

INTRODUCTION

GENERAL

This section describes the repair and adjustments for the ducted fan assembly used on the S30–120E and H60–110E lift trucks. The fan belt adjustments are different for the two series of lift trucks. The design and operation is similar.

DESCRIPTION

The ducted fan and thick radiator core gives good cooling efficiency and decreases noise. Damage to the radiator core is decreased because particles are not sent into the core at high speed by the fan. The fan pulls air through the radiator. A radiator screen is available. This screen is easily removed for cleaning and prevents particles from stopping the flow of air through the radiator.

The cooling system has the following parts: fan assembly, radiator, and auxiliary coolant reservoir. The water pump and thermostat are part of the engine assembly. The radiator and fan assembly are connected to the counterweight in the S30–120E lift trucks. The radiator and fan assembly are connected to the frame in the H60–110E lift trucks. See FIGURE 1. for the S30–120E lift trucks and FIGURE 2. for the H60–110E lift trucks. A drive shaft is connected to the crankshaft pulley on the engine. The drive shaft turns the lower pulley of the fan assembly. A fan belt connects the lower pulley to the pulley on the fan. A one way clutch (roller clutch) assembly in the drive shaft prevents power pulses being sent from the engine to the fan. The roller clutch assembly decreases noise in the fan assembly.

NOTE: (S30–100E) A modification of the drive shaft for the fan assembly was made to decrease noise. The

drive shaft was changed from a spline to a roller clutch arrangement in the lower pulley assembly. Lift trucks models made with the drive shaft modifications begin with the following serial numbers and dates:

D2D–4264X September 1977

C4D–2876X September 1977

C4T–1523Y September 1978

NOTE: When repairs are made to a drive shaft of the older design, replace the drive shaft with the new design. A new hub assembly will be needed also.

NOTE: The drive shaft of the newer design is used in both series of lift trucks. This common part causes two grease fittings to be found on the lower pulley assembly for the H60–110E. Either grease fitting will lubricate the roller clutches in the H60–110E. Use a special grease, part number 326457 (Aeroshell Number 14), to lubricate the roller clutches every 350 hours of operation. This special grease is for both series of lift trucks.

A special polyurethane belt is used for a fan belt. The tension on the belt is important. A belt that is loose will wear rapidly. See the fan belt adjustment procedure in this section to adjust the tension on the fan belt.

A rubber seal between the fan shroud and the radiator prevents the by-pass of air around the radiator. This seal is necessary for an efficient cooling system. A cooler for the transmission oil is in the lower section of the radiator. An auxiliary coolant reservoir is mounted on the frame near the radiator. The coolant in the coolant system expands when heated. The coolant expands out of the radiator and flows to the auxiliary coolant reservoir. When the coolant system cools, the coolant is pushed back into the radiator by atmospheric pressure.

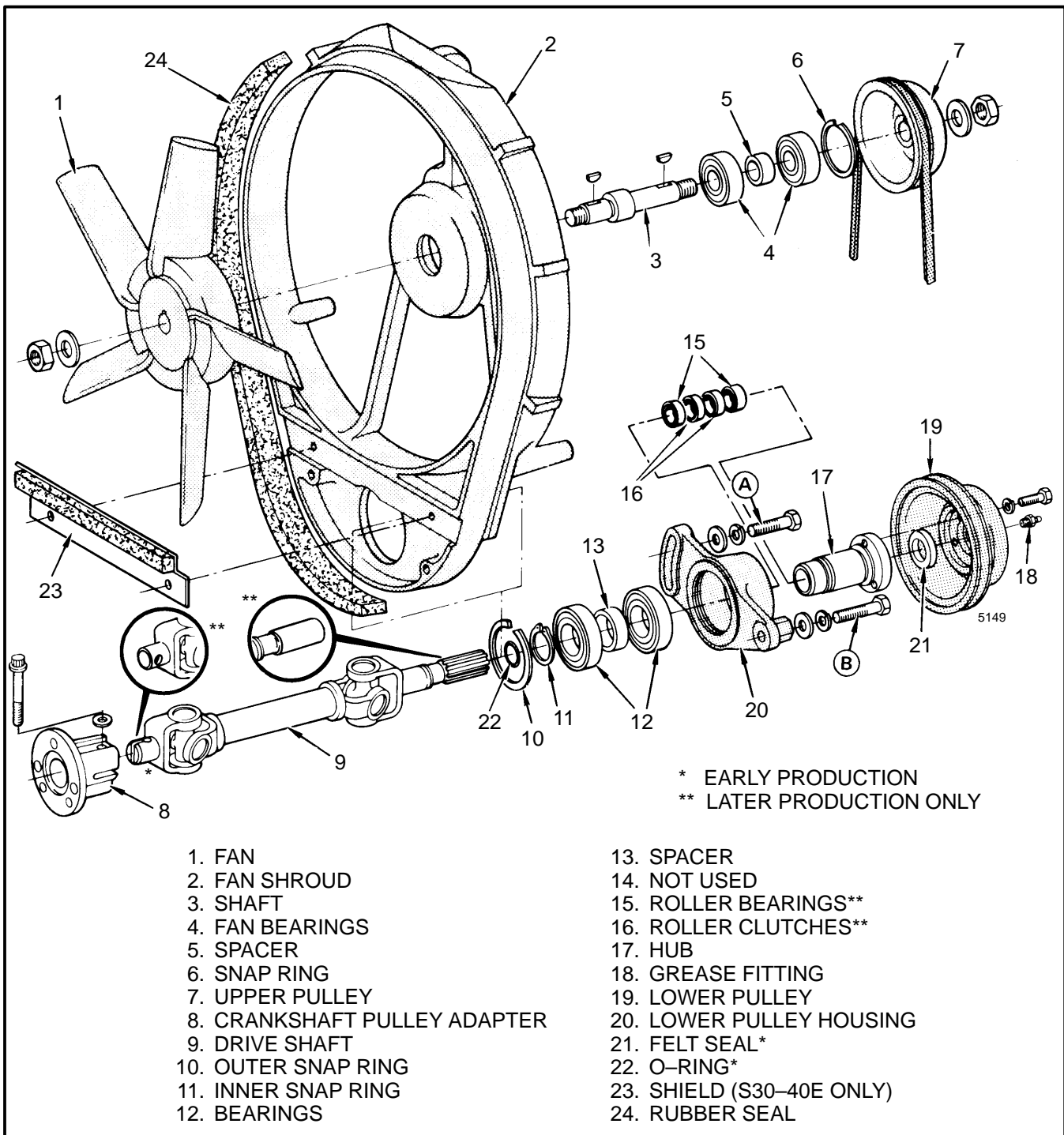


FIGURE 1. FAN ASSEMBLY (S30-120E)

(More Content includes: Brake system, Capacities, and specifications, Frame, Hydraulic, System, Industrial battery, Main control, Valve, Mast repair, Fasteners, Schematics diagrams, Steering axle, Steering system, Wire harness repair And more)

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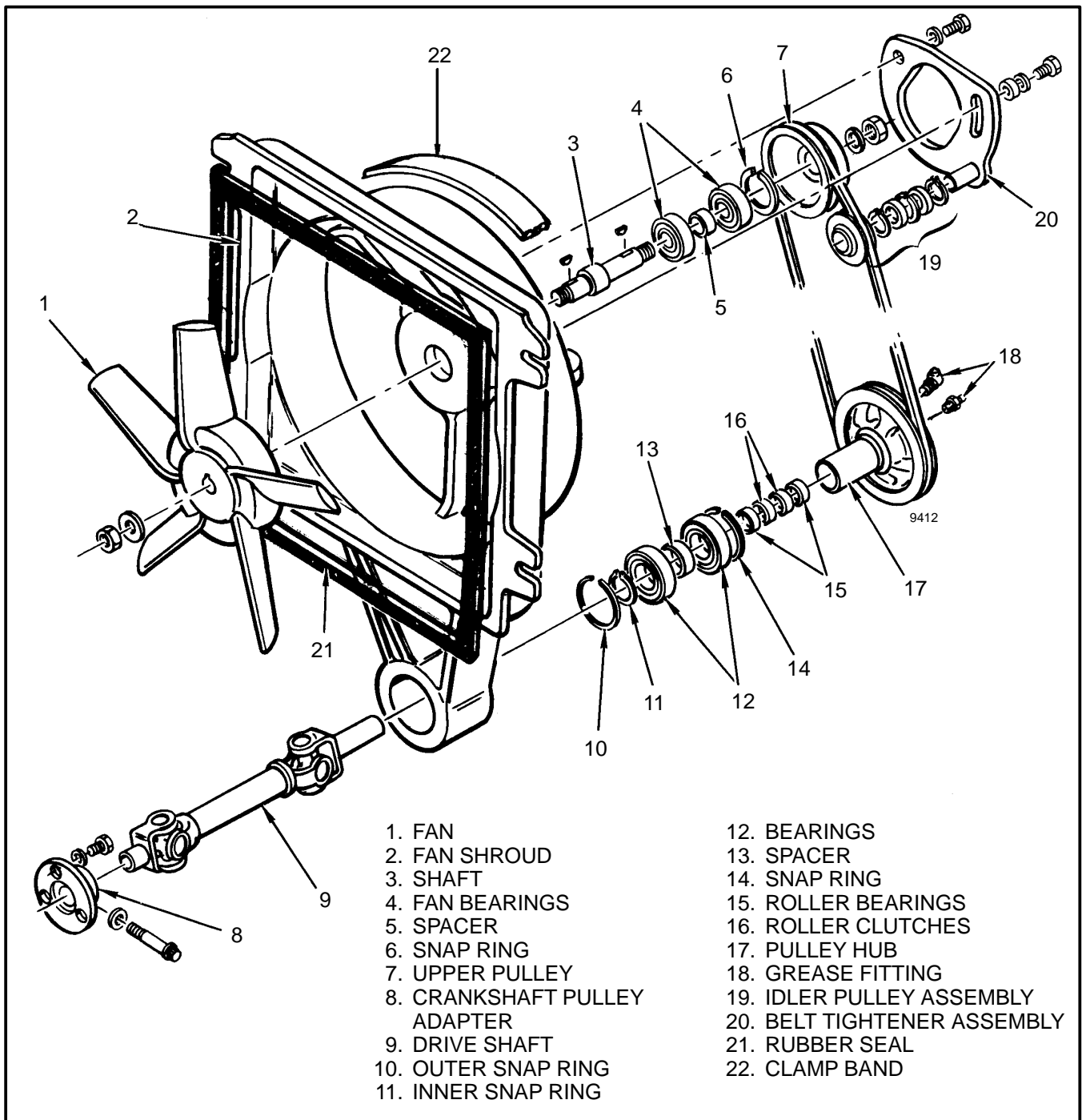


FIGURE 2. FAN ASSEMBLY (H60-110E)

REPAIRS

WARNING

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

FAN ASSEMBLY

Removal (S30–120E)

1. Remove the two 12 point capscrews and remove the counterweight part with the Hyster name.
2. Remove the three capscrews that hold the fan assembly to the grille. See FIGURE 3.
3. Remove the four capscrews that hold the grille to the counterweight and remove the grille. Pull the fan assembly out of the counterweight. The drive shaft will slide out of the lower pulley hub.
4. If necessary, disconnect the drive shaft from the crankshaft pulley adaptor by removing the 12 point capscrew.

Removal (H60–110E)

1. Remove the access panel over the radiator.

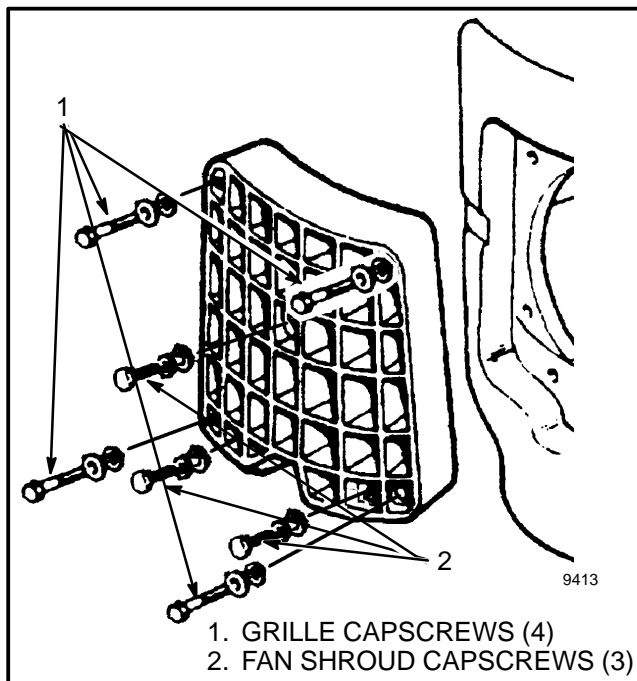


FIGURE 3. FAN ASSEMBLY MOUNT
(S30–120E)

2. Drain the coolant from the radiator. Remove the radiator screen, if equipped.
3. Disconnect the radiator hoses. Disconnect the two lines to the oil cooler. Disconnect the hose to the auxiliary coolant reservoir.
4. Remove the four nuts and washers and remove the radiator from the lift truck.
5. Disconnect the drive shaft from the crankshaft pulley adaptor, by removing the 12 point capscrew. The drive shaft will slide out of the pulley hub assembly.
6. Remove the fan assembly from the frame.

Disassembly (S30–120E)

NOTE: Removing of the bearings and roller clutches during disassembly will usually damage them so that they must be replaced. Disassemble the fan assembly only enough to make repairs.

1. Remove the lower pulley housing and remove the fan belt. Remove the lower pulley (19) from the hub.

NOTE: When the upper hub assembly must be removed from the fan housing, heat the aluminum near the bearings to 120°C (250°F). Heat the area evenly so that you do not cause distortion. Push the hub assembly out of the housing.

NOTE: Heating the aluminum over 260°C (500°F) can cause permanent damage. Many service technicians use a temperature indicator such as a TEMP-STIX® to prevent damage.

2. Remove the snap ring (10) and remove the hub assembly.
3. Remove the inner snap ring (11).
4. Use a press to remove the two bearings (12) and spacer (13) from the hub (17). Discard the bearings.
5. Use a press to push the two roller bearings (15) and the two roller clutches (16) out of the lower hub. Discard the bearings and roller clutches.
6. Remove the nut that holds the upper pulley to the shaft. Remove the pulley (7) and woodruff key.
7. Remove the nut that holds the fan to the shaft. Remove the fan (1) and woodruff key.

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.

8. Remove the snap ring (6). Heat the area near the bearings and remove the fan bearings (4) and shaft (3).
9. Use a press to remove the two bearings (4) and spacer (5) from the shaft (3). Discard the bearings.
10. Remove the foam rubber seal and replace as necessary.

Disassembly (H60–110E)

NOTE: Removing the bearings and roller clutches during disassembly will usually damage them so that they must be replaced. Disassemble the fan assembly only enough to make repairs.

1. Remove the belt tightener assembly. Remove the fan belt.
2. Reach through the spokes of the pulley with snap ring pliers and remove the snap ring (14) from its position in the housing. Leave the snap ring loose on the pulley hub.

NOTE: When the upper shaft assembly must be removed, the aluminum housing must be heated. Heat the aluminum near the bearings to 120°C (250°F). Heat the area evenly so that you do not cause distortion. Push the assembly out of the housing.

NOTE: Heating the aluminum over 260°C (500°F) can cause permanent damage. Many service technicians use a temperature indicator such as a TEMP–STIX® to prevent damage.

3. Remove the pulley hub assembly.
4. Remove the inner snap ring (11). Use a press to remove the two bearings (12) and spacer (13) from the pulley hub (17). Discard the bearings.
5. Use a press to push the two roller bearings (15) and the two roller clutches (16) out of the lower hub. Discard the bearings and roller clutches.
6. Remove the nut that holds the upper pulley to the shaft. Remove the pulley and woodruff key.

7. Remove the nut that holds the fan to the shaft. Remove the fan and woodruff key.

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.

8. Remove the snap ring (6). Heat the area near the bearings and remove the fan bearings (4).
9. Use a press to remove the two bearings (4) and spacer (5) from the shaft (3). Discard the bearings.
10. Remove the foam rubber seal and replace as necessary.

Assembly (Both Series) (See FIGURE 1. or FIGURE 2.)

NOTE: The bore for the upper bearings in the fan shroud must be heated for the installation of the bearings. Heat the aluminum bore evenly so that you do not cause distortion. Do not heat the aluminum more than 120°C (250°F). A difference in temperature between the bearings and the bore must be 65 to 80°C (150 to 180°F) to install the bearings. Do not cool the bearings below 2°C (35°F).

NOTE: Heating the aluminum over 260°C (500°F) can cause permanent damage. Many service technicians use a temperature indicator such as a TEMP–STIX® to prevent damage.

CAUTION

The bearings must move freely into position in the heated aluminum bore. DO NOT use force to install the bearings. If the bearings are not in the correct position in the aluminum bore, heat the aluminum again and remove the assembly. Begin the installation procedure again.

NOTE: The numbers in the following procedure are item numbers in FIGURE 1. or FIGURE 2.

1. Use a press to install the bearings (4) and spacer (5) on the shaft (3). Make sure the force from the press is on the inner bearing race.
2. Use a cloth to clean the bore and ball bearings (4) for the upper hub. Use retaining compound (part number

340419) on O.D. of the bearings before installing the bearings in the bore.

3. Heat the aluminum bore for the bearings. Install the shaft assembly in the bore. Install the snap ring (6). Use the cloth to remove all the retaining compound from the bore and face of the bearing. Install the snap ring (6).

4. Install the woodruff key, fan, and washer and nut on the shaft.

5. Install the woodruff key, upper pulley, washer and nut on the shaft. Tighten the nuts on both ends of the shaft to 54 N.m (40 ft lb).

6. A special driver (kit part number 321006) is necessary to install the roller bearings and roller clutches in the lower hub. See the procedure in FIGURE 4.

7. For the S30–120E models, use a press to install the bearings (12) and spacer (13) on the hub (17). Make sure

the force from the press is on the inner bearing race. Install the inner snap ring (11).

8. For the H60–110E models, put the snap ring (14) loosely on the pulley hub (17). Use a press to install the bearings (12), and the spacer (13) on the pulley hub (17). Make sure the force from the press is on the inner bearing race.

9. Install the snap ring (10) and install the hub assembly. Install the snap ring.

10. For the S30–120E models, fasten the lower pulley housing (20) to the fan shroud. Install the lower pulley on the hub. Tighten the capscrews to 11.3 N.m (100 inch lb).

11. Install the fan belt on the pulleys.

12. For the H60–110E models, fasten the belt tightener assembly to the fan shroud. Replace the bearings in the idler pulley as necessary.

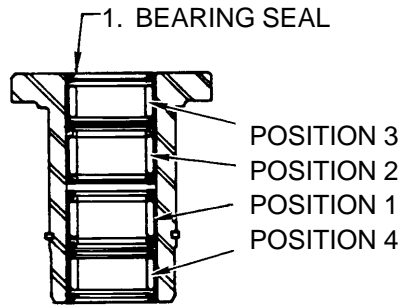


FIGURE A. ROLLER CLUTCH AND ROLLER BEARING ARRANGEMENT

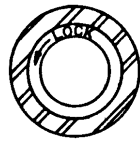


FIGURE B. ROLLER CLUTCH

The word "LOCK" on the roller clutches must be towards the flange or pulley of the hub when the roller clutches are installed.

STEP 1. Put the hub so that the flange or pulley is in the up position. Put a roller clutch on the special drive with the part number 321008. Make sure the numbers marked on the roller clutch are toward the special driver. Use the special driver to press the roller clutch to the position number 1 described in Figure A.

STEP 2. Put the collar with the part number 321009 on the special driver. Put the second roller clutch on the special driver. Press the roller clutch to position number 2 described in Figure A. Remove the collar 321009 from the special driver.

STEP 3. Put the collar with the part number 321010 on the special driver. Put a roller bearing on the special driver. Make sure the bearing seal is toward the special driver. Press the roller bearing to position number 3 described in Figure A.

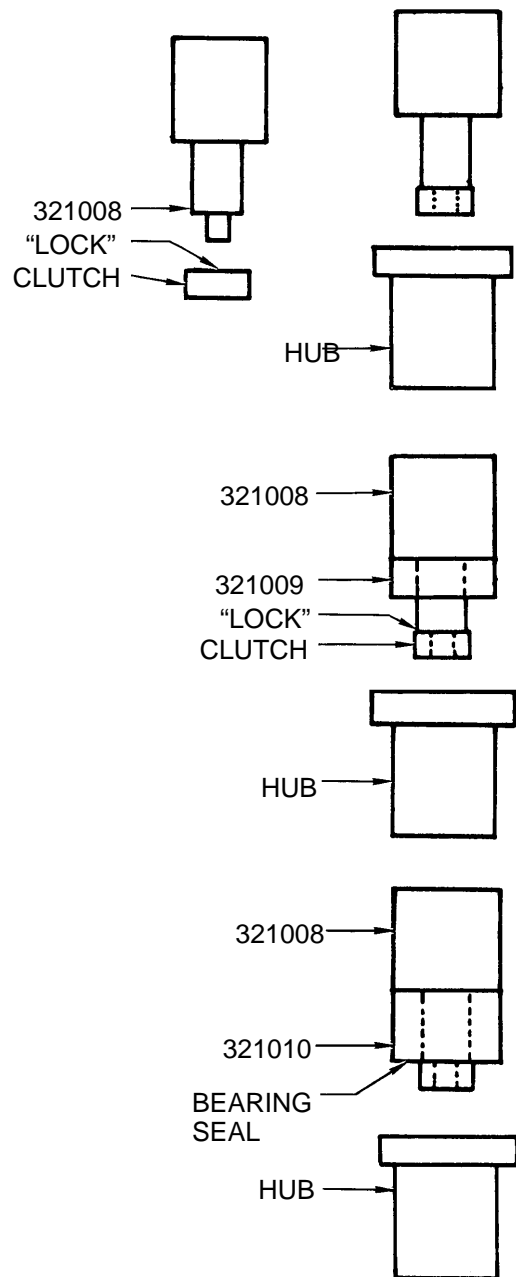
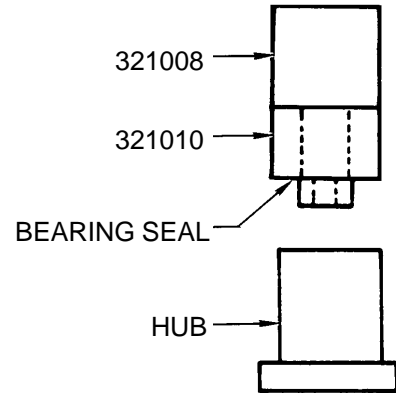


FIGURE 4. INSTALLATION OF THE ROLLER CLUTCHES AND ROLLER BEARINGS IN THE FAN DRIVE HUB (1 of 2)

STEP 4. Put the hub so that the flange or pulley is in the down position. Use the special driver with the collar 321010. Put a roller bearing on the special driver. Make sure the bearing seal is toward the special driver. Press the roller bearing to position number 4 described in Figure A.

STEP 5. Check the rotation of the hub on the drive shaft. When the flange or pulley is toward you, turn the hub clockwise on the drive shaft. The hub must turn freely. Turn the hub counterclockwise. The roller clutches must lock the hub to the drive shaft.

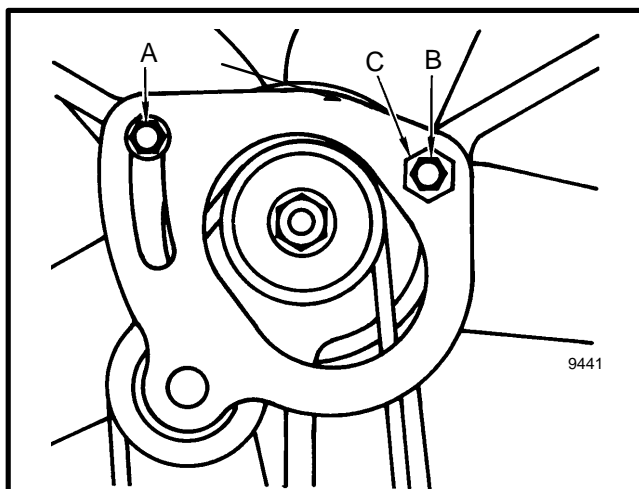


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FIGURE 4. INSTALLATION OF THE ROLLER CLUTCHES AND ROLLER BEARINGS IN THE FAN DRIVE HUB (2 of 2)

Fan Belt Adjustment (See FIGURE 5.)

The fan belt is a special polyurethane belt. When the fan belt is correctly adjusted, the tension will be tighter than other types of fan belts. A fan belt that is not adjusted correctly will wear rapidly. Reset the adjustment of a new fan belt at 10 to 12 hours. After a check at 100 hours, reset the adjustment of the fan belt at the regular schedule of 350 hours.



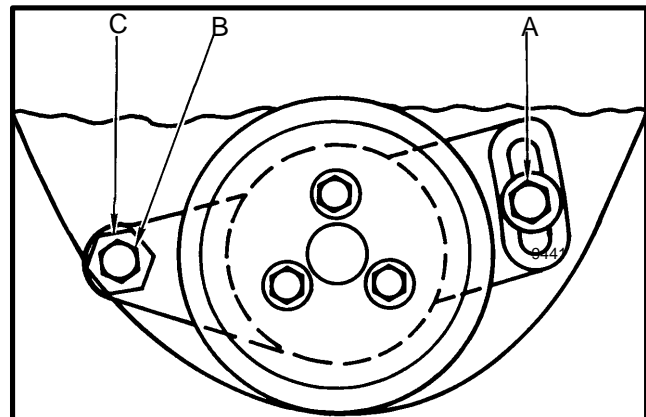
H60-110E

STEP 1. Loosen the two cap screws that hold the belt tightener assembly.

STEP 2. Put a torque of 49 N.m (36 ft lb) on the nut (C). Hold the torque on the nut (C) and tighten cap screw (A) to 34 N.m (25 ft lb).

STEP 3. Tighten cap screw (B) to 34 N.m (25 ft lb).

FIGURE 5. ADJUSTMENT OF THE FAN BELT (1 of 2)



S30-120E

STEP 1. Loosen the two cap screws that hold the lower pulley housing to the fan shroud.

STEP 2. Put a torque of 68 N.m (50 ft lb) on the nut (C) and tighten the cap screw (A) to 25 ft lb (34 N.m).

STEP 3. Tighten cap screw (B) to 34 N.m (25 ft lb).

FIGURE 5. ADJUSTMENT OF THE FAN BELT (2 of 2)

Installation

1. Install new foam rubber seals. The seals are foam rubber tape for both series of lift trucks. The normal procedure is to install new foam rubber seals if the fan assembly is removed for maintenance. The foam rubber seals are applied to the fan shroud.

2. Lift the fan assembly into position. If the drive shaft was not removed from the crankshaft, the drive shaft must be assembled into the hub. For the H60-110E series, install the nuts and washers that hold the fan assembly and radiator to the frame.

NOTE: Some service technicians find the installation of the fan assembly is easier if the drive shaft is removed from the crankshaft. The installation of the drive shaft in the hub can be difficult when lifting the fan assembly into position.

3. Install the drive shaft if it was removed. Tighten the 12 point capscrew on the crankshaft pulley adaptor to 34 N.m (25 ft lb).

4. Check that the hub rotates freely in a clockwise direction on the drive shaft. If the hub does not rotate freely in a clockwise direction, check the installation of the roller clutches. Lubricate the roller clutches with the special grease (part number 326457 or approved equivalent).

5. Check that the rubber seal is correctly installed. A loss of cooling efficiency will occur if the seal is not correctly installed or is damaged.

6. For the S30–120E series, lift the grille in position on the counterweight. Install the three capscrews that hold the fan assembly to the grille. Tighten the capscrews to 34 N.m (25 ft. lb). Install the four capscrews that hold the grille to the counterweight. Tighten the capscrews to 54 to 61 N.m (40 to 45 ft lb). Install the counterweight part with the HYSTER name. Tighten the two 12 point capscrews to 270 N.m (200 ft lb).

RADIATOR

Removal (See FIGURE 6.)

1. Remove the access panel over the radiator.

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.

2. Drain the coolant from the radiator. Remove the radiator screen, if equipped.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

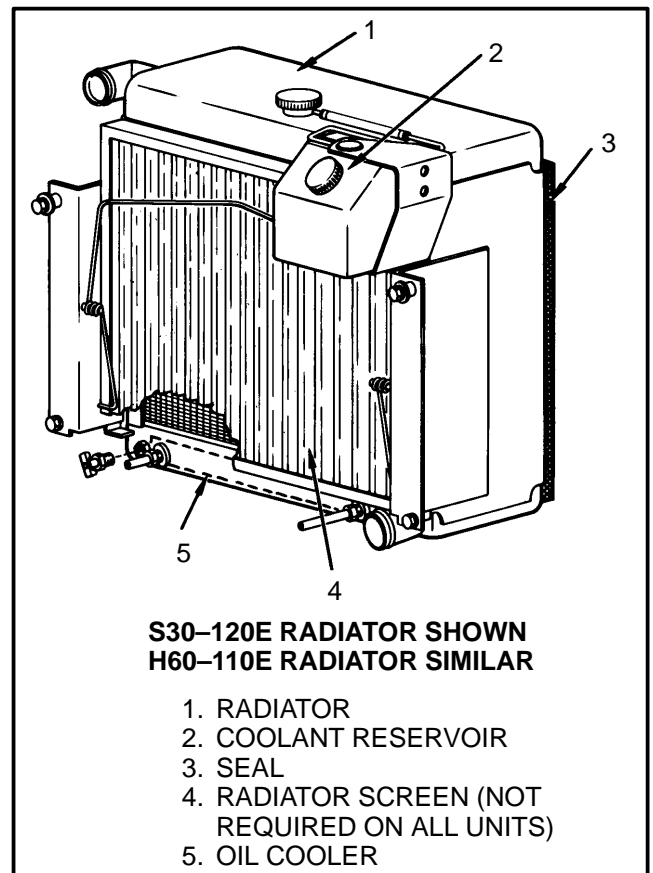


FIGURE 6. RADIATOR

3. Disconnect the radiator hoses. Disconnect the two lines to the oil cooler. Disconnect the hose to the auxiliary coolant reservoir.

4. Remove the four capscrews or nuts and washers and remove the radiator from the lift truck.

Installation

1. Install new foam rubber seals. Install the radiator in the lift truck. Install the four capscrews or nuts and washers that hold the radiator in position.

2. Connect the two lines to the oil cooler. Connect the radiator hoses. Connect the hose to the coolant reservoir.

3. Add coolant to the coolant system. Install the radiator screen, if equipped.

CAUTION

Do not use an alcohol or methanol base anti-freeze. They are flammable and cause personal injury or damage to the lift truck.

4. Install the access panel over the radiator.

Cleaning and Inspection

CAUTION

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

The radiator and radiator screen must be cleaned if particles stop or decrease the air flow through the radiator. Use compressed air or steam to remove the particles. Apply the air or steam in the opposite direction from the normal air flow. This cleaning can be done with the radiator in the lift truck. Remove the radiator screen to clean the radiator or the radiator screen.

CAUTION

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

Check the radiator cap for the correct operation. The radiator cap has a pressure rating of 103 kPa (15 psi).

Flush the cooling system if there is rust or dirt in the coolant. Reverse flush the cooling system every 2 years. Use the procedure shown in FIGURE 7.

CAUTION

DO NOT operate the engine without a thermostat. The engine and cooling system can be damaged.

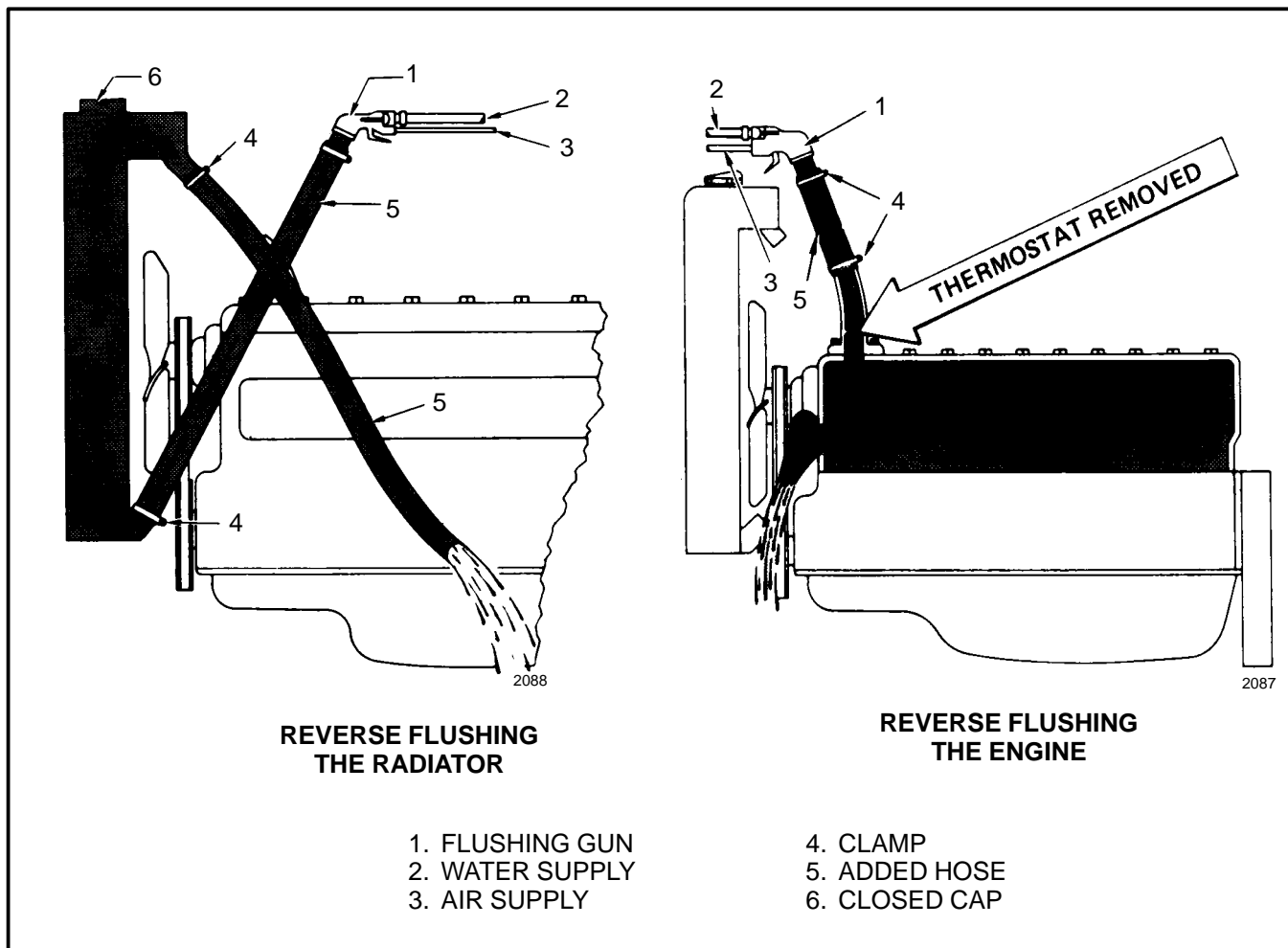


FIGURE 7. FLUSHING THE COOLING SYSTEM

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Coolant leakage.	<p>There is a leak in the radiator.</p> <p>There is a leak in a radiator hose or coolant hose.</p> <p>There is a leak from a plug or sensor in the engine block.</p> <p>Water pump leaks.</p> <p>Thermostat housing leaks.</p> <p>Cylinder head gasket is damaged.</p> <p>Cylinder head is cracked.</p> <p>Engine block is cracked.</p>	<p>Repair the radiator.</p> <p>Install new hoses.</p> <p>Check the sensors and plugs and repair the leaks.</p> <p>Install a new water pump.</p> <p>Install a new thermostat housing. Check for correct installation of the thermostat.</p> <p>Install a new head gasket.</p> <p>Install a new cylinder head.</p> <p>Install a new cylinder block.</p>
The engine is too hot during operation.	<p>There is not enough coolant in the cooling system.</p> <p>The radiator is dirty.</p> <p>The drive belt for the fan belt is not adjusted correctly, worn, or broken.</p> <p>The thermostat is wrong heat range or does not operate correctly.</p> <p>The cooling system has restrictions.</p> <p>The water pump worn or damaged.</p> <p>The exhaust system has restrictions.</p> <p>Ignition timing is not correct.</p> <p>Fan does not rotate at the correct speed.</p>	<p>Check coolant level in radiator and coolant recovery bottle. Add coolant to correct level.</p> <p>Drain and clean radiator. Clean radiator fins with low pressure air or water in reverse direction of normal air flow. Be careful not to bend fins. Refill with clean coolant.</p> <p>Check fan drive belt. Adjust or install new belt as required.</p> <p>Check heat range. Install new thermostat.</p> <p>Drain and back-flush engine and radiator. Refill with clean coolant.</p> <p>Install new water pump.</p> <p>Check the exhaust system. Remove restrictions.</p> <p>Check and adjust timing.</p> <p>Adjust or install new belt as required.</p>
Exhaust leakage into coolant.	<p>Head gasket(s) leaks.</p> <p>Cylinder head is damaged.</p>	<p>Install new gasket(s).</p> <p>Install new cylinder head.</p>
Fan does not rotate at the correct speed.	<p>Roller clutches are worn or damaged.</p> <p>Fan belt is loose.</p> <p>Roller clutches installed wrong.</p>	<p>Install new roller clutches.</p> <p>Adjust or install new belt as required.</p> <p>Install roller clutches correctly.</p>
Fan assembly makes noise.	<p>Drive shaft loose at the crankshaft adapter.</p> <p>Universal joints worn.</p> <p>Roller clutches and roller bearings worn.</p> <p>Fan bearings worn.</p>	<p>Tighten hardware for crankshaft adapter.</p> <p>Install new universal joint.</p> <p>Install new roller clutches and roller bearings.</p> <p>Install new fan bearings.</p>