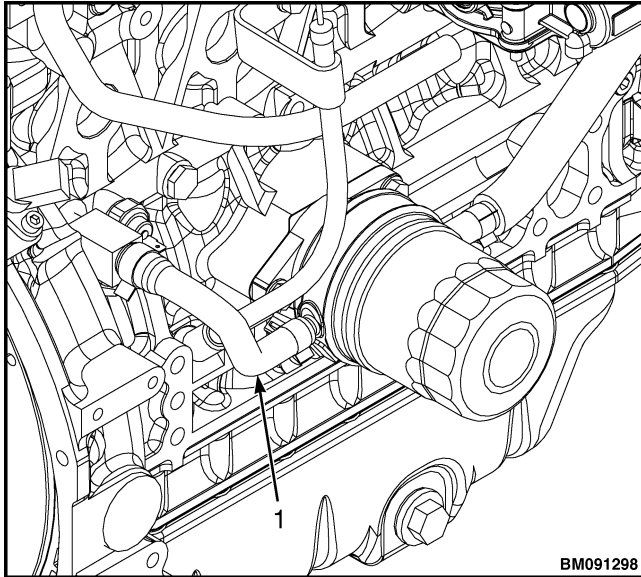


1. RADIATOR CAP
2. DRAIN VALVE AND DRAIN PLUG

Figure 31. Radiator

8. For 2.2L engines,

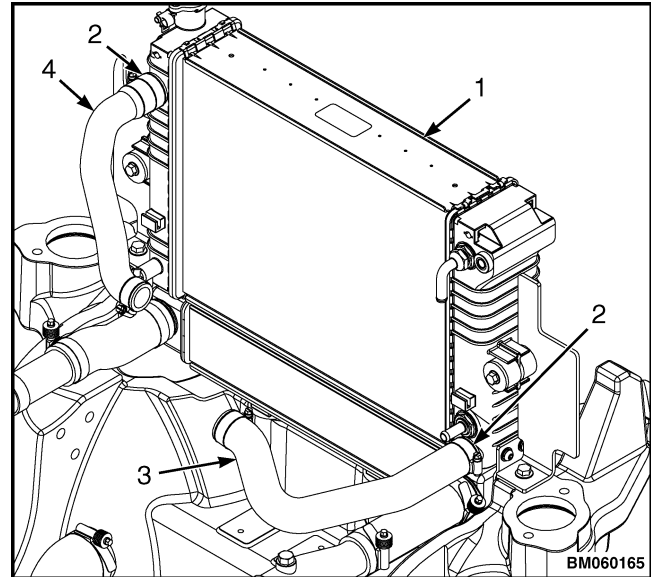
Drain the coolant from the engine block by removing the coolant hose at the oil cooler and allowing the coolant hose to drain into the container. See Figure 32.



1. COOLANT HOSE

Figure 32. Oil cooler hose

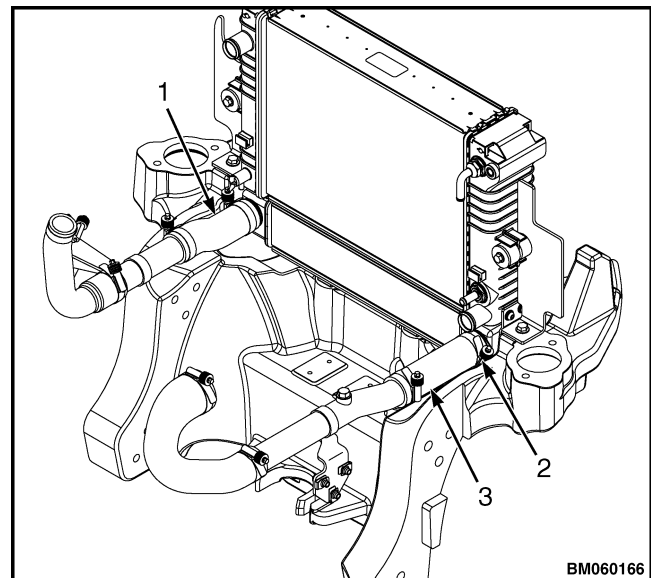
9. Once all coolant is drained from the engine, loosen the hose clamps connecting the upper and lower cooling hoses to the radiator. See Figure 33. Disconnect the cooling hoses from the radiator. Cap the cooling hoses.



1. RADIATOR
2. HOSE CLAMP
3. LOWER COOLING HOSE
4. UPPER COOLING HOSE

Figure 33. Cooling hoses

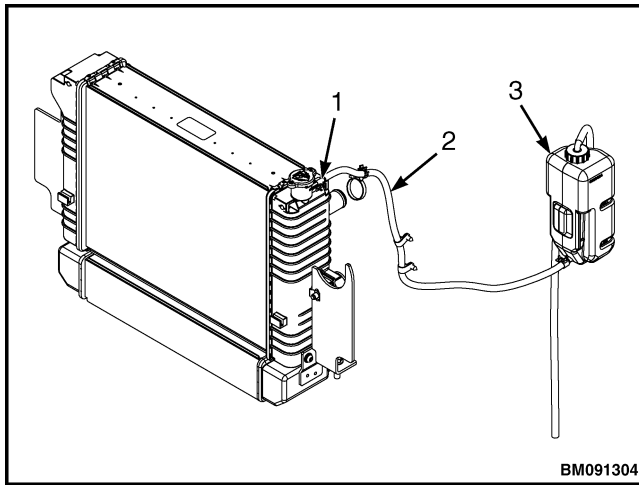
10. Loosen the hose clamps connecting the two charge air cooler hoses to the radiator. See Figure 34. Disconnect the charge air cooler hoses from the radiator and cap the hoses.



1. CHARGE AIR COOLER HOSE (HOT SIDE)
2. HOSE CLAMP
3. CHARGE AIR COOLER HOSE (COLD SIDE)

Figure 34. Charge air cooler hoses

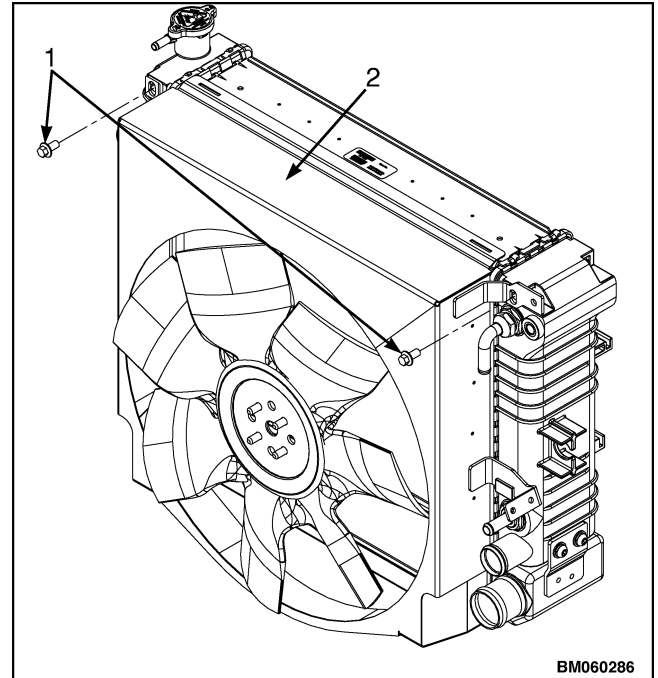
11. Loosen the hose clamp connecting the reservoir hose to the radiator. See Figure 35. Disconnect the reservoir hose from the radiator and cap the hose. Remove the reservoir.



1. HOSE CLAMP
2. RESERVOIR HOSE
3. RESERVOIR

Figure 35. Reservoir

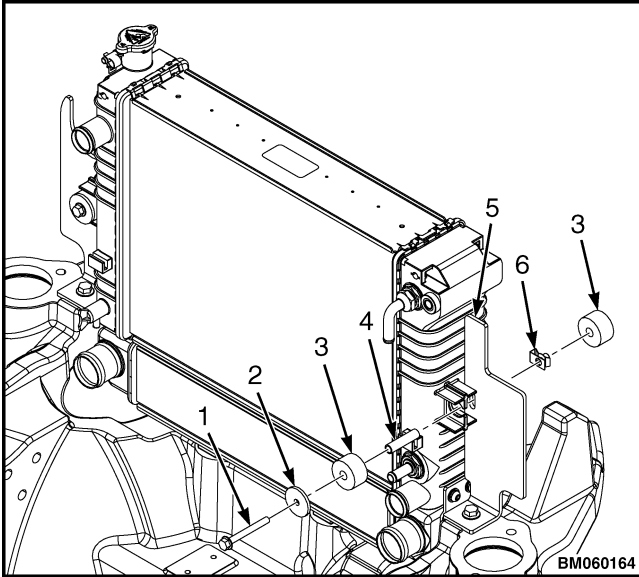
12. Remove the battery and battery tray. See Battery service.
13. Place a radiator guard shield between the radiator and the fan, to prevent damage to the radiator during fan removal.
14. Remove the two capscrews from the shroud and pull the shroud back to access the fan. See Figure 36.



1. CAPSCREW
2. FAN SHROUD

Figure 36. Fan shroud

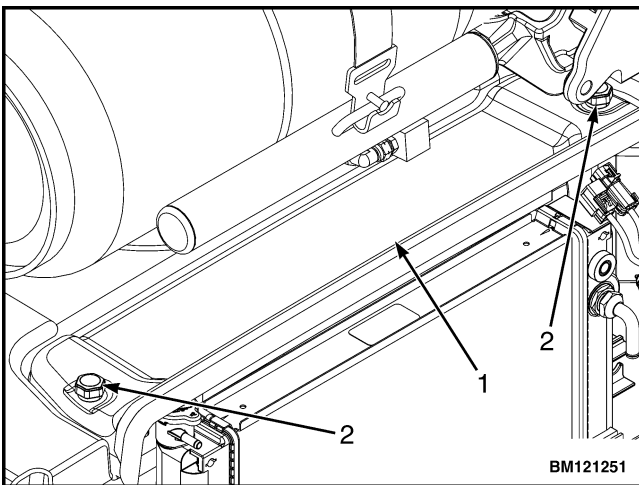
15. Remove the fan, fan spacer, and pulley. See Fan repair.
16. Remove the radiator guard shield.
17. Loosen the capscrews retaining the radiator to the two mounting brackets. Remove the capscrews and hardware. See Figure 37.



- 1. CAPSCREW
- 2. WASHER
- 3. RUBBER CUSHION
- 4. SPACER
- 5. BRACKET
- 6. CLIP NUT

Figure 37. Radiator mounting

- 18. Remove the radiator cover from the rear counterweight, by turning the stand-offs counterclockwise and lifting the cover up. See Figure 38.



- 1. RADIATOR COVER
- 2. STAND-OFFS

Figure 38. Radiator cover

- 19. Lift the radiator up to remove the radiator from the truck.

INSTALL

- 1. Install the radiator into the truck.
- 2. Insert the capscrews and hardware retaining the radiator to the two mounting brackets. See Figure 37. Tighten the capscrews to standard torque value.
- 3. Place a radiator guard shield between the radiator and fan, to prevent damage to the radiator during fan installation.
- 4. Place the shroud in the lift truck. **DO NOT** attach the shroud to the radiator at this time.

NOTE: Pull the radiator shroud away from the radiator while installing the fan, fan spacer and pulley.

- 5. Install the fan, fan spacer and pulley. See Fan repair.
- 6. Remove the radiator guard shield.
- 7. Install the capscrew into the shroud and install the shroud. Make sure that shroud mounting tabs are properly installed into the grooves on the radiator. See Figure 36. Tighten the capscrew to standard torque value.
- 8. Install the battery and battery tray. See Battery service.
- 9. Install the reservoir. Uncap and connect the reservoir hose to the radiator. Tighten the hose clamp. See Figure 35.
- 10. Uncap and connect the two charge air cooler hoses to the radiator and tighten the hose clamps. See Figure 34.
- 11. Uncap and connect the upper cooling hose to the radiator. Tighten the hose clamps. See Figure 33.
- 12. Uncap and connect the lower cooling hose to the radiator. Tighten the hose clamps. See Figure 33.
- 13. Install the drain valve back onto the radiator and tighten.

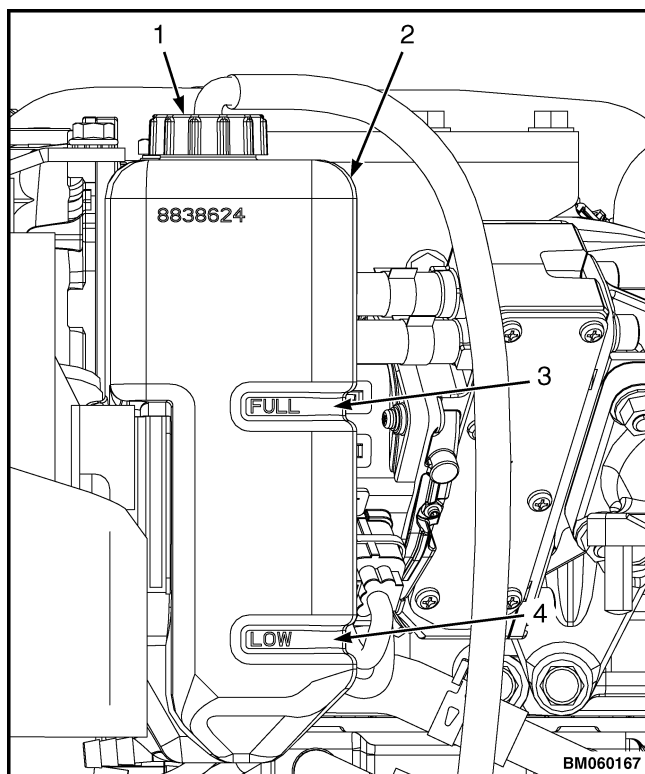
**WARNING**

DO NOT use an alcohol or methanol based antifreeze. They are flammable and could cause personal injury or damage to the lift truck.

**CAUTION**

Additives may damage the cooling system. Before using additives, contact your local Hyster dealer.

14. Fill the engine and radiator with engine coolant. See Every 2000 hour periodic maintenance (PM) schedule in the **Periodic Maintenance** 8000SRM2305 manual.
15. Use the same coolant to fill the reservoir between the ADD and FULL marks. See Figure 39.



1. RESERVOIR CAP
2. COOLANT RESERVOIR
3. FULL MARK
4. LOW MARK

Figure 39. Reservoir fill

16. Connect the positive battery cable from the battery. See Battery service.

17. Connect the negative battery cable from the battery. See Battery service.
18. Install the radiator cover onto the rear counterweight and tighten the stand-offs. See Figure 38.
19. Install the hood and seat. See **Operator's Cab** 0100SRM2298 manual.
20. Start and run the engine until the thermostat opens (the upper hose will feel warm).

**WARNING**

During engine operation, be careful not to touch the fan, pulleys or drive belts. Contact with these parts can cause serious injury.

**WARNING**

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury.

**CAUTION**

Additives may damage the cooling system. Before using additives, contact your local Hyster dealer.

21. Check the coolant level at the reservoir. Add coolant as necessary to keep the coolant level between the ADD and FULL marks on the reservoir.

RADIATOR REPAIR (WITH HYDRAULIC FAN DRIVE) 202001-241

REMOVE**WARNING**

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury. Wait for 30 minutes for the radiator to cool. Check the temperature of the radiator using a touchless infrared thermometer (see Figure 40). If the radiator is still hot (37.8°C (100°F) or above), wait for the radiator to cool before attempting to check or fix any part of the cooling system.



BM091472

Figure 40. Touchless infrared thermometer

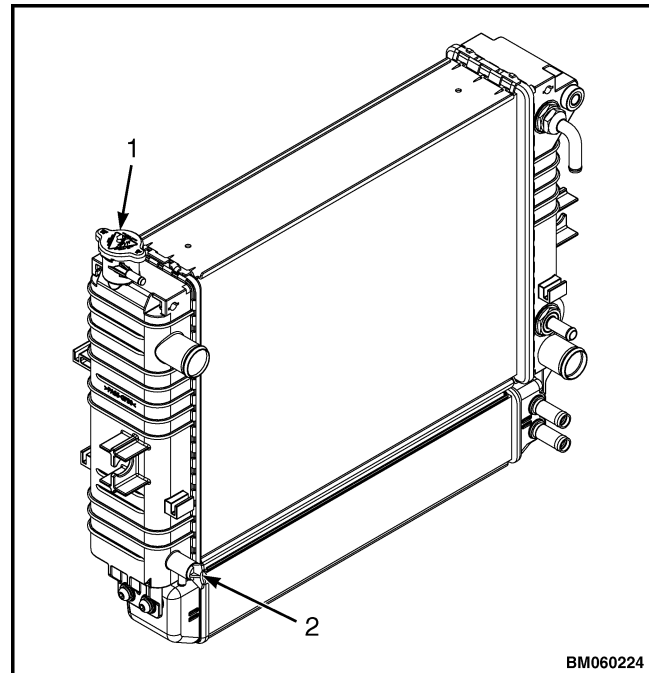
1. Turn the keyswitch of the lift truck to the OFF position.
2. Remove the seat and hood. See **Operator's Cab** 0100SRM2298.
3. Disconnect the negative battery cable from the battery. See Battery service in **Electrical, software, and controls** 2200SRM2304.
4. Disconnect the positive battery cable from the battery. See Battery service in **Electrical, software, and controls** 2200SRM2304.

**WARNING**

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns.

5. Let the coolant cool to ambient temperature.
6. Attach an 8 mm (0.31 in.) drain hose to the drain valve on the radiator. See Figure 41.
7. Place a drain pan with a capacity greater than the capacity of the cooling system, under the radiator.
 - a. Turn the handle on the drain valve clockwise to drain the coolant from the radiator.

- b. Remove the radiator cap. See Figure 41.
- c. Remove the drain plug at the bottom of the radiator and drain the coolant into the container. See Figure 41.

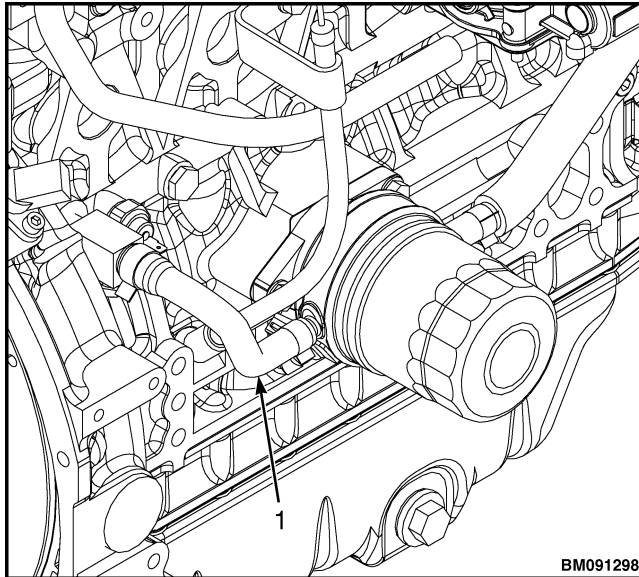


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1. RADIATOR CAP
2. DRAIN PLUG

Figure 41. Radiator

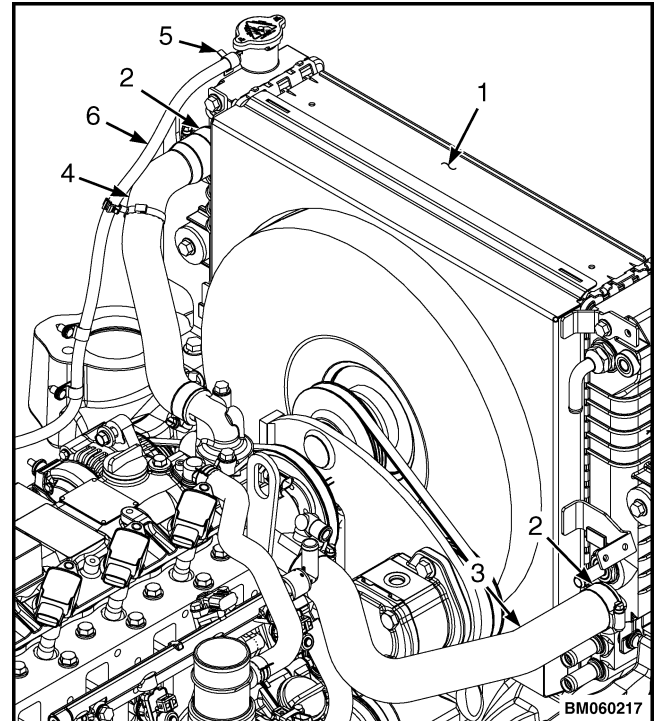
8. For 2.2L engines, Drain the coolant from the engine block by removing the coolant hose at the oil cooler and allowing the coolant hose to drain into the container. See Figure 42.



1. COOLANT HOSE

Figure 42. Oil cooler hose

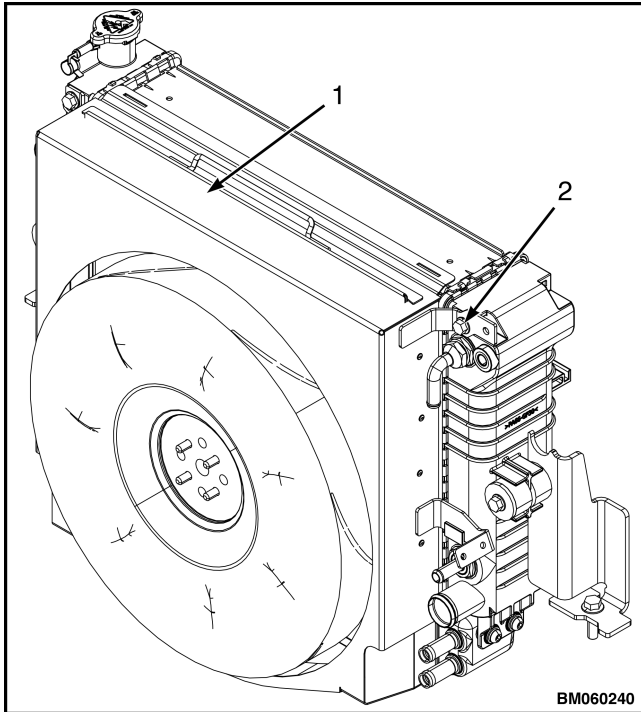
9. Once all coolant is drained from the engine, loosen the hose clamps connecting the upper and lower cooling hoses to the radiator. See Figure 43. Disconnect the cooling hoses from the radiator. Cap the cooling hoses.



1. RADIATOR
2. HOSE CLAMP
3. LOWER COOLING HOSE
4. UPPER COOLING HOSE
5. RESERVOIR HOSE
6. RESERVOIR HOSE CLAMP

Figure 43. Cooling hoses

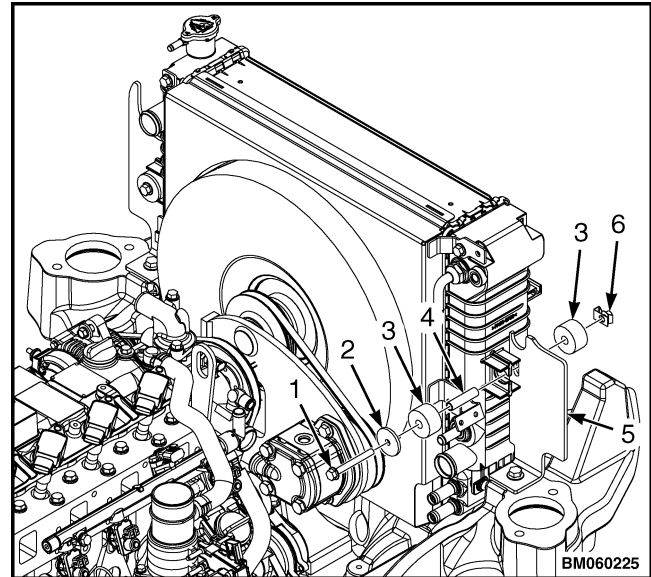
10. Loosen the hose clamp connecting the reservoir hose to the radiator. See Figure 43. Disconnect the reservoir hose from the radiator and cap the hose.
11. Remove the battery and battery tray. See Battery service in **Electrical, software, and controls** 2200SRM2304.
12. Place a radiator guard shield between the radiator and the fan, to prevent damage to the radiator during fan removal.
13. Remove the hydraulic fan drive assembly. See Fan repair (with hydraulic fan drive).
14. Remove the two capscrews from the shroud and remove the shroud. See Figure 44.



1. FAN SHROUD
2. CAPSCREW

Figure 44. Fan shroud

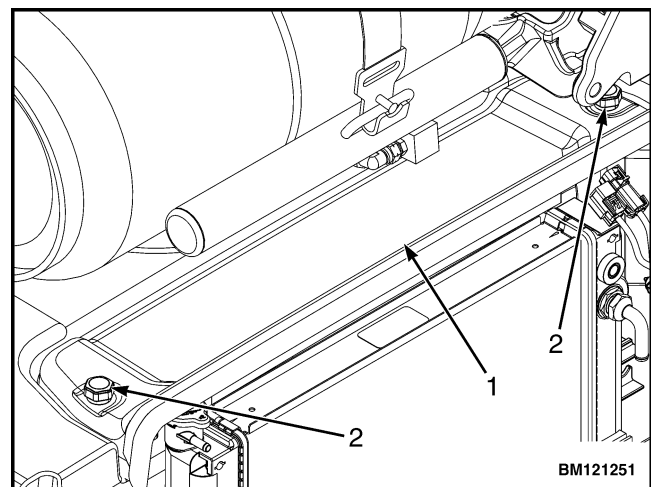
15. Remove the radiator guard shield.
16. Loosen the capscrews retaining the radiator to the two mounting brackets. Remove the capscrews and hardware. See Figure 45.



1. CAPSCREW
2. WASHER
3. RUBBER CUSHION
4. SPACER
5. BRACKET
6. CLIP NUT

Figure 45. Radiator mounting

17. Remove the radiator cover from the rear counterweight, by turning the stand-offs counterclockwise and lifting the cover up. See Figure 46.



1. RADIATOR COVER
2. STAND-OFFS

Figure 46. Radiator cover

18. Remove the radiator from the truck.

INSTALL

1. Install the radiator into the truck.
2. Insert the capscrews and hardware retaining the radiator to the two mounting brackets. See Figure 45. Tighten the capscrews to standard torque value.
3. Place a radiator guard shield between the radiator and fan, to prevent damage to the radiator during fan installation.
4. Place the shroud in the lift truck. **DO NOT** attach the shroud to the radiator at this time.
5. Install the hydraulic fan drive assembly. See Fan repair (with hydraulic fan drive).
6. Install the capscrew into the shroud and install the shroud. See Figure 44. Tighten the capscrew to standard torque value.
7. Remove the radiator guard shield.
8. Install the battery and battery tray. See Battery service in **Electrical, software, and controls** 2200SRM2304.
9. Uncap and connect the reservoir hose to the radiator. Tighten the hose clamp. See Figure 43.
10. Uncap and connect the upper cooling hose to the radiator. Tighten the hose clamps. See Figure 43.
11. Uncap and connect the lower cooling hose to the radiator. Tighten the hose clamps. See Figure 43.
12. Install the drain valve back onto the radiator and tighten.

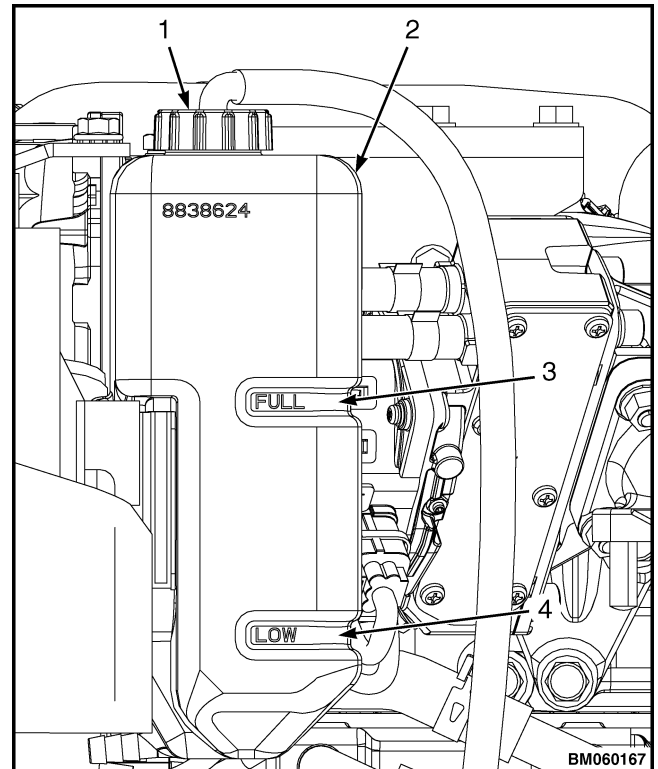
**WARNING**

DO NOT use an alcohol or methanol based antifreeze. They are flammable and could cause personal injury or damage to the lift truck.

**CAUTION**

Additives may damage the cooling system. Before using additives, contact your local Hyster dealer.

13. Fill the engine and radiator with engine coolant. See **Periodic Maintenance** 8000SRM2305 manual.
14. Use the same coolant to fill the reservoir between the ADD and FULL marks. See Figure 47.



1. RESERVOIR CAP
2. COOLANT RESERVOIR
3. FULL MARK
4. LOW MARK

Figure 47. Reservoir fill

15. Connect the positive battery cable from the battery. See Battery service in **Electrical, software, and controls** 2200SRM2304.
16. Connect the negative battery cable from the battery. See Battery service in **Electrical, software, and controls** 2200SRM2304.
17. Install the radiator cover and tighten the stand-offs. See Figure 46.
18. Install the hood and seat. See **Operator's Cab** 0100SRM2298.

19. Start and run the engine until the thermostat opens (the upper hose will feel warm).

WARNING

During engine operation, be careful not to touch the fan, pulleys or drive belts. Contact with these parts can cause serious injury.

WARNING

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury.

CAUTION

Additives may damage the cooling system. Before using additives, contact your local Hyster dealer.

20. Check the coolant level at the reservoir. Add coolant as necessary to keep the coolant level between the ADD and FULL marks on the reservoir.

COOLING SYSTEM FLUSHING 202001-047

WARNING

Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

WARNING

The radiator fins on the radiator are very sharp and can cause serious injury. Wear gloves while checking the radiator fins.

1. Check radiator fins. Clean exterior of radiator with compressed air or water as needed.

WARNING

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury. Wait for 30 minutes for the radiator to cool. Check the temperature of the radiator

using a touchless infrared thermometer (see Figure 48). If the radiator is still hot (37.8°C (100°F) or above), wait for the radiator to cool before attempting to check or fix any part of the cooling system.



Figure 48. Touchless infrared thermometer

WARNING

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

1. Attach an 8 mm (0.31 in.) drain hose to the drain valve on the radiator. Turn the handle on the drain valve clockwise to drain fluid from the cooling system into a pan.
2. Fill cooling system with clean water. See Radiator Replacement for procedures.
3. Install radiator cap. Run engine until top radiator hose is hot. Stop engine and let engine cool.

4. Drain water from radiator. If water is dirty, fill system with water and repeat procedure until water is clean.

**CAUTION**

Follow the manufacturer's instructions when using a chemical radiator cleaner.

5. If water does not clean system, use a chemical radiator cleaner.

**CAUTION**

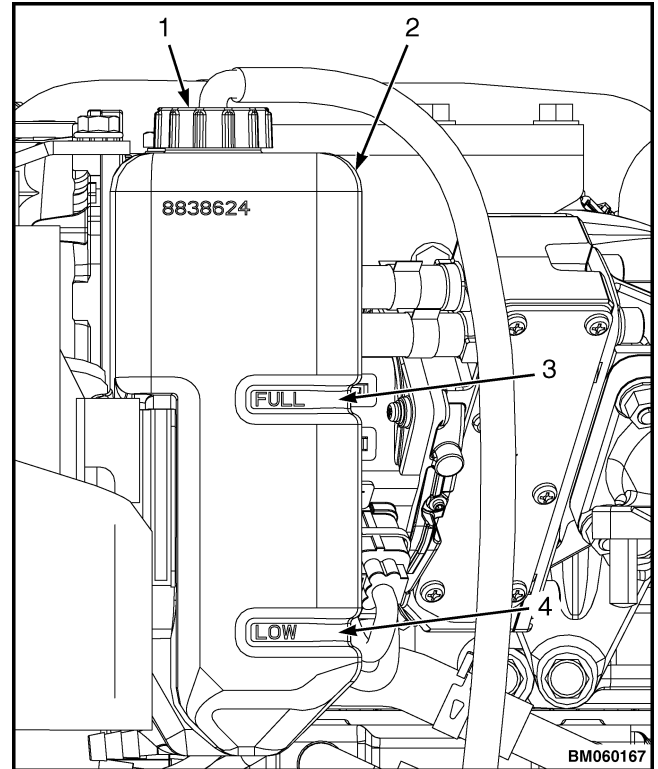
Follow the manufacturer's instructions when using special equipment to reverse clean the radiator.

6. If radiator or cooling system is very dirty or has a restriction, use reverse cleaning method. This method uses water pressure to force water through radiator in opposite direction of normal flow.

**CAUTION**

Additives may damage the cooling system. Before using additives, contact your local Hyster dealer.

7. Fill cooling system with ethylene glycol boron-free antifreeze. Purchase a pre-diluted 50/50 solution; or mix 50 percent concentrate with 50% distilled or deionized water. The 50/50 mixture will protect cooling system to -37°C (-35°F). Add coolant as necessary to keep level between the LOW and FULL marks on the reservoir. See Figure 49.



1. RESERVOIR CAP
2. COOLANT RESERVOIR
3. FULL MARK
4. LOW MARK

Figure 49. Coolant reservoir

Cooling system checks, adjustments, and calibrations

HOSE CHECK 202001-048

Inspect all radiator hoses. If they feel spongy or have visible cracks, replace hoses.

FLOW RESTRICTION CHECK 202001-049

WARNING

During engine operation, be careful not to touch the fan, pulleys, or drive belts. Contact with these parts can cause serious injury.

WARNING

The radiator or other parts of the cooling system may be hot or under pressure and can cause serious injury. Wait for 30 minutes for the radiator to cool. Check the temperature of the radiator using a touchless infrared thermometer (see Figure 50). If the radiator is still hot (37.8°C (100°F) or above), wait for the radiator to cool before attempting to check or fix any part of the cooling system.



Figure 50. Touchless infrared thermometer

CHECK FOR WATER FLOW RESTRICTIONS IN THE RADIATOR

1. Run the engine until it is warm.
2. Remove the counterweight. See Counterweight repair in **Frame and Main Components** 8000SRM2306.
3. Remove the fan and fan shroud. See Fan repair.
4. Use the infrared thermometer to check the temperature of the left and right side tanks of the radiator.
5. Check the temperature in the center of the radiator. If the temperature reading at the center of the radiator is -6.7°C (20°F) less than the temperature at the left and right side tanks, there may be a flow restriction in the radiator core.

If radiator has leaks, either replace the radiator or have it repaired by trained personnel.

EXHAUST LEAK CHECK 202001-050

WARNING

During engine operation, be careful not to touch the fan, pulleys, or drive belts. Contact with these parts can cause serious injury.

To check for exhaust leaks into the cooling system, use a Combustion Leak Test Kit. Follow the manufacturer's instructions when doing the test.

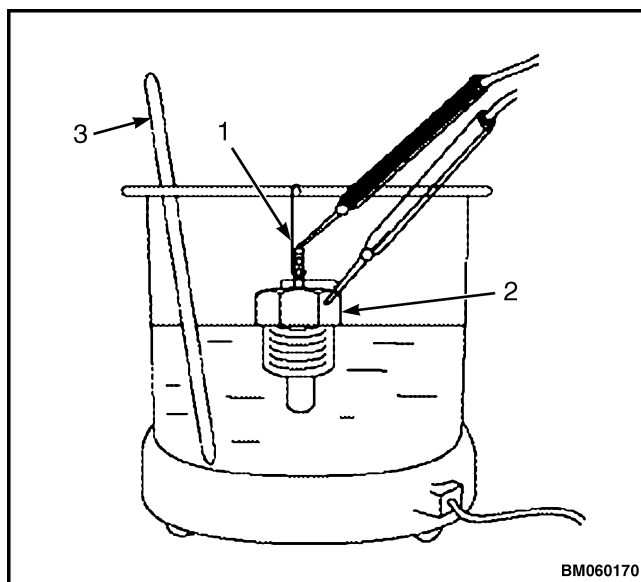
THERMOSTAT AND COOLING SYSTEM SENSORS CHECK

202001-051

INSPECT

Temperature switch

- To check for proper operation of the temperature switch, connect a continuity light or ohmmeter to the temperature switch. Connect one lead to the terminal of the temperature switch, and the other lead to the metal portion. See Figure 51.



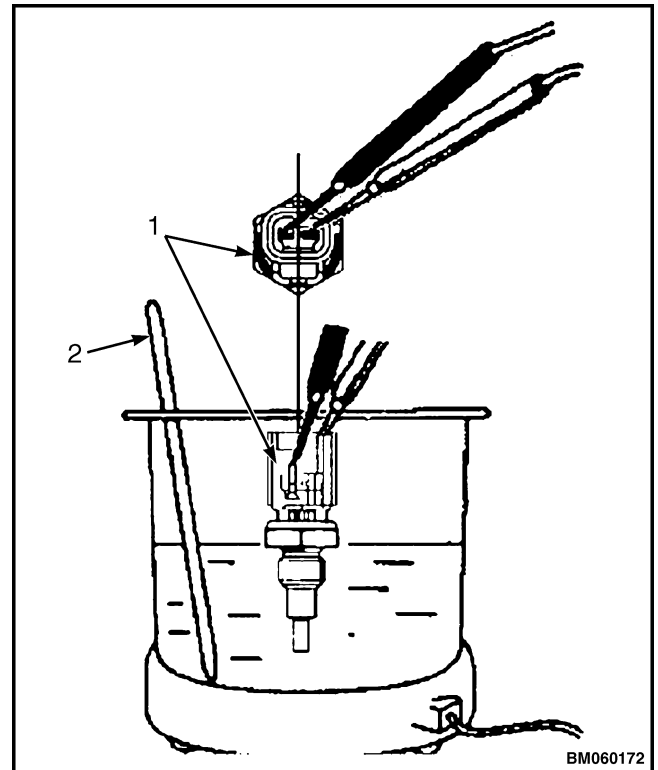
- TEMPERATURE SWITCH TERMINAL
- TEMPERATURE SWITCH METAL PORTION
- THERMOMETER

Figure 51. Test temperature switch

- Place some engine coolant in a heat-proof vessel with a heating source.
- Place the temperature switch and a thermometer in the heat-proof vessel with the engine coolant.
- Slowly increase the temperature of the water.
- The temperature switch is operating properly if the continuity light or ohmmeter indicates continuity when the engine coolant temperature reaches 107-113°C (225-235°F).

Water temperature sensor

- To check for proper operation of the water temperature sensor, connect an electric resistor to the coupler of the water temperature sensor. Connect one lead to the terminal of the temperature switch, and the other lead to the metal portion.



- WATER TEMPERATURE SENSOR
- THERMOMETER

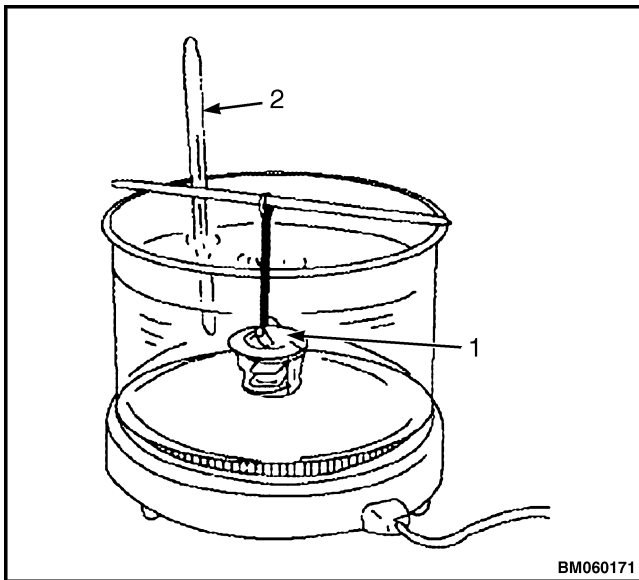
Figure 52. Test water temperature sensor

- Place some water in a heat-proof vessel with a heating source.
- Place the water temperature sensor and a thermometer into the water.
- Measure the electric resistance value while slowly raising the water temperature.
- Note the resistance value at each of the following temperatures. If temperatures are within the specified range as shown in the table below, the water temperature sensor is operating correctly.

Cooling water temperature	Resistance (k Ω)
20°C (68°F)	2.45 \pm 0.14
80°C (176°F)	0.318 \pm 0.008
100°C (212°F)	0.1836

Thermostat

- To check for proper operation of the thermostat, place the thermostat and a thermometer in a heat-proof vessel full of water with a heat source. See Figure 53.



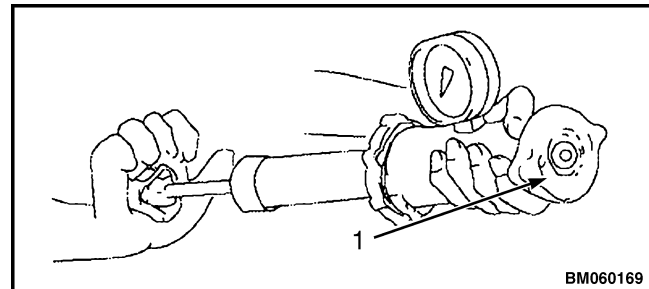
- THERMOSTAT
- THERMOMETER

Figure 53. Test thermostat

- Slowly increase the temperature of the water.
- The thermostat is operating properly if it begins to open at the specified temperature value (as stamped on the flange of the thermostat), and fully opens as the temperature of the water is increased.

Radiator cap

- To check for proper operation of the radiator cap, install the radiator cap on a cooling system tester. See Figure 54.



- RADIATOR CAP

Figure 54. Radiator cap

- Use the cooling system tester to apply 75-105 kPa (10.9-15.2 psi) to the radiator cap. If the radiator cap opens when pressure reaches the specified range, the radiator cap is functioning properly. See Figure 54.



TECHNICAL PUBLICATIONS