SERVICE MANUAL SECTION

SIDE MOUNT COOLING PACKAGE

Model: RE BUS

S12023

09/10/2007

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1. DESCRIPTION

The purpose of the cooling system is to circulate the coolant, maintain efficient operating temperature, and protect system components. About one-third of the energy produced when diesel fuel burns is converted into power by the engine. The remaining energy must be disposed of by the exhaust and cooling systems, or the engine components will be damaged by excessive heat and contamination.

1.1. COOLING PACKAGE

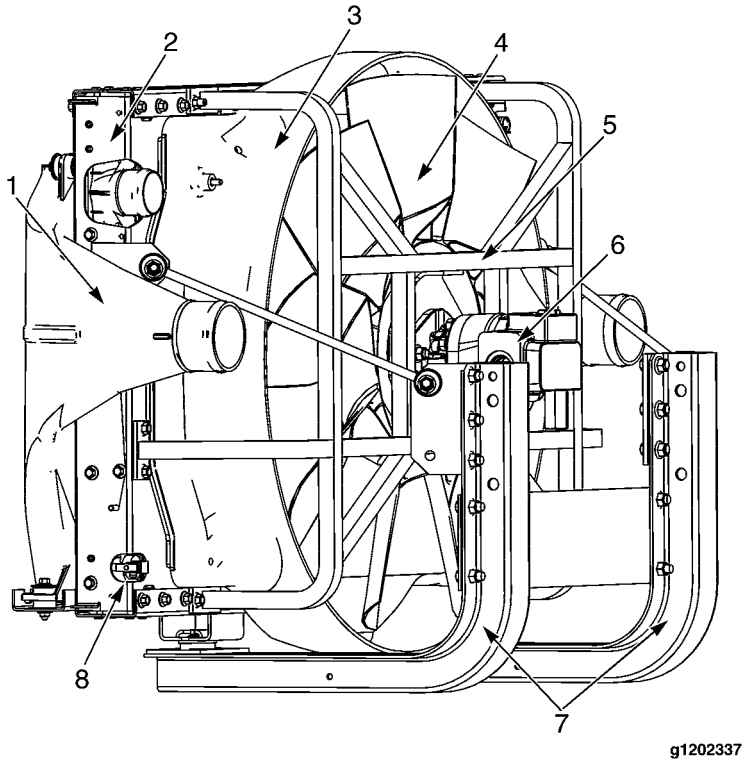

Figure 1 Cooling Package

1. CHARGE AIR COOLER
2. RADIATOR FRAME
3. FAN SHROUD
4. RADIATOR FAN
5. SPIDER CAGE
6. HYDRAULIC FAN DRIVE MOTOR
7. COOLING PACKAGE MOUNT BRACKETS
8. DRAIN VALVE

The rear engine (RE) bus cooling package is removed and installed as one assembly. The cooling package consists of the following components: charge air cooler, radiator, fan shroud, radiator fan, spider cage, hydraulic fan drive motor, and the cooling package mount brackets.

The cooling package is located on the right side of the engine and faces the curb side of the bus.

Charge Air Cooler

The RE bus is equipped with a charge air cooler to improve fuel economy, increase horsepower, and decrease gaseous emissions. The air-to-air charge air cooler is composed of cast aluminum inlet and outlet tanks, with a tube-and-fin structure cooler core. The core disperses heat to cool and condense the air from the turbocharger before it enters the engine air intake manifold.

The charge air cooler is located directly in front of, and attached to, the radiator.

Radiator

The RE bus utilizes a radiator made with advanced aluminum alloys. The core is constructed of welded aluminum tubes and high-efficiency louvered aluminum fins. A side accessed hand-operated drain valve is provided for quick, sanitary draining of the cooling system.

Spider Cage

The spider cage is the mounting frame for the hydraulic fan drive motor and radiator fan. The spider cage mounts to the radiator frame, the hydraulic fan drive motor mounts to the spider cage, and the radiator fan mounts to the hydraulic fan drive motor.

Fan Shroud

The fan shroud helps in controlling the airflow through the radiator and charge air cooler. The RE bus is equipped with a one-piece fan shroud that can only be removed or installed once the cooling package is removed from the vehicle.

1.2. SURGE TANK

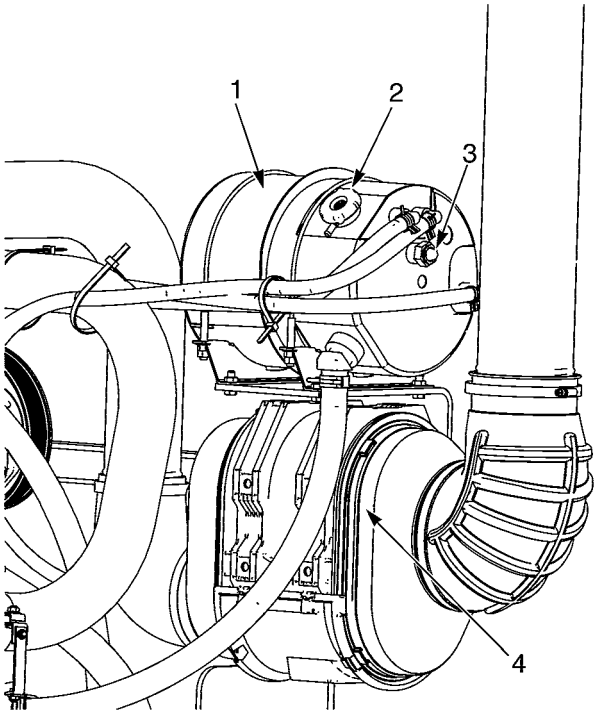

Figure 2 Surge Tank

1. SURGE TANK
2. CAP
3. SITE GLASS
4. AIR CLEANER HOUSING

The surge tank prevents over/under filling and accurate coolant level inspections. The surge tank efficiently collects air bubbles in the engine and radiator coolant to promote longer water pump and cylinder liner life. The coolant level can easily be checked by viewing the sight glass located on the side of the surge tank.

The surge tank is located to the left side of the engine, faces the road side of the bus, and is mounted above the air cleaner housing. The surge tank can be accessed through the left-side rear compartment service door.

1.3. HYDRAULIC SYSTEM

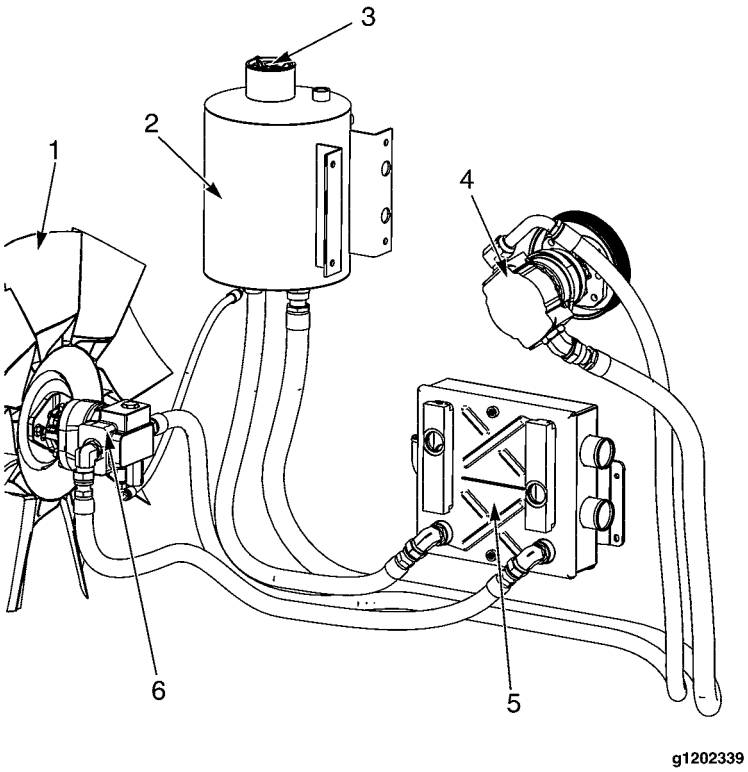

Figure 3 Hydraulic System

1. RADIATOR FAN
2. HYDRAULIC RESERVOIR
3. HYDRAULIC FILTER
4. HYDRAULIC PUMP
5. HYDRAULIC OIL COOLER
6. HYDRAULIC FAN DRIVE MOTOR

The RE bus utilizes a hydraulic system to drive the radiator fan and cool the radiator and charge air cooler. The hydraulic system responds to cooling requirements by monitoring engine temperatures. The hydraulic system consists of the following components: hydraulic pump, hydraulic reservoir, hydraulic fan drive motor, and hydraulic oil cooler.

Hydraulic Reservoir and Filter

The hydraulic reservoir provides a supply of clean, air-free oil to the hydraulic system. The hydraulic reservoir is vented and uses a two-site glass system for monitoring the oil level. The hydraulic reservoir is located to the right of the engine and can be accessed through the rear compartment service door.

The hydraulic reservoir has an internal filter that filters return oil flow and can easily be replaced from the top of the hydraulic reservoir.

Hydraulic Pump

The hydraulic pump provides oil flow for the hydraulic fan drive system and the power steering circuit. The hydraulic pump is mounted to the left side of the engine and can be accessed through the left-side rear compartment service door.

Hydraulic Fan Drive Motor

The hydraulic fan drive motor drives the radiator fan to cool the charge air cooler and engine coolant. Hydraulic oil is supplied to the hydraulic fan drive motor by the hydraulic pump.

Hydraulic Oil Cooler

The hydraulic system is protected by a hydraulic oil cooler to keep the hydraulic oil cool. The two-part hydraulic oil cooler allows the hydraulic oil to flow through the center of the hydraulic oil cooler while engine coolant flows through the outside of the hydraulic oil cooler. This process allows the engine coolant to cool the hydraulic oil.

The hydraulic oil cooler is mounted to a crossmember behind the rear bumper and can be accessed through the rear compartment service door.

2. REMOVE AND INSTALL PROCEDURES

WARNING – To prevent vehicle damage, personal injury, or possible death, park the vehicle on a flat level surface. Make sure the engine ignition is in the off position, and the transmission is in neutral or in the park position if the vehicle is equipped with an automatic transmission. Set the parking brake, chock the wheels, and disconnect the batteries at the negative terminal before doing any service procedures on the engine or vehicle.

WARNING – To prevent vehicle damage and/or personal injury, use care when removing or installing cooling system components with the hood in the open position. With the hood assembly in the open position, the available space to maneuver components such as the charge air cooler, air conditioning condenser, external transmission cooler (if applicable) and radiator frame and core assembly is limited, making handling of the components difficult.

NOTE – The hydraulic system is equipped with large hoses that will require 1 3/8-, 1 5/8-, and 1 7/8-inch wrenches for removal and installation.

IMPORTANT – Before performing any work on the cooling package components, be sure to perform these basic procedures:

1. Park the chassis on a flat level surface.
2. Place transmission in neutral (or park if automatic transmission).
3. Set the parking brake.
4. Turn off ignition.
5. Install wheel chocks.
6. Disconnect the battery.

2.1. SURGE TANK

Surge Tank – Removal

IMPORTANT – Prior to draining any coolant from the system, close two heater shut-off valves. The heater shut-off valves can be accessed through the left-side rear compartment service door.

1. Unlatch and open the rear compartment service doors, left-side door, and rear door.

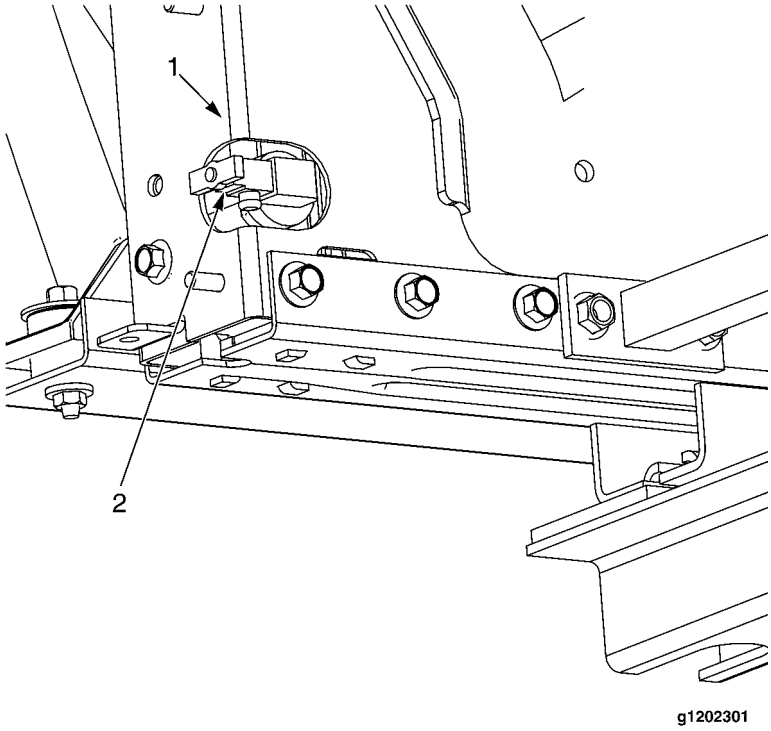

Figure 4 Radiator Drain Valve

1. LEFT-SIDE RADIATOR FRAME
2. DRAIN VALVE

NOTE – The entire cooling system will not require draining to remove the surge tank. Only drain enough coolant to empty the surge tank.

2. Locate the radiator drain valve prior to removal of the surge tank. Place tray under the radiator to collect coolant from radiator. Open the drain valve and drain coolant.

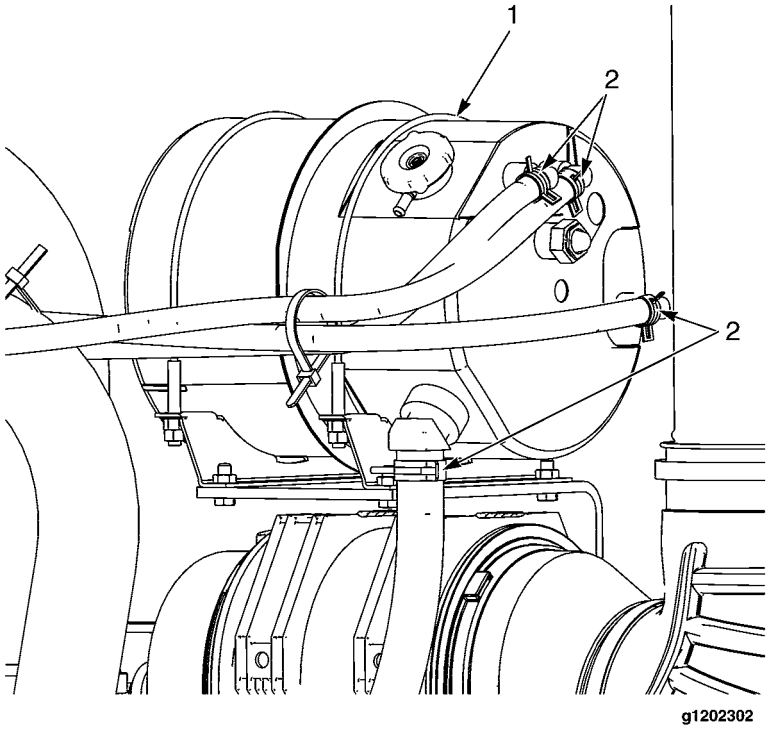

Figure 5 Surge Tank Hoses

1. SURGE TANK
2. SURGE TANK HOSES

NOTE –

- **Tag and mark hoses before removal to ensure proper installation.**
- **Cap and plug all hoses upon removal to stop leakage and prevent contamination.**

3. Remove four hoses from surge tank.

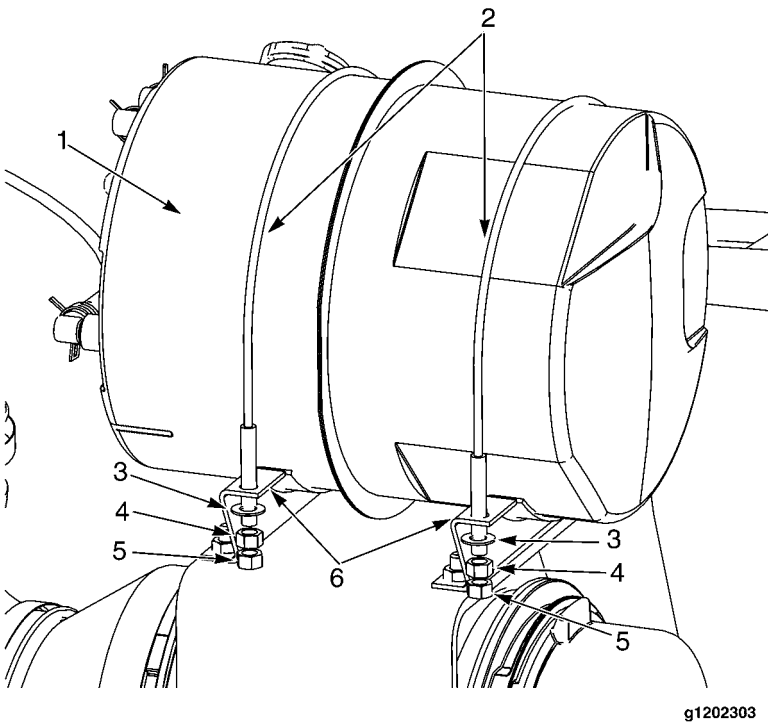

Figure 6 Surge Tank Mouting

1. SURGE TANK
2. CABLE STRAPS
3. WASHER
4. MOUNT NUT
5. JAM NUT
6. MOUNT BRACKET

4. Remove two jam nuts, mount nuts, and washers from two cable straps.

5. Remove surge tank from mount brackets.

6. If replacement is needed, transfer all fittings to the new surge tank.

Surge Tank – Installation

NOTE – Check the surge tank prior to installation for any leaks and/or damage.

1. Position surge tank on mount brackets (Figure 6, Items 1 and 6).

2. Position two cable straps on surge tank and install two washers, mount nuts, and jam nuts on cable straps (Figure 6). Torque mount nuts to 21 to 27 lbf-ft (28 to 37 N•m).

3. Install four surge tank hoses (Figure 5).

4. Fill cooling system to proper level and leak test the cooling system. Special Tool number **550500INT** is recommended to fill and leak test the cooling system.

IMPORTANT – After filling the cooling system, open two heater shut-off valves and recheck the coolant level. The heater shut-off valves can be accessed through the left-side rear compartment service door.

5. Close and latch the rear compartment service doors, left-side door, and rear door.

2.2. HYDRAULIC FILTER

Hydraulic Filter – Removal

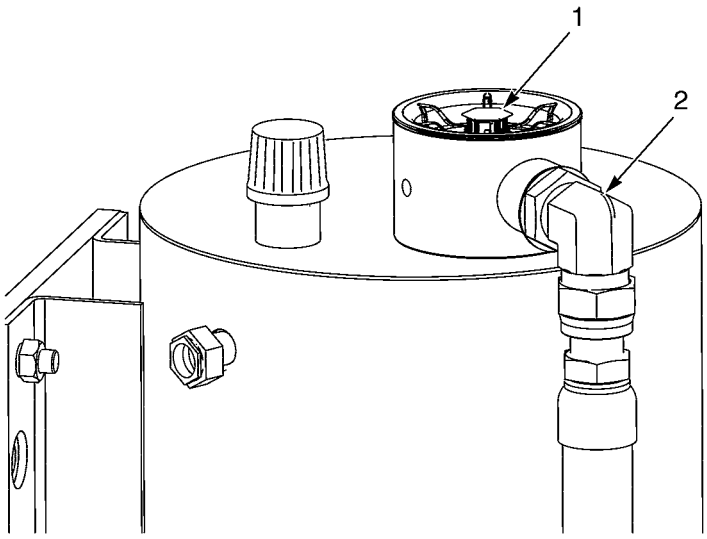

Figure 7 Hydraulic Filter

1. HYDRAULIC FILTER HOUSING
2. HYDRAULIC RESERVOIR

1. Unlatch and open the rear compartment service door.
2. Loosen filter top cover.
3. Lift hydraulic filter out of hydraulic reservoir.

Hydraulic Filter – Installation

1. Inspect the hydraulic filter housing O-ring and replace as needed.
2. Install hydraulic filter into hydraulic reservoir (Figure 7). Torque hydraulic filter top cover to 17 to 20 lbf-ft (23 to 27 N•m).
3. Close and latch the rear compartment service door.

2.3. HYDRAULIC RESERVOIR

Hydraulic Reservoir – Removal

1. Unlatch and open the rear compartment service doors, left-side door, and rear door.

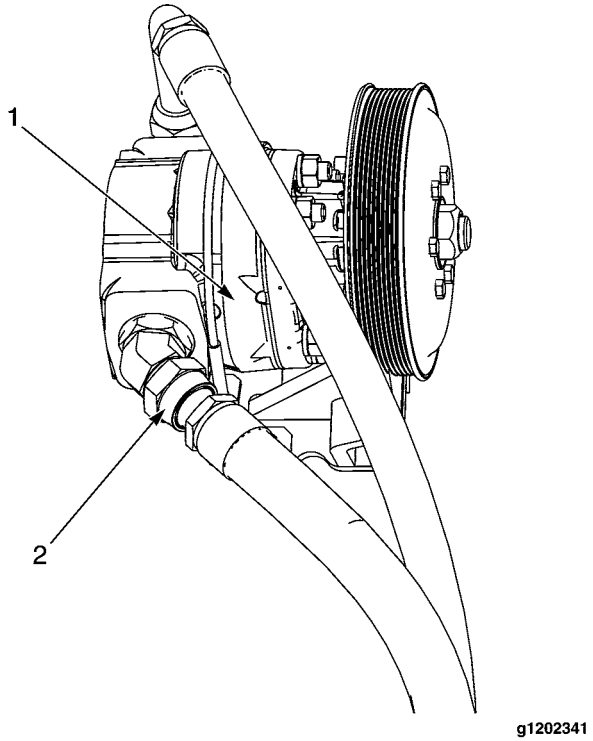

Figure 8 Hydraulic Oil Draining

1. HYDRAULIC PUMP
2. LOWER HYDRAULIC HOSE

2. Place a suitable container under the lower hydraulic hose to catch the hydraulic oil from the system.

3. Remove P-clips and wire ties as needed from the lower hydraulic hose.

4. Disconnect the lower hydraulic hose from the hydraulic pump and position lower hydraulic hose into the container for draining.

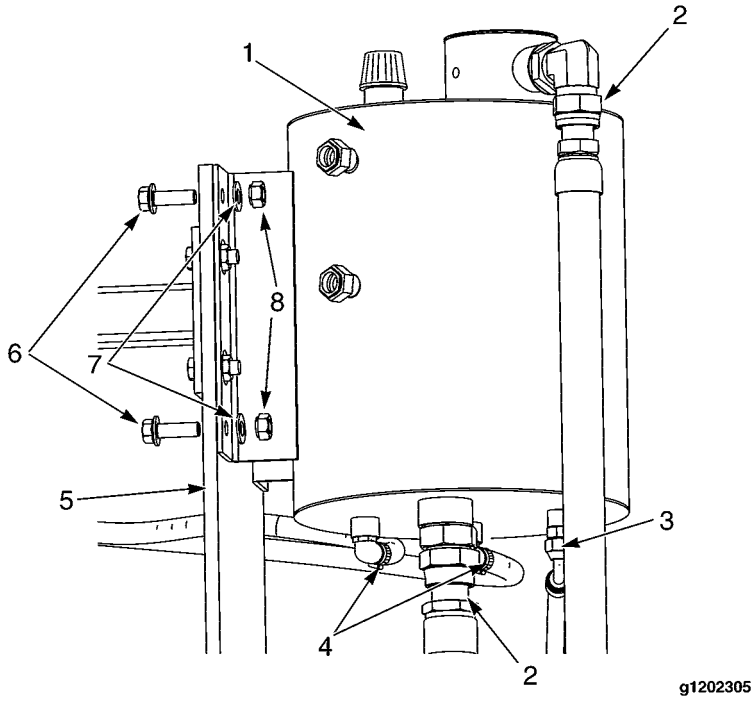

Figure 9 Hydraulic Reservoir

1. HYDRAULIC RESERVOIR
2. HYDRAULIC HOSE
3. HYDRAULIC PILOT HOSE
4. POWER STEERING HOSE
5. MOUNT BRACKET
6. BOLTS
7. WASHER
8. NUT

NOTE –

- **Tag and mark hoses before removal to ensure proper installation.**
- **Cap and plug all hoses upon removal to stop leakage and prevent contamination.**

5. Disconnect two power steering hoses from the hydraulic reservoir.
6. Disconnect two hydraulic hoses from the hydraulic reservoir.
7. Disconnect the hydraulic pilot hose from the hydraulic reservoir.
8. Remove four bolts, washers, and nuts from the hydraulic reservoir and mount bracket.
9. Remove the hydraulic reservoir from the mount bracket.
10. If replacing the hydraulic reservoir, transfer all fittings to the new hydraulic reservoir.

Hydraulic Reservoir – Installation

1. Install the hydraulic reservoir on the mount bracket and secure with four nuts, washers, and bolts (Figure 9). Torque bolts to 100 to 120 lbf-ft (136 to 163 N•m).

CAUTION – Some hydraulic hoses and fittings in the hydraulic system are equipped with O-rings to seal the hydraulic hoses. Inspect all O-rings prior to installation and replace as needed.

NOTE – Be sure to remove all caps and plugs that were installed during the removal procedures before installing hydraulic hoses.

2. Connect the hydraulic pilot hose to the hydraulic reservoir (Figure 9, Items 1 and 3).
3. Connect two hydraulic hoses to the hydraulic reservoir (Figure 9, Items 1 and 2).
4. Connect two power steering hoses to the hydraulic reservoir (Figure 9, Items 1 and 4).
5. Connect the lower hydraulic hose on the hydraulic pump (Figure 8).
6. Install P-clips and wire ties on the lower hydraulic hose as needed (Figure 8, Item 2).
7. Fill the hydraulic system.
8. Close and latch the rear compartment service door.

2.4. HYDRAULIC PUMP

Hydraulic Pump – Removal

1. Unlatch and open the rear compartment service doors, left-side door, and rear door.

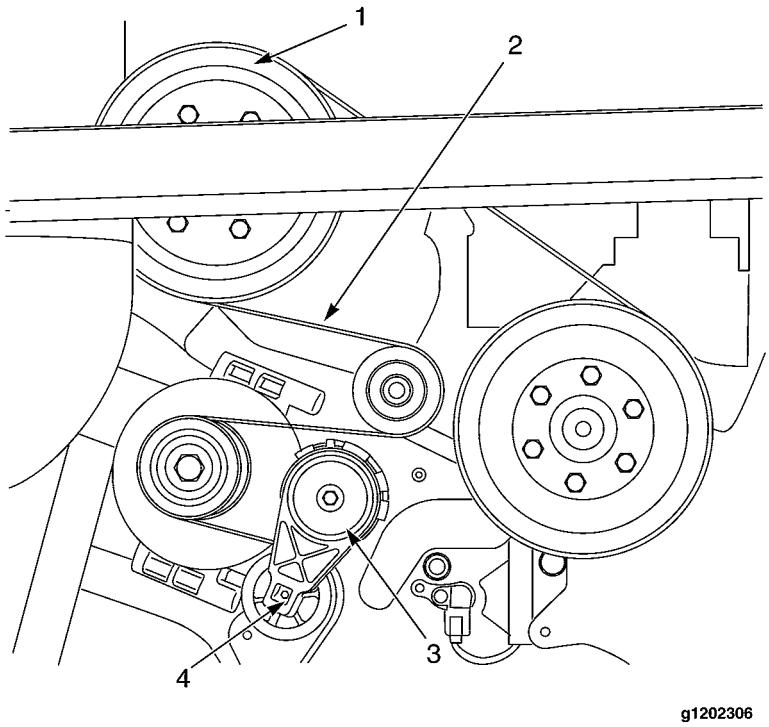

Figure 10 Drive Belt

1. HYDRAULIC PUMP PULLEY
2. DRIVE BELT
3. BELT TENSIONER
4. TENSIONER RELEASE HOLE

2. Insert ratchet in belt tensioner release hole, relieve tension from drive belt, and remove drive belt from hydraulic pump pulley.

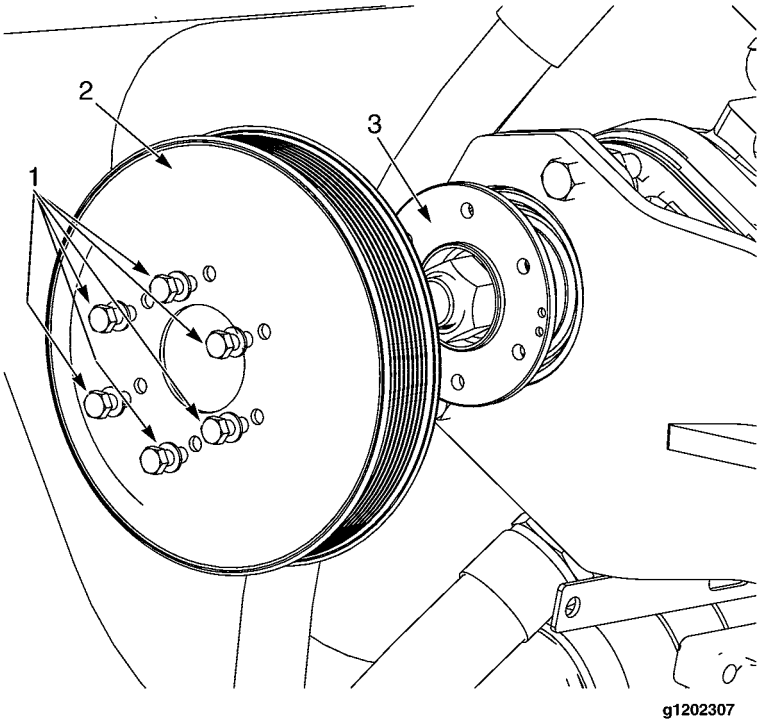

Figure 11 Hydraulic Pump Pulley

1. BOLTS AND WASHERS
2. HYDRAULIC PUMP PULLEY
3. HYDRAULIC PUMP

3. Remove six bolts and washers from the hydraulic pump pulley.

4. Remove the hydraulic pump pulley from the hydraulic pump.

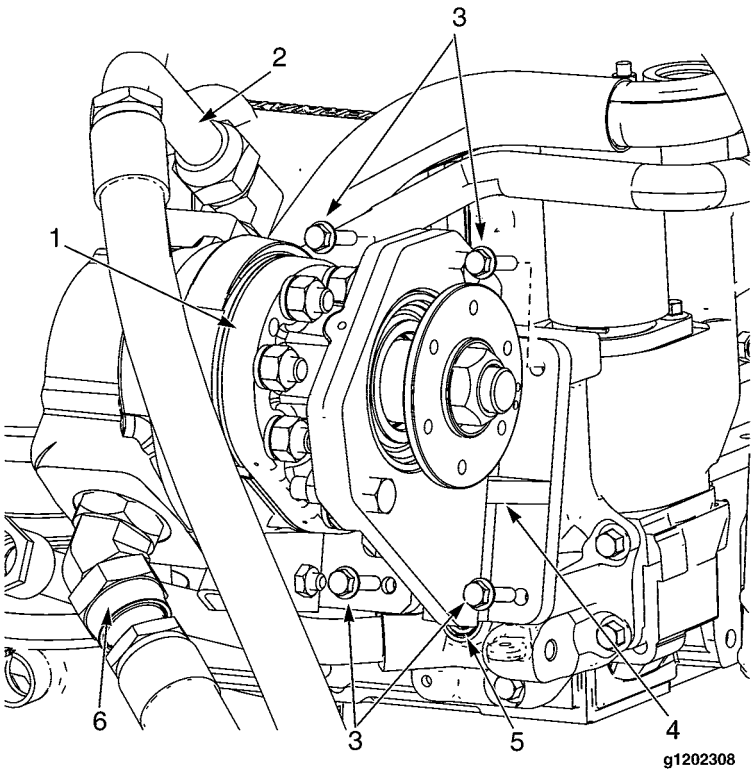

Figure 12 Hydraulic Pump

1. HYDRAULIC PUMP
2. UPPER HYDRAULIC HOSE
3. BOLTS
4. MOUNT BRACKET
5. TEMPERATURE SENSOR LOCATION
6. LOWER HYDRAULIC HOSE

NOTE – Cap and plug all hoses upon removal to stop leakage and prevent contamination.

5. Place a suitable container under the lower hydraulic hose to catch the hydraulic oil from the system.

6. Remove P-clips and wire ties as needed from the lower hydraulic hose.

7. Disconnect the lower hydraulic hose from the hydraulic pump and position lower hydraulic hose into the container for draining.

8. Disconnect the upper hydraulic hose from the hydraulic pump.

CAUTION – The hydraulic pump weighs 77 lbs. (35 kg) and care should be taken when removing the hydraulic pump. The temperature sensor and wiring located under the hydraulic pump can be broken if the hydraulic pump is allowed to drop down.

IMPORTANT – To aid in removal of the hydraulic pump, remove two bolts from the pulley end mount holes, install two 8 mm studs into those holes, and remove the remaining two bolts.

9. Support the hydraulic pump and remove four bolts from the mount bracket.

10. Carefully lift the hydraulic pump up and clear of the engine.

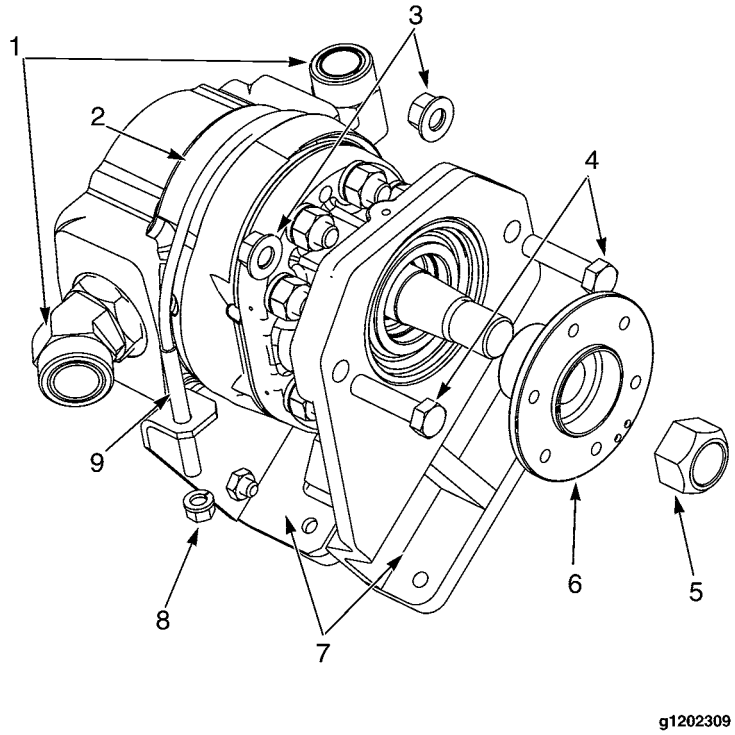

Figure 13 Hydraulic Pump Disassembly

1. FITTINGS
2. HYDRAULIC PUMP
3. NUT AND WASHER
4. MOUNT BOLT
5. HUB MOUNT NUT
6. HUB
7. MOUNT BRACKET
8. NUT AND LOCK WASHER
9. CABLE STRAP

11. If the hydraulic pump is being replaced, follow these instructions to disassemble the hydraulic pump:

    a. Remove the hub mount nut from the hydraulic pump.

    b. Using an appropriate puller, remove the hub from the hydraulic pump.

    c. Note the location of two fittings and remove two fittings from hydraulic pump.

    d. Remove nut, lock washer, and cable strap from mount bracket and hydraulic pump.

    e. Remove two mount bolts, washers, and nuts from mount bracket and hydraulic pump.

    f. Remove hydraulic pump from mount brackets.

Hydraulic Pump – Installation

1. If the hydraulic pump is being replaced, follow these instructions to assemble the hydraulic pump:

    a. Install the hydraulic pump on the mount brackets (Figure 13, Items 2 and 7).

    b. Install two mount bolts, washers, and nuts on the mount bracket and hydraulic pump (Figure 13). Torque bolts to 70 to 85 lbf-ft (95 to 115 N•m).

    c. Install the cable strap on the mount bracket and hydraulic pump. Secure the cable strap with the lock washer and nut (Figure 13). Torque nut to 21 to 27 lbf-ft (28 to 37 N•m).

    d. Install two fittings on hydraulic pump as noted during removal procedure (Figure 13, Items 1 and 2).

    e. Install the hub on the hydraulic pump and secure with hub mount nut (Figure 13, Items 2, 5, and 6). Torque nut to 220 to 240 lbf-ft (298 to 325 N•m).

CAUTION – The hydraulic pump weighs 77 lbs. (35 kg) and care should be taken when installing the hydraulic pump. The temperature sensor and wiring located under the hydraulic pump can be broken if the hydraulic pump is allowed to drop down.

2. Carefully align the hydraulic pump and mount brackets on the two studs that were installed during the removal procedures.

3. Install two bolts on the mount bracket, remove two studs, and install two remaining bolts on the mount bracket (Figure 12, Items 1, 3, and 4). Torque bolts to 17 to 21 lbf-ft (23 to 28 N•m).

CAUTION – Some hydraulic hoses and fittings in the hydraulic system are equipped with O-rings to seal the hydraulic hoses. Inspect all O-rings prior to installation and replace as needed.

NOTE – Be sure to remove all caps and plugs that were installed during the removal procedures before installing hydraulic hoses.

4. Connect the upper hydraulic hose on the hydraulic pump (Figure 12, Items 1 and 2).

5. Connect the lower hydraulic hose on the hydraulic pump (Figure 12, Items 1 and 6).

6. Install P-clips and wire ties on the lower hydraulic hose as needed.

7. Install the hydraulic pump pulley on the hydraulic pump and secure with six bolts and washers (Figure 11). Torque bolts to 13 to 16 lbf-ft (18 to 21 N•m).

8. Insert ratchet in belt tensioner release hole, relieve tension, and install drive belt on hydraulic pump pulley (Figure 10). Ensure that the belt is properly mounted on all other pulleys.

9. Fill the hydraulic system.

10. Close and latch the rear compartment service doors, left-side door, and rear door.

2.5. FAN DRIVE MOTOR SOLENOID

Fan Drive Motor Solenoid – Removal

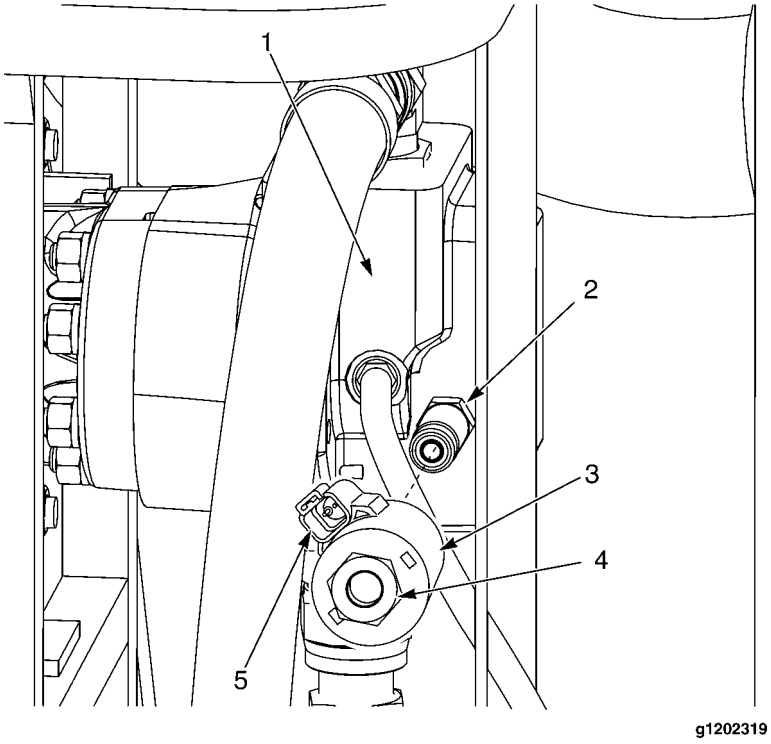

Figure 14 Fan Drive Motor Solenoid

1. HYDRAULIC FAN DRIVE MOTOR
2. MOUNT SHAFT
3. FAN DRIVE MOTOR SOLENOID
4. NUT
5. SOLENOID ELECTRICAL CONNECTOR

1. Disconnect solenoid electrical connector.

2. Remove nut from bottom of fan drive motor solenoid and slide fan drive motor solenoid off mount shaft.

Fan Drive Motor Solenoid – Installation

1. Inspect O-ring on mount shaft for damage (Figure 14, Item 2). Replace O-ring as needed.

2. Position the fan drive motor solenoid on the mount shaft and install nut (Figure 14, Items 2, 3, and 4). Torque nut to 7 to 9 lbf-ft (9 to 12 N•m).

3. Connect solenoid electrical connector (Figure 14, Item 5).

2.6. HYDRAULIC FAN DRIVE MOTOR

Hydraulic Fan Drive Motor – Removal

1. Unlatch and open the rear compartment service doors, left-side door, and rear door.
2. Place a suitable container under the lower hydraulic hose to catch the hydraulic oil from the system.
3. Remove P-clips and wire ties as needed from the lower hydraulic hose (Figure 8, Item 2).
4. Disconnect the lower hydraulic hose from the hydraulic pump and position lower hydraulic hose into the container for draining (Figure 8).

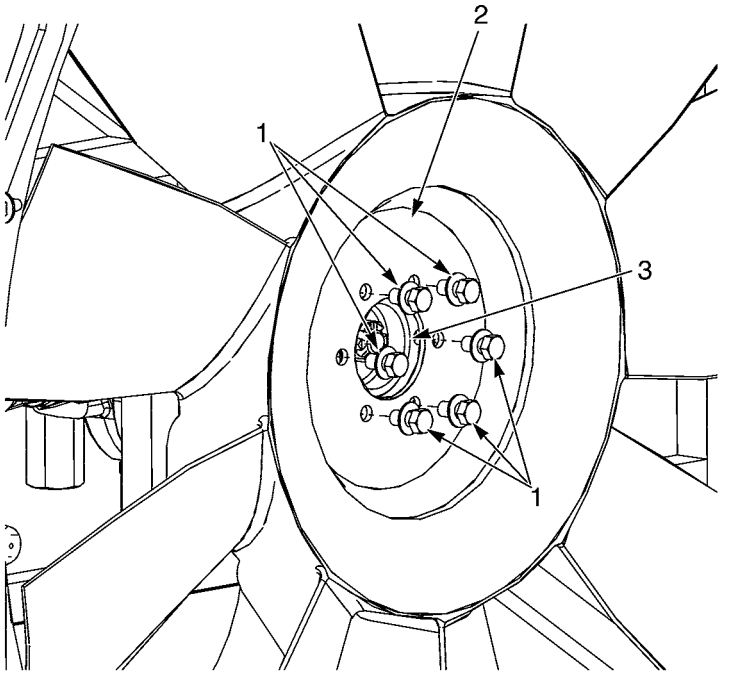

Figure 15 Fan Mount Bolts

1. BOLT AND WASHER
2. RADIATOR FAN
3. HYDRAULIC FAN DRIVE MOTOR HUB

5. Remove six bolts and washers from the radiator fan and hydraulic fan drive motor hub. Position the radiator fan in the radiator shroud and against the radiator.

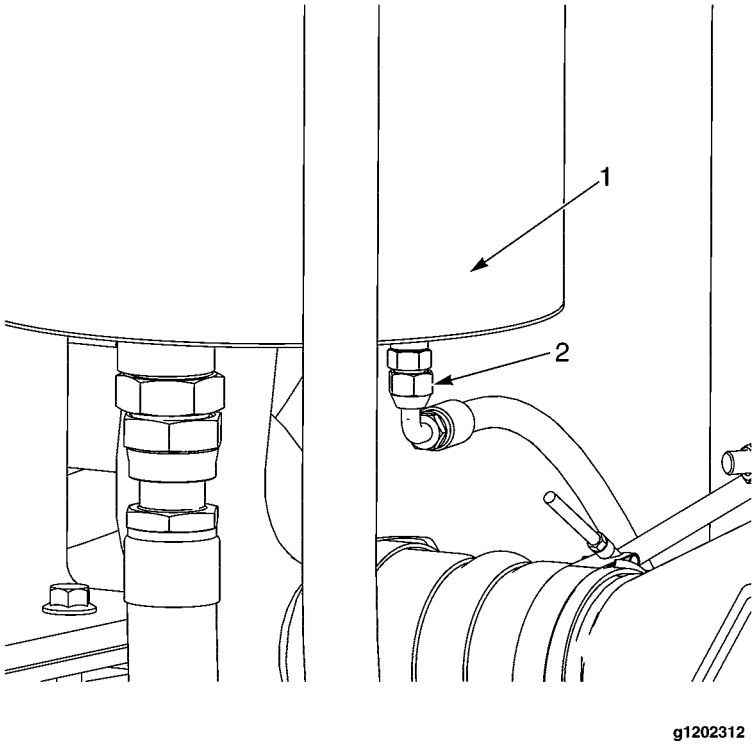

Figure 16 Hydraulic Pilot Hose

1. HYDRAULIC RESERVOIR
2. PILOT HOSE

NOTE –

- **Tag and mark hoses before removal to ensure proper installation.**
- **Cap and plug all hoses upon removal to stop leakage and prevent contamination.**

6. Remove P-clips and wire ties as needed from the pilot hose.

7. Disconnect pilot hose from the hydraulic reservoir.

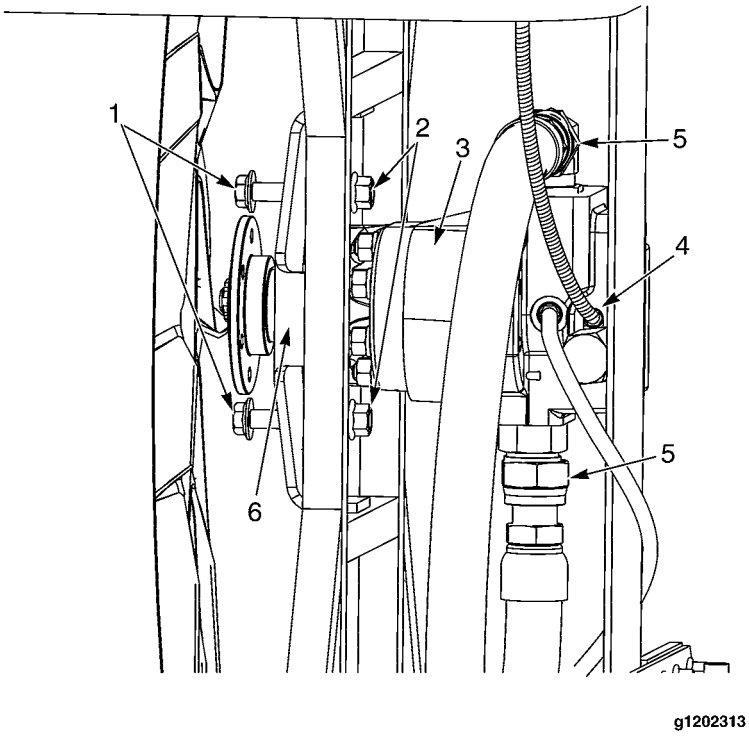

Figure 17 Hydraulic Fan Drive Motor

1. BOLT
2. NUT
3. HYDRAULIC FAN DRIVE MOTOR
4. SOLENOID ELECTRICAL CONNECTOR
5. HYDRAULIC HOSES
6. SPIDER CAGE

8. Disconnect solenoid electrical connector from the hydraulic fan drive motor.

9. Disconnect two hydraulic hoses from the hydraulic fan drive motor. Relocate hoses out of the way.

10. Support the hydraulic fan drive motor and remove two bolts and nuts from the hydraulic fan drive motor and spider cage.

11. Remove the hydraulic fan drive motor from the spider cage.

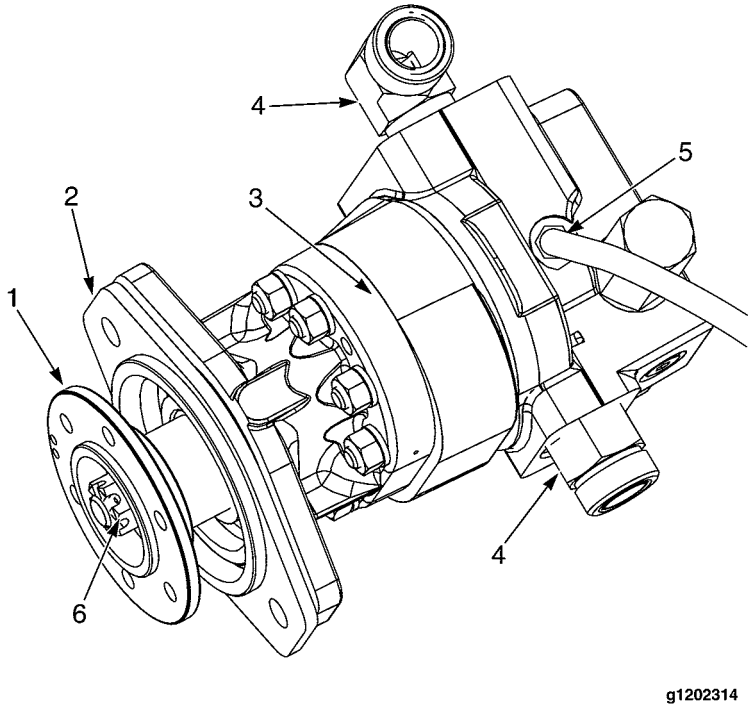

Figure 18 Motor Assembly

1. HUB
2. SPACER PLATE
3. HYDRAULIC FAN DRIVE MOTOR
4. FITTING
5. PILOT HOSE
6. HUB MOUNT NUT

12. If the hydraulic fan drive motor is being replaced, follow these instructions to disassemble the hydraulic fan drive motor:

    a. Remove the hub mount nut from the hydraulic fan drive motor.

    b. Using an appropriate puller, remove the hub from the hydraulic fan drive motor.

    c. Remove spacer plate from front of hydraulic fan drive motor.

    d. Remove nut from bottom of fan drive motor solenoid and slide fan drive motor solenoid off mount shaft (Figure 14, Items 2, 3, and 4).

    e. Remove the mount shaft from the hydraulic fan drive motor (Figure 14, Items 1 and 2).

    f. Remove pilot hose from the hydraulic fan drive motor.

    g. Note the location of two fittings and remove two fittings from the hydraulic fan drive motor.

Hydraulic Fan Drive Motor – Installation

1. If the hydraulic pump is being replaced, follow these instructions to assemble the hydraulic pump:

    a. Install two fittings on the hydraulic fan drive motor as noted during removal procedures (Figure 18, Items 3 and 4).

    b. Install pilot hose on the hydraulic fan drive motor (Figure 18, Items 3 and 5).

    c. Inspect O-ring on mount shaft for damage. Replace O-ring as needed.

    d. Install the mount shaft on the hydraulic fan drive motor (Figure 14, Items 1 and 2).

    e. Position the fan drive motor solenoid on the mount shaft and install nut (Figure 14, Items 2, 3, and 4). Torque nut to 4 to 5 lbf-ft (5 to 7 N•m).

    f. Install the spacer plate on front of the hydraulic fan drive motor (Figure 18, Items 2 and 3).

    g. Install the hub on the hydraulic fan drive motor and secure with the hub mount nut (Figure 18, Items 1, 3 and 6). Torque nut to 220 to 240 lbf-ft (298 to 325 N•m).

2. Align the hydraulic fan drive motor on the spider cage and secure with two bolts and nuts (Figure 17). Torque nut to 80 to 100 lbf-ft (108 to 136 N•m).

CAUTION – Some hydraulic hoses and fittings in the hydraulic system are equipped with O-rings to seal the hydraulic hoses. Inspect all O-rings prior to installation and replace as needed.

NOTE – Be sure to remove all caps and plugs that were installed during the removal procedures before installing hydraulic hoses.

3. Connect two hydraulic hoses to the hydraulic fan drive motor (Figure 17, Items 3 and 5).

4. Connect solenoid electrical connector to the hydraulic fan drive motor (Figure 17, Items 3 and 4).

5. Install the pilot hose to the hydraulic reservoir (Figure 16).

6. Install the radiator fan on the hydraulic fan drive motor hub and secure with six bolts and washers (Figure 15). Torque nut to 30 to 38 lbf-ft (41 to 52 N•m).

7. Install P-clips and wire ties as needed on all hydraulic hoses.

8. Connect the lower hydraulic hose on the hydraulic pump (Figure 8).

9. Install P-clips and wire ties on the lower hydraulic hose as needed (Figure 8, Item 2).

10. Fill the hydraulic system.

11. Close and latch the rear compartment service door.

2.7. HYDRAULIC OIL COOLER

Hydraulic Oil Cooler – Removal

IMPORTANT – Prior to draining any coolant from the system, close two heater shut-off valves. The heater shut-off valves can be accessed through the left-side rear compartment service door.

1. Unlatch and open the rear compartment service door.

2. Locate the radiator drain valve prior to removal of the hydraulic oil cooler. Place tray under the radiator to collect coolant from radiator. Open drain valve and drain coolant (Figure 4).

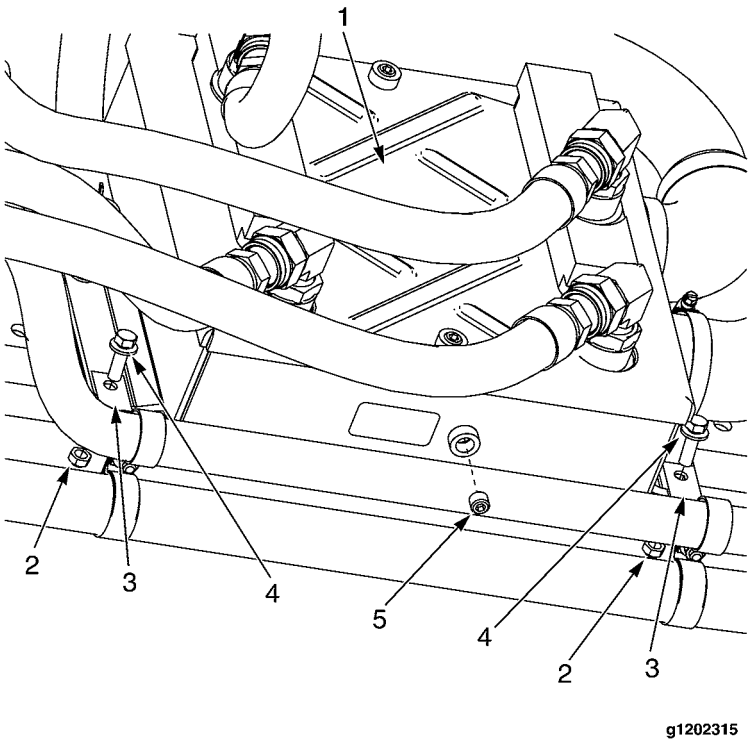

Figure 19 Hydraulic Oil Cooler

1. HYDRAULIC OIL COOLER
2. NUT
3. CLIPPING BRACKET
4. BOLT AND WASHER
5. DRAIN PLUG

3. Remove two bolts, washers, and nuts from the hydraulic oil cooler and clipping brackets.

4. Position hydraulic hoses out of the way.

5. Place a suitable container under the hydraulic oil cooler to catch the hydraulic oil from the system.

6. Drain the hydraulic fluid by removing the drain plug from the bottom of the hydraulic oil cooler.

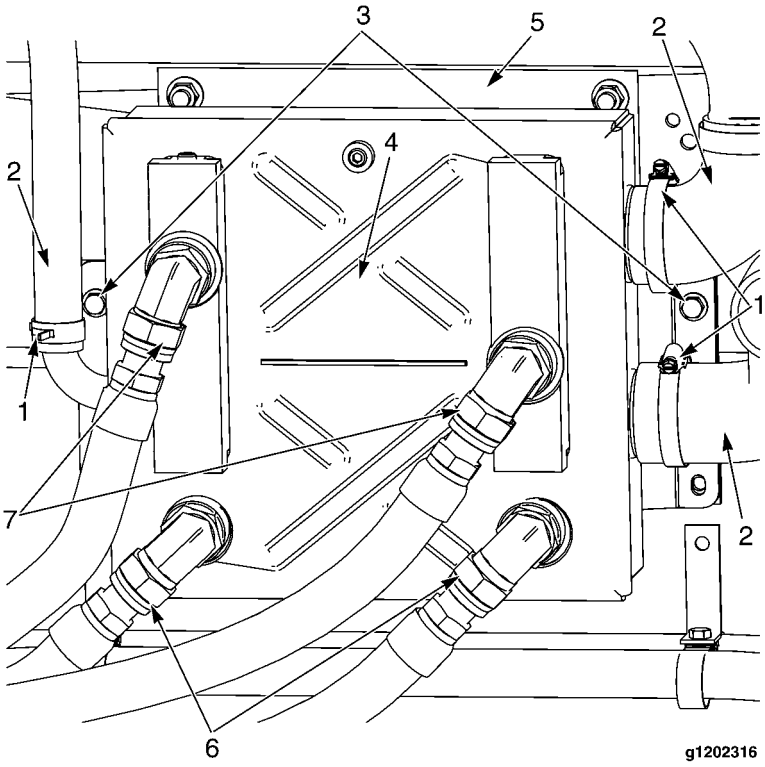

Figure 20 Hydraulic Oil Cooler Mounting

1. HOSE CLAMP
2. COOLANT HOSE
3. BOLT, WASHER, AND NUT
4. HYDRAULIC OIL COOLER
5. MOUNT BRACKET
6. HYDRAULIC HOSES
7. HYDRAULIC TRANSMISSION HOSES

NOTE –

- **Tag and mark hoses before removal to ensure proper installation.**
- **Cap and plug all hoses upon removal to stop leakage and prevent contamination.**

IMPORTANT – If the transmission is equipped with a retarder the hydraulic oil cooler will have one small coolant bypass hose on the right-side and two coolant hoses connected to the left-side. If the transmission has no retarder than only two coolant hoses will be connected to the left-side of the hydraulic oil cooler.

7. Loosen clamps on three coolant hoses, two on the right side of the hydraulic oil cooler and one on the left side of the hydraulic oil cooler. Remove three coolant hoses from the hydraulic oil cooler.

8. Disconnect two hydraulic hoses from the hydraulic oil cooler.

9. Disconnect two hydraulic transmission hoses from the hydraulic oil cooler.

WARNING – A jack and strap should be used to remove the hydraulic oil cooler. The hydraulic oil cooler weighs 110 lbs. (50 kg). Failure to comply could result in personnel injury.

10. Position a suitable jack under the hydraulic oil cooler and secure the jack with a strap around the hydraulic oil cooler.

11. Remove two bolts, washers, and nuts from top of the hydraulic oil cooler. Remove the hydraulic oil cooler from the mount bracket.

12. If replacement is needed, transfer all fittings to the new hydraulic oil cooler.

Hydraulic Oil Cooler – Installation

1. Position the hydraulic oil cooler on a suitable jack and secure the jack with a strap around the hydraulic oil cooler.

2. Align the hydraulic oil cooler on the mount bracket and install top two bolts, washers, and nuts (Figure 20, Items 3, 4, and 5). Torque bolts to 30 to 38 lbf-ft (41 to 52 N•m).

CAUTION – Some hydraulic hoses and fittings in the hydraulic system are equipped with O-rings to seal the hydraulic hoses. Inspect all O-rings prior to installation and replace as needed.

NOTE – Be sure to remove all caps and plugs that were installed during the removal procedures before installing hydraulic hoses.

3. Connect two hydraulic transmission hoses to the hydraulic oil cooler (Figure 20, Items 4 and 7).

4. Connect two hydraulic hoses to the hydraulic oil cooler (Figure 20, Items 4 and 6).

IMPORTANT – If the transmission is equipped with a retarder the hydraulic oil cooler will have one small coolant bypass hose on the right-side and two coolant hoses connected to the left-side. If the transmission has no retarder than only two coolant hoses will be connected to the left-side of the hydraulic oil cooler.

5. Install three coolant hoses on the hydraulic oil cooler and secure clamps (Figure 20, Items 1, 2, and 4).

6. Install two bolts, washers, and nuts on the hydraulic oil cooler and clipping brackets (Figure 19). Torque bolts to 30 to 38 lbf-ft (41 to 52 N•m).

7. Install the drain plug in the hydraulic oil cooler (Figure 19, Items 1 and 5).

8. Fill the hydraulic system.

9. Fill cooling system to proper level and leak test the cooling system. Special Tool number **550500INT** is recommended to fill and leak test the cooling system.

IMPORTANT – After filling the cooling system, open two heater shut-off valves and recheck the coolant level. The heater shut-off valves can be accessed through the left-side rear compartment service door.

10. Close and latch the rear compartment service door.

2.8. RADIATOR FAN

The radiator fan can be removed and installed without removing the cooling package.

Radiator Fan – Removal

1. Unlatch and open the rear compartment service doors, left-side door, and rear door.
2. Place a suitable container under the lower hydraulic hose to catch the hydraulic oil from the system.
3. Remove P-clips and wire ties as needed from the lower hydraulic hose (Figure 8, Item 2).
4. Disconnect the lower hydraulic hose from the hydraulic pump and position lower hydraulic hose into the container for draining (Figure 8).

NOTE –

- **Tag and mark hoses before removal to ensure proper installation.**
- **Cap and plug all hoses upon removal to stop leakage and prevent contamination.**

5. Disconnect two power steering hoses from the hydraulic reservoir (Figure 9, Items 1 and 4).
6. Disconnect two hydraulic hoses from the hydraulic reservoir (Figure 9, Items 1 and 2).
7. Disconnect the hydraulic pilot hose from the hydraulic reservoir (Figure 9, Items 1 and 3).
8. Remove four bolts, washers, and nuts from the hydraulic reservoir and mount bracket (Figure 9).
9. Remove the hydraulic reservoir from the mount bracket (Figure 9, Items 1 and 5).
10. Remove six bolts and washers from the radiator fan and hydraulic fan drive motor hub. Position the radiator fan in the radiator shroud and against the radiator (Figure 15).

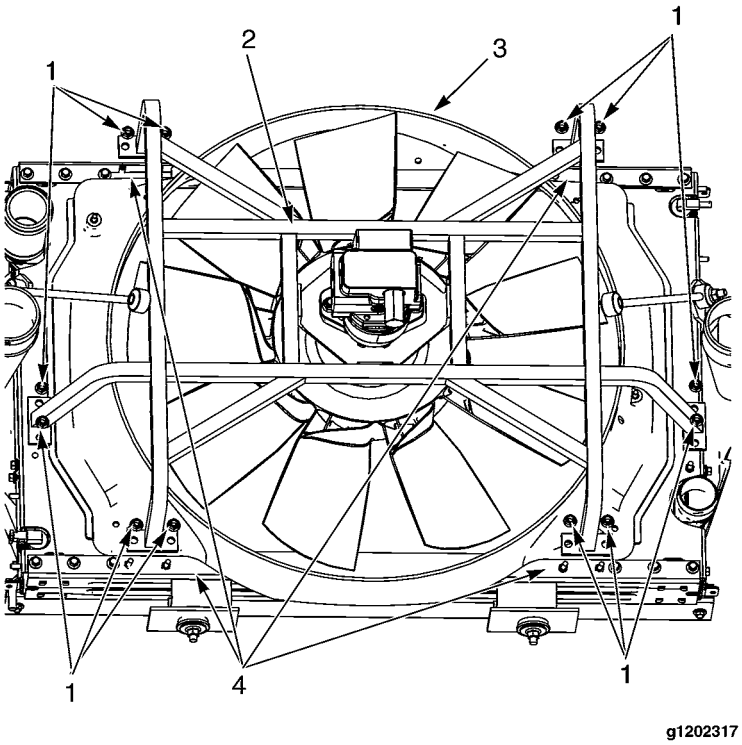

Figure 21 Spider Cage Repositioning

1. NUT
2. SPIDER CAGE
3. RADIATOR SHROUD
4. RADIATOR FRAME

11. Remove 12 nuts from the spider cage and radiator frame.

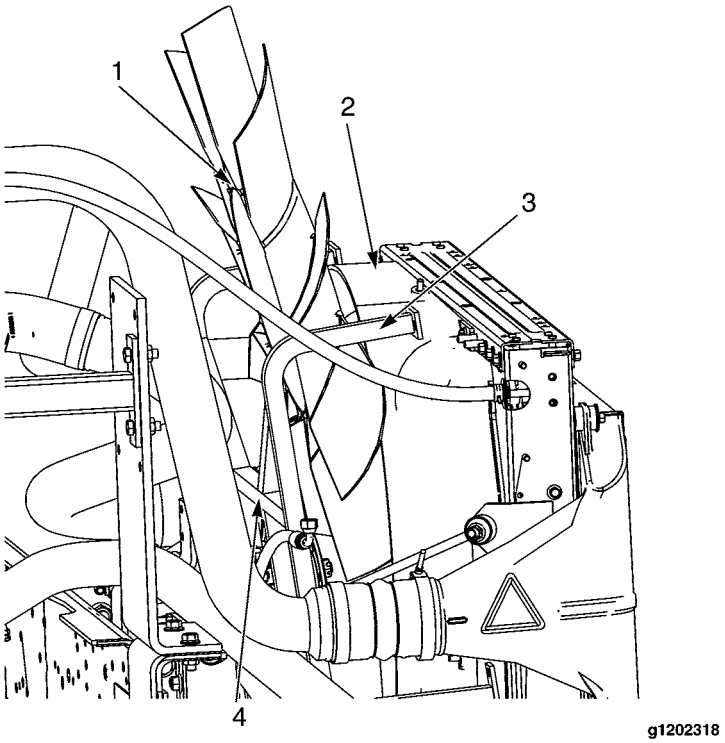

Figure 22 Radiator Fan

1. RADIATOR FAN
2. RADIATOR SHROUD
3. RIGHT UPRIGHT
4. SPIDER CAGE

CAUTION – When repositioning the spider cage, exercise caution. The hydraulic hoses are still connected to the hydraulic fan drive motor. Failure to comply could result in damage to components.

12. Position and secure the spider cage as far away from the fan shroud as possible.

13. Carefully lift the radiator fan out of the fan shroud. The radiator fan can be worked around the spider cage by turning the radiator fan clockwise around the right upright of the spider cage.

Radiator Fan – Installation

1. Carefully lower the radiator fan down into the fan shroud. The radiator fan can be worked around the spider cage by turning the radiator fan counterclockwise around the right upright of the spider cage (Figure 22).

2. Position the spider cage onto the radiator frame (Figure 21, Items 2 and 4).

3. Install 12 nuts on the spider cage and radiator frame (Figure 21, Items 1, 2, and 4). Torque nuts to 41 to 50 lbf-ft (56 to 68 N•m).

4. Install the radiator fan on the hydraulic fan drive motor hub and secure with six bolts and washers (Figure 15). Torque bolts to 30 to 38 lbf-ft (41 to 52 N•m).

5. Install the hydraulic reservoir on the mount bracket and secure with four nuts, washers, and bolts (Figure 9). Torque bolts to 100 to 120 lbf-ft (136 to 163 N•m).

CAUTION – Some hydraulic hoses and fittings in the hydraulic system are equipped with O-rings to seal the hydraulic hoses. Inspect all O-rings prior to installation and replace as needed.

6. Connect the hydraulic pilot hose to the hydraulic reservoir (Figure 9, Items 1 and 3).

7. Connect two hydraulic hoses to the hydraulic reservoir (Figure 9, Items 1 and 2).

8. Connect two power steering hoses to the hydraulic reservoir (Figure 9, Items 1 and 4).

9. Connect the lower hydraulic hose on the hydraulic pump (Figure 8).

10. Install P-clips and wire ties on the lower hydraulic hose as needed (Figure 8, Item 2).

11. Fill the hydraulic system.

12. Close and latch the rear compartment service door.

2.9. COOLING PACKAGE

Cooling Package – Removal

IMPORTANT – Prior to draining any coolant from the system, close two heater shut-off valves. The heater shut-off valves can be accessed through the left-side rear compartment service door.

1. Unlatch and open the rear compartment service doors, left-side door, and rear door.

2. Locate the radiator drain valve prior to removal of the cooling package. Place tray under the radiator to collect coolant from radiator. Open drain valve and drain coolant (Figure 4).

3. Place a suitable container under the hydraulic oil cooler to catch the hydraulic oil from the system.

4. Remove P-clips and wire ties as needed from the lower hydraulic hose (Figure 8, Item 2).

5. Disconnect the lower hydraulic hose from the hydraulic pump and position lower hydraulic hose into the container for draining (Figure 8).

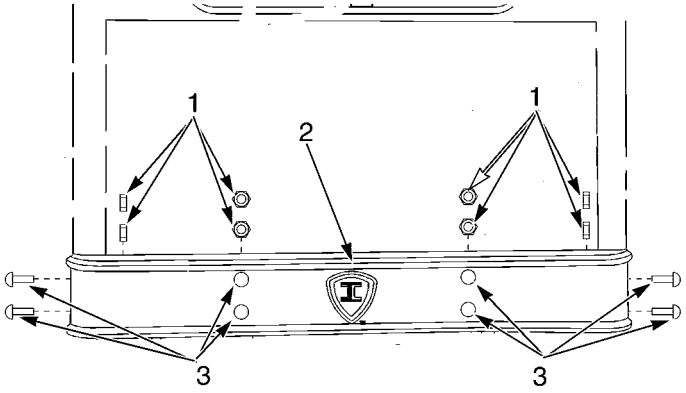

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Figure 23 Rear Bumper

1. NUT
2. REAR BUMPER
3. CARRIAGE BOLTS

6. With the aid of an assistant, remove eight carriage bolts and nuts from the rear bumper and rear frame mounts.

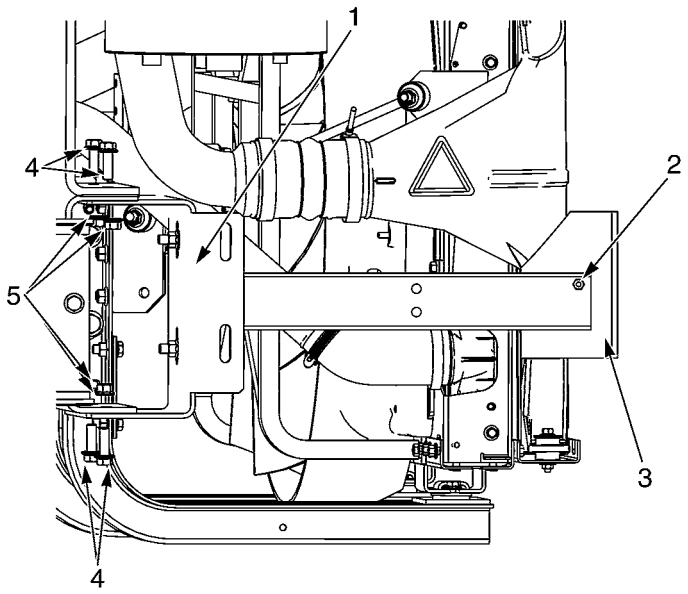

Figure 24 Right Bumper Crossmember

1. RIGHT BUMPER CROSSMEMBER MOUNT BRACKET
2. BOLT AND NUT
3. RIGHT SIDE BUMPER MOUNT BRACKET
4. BOLT
5. NUT

7. Loosen bolt and nut at right-side bumper mount bracket and slide right-side bumper mount bracket away from the bumper.

8. With the aid of an assistant, remove the rear bumper by pulling the right side free first.

9. Remove four bolts and nuts from the right bumper crossmember bracket and remove the right bumper crossmember bracket.

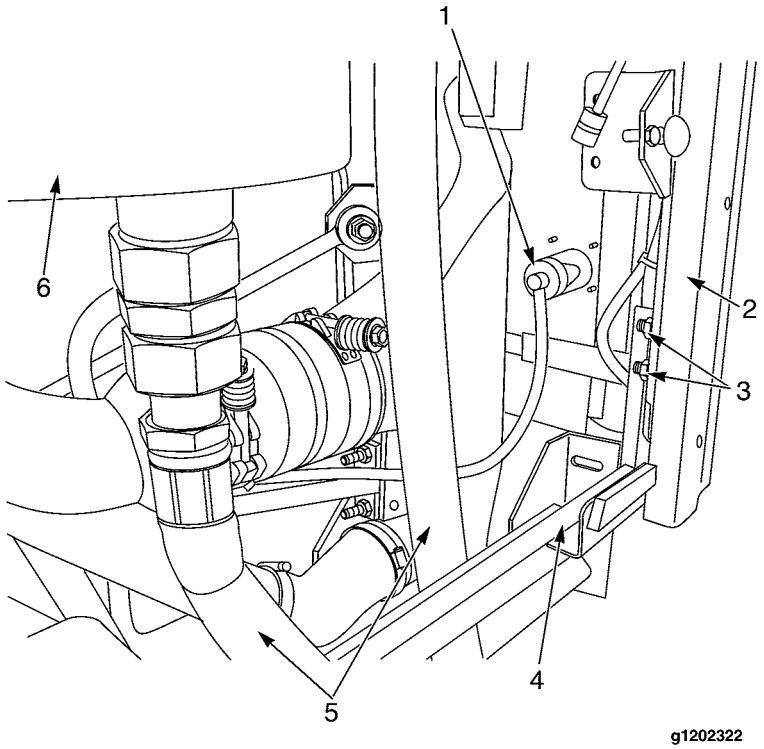

Figure 25 Body Support Brace

1. ENGINE BLOCK HEATER ELECTRICAL CONNECTOR
2. BUS BODY
3. NUT AND BOLT
4. BODY SUPPORT BRACE
5. HYDRAULIC HOSES
6. HYDRAULIC RESERVOIR

10. Remove two nuts and bolts from both sides of the body support brace and bus body.

11. Remove the body support brace from the bus body.

12. Depress the button on the engine block heater electrical connector and disconnect the engine block heater electrical connector.

13. Remove wire ties as needed to move the wiring out of the way.

NOTE –

- **Tag and mark hoses before removal to ensure proper installation.**
- **Cap and plug all hoses upon removal to stop leakage and prevent contamination.**

14. Remove P-clips and wire ties from hydraulic hoses as needed. Reposition and secure hydraulic hoses as far to the left as possible.

15. Remove the pilot hose from the hydraulic reservoir (Figure 16).

16. Disconnect solenoid electrical connector from the hydraulic fan drive motor (Figure 17, Items 3 and 4).

17. Disconnect two hydraulic hoses from the hydraulic fan drive motor (Figure 17, Items 3 and 5).

18. Remove P-clips from hydraulic hoses and relocate hoses out of the way .

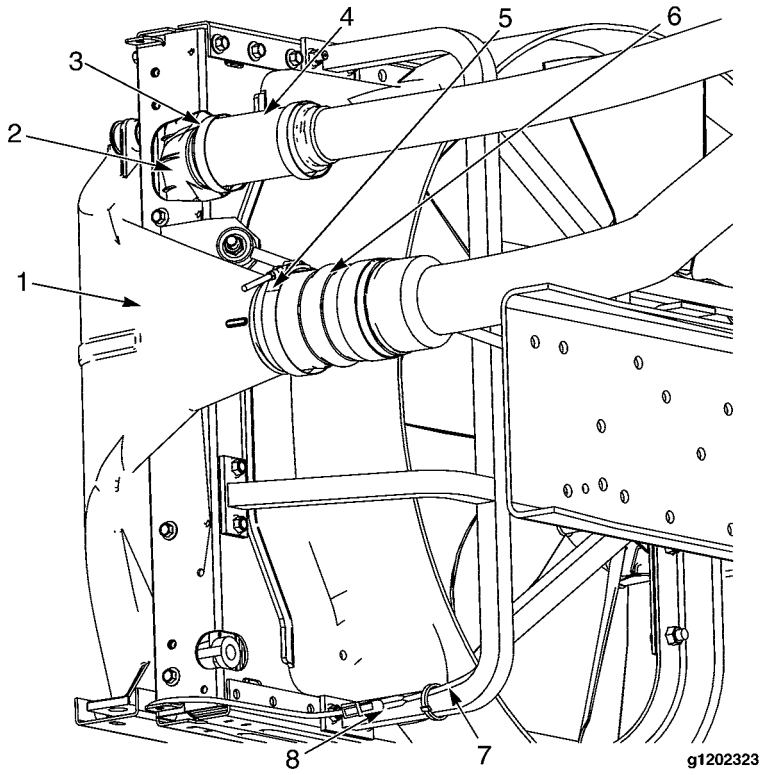

Figure 26 Left side of Cooling Package

1. CHARGE AIR COOLER
2. RADIATOR
3. CLAMP
4. UPPER RADIATOR HOSE
5. SPRING CLAMP
6. LEFT CHARGE AIR COOLER HOSE
7. GROUND WIRING
8. ELECTRICAL CONNECTOR

19. Loosen spring clamp and remove the left charge air cooler hose from the charge air cooler.

20. Loosen clamp and remove the upper radiator hose from the radiator.

21. Remove P-clips and wire ties as needed and secure the left charge air cooler hose and upper radiator hose as far away from the cooling package as possible.

22. Disconnect the electrical connector, remove wire ties as needed, and secure ground wiring away from the cooling package.

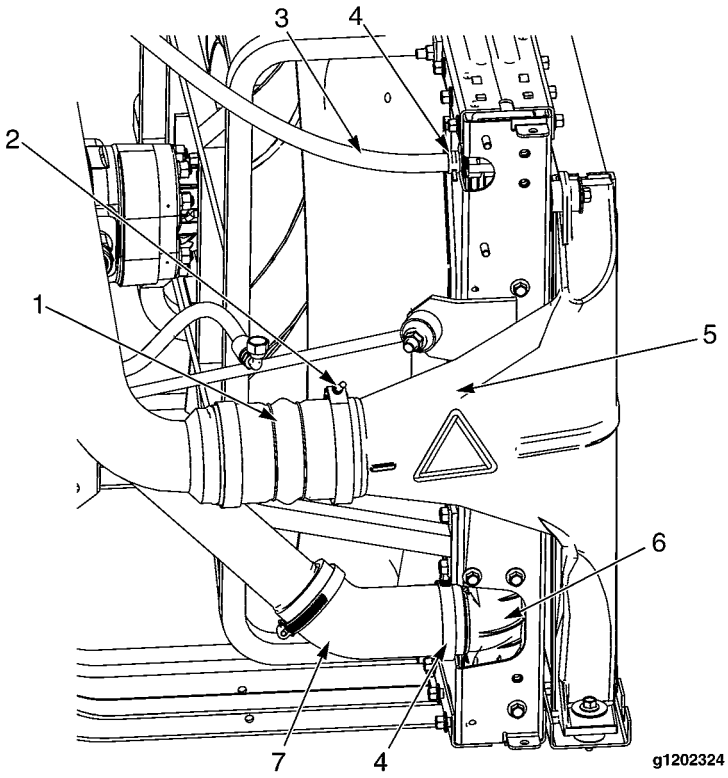

Figure 27 Right side of Cooling Package

1. RIGHT CHARGE AIR COOLER HOSE
2. SPRING CLAMP
3. DEAERATION HOSE
4. CLAMP
5. CHARGE AIR COOLER
6. RADIATOR
7. LOWER RADIATOR HOSE

23. Loosen spring clamp and remove the right charge air cooler hose from the charge air cooler.

24. Loosen clamp and remove the deaeration hose from the radiator.

25. Loosen clamp and remove the lower radiator hose from the radiator.

26. Disconnect charge air cooler hose from the turbocharger.

27. Remove P-clips and wire ties as needed and secure the right charge air cooler hose as far away from the cooling package as possible.

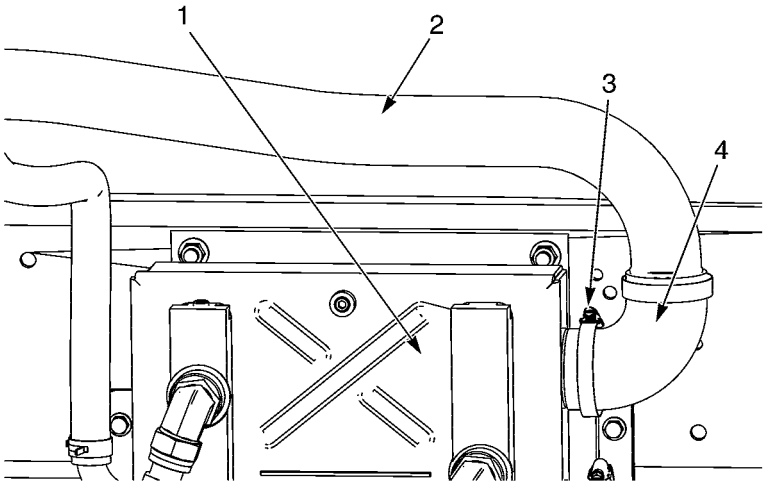

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Figure 28 Oil Cooler Radiator Hose

1. OIL COOLER
2. COOLANT TUBE
3. CLAMP
4. COOLANT HOSE

28. Loosen clamp and remove the coolant hose from the oil cooler.

29. Remove P-clips and wire ties as needed and remove the coolant tube from the vehicle.

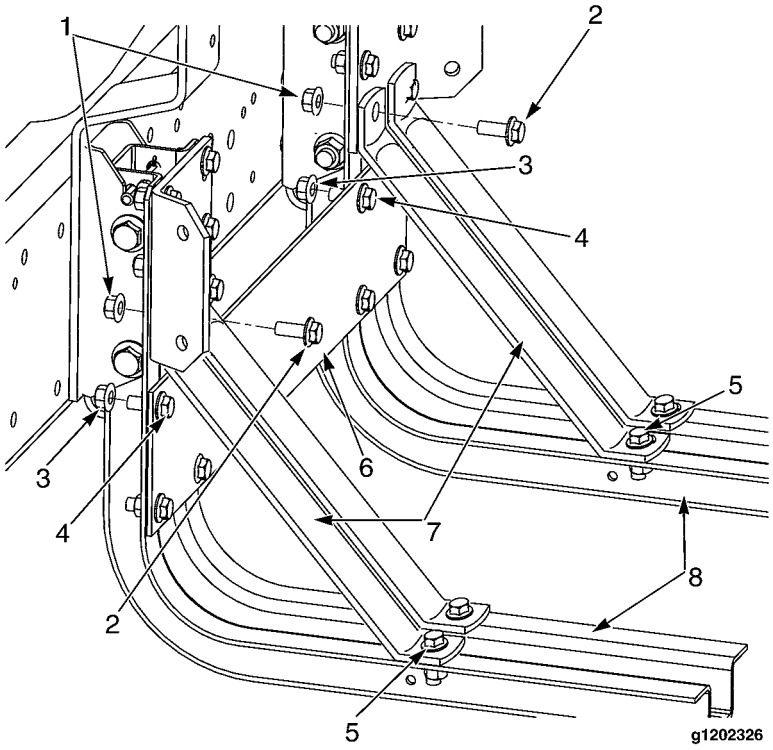

Figure 29 Support Braces

1. TOP NUT
2. TOP BOLT
3. SUPPORT PLATE NUT
4. SUPPORT PLATE BOLT
5. BOTTOM BOLT
6. SUPPORT PLATE
7. REAR SUPPORT BRACE
8. COOLING PACKAGE MOUNT BRACKETS

NOTE – To gain access to the cooling package mount bolts, the rear support brace on each cooling package mount bracket must be loosened. Then, two support plate bolts must be removed.

30. Loosen the bottom bolt and remove the top bolt on each rear support brace.

31. Pivot the rear support braces to gain access to the support plate bolts under each rear support brace.

32. Remove two support plate bolts and nuts.

33. Jack the rear axle approximately 18 inches (46 cm) and support axle with jack stands.

34. Place a suitable jack under the cooling package mount brackets and secure the jack to the cooling package mount brackets with a strap.

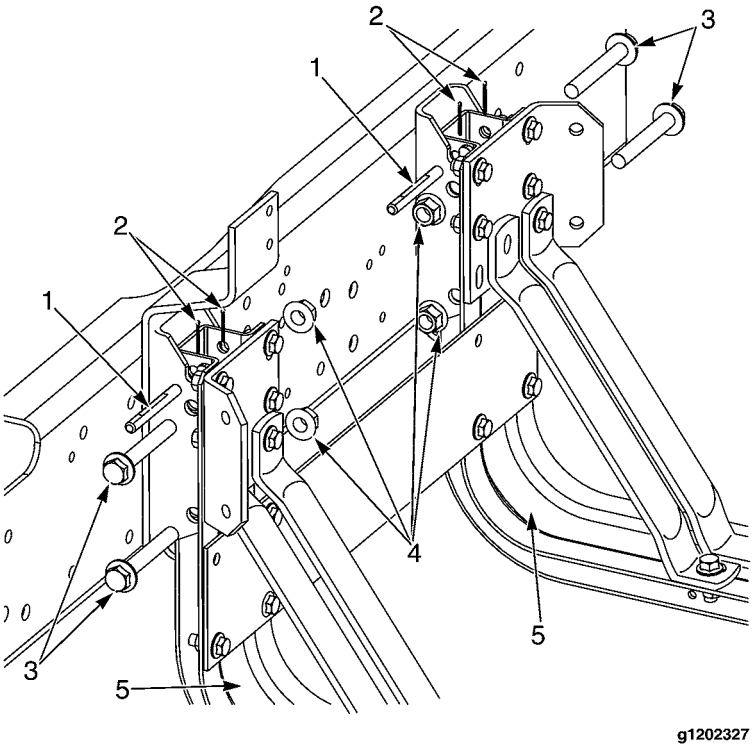

Figure 30 Cooling Package Mount Brackets

1. ANCHOR PIN
2. COTTER PIN
3. MOUNT BOLT
4. NUT
5. COOLING PACKAGE MOUNT BRACKETS

35. Remove four mount bolts and nuts from the cooling package mount brackets.

36. Remove four cotter pins from two anchor pins.

37. Slightly raise the cooling package to release the pressure from the anchor pins.

38. Remove two anchor pins from the cooling package mount brackets. Discard the four cotter pins and two anchor pins. They are used for manufacturing purposes and do not need to be reinstalled.

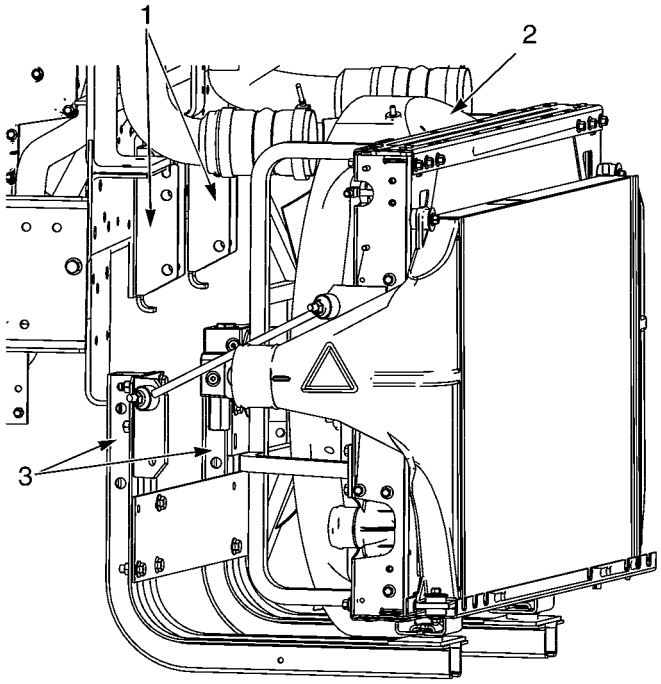

Figure 31 Cooling Package Removal

1. FRAME BRACKET
2. COOLING PACKAGE
3. COOLING PACKAGE MOUNT BRACKETS

39. Lower the cooling package straight down to clear the frame brackets. Using the jack, remove the cooling package out from under the vehicle.

Cooling Package – Disassembly

Recirculation Seal – Removal

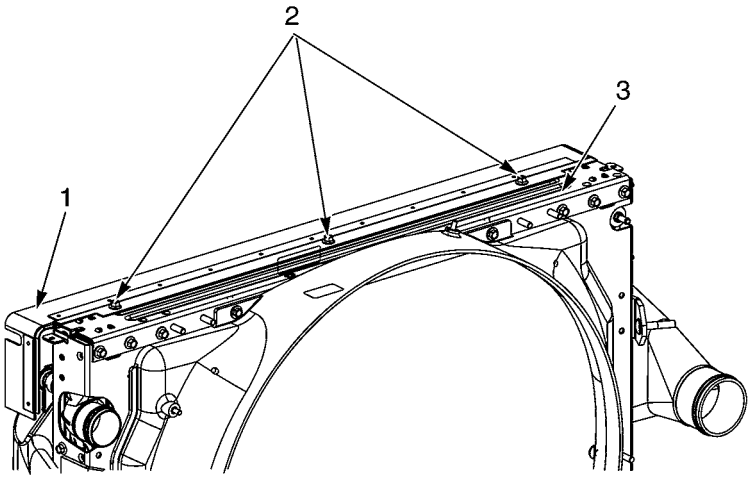

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Figure 32 Recirculation Seal

1. RECIRCULATION SEAL
2. BOLT
3. UPPER FRAME COVER

1. Remove three bolts and the recirculation seal from the upper frame plate.

Support Rods – Removal

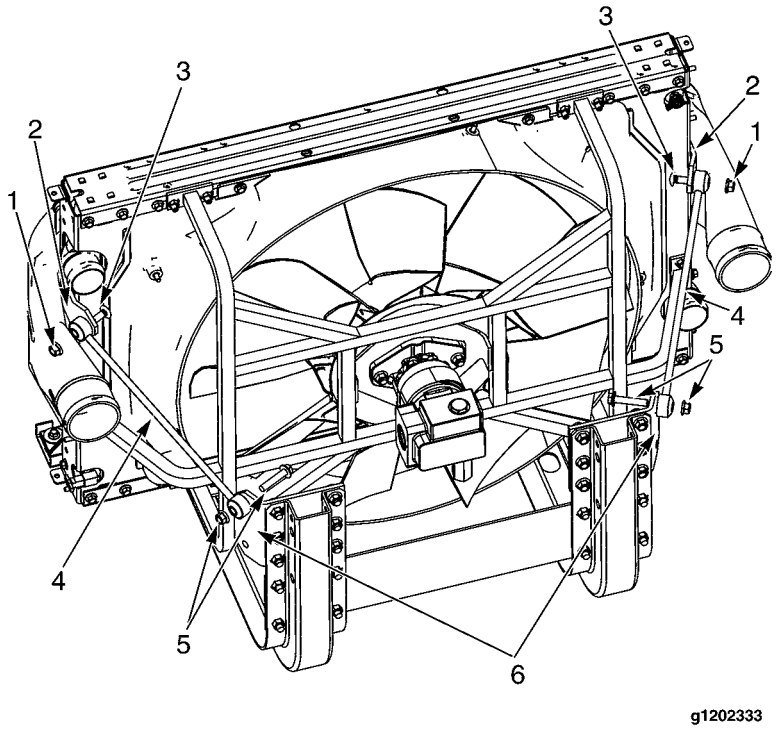

Figure 33 Fan Shroud

1. NUT
2. RADIATOR FRAME
3. CARRIAGE BOLT
4. SUPPORT ROD
5. NUT AND BOLT
6. MOUNT BRACKET

2. Remove two nuts from two support rods and the radiator frame.

3. Using a soft faced hammer, tap the two carriage bolts free from the radiator frame and remove two carriage bolts.

4. Remove two bolts and nuts from two support rods and mount brackets.

5. Remove two support rods from the radiator frame and mount brackets.

Charge Air Cooler – Removal

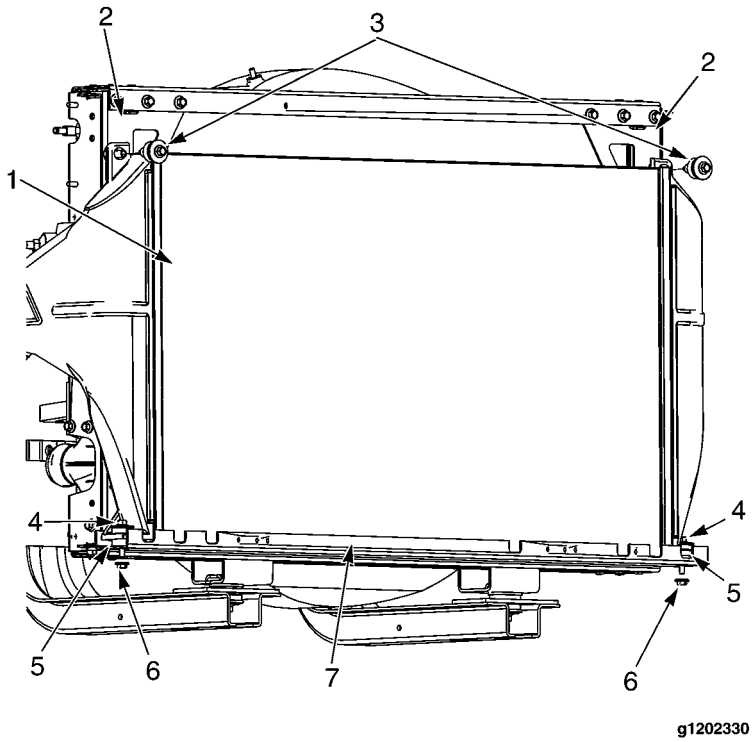

Figure 34 Charge Air Cooler

1. CHARGE AIR COOLER
2. RADIATOR FRAME
3. TOP BOLT, WASHER, AND BUSHING
4. BOTTOM BOLT, WASHER, AND BUSHING
5. LOWER MOUNT BUSHING
6. NUT AND WASHER
7. LOWER MOUNT TRAY

CAUTION – Protect all open ports on the charge air cooler system during removal and installation procedures. Dirt or foreign particles in charge air cooling piping or cooling system components could cause internal damage to engine parts.

6. Remove two bottom bolts, nuts, washers, and bushings from the charge air cooler and lower mount tray.
7. Remove two top bolts, washers, and bushings from the charge air cooler and radiator frame.
8. Remove the charge air cooler from the lower mount tray and remove two lower mount bushings.

Spider Cage – Removal

9. Remove 12 nuts from the spider cage and radiator frame (Figure 21, Items 1, 2, and 4).

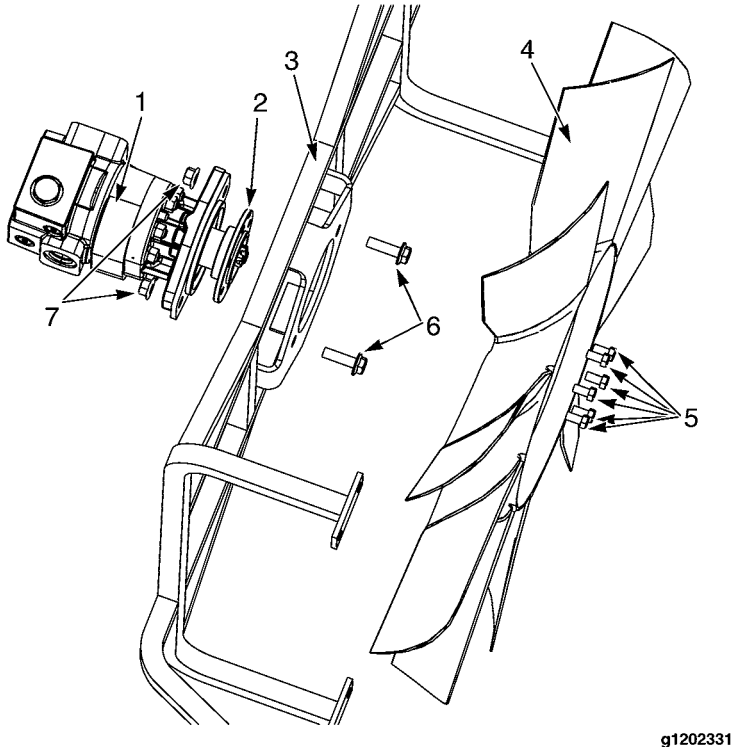

Figure 35 Spider Cage Disassembly

1. HYDRAULIC FAN DRIVE MOTOR
2. HYDRAULIC FAN DRIVE MOTOR HUB
3. SPIDER CAGE
4. RADIATOR FAN
5. FAN BOLT AND WASHER
6. BOLT
7. NUT

10. Remove six fan bolts and washers from the radiator fan and hydraulic fan drive motor hub. Remove the radiator fan from the hydraulic fan drive motor hub.

11. Support the hydraulic fan drive motor and remove two bolts and nuts from the hydraulic fan drive motor and spider cage.

12. Remove the hydraulic fan drive motor from the spider cage.

Fan Shroud – Removal

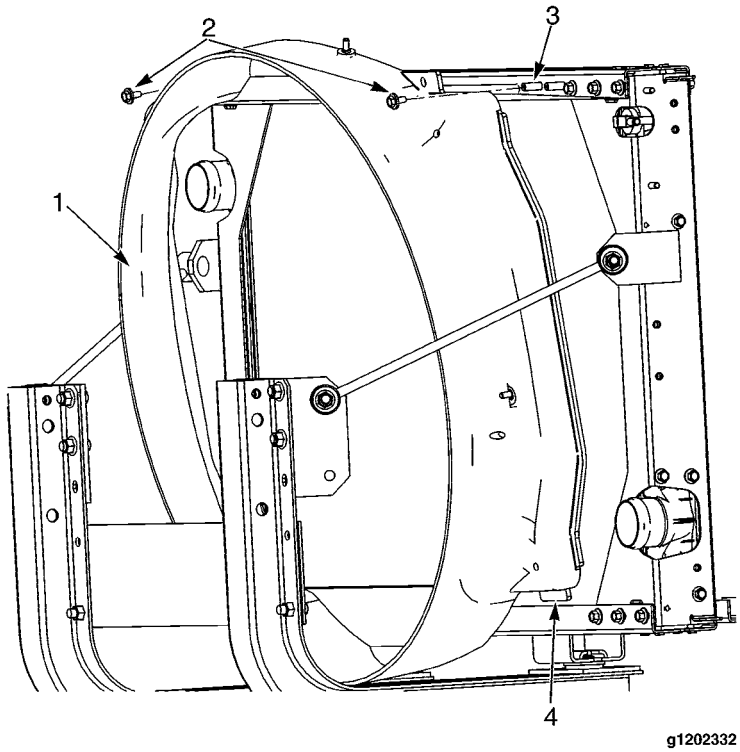

Figure 36 Fan Shroud

1. FAN SHROUD
2. BOLT
3. RADIATOR FRAME
4. LOWER SHROUD TAB

13. Remove two bolts from the fan shroud and radiator frame.

14. Lift the fan shroud to release the lower shroud tabs and remove fan shroud.

Radiator – Removal

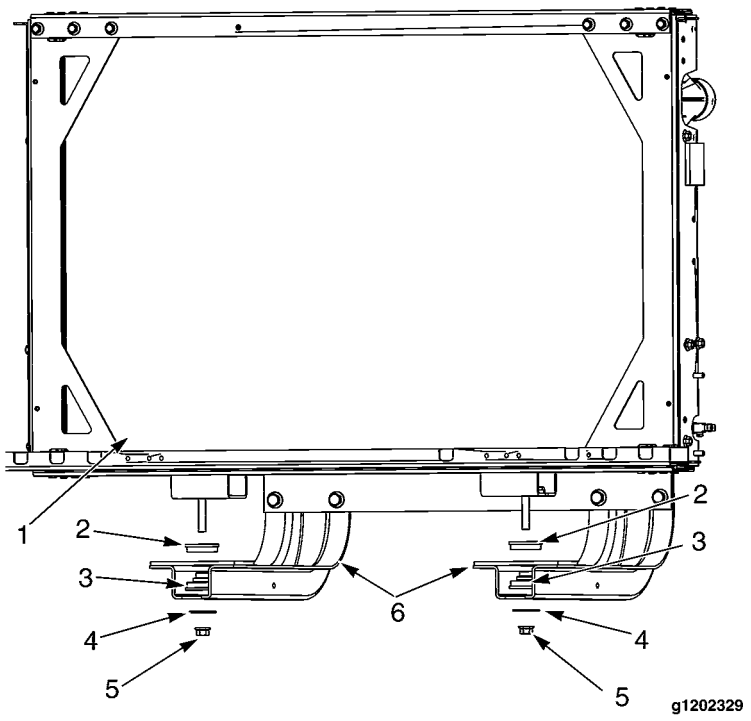

Figure 37 Radiator Mounts

1. RADIATOR
2. UPPER BUSHING
3. LOWER BUSHING
4. WASHER
5. NUT
6. COOLING PACKAGE MOUNT BRACKET

15. Remove two nuts, washers, and lower bushings from the radiator and cooling package mount brackets.

16. With the aid of an assistant, remove the radiator from the cooling package mount brackets.

17. Remove two upper bushings from the cooling package mount brackets.

Radiator Core – Removal

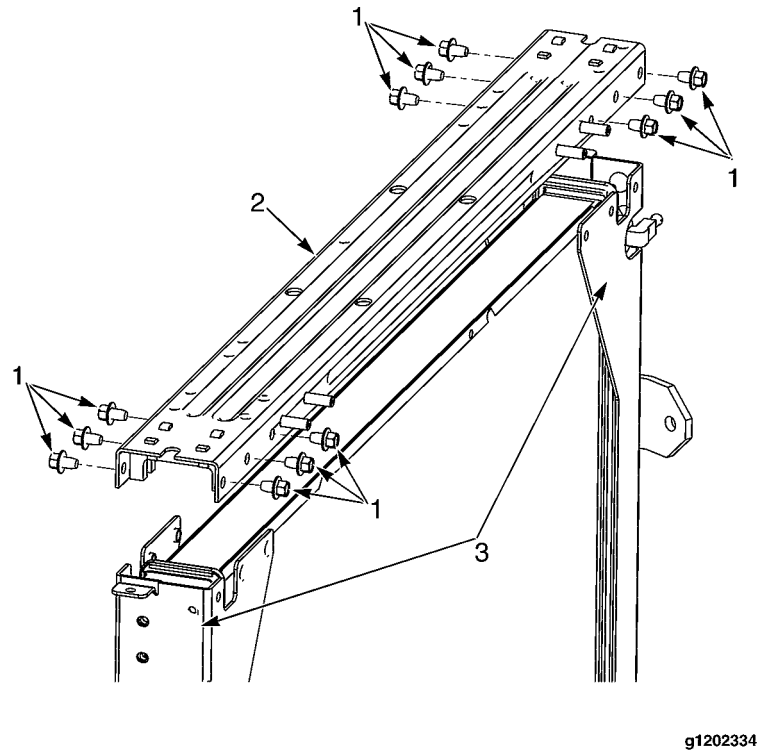

Figure 38 Upper Frame Plate

1. BOLT
2. UPPER FRAME PLATE
3. SIDE FRAME PLATES

18. Remove 12 bolts from the upper frame plate and side frame plates.

19. Remove the upper frame plate from the side frame plates.

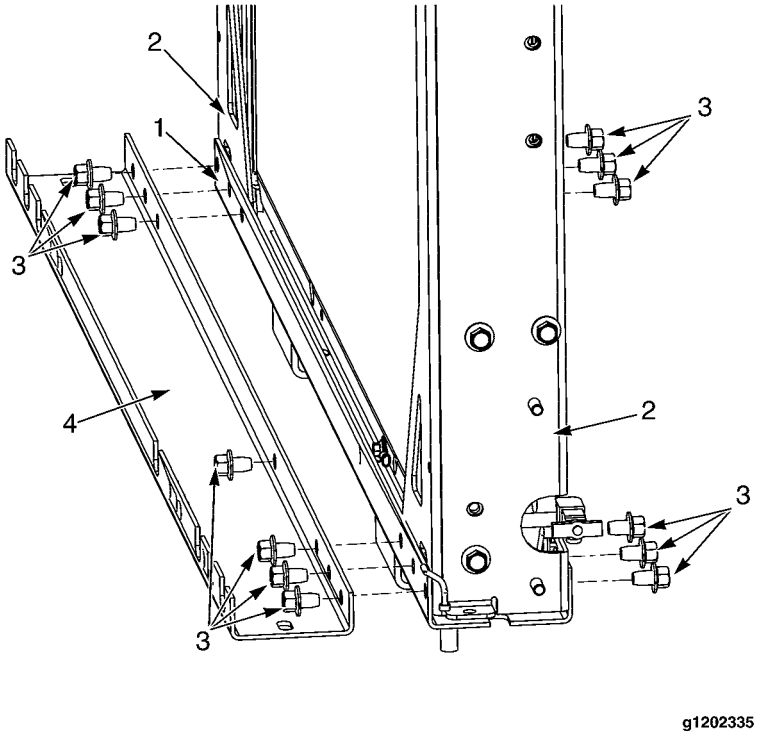

Figure 39 Lower Frame Plate

1. LOWER FRAME PLATE
2. SIDE FRAME PLATE
3. BOLT
4. LOWER MOUNT TRAY

20. Remove 13 bolts from the lower frame plate, lower mount tray, and the side frame plates.

21. Remove the lower mount tray from the lower frame plate.

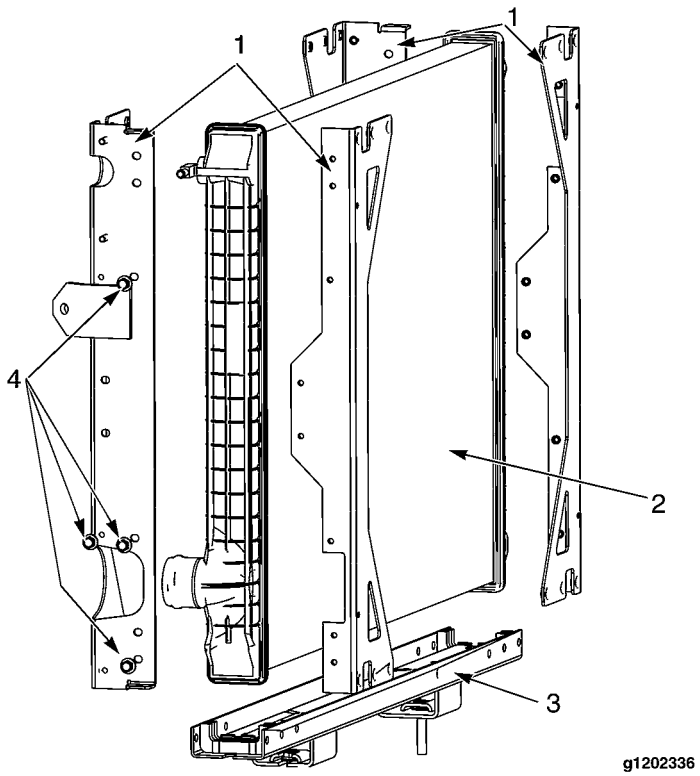

Figure 40 Side Frame Plates

1. SIDE FRAME PLATE
2. RADIATOR CORE
3. LOWER FRAME PLATE
4. BOLT

22. Remove four bolts from each side frame plate.

23. Separate and remove each side frame plate from the radiator core and lower frame plate.

24. Carefully lift and remove the radiator core from the lower frame plate.

25. Transfer ground wire, fittings, and drain valve to new replacement radiator core (if applicable).

Cooling Package – Assembly

Radiator Core – Installation

1. Carefully install radiator core on the lower frame plate (Figure 40, Items 2 and 3).

2. Install the two-piece side frame plates on both sides of the radiator core and lower frame plate (Figure 40, Items 1, 2, and 3).

3. Install four bolts on each side frame plate (Figure 40, Items 1 and 4). Torque bolts to 52 to 59 lbf-ft (71 to 80 N•m).

4. Install the lower mount tray on the lower frame plate (Figure 39, Items 1 and 4).

5. Install 13 bolts on the lower frame plate, lower mount tray, and the side frame plates (Figure 39). Torque bolts to 52 to 59 lbf-ft (71 to 80 N•m).

6. Install the upper frame plate on the side frame plates (Figure 38, Items 2 and 3).

7. Install 12 bolts on the upper frame plate and side frame plates (Figure 38). Torque bolts to 52 to 59 lbf-ft (71 to 80 N•m).

Radiator – Installation

8. Align two upper bushings on the cooling package mount brackets (Figure 37, Items 2 and 6).

9. With the aid of an assistant, install the radiator on the cooling package mount brackets (Figure 37, Items 1 and 6).

10. Install two lower bushings, washers, and nuts on the radiator and cooling package mount brackets (Figure 37). Torque nuts to 80 to 100 lbf-ft (108 to 136 N•m).

Fan Shroud – Installation

11. Install the fan shroud on the radiator frame, making certain that the lower shroud tabs engage on the radiator frame (Figure 36, Items 1, 3, and 4).

12. Install two bolts on the fan shroud and radiator frame (Figure 36, Items 1, 2, and 3). Torque bolts to 13 to 15 lbf-ft (18 to 20 N•m).

Spider Cage – Installation

13. Align the hydraulic fan drive motor on the spider cage and secure with two bolts and nuts (Figure 35). Torque nuts to 80 to 100 lbf-ft (108 to 136 N•m).

14. Install the radiator fan on the hydraulic fan drive motor hub and secure with six fan bolts and washers (Figure 35, Items 2, 4, and 5). Torque nut to 30 to 38 lbf-ft (41 to 52 N•m).

15. Position the spider cage onto the radiator frame (Figure 21, Items 2 and 4).

16. Install 12 nuts on the spider cage and radiator frame (Figure 21, Items 1, 2, and 4). Torque bolts to 41 to 50 lbf-ft (56 to 68 N•m). Figure 18

Charge Air Cooler – Installation

NOTE – Prior to installation of charge air cooler hoses and pipes, inspect for dirt or particles. Remove any dirt or particles.

17. Install two lower mount bushings on the lower mount tray (Figure 34, Items 5 and 7).

18. Position the charge air cooler on the lower mount bushings and lower mount tray (Figure 34, Items 1, 5, and 7).

19. Install two top bolts, washers, and bushings on the charge air cooler and radiator frame (Figure 34, Items 1, 2, and 3). Torque bolts to 13 to 15 lbf-ft (18 to 20 N•m).

20. Install two bottom bolts, nuts, washers, and bushings on the charge air cooler and lower mount tray (Figure 34). Torque bolts to 13 to 15 lbf-ft (18 to 20 N•m).

Support Rods – Installation

21. Align two support rods on the radiator frame and mount brackets (Figure 33, Items 2, 4, and 6).

22. Install two bolts and nuts on support rods and mount brackets (Figure 33, Items 3, 4, and 5). Torque nuts to 80 to 100 lbf-ft (108 to 136 N•m).

23. Install two carriage bolts on the support rods at the radiator frame (Figure 33, Items 2, 3, and 4).

24. Install nut on each support rod at the radiator frame (Figure 33, Items 1, 2, and 4). Torque nuts to 80 to 100 lbf-ft (108 to 136 N•m).

Recirculation Seal – Installation

25. Install the recirculation seal on the upper frame plate and secure with three bolts (Figure 32). Torque bolts to 13 to 15 lbf-ft (18 to 20 N•m).

Cooling Package – Installation

1. Place a suitable jack under the cooling package mount brackets and secure the jack to the cooling package mount brackets with a strap.

2. Using the jack, install the cooling package under the vehicle and align the cooling package mount brackets under the frame brackets (Figure 31).

3. Raise the cooling package up and align the mount holes for the cooling package mount brackets and the frame brackets (Figure 31).

4. Install four mount bolts and nuts on the cooling package mount brackets (Figure 30, Items 3, 4, and 5). Torque bolts to 142 to 175 lbf-ft (193 to 237 N•m).

5. Remove jack and strap from the cooling package mount brackets.

6. Remove the jack stands and jack from under the rear axle.

7. Install two support plate bolts and nuts (Figure 29, Items 4 and 6). Torque bolts to 80 to 100 lbf-ft (108 to 136 N•m).

8. Align the rear support braces, and install the top bolt and nut on each rear support (Figure 29, Items 1, 2, and 7).

9. Torque all four bolts to 80 to 100 (108 to 136 N•m) on the rear support braces (Figure 29, Items 2, 5, and 7).

10. Install the coolant hose on the oil cooler and secure the clamp (Figure 28, Items 1, 3, and 4).

11. Install P-clips and wire ties on coolant tube as needed (Figure 28).

12. Install the deaeration hose on the radiator and secure the clamp (Figure 27, Items 3, 4, and 6).

13. Install the lower radiator hose on the radiator and secure the clamp (Figure 27, Items 4, 6, and 7).

14. Install the right charge air cooler hose on the charge air cooler and secure the spring clamp (Figure 27, Items 1, 2, and 5). Torque bolts to 72 lbf-in (8 N•m).

15. Connect charge air cooler hose to the turbocharger.

16. Install P-clips and wire ties as needed on the right charge air cooler hose, lower radiator hose, and the deaeration hose (Figure 27, Items 1, 3, and 7).

17. Connect the electrical connector and secure ground wiring with wire ties as needed (Figure 26, Items 7 and 8).

18. Install the upper radiator hose on the radiator and secure the clamp (Figure 26, Items 2, 3, and 4).

19. Install the left charge air cooler hose on the charge air cooler and secure the spring clamp (Figure 26, Items 1, 5, and 6). Torque bolts to 72 lbf-in (8 N•m).

20. Install P-clips and wire ties as needed to the left charge air cooler hose and upper radiator hose (Figure 26, Items 4 and 6).

CAUTION – Some hydraulic hoses and fittings in the hydraulic system are equipped with O-rings to seal the hydraulic hoses. Inspect all O-rings prior to installation and replace as needed.

NOTE – Be sure to remove all caps and plugs that were installed during the removal procedures before installing hydraulic hoses.

21. Connect two hydraulic hoses on the hydraulic fan drive motor. Install P-clips on the hydraulic hoses as needed (Figure 17, Items 3 and 5).

22. Connect solenoid electrical connector on the hydraulic fan drive motor (Figure 17, Items 3 and 4).

23. Install the pilot hose on the hydraulic reservoir (Figure 16).

24. Install P-clips and wire ties on hydraulic hoses as needed (Figure 25, Items 5 and 6).

25. Connect the engine block heater electrical connector. Install wire ties as needed to wiring (Figure 25, Items 1).

26. Align the body support brace on the bus body (Figure 25, Items 2 and 4).

27. Install two nuts and bolts on each side of the body support brace and bus body (Figure 25). Torque bolts to 30 to 38 lbf-ft (41 to 52 N•m).

28. Install the right bumper crossmember bracket and secure with four bolts and nuts (Figure 24, Items 1, 4, and 5). Torque bolts to 100 to 120 lbf-ft (136 to 163 N•m).

29. With the aid of an assistant, install the rear bumper by positioning the left side on the vehicle first.

30. Install eight carriage bolts and nuts on the rear bumper and rear frame mounts (Figure 23). Torque carriage bolts to 45 to 65 lbf-ft (61 to 88 N•m).

31. Tighten bolt and nut at right side bumper mount bracket (Figure 24, Items 1, 2, and 3). Torque bolts to 100 to 120 lbf-ft (136 to 163 N•m).

32. Connect the lower hydraulic hose on the hydraulic pump (Figure 8).

33. Install P-clips and wire ties on the lower hydraulic hose as needed (Figure 8, Item 2).

34. Fill the hydraulic system.

35. Fill cooling system to proper level and leak test the cooling system. Special Tool number **550500INT** is recommended to fill and leak test the cooling system.

IMPORTANT – After filling the coolant system, open two heater shut-off valves and recheck the coolant level. The heater shut-off valves can be accessed through the left-side rear compartment service door.

36. Close and latch the rear compartment service doors, left-side door, and rear door.

TORQUE

Table 1 Torque Chart

Figure No. (Item No.)	Location	Lbf-ft/in	N•m
Figure 6 (Item 4 and 5)	Surge Tank Cable Strap Nuts	21 to 27	28 to 37
Figure 7 (Item 1)	Hydraulic Filter	17 to 20	23 to 27
Figure 9 (Item 6)	Hydraulic Reservoir Mount Bolts	100 to 120	136 to 163
Figure 11 (Item 1)	Hydraulic Pump Pulley Bolts	13 to 16	18 to 21
Figure 12 (Item 3)	Hydraulic Pump Mount Bracket to Engine Bolts	17 to 21	23 to 29
Figure 13 (Item 4)	Hydraulic Pump to Mount Bracket Bolts	70 to 85	95 to 115
Figure 13 (Item 5)	Hydraulic Pump Hub Mount Nut	220 to 240	298 to 325
Figure 13 (Item 8)	Hydraulic Pump Cable Strap Nut	21 to 27	28 to 37
Figure 14 (Item 4)	Fan Drive Motor Solenoid	7 to 9	9 to 12
Figure 15 (Item 1) Figure 34 (Item 6)	Radiator Fan Bolts	30 to 38	41 to 52
Figure 17 (Item 1) Figure 34 (Item 6)	Hydraulic Fan Drive Motor Mount Bolts	80 to 100	108 to 136
Figure 18 (Item 6)	Hydraulic Fan Drive Motor Hub Nut	220 to 240	298 to 325
Figure 19 (Item 4) Figure 20 (Item 3)	Hydraulic Oil Cooler Mount Bolts	30 to 38	41 to 52
Figure 21 (Item 1)	Spider Cage Mount Nuts	41 to 50	56 to 68
Figure 23 (Item 3)	Bumper Carriage bolts	45 to 65	61 to 88
Figure 24 (Item 2)	Right Side Bumper Mount Bracket Bolt	100 to 120	136 to 163
Figure 24 (Item 4)	Bumper Crossmember Mount Bolts	100 to 120	136 to 163
Figure 25 (Item 3)	Body Support Brace Mount Bolts	30 to 38	41 to 52
Figure 26 (Item 5) Figure 27 (Item 2)	Charge Air Cooler Hose Spring Clamps	6/72	8
Figure 29 (Item 2 and 5)	Support Brace Mount Bolts	80 to 100	108 to 136
Figure 29 (Item 4)	Support Plate Mount Bolts	80 to 100	108 to 136
Figure 30 (Item 3)	Cooling Package Mount Bolts	142 to 175	193 to 237
Figure 32 (Item 2)	Recirculation Seal Mount Bolts	13 to 15	18 to 20
Figure 33 (Item 1 and 4)	Support Rod Mount Bolts and Nuts	80 to 100	108 to 136
Figure 34 (Item 3 and 4)	Charge Air Cooler Mount Bolts	13 to 15	18 to 20
Figure 36 (Item 2)	Fan Shroud bolts	13 to 15	18 to 20

Table 1 Torque Chart (cont.)

Figure No. (Item No.)	Location	Lbf-ft/in	N•m
Figure 38 (Item 5)	Radiator Mount Nuts	80 to 100	108 to 136
Figure 39 (Item 1) Figure 40 (Item 3) Figure 41 (Item 4)	Radiator Frame Bolts	52 to 59	71 to 80