

50 Hydraulic Excavator

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Section

1001

**SAFETY INSTRUCTIONS,
GENERAL INFORMATION AND
TORQUE SPECIFICATIONS**

SAFETY

Follow the safety instructions given in this section and throughout this manual to prevent any risk of accident.

Parking the machine

- When parking the machine, proceed as follows:
 1. Park the machine on flat, level ground, away from any soft ground, excavations or badly shored cavities.
 2. Place the upperstructure and the attachment in line with the undercarriage, retract the attachment and anchor the bucket or the clamshell in the ground.
 3. Lower the dozer blade to the ground.
 4. Shut down the engine and remove the starter switch key.

Maintenance and adjustments

- Do not carry out any maintenance operations until you have read and assimilated the instructions and warnings contained in this manual.
- Wear suitable clothing when servicing the machine. Avoid loose-fitting clothes.
- When servicing the machine, place a "Do not start up" label on the instrument panel.
- Always wear eye protection when using a tool which can cause metal particles to be projected. Use a soft-faced hammer (copper or brass) when installing pins.
- Incorrectly performed maintenance or adjustments can cause serious injuries. If you do not understand a maintenance or adjustment procedure, consult your Dealer.

5. It is essential to lift the left-hand control arm before leaving the operator's compartment.
6. Lock the operator's compartment door.
7. Make sure that the hoods are correctly locked.
8. Make sure that no component of the machine is protruding onto the public highway. If this cannot be avoided, install signals in conformity with regulations.

- If the attachment is raised or if the machine moves when there is no operator, serious injury can result. Before carrying out any servicing operations on this machine, proceed as follows:
 1. Park the machine on flat, level ground.
 2. Lower the attachment until it is resting on the ground.
 3. Shut down the engine and remove the starter switch key.
 4. Block the tracks to prevent any machine movement.
- To operate the machine or the attachment controls, it is essential for the operator to be seated in his seat. Any other manner of operation could cause a serious accident.
- This is a machine for one person only. No passenger is permitted.

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- Unauthorized modifications made to this machine may cause serious injury. Do not undertake any modification to the machine without prior authorization from your Dealer. Any modifications made must be in conformity with the technical specifications of the machine and any current safety legislation requirements.
- Certain components of the machine are subject to type approval. When replacing such components, it is compulsory to make sure that they conform to regulations. For safety's sake, use genuine parts.
- Pressurized hydraulic fluid or grease which penetrates the skin can cause serious injury. Take the necessary safety precautions (safety clothing and protection for the face and hands) to avoid such risks. Also, before using these products, read the manufacturer's instructions concerning their use. If hydraulic fluid penetrates the skin, call a doctor immediately.
- Pressure in the track tension cylinders is high. Carefully follow the procedure described in this manual to increase or decrease track tension.
- Whenever carrying out a welding operation on the undercarriage or upperstructure chassis, as authorized by the manufacturer and in accordance with his instructions, disconnect the battery, the B+ and D+ cables of the alternator and connect the welding apparatus earth cable to the component on which the welding operation is to be performed. Never connect the welding apparatus earth cable to the undercarriage when welding on the upperstructure (or vice-versa). Never connect the welding apparatus earth to a component of the hydraulic system.
- When using compressed air, take the necessary safety precautions to protect your face.
- Before starting the engine, study the safety messages contained in this manual. Read all the signs concerning safety which are on the machine. Make sure that no person is within the machine's working area. Learn how to use the controls in a safe manner before using them. You must understand and follow the manufacturer's instructions concerning the operation and maintenance of the machine and you must observe current laws and regulations. You can order the relevant operator's manual and service manual from your Dealer.
- If you wear clothing which is too loose-fitting or if you do not use safety equipment suitable for your work, you risk having an accident. Always wear clothing which does not catch on objects. Among supplementary safety equipment which may be necessary are a helmet, safety shoes, ear, eye and face protection, thick gloves, and reflective clothing.
- When carrying out any operation near the fan when the engine is running, avoid wearing loose-fitting clothing and take great care.
- When carrying out inspections and tests on the hydraulic equipment, follow the procedures to the letter. DO NOT CHANGE the procedures.
- Make sure that no person is within the working range of the hydraulic cylinders when they are being operated to test their operation or to bleed air from the system.
- Use heat-proof gloves when handling hot parts.
- When using a hammer to install pivot pins or accessories which are operated by compressed air, or yet again when using a grinder, it is necessary to wear protection which covers the eyes completely (work goggles or any other authorized protection).
- To raise the wheels or tracks off the ground, use jacks, chain lift hoists and carry out such work on suitable ground. Always place suitable, safe blocks under the machine.
- When maintaining or servicing a machine, there must be no oil, grease, tools, etc. on the workshop floor, the cab floor or on the steps. If necessary, use a product to absorb the oil and wear workshop overalls. Always employ safe methods of working.
- Exhaust gases can cause death. If it is necessary to run an engine in an enclosed space, the exhaust fumes must be evacuated from the area by means of an evacuation pipe. Open the doors and allow air from the outside to enter the building where the engine is running.
- Certain components of this machine are very heavy. Use suitable lifting equipment or request assistance as indicated in this manual.

Prevention of fire or explosions

- Engine fuel can cause an explosion or a fire.
 - Never refuel when the engine is running.
 - Never smoke when refuelling.
 - Take all necessary safety measures when welding, grinding or when working near a naked light.
- Always use a non-inflammable solvent when cleaning parts.
- A spark or a naked light can cause the hydrogen in a battery to explode. To avoid all risk of explosion, be sure to follow the instructions below:
 - When disconnecting battery cables, always disconnect the negative cable (-) first.
 - When connecting battery cables, always connect the negative cable (-) last.
 - Never short-circuit the battery terminals with metal objects.
- - Do not weld, grind or smoke near a battery.
- Sparks can fly from the electrical system or the engine exhaust. Before running the machine in an area where there may be inflammable gases, make sure that there is adequate ventilation.
- Make sure that there is always a fire extinguisher within easy reach on board the machine. Make sure the fire extinguisher is regularly serviced in accordance with the manufacturer's instructions.
- Clean the machine regularly, removing all debris and inflammable material.
- Make sure there are no leaks and replace any damaged hoses, lines or connectors. After any repair work, clean the machine before operating it.

Prevention of burns

- The electrolyte in the batteries can cause serious burns. Batteries contain sulphuric acid. Avoid contact with skin, eyes and clothing.
Antidote:
EXTERNAL: rinse with water.
INTERNAL: drink large amounts of water or milk. Then drink milk of magnesia, a beaten egg or vegetable oil. Call a doctor immediately.
EYES: rinse with water for fifteen minutes and consult a doctor immediately.
- When battery electrolyte freezes it can explode if you try to charge the battery or to start the engine with a booster battery. Keep batteries charged at all times to prevent the electrolyte from freezing.
- Boiling coolant solution can escape if the coolant reservoir cap is removed when the system is still hot. Before removing the cap, let the system cool down and then turn the cap to the first notch, waiting until all pressure is released. Then remove the cap.

GENERAL INFORMATION

CLEANING

Clean all metal parts, except ball or roller bearings with white spirit or steam. Do not use caustic soda when steam-cleaning. After cleaning, dry and oil all parts. Clean oil passages with compressed air. Clean ball or roller bearings with paraffin, dry them completely and lubricate them.

INSPECTION

Inspect all parts when they have been disassembled. Replace any parts which show wear or damage. Shallow scuffing or scratches can be removed by honing or with a rag soaked in jeweller's rouge. A complete inspection to detect wear and pitting and the replacement of the parts concerned as required avoid premature failures.

BALL AND ROLLER BEARINGS

Check that bearings run freely. If their clearance has become too great or if they run irregularly, they must be replaced. Wash bearings using a good solvent or paraffin and allow them to dry in the air. **NEVER DRY BEARINGS WITH COMPRESSED AIR.**

NEEDLE ROLLER BEARINGS

Before pressing needle roller bearings into a bore, always remove any metal protrusions from the bore or its edges. When needle roller bearings are to be inserted by means of a press, first coat the inside and the circumference of the bearings with Vaseline before insertion.

GEARS

Check all gears to ensure they show no signs of wear or damage. Replace worn or damaged gears.

SEALING RINGS, O-RINGS AND GASKETS

Always install new sealing rings, O-rings and gaskets. Coat sealing rings and O-rings with Vaseline before installation.

SHAFTS

Check all shafts showing signs of wear or damage. Check that the surface of any shaft carrying a bearing or a sealing ring is not damaged.

REPLACEMENT PARTS

Always install genuine replacement parts. When passing orders for replacement parts, consult the Parts Catalogue so as to provide the correct part number for the genuine replacement parts. Failures caused by the use of parts other than genuine parts are not covered by the warranty.

LUBRICATION

Use only the oils and lubricants specified in the operator's manual or the service manual. Failures caused by the use of non-specified oils or lubricants are not covered by the warranty.

Section

2000

ENGINE REMOVAL AND INSTALLATION

ENGINE REMOVAL AND INSTALLATION



WARNING: *The engine and hydraulic pump components attain high temperatures when the machine is operating. To avoid being burnt by hot metal or scalded by high temperature water or oil, allow the machine to cool down before starting any operation.*

STEP 1

Park the machine on flat, horizontal ground, lower the attachment to the ground and stop the engine.

STEP 2

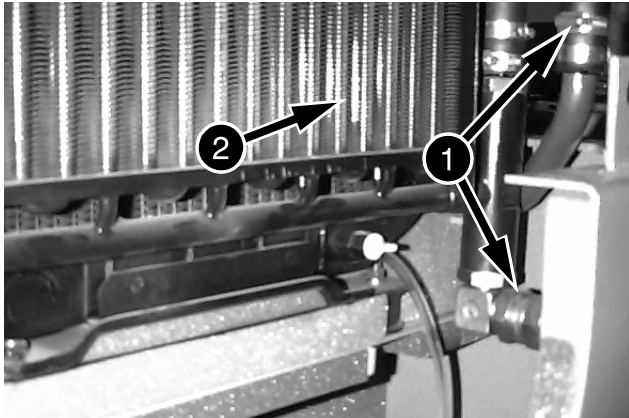
Disconnect the cables from the battery, starting with the negative terminal (-).

NOTE: *When installing, connect the positive cable (+) first.*

STEP 3

Remove the counterweight and the rear hood (See Section 9002). Remove the engine and main pump lower panels.

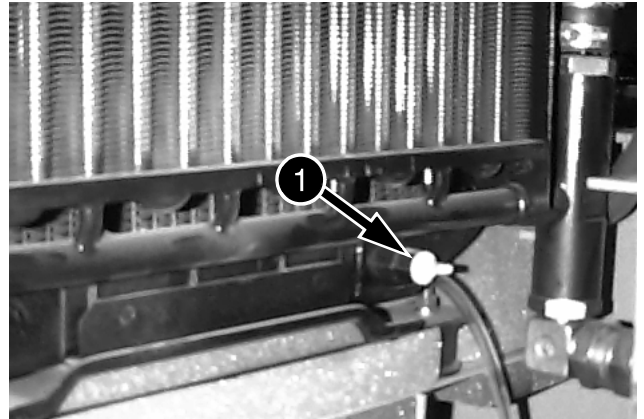
STEP 4



CD98C006

Release pressure in the hydraulic system, disconnect the hoses (1) from the oil cooler (2) and drain the hydraulic reservoir.

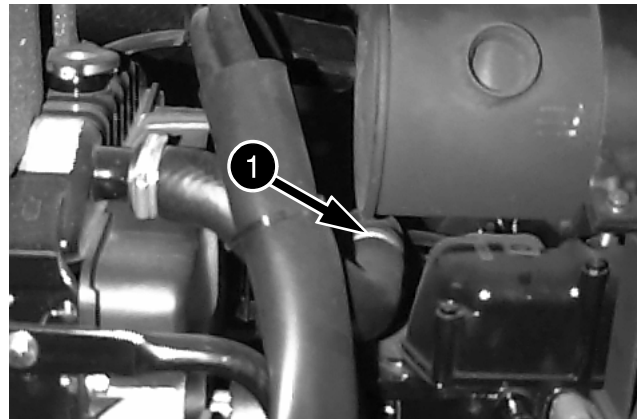
STEP 5



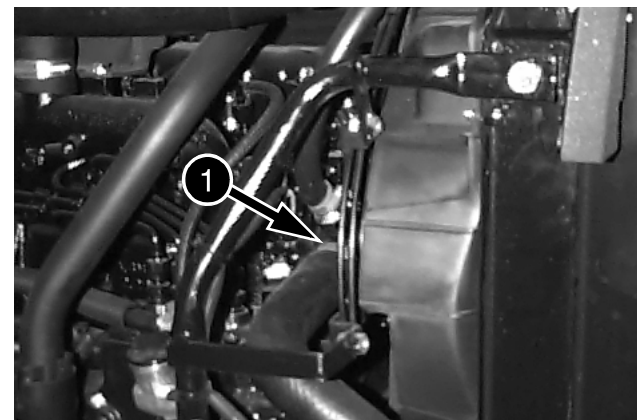
CD98C006

Drain the water radiator by means of the valve (1).

STEP 6



CD98C021



CD98C003

Remove the engine cooling hoses (1), disconnecting them from the engine end.

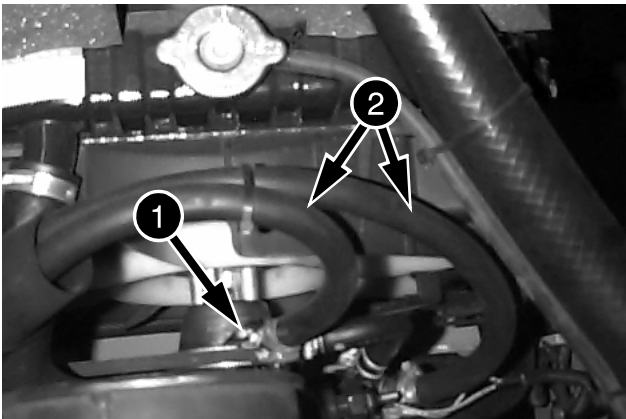
STEP 7



CD98C005

Remove the hose (1) going to the expansion reservoir.

STEP 8

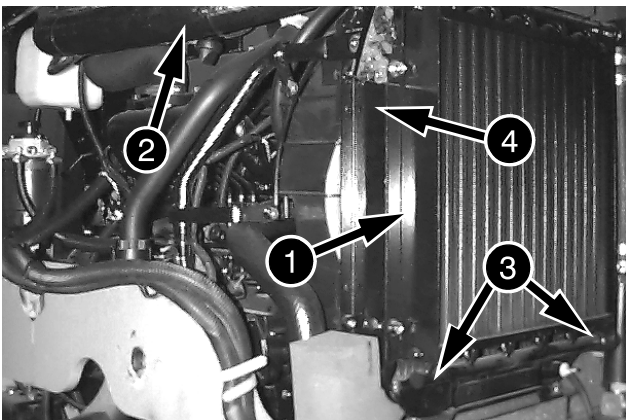


CD98C005

Close the heater valve (1) and drain the heater system by removing the two hoses (2).

NOTE: When installing, do not forget to open the heater valve.

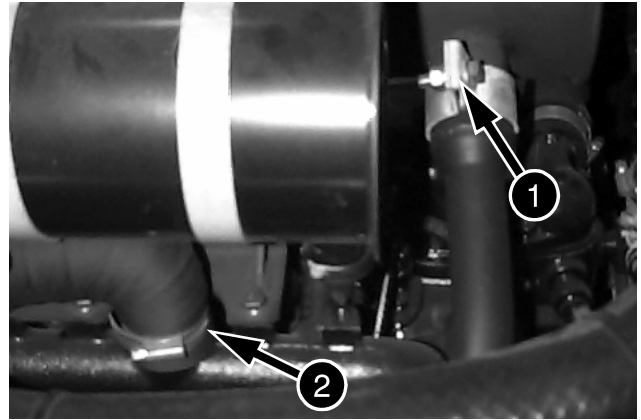
STEP 9



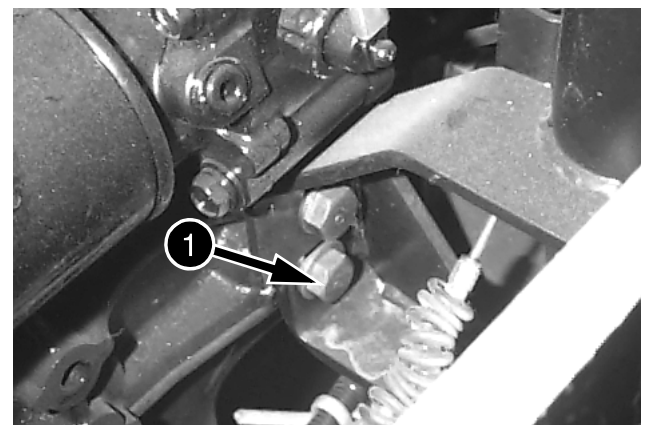
CD98C024

Remove the cooling system (1) (radiator, fan shroud, oil cooler), first removing the air filter supply hose (2) and unscrewing the retaining screws (3) and (4).

STEP 10



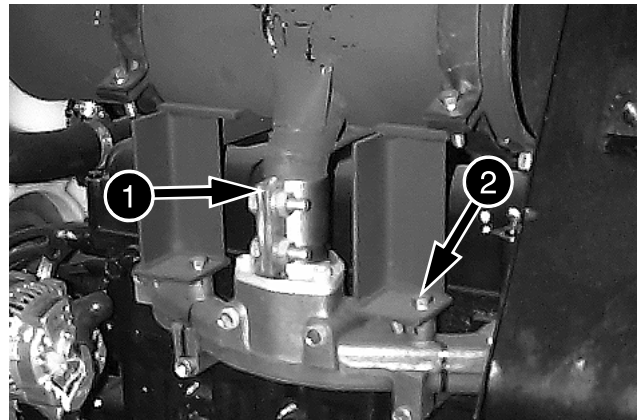
CD98C026



CD98C025

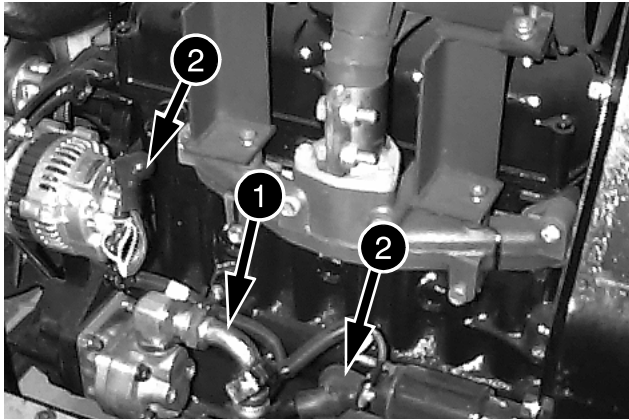
Remove the exhaust clamps (1). Remove the air filter hose (2).

STEP 11



CD98C023

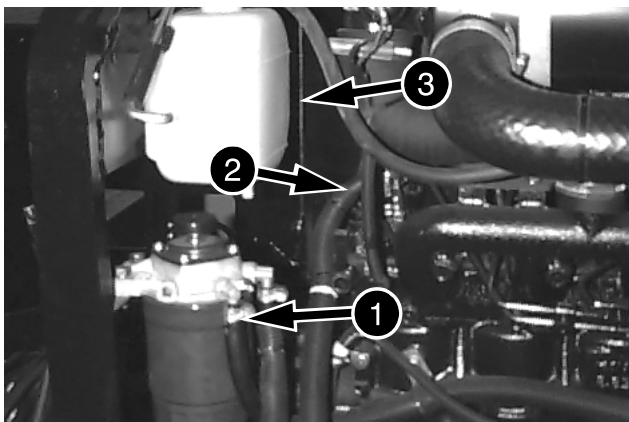
Remove the clamp (1) from the silencer. Remove the exhaust and air filter bracket by unscrewing the five retaining screws (2).

STEP 12

CD98C027

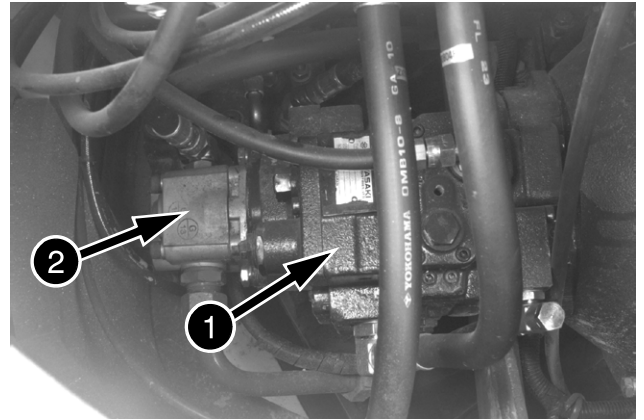
Remove the supply hoses (1) to the servo pump. Disconnect the engine harness (2) at the starter motor and the alternator.

NOTE: First, remove the engine earth harness. When installing, connect it last.

STEP 13

CD98C028

Disconnect the fuel hoses, the water separator hose (1) and the engine return hose (2). Remove the throttle cable. Remove the plate (3). Disconnect the engine harness at the engine solenoid valve, the oil pressure switch, the water separator bowl, the air filter, the pre-heat glow-plugs and the thermostat.

STEP 14

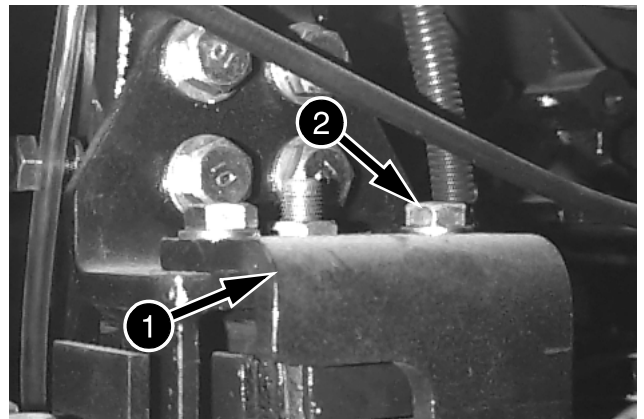
CK98J003

Remove the hoses from the main pump (1) and the swing pump (2). Separate the main pump from the engine by suspending it using the slings.

NOTE: When installing, apply Loctite 262 and tighten the retaining screws to a torque of 164 ± 16 Nm.

STEP 15

Support the engine using the slings and a suitable lifting device.

STEP 16

CD98C029

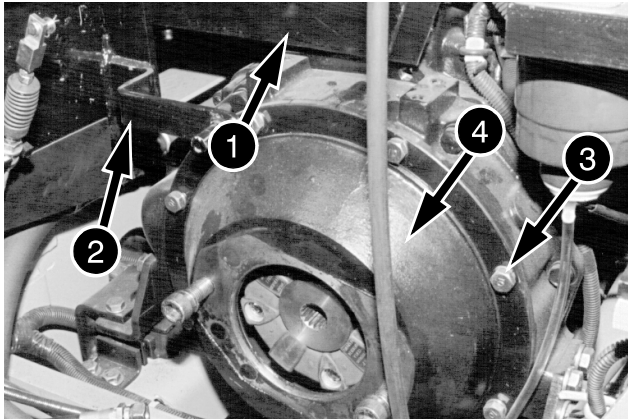
Remove the four engine retaining safety hooks (1). Unscrew the four retaining screws linking the angle irons to the upperstructure frame.

NOTE: When installing, apply Loctite 271 and tighten the retaining screws to a torque of 73 ± 3 Nm.

STEP 17

Slowly lift the engine off the frame using a hoist and move it towards the radiator housing. Lift the engine, taking care not to damage the machine.

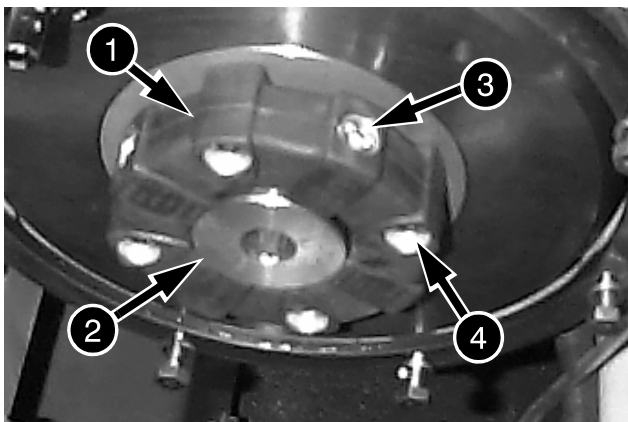
NOTE: Take care concerning the weight of the engine when removing or installing. It weighs approximately 200 kg.

STEP 18

CP98J001

Remove the plate (1) mounted on the support (2) and unscrew the coupling housing (2) retaining screws (1).

NOTE: When installing, apply Loctite 262 and tighten the screws (1) to a torque of 42 ± 5 Nm.

STEP 19

CD98C031

To remove the flexible coupling (1) from the sleeve (2), unscrew screws (3) and (4) one after the other.

NOTE: Change the components of the coupling if necessary. When installing, tighten screws (3) and (4) to a torque of 90 ± 5 Nm, without Loctite.

STEP 20

When installing, follow the same procedure mentioned above, but in the reverse order.

After using the machine, carry out all the following operations:

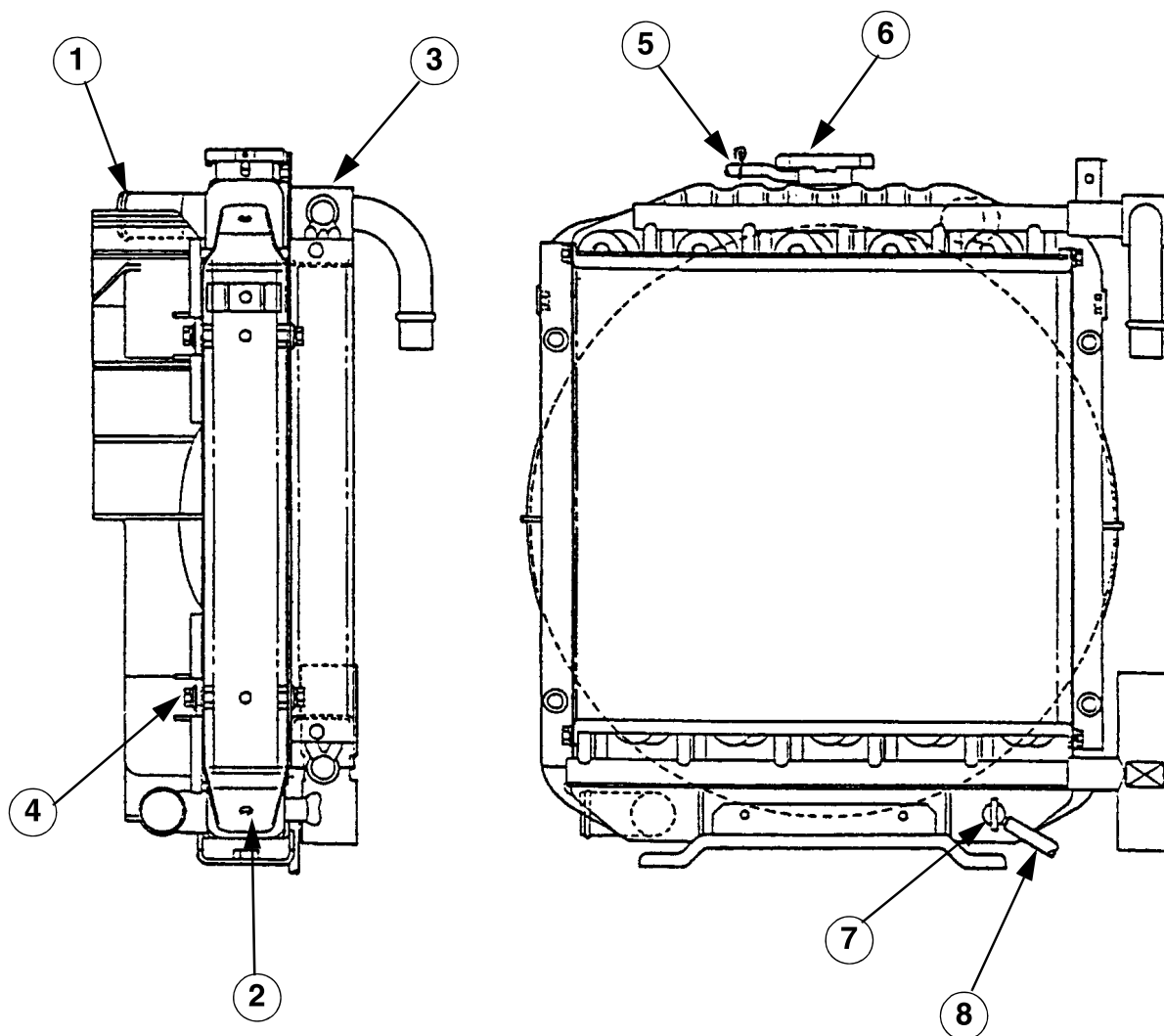
- Fill the cooling system (See Section 2003).
- Check that the oil pressure warning lamp goes out when the engine is running.
- After running for five minutes, stop the engine and check the coolant solution level. Top up if necessary.
- Bring the hydraulic system up to pressure and bleed the air from it as follows:
Retract the attachment and blade cylinder rods and loosen the pressure release screws. Extend the attachment cylinder rods, but not to the end of their stroke, and tighten the reservoir screws. Carry out the operation four or five times until the system is completely bled.



WARNING: Never run the engine in a closed building. A ventilation system is necessary in all circumstances.

RADIATOR AND OIL COOLER

Description



- 1 SHIELD
- 2 RADIATOR
- 3 OIL COOLER
- 4 SCREW
- 5 HOSE
- 6 PLUG
- 7 DRAW TAP
- 8 HOSE

CS98C064

Removal and installation

STEP 1

Park the machine on flat, level ground. Lower the attachment to the ground and shut down the engine.



WARNING: *When the machine is operating the components of the engine and the hydraulic system reach a high temperature. To avoid being burnt by hot metal or scalded by high temperature water or oil, allow the machine to cool down before starting any operation.*

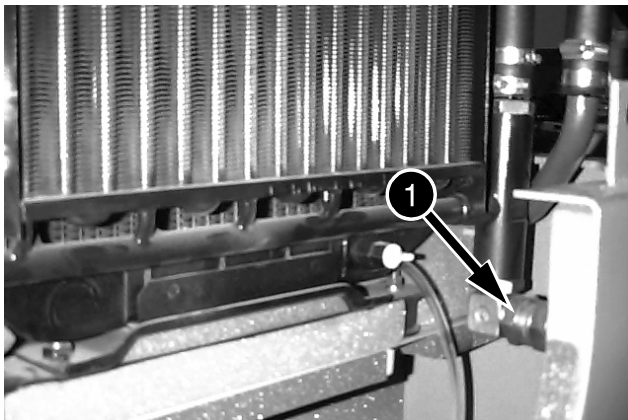
STEP 2

Tilt the rear hood, using the strut and remove the side counterweights.

STEP 3

Remove the engine hood.

STEP 4

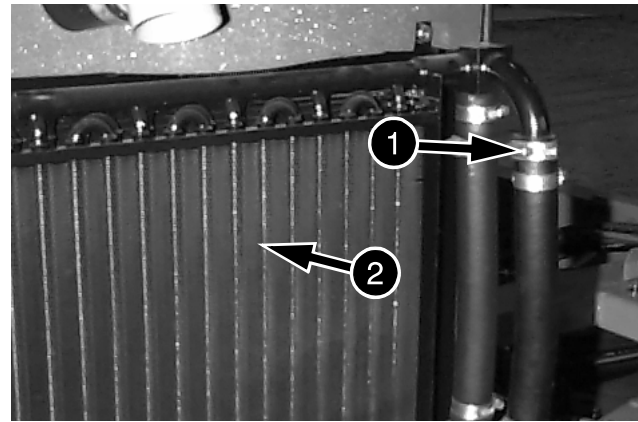


CD98C006

Release pressure in the hydraulic system and then drain the hydraulic reservoir by disconnecting the hose (1).

NOTE: *Provide a receptacle of a suitable capacity.*

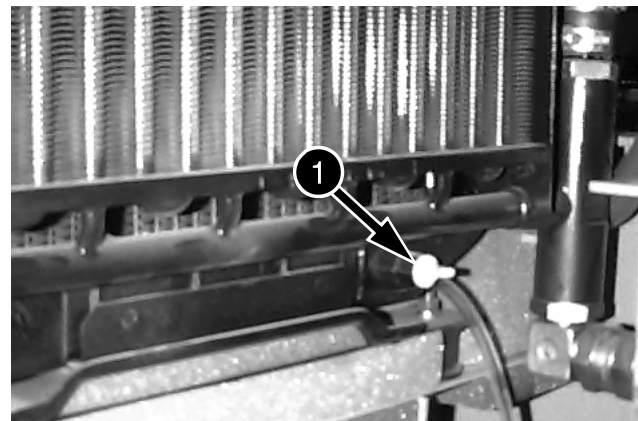
STEP 5



CD98C007

Disconnect the return hose (1) from the oil cooler (2).

STEP 6

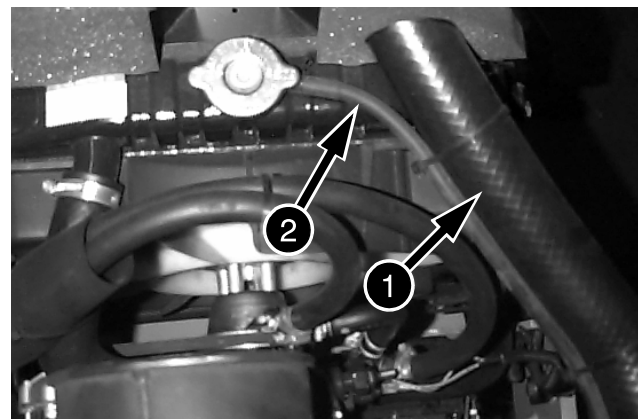


CD98C006

Remove the radiator cap and drain the radiator via the drain tap (1).

NOTE: *Prepare a receptacle of a suitable capacity.*

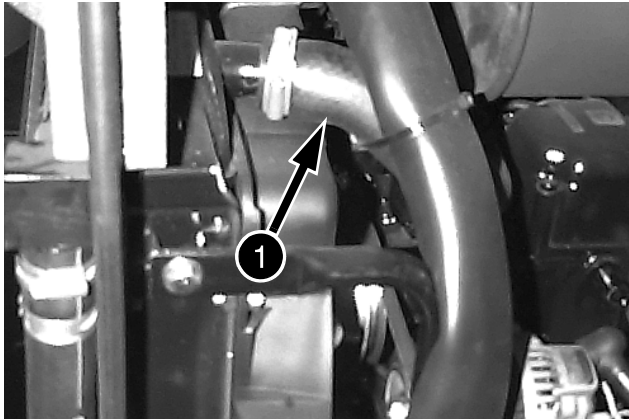
STEP 7



CD98C005

Loosen the air filter intake hose (1) by removing the plastic elbow and remove the expansion reservoir hose (2).

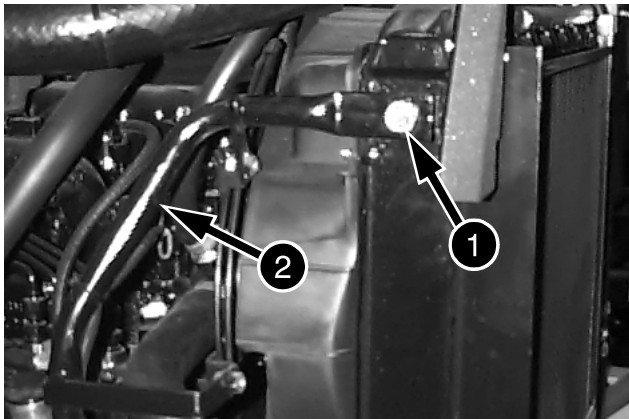
STEP 8



CD98C004

Remove the two water hoses (1) from the engine.

STEP 9



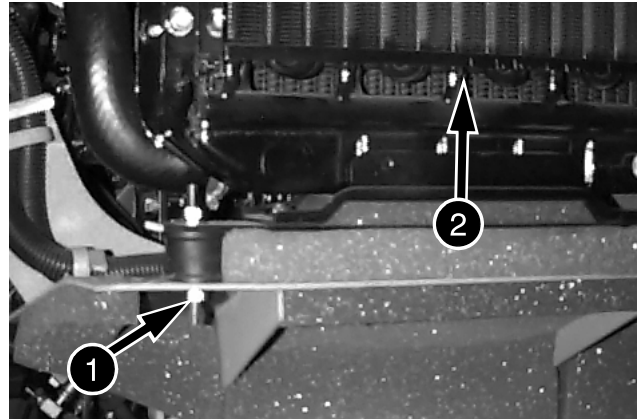
CD98C003

Loosen the oil cooler side retaining screws (1) and tilt the retainers (2) slightly towards the engine.

STEP 10

Support the oil cooler with the slings.

STEP 11



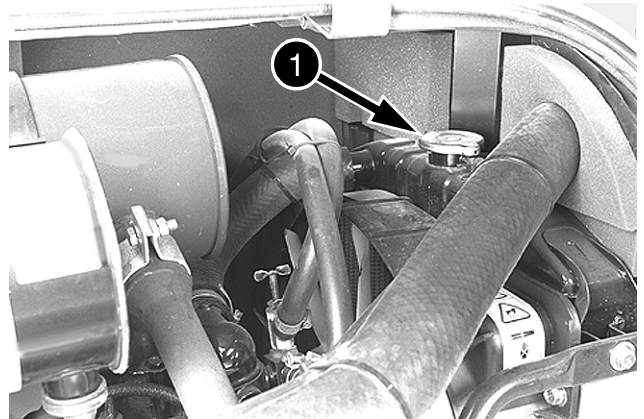
CD98C002

Remove the hardware (1) from the flexible mounting and raise the radiator/oil cooler assembly (2).

NOTE: When installing, check the condition of the flexible mountings, changing them if necessary.

NOTE: To install, follow the same procedure as shown above, but in the reverse order.

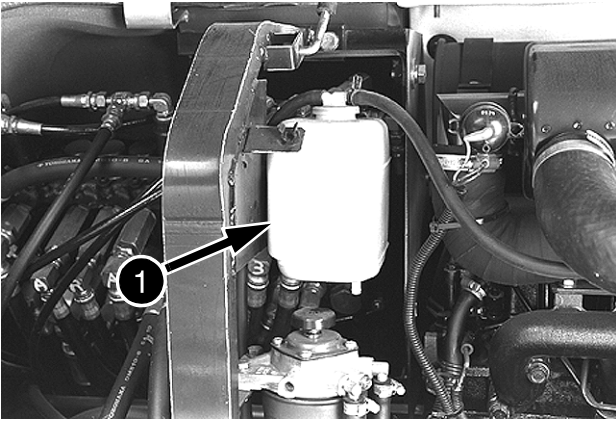
STEP 12



CK98B014

Fill the radiator with coolant solution until it overflows, then install the cap (1).

STEP 13



CK98B026

Fill the expansion reservoir (1) to the "FULL" mark, then install the cap.

NOTE: Use the coolant solution specified in Section 1002.

STEP 14

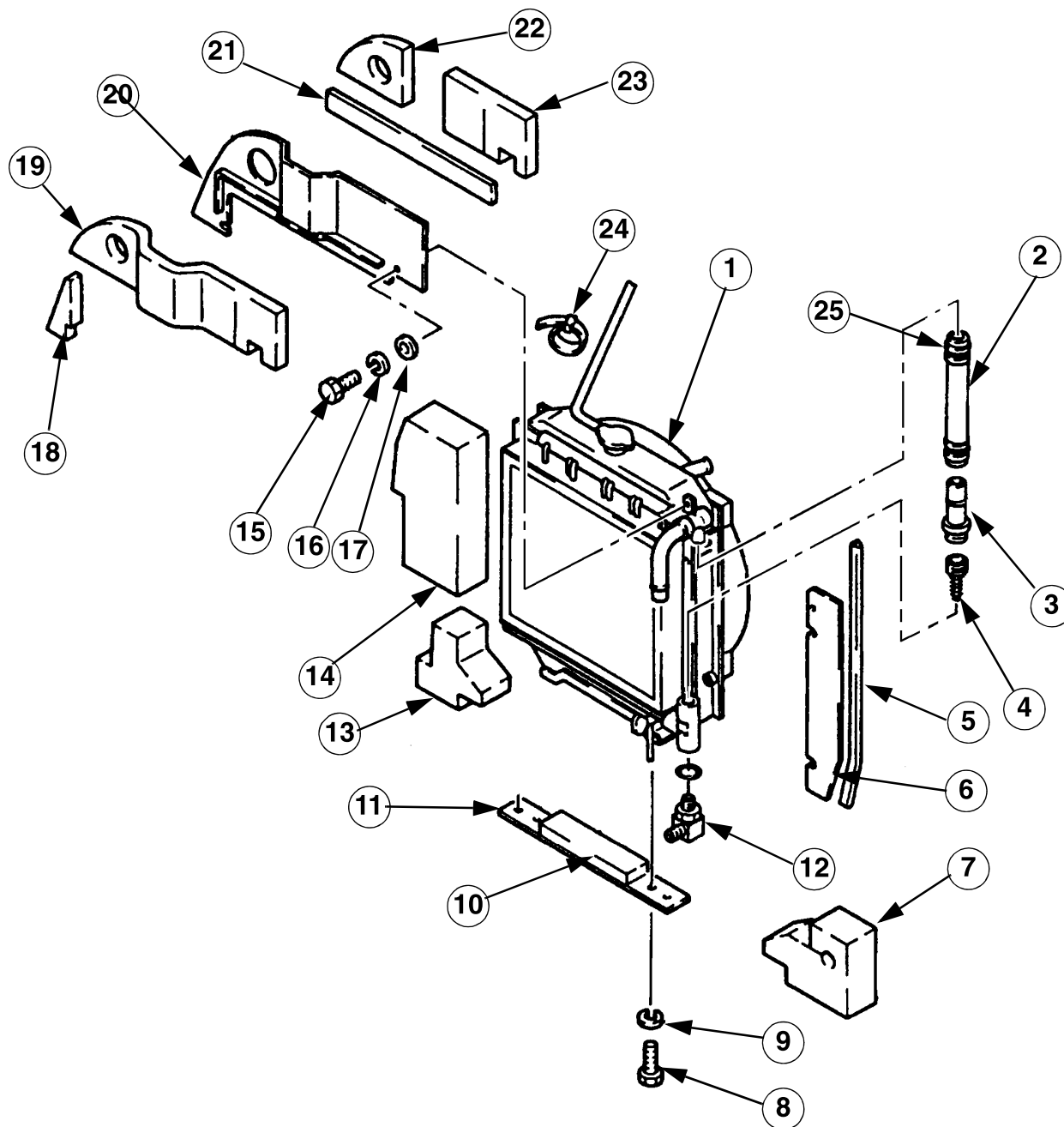
Run the engine at idle for five minutes and then check the coolant solution level. Top up if necessary.

NOTE: Do not fill the expansion reservoir higher than the "FULL" mark.



WARNING: Never run the engine in a closed building. A ventilation system is necessary in all circumstances.

OIL COOLER ASSEMBLY FITTINGS



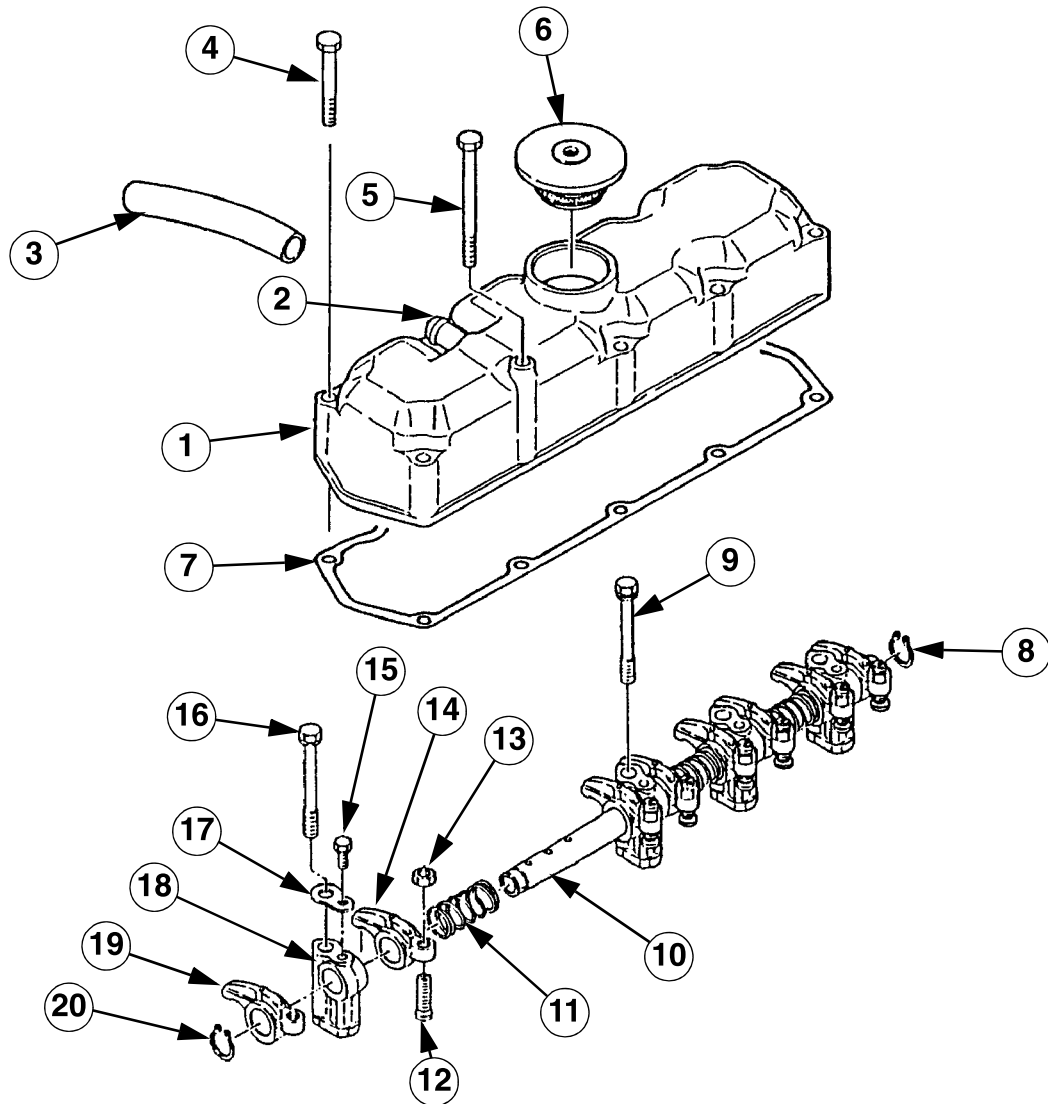
CS98C065

NOTE: If a service exchange oil cooler (1) or one of the oil cooler components is replaced, the numbered parts must be disassembled or replaced, depending on their condition.

1	RADIATOR ASSEMBLY	11	FOAM	21	FOAM
2	HOSE	12	ELBOW	22	FOAM
3	UNION	13	FOAM	23	FOAM
4	CHECK VALVE	14	FOAM	24	CLAMP
5	SEAL	15	SCREW	25	CLAMP
6	PLATE	16	LOCKWASHER		
7	FOAM	17	WASHER		
8	SCREW	18	FOAM		
9	LOCKWASHER	19	FOAM		
10	BRACKET	20	PLATE		

ROCKER ARM AND SHAFT

Description



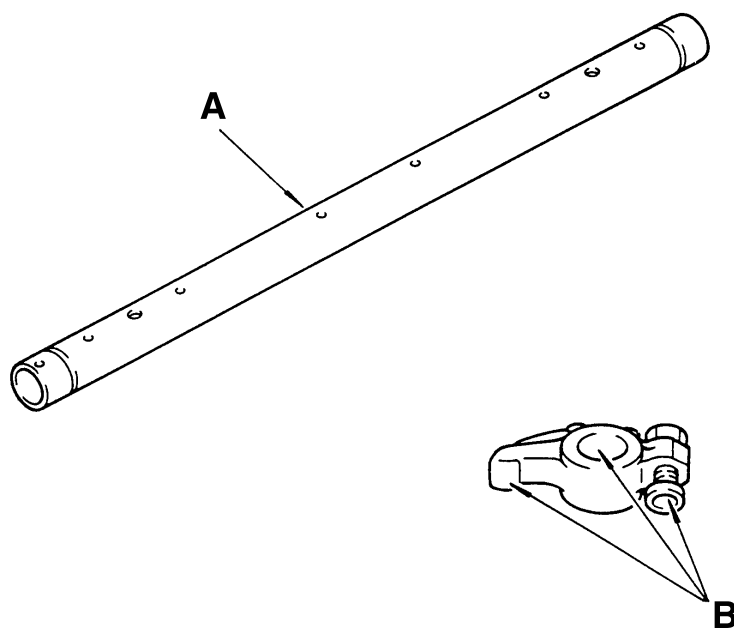
1 ROCKER ARM COVER
 2 UNION
 3 HOSE
 4 SCREW
 5 SCREW
 6 FILLER CAP
 7 SEAL

8 SNAP RING
 9 SCREW
 10 SHAFT
 11 SPRING
 12 SCREW
 13 NUT
 14 ROCKER ARM

15 SCREW
 16 SCREW
 17 PLATE
 18 BRACKET
 19 ROCKER ARM
 20 SNAP RING

CS98C237

INSPECTION OF ROCKER ARM AND ROCKER ARM SHAFT



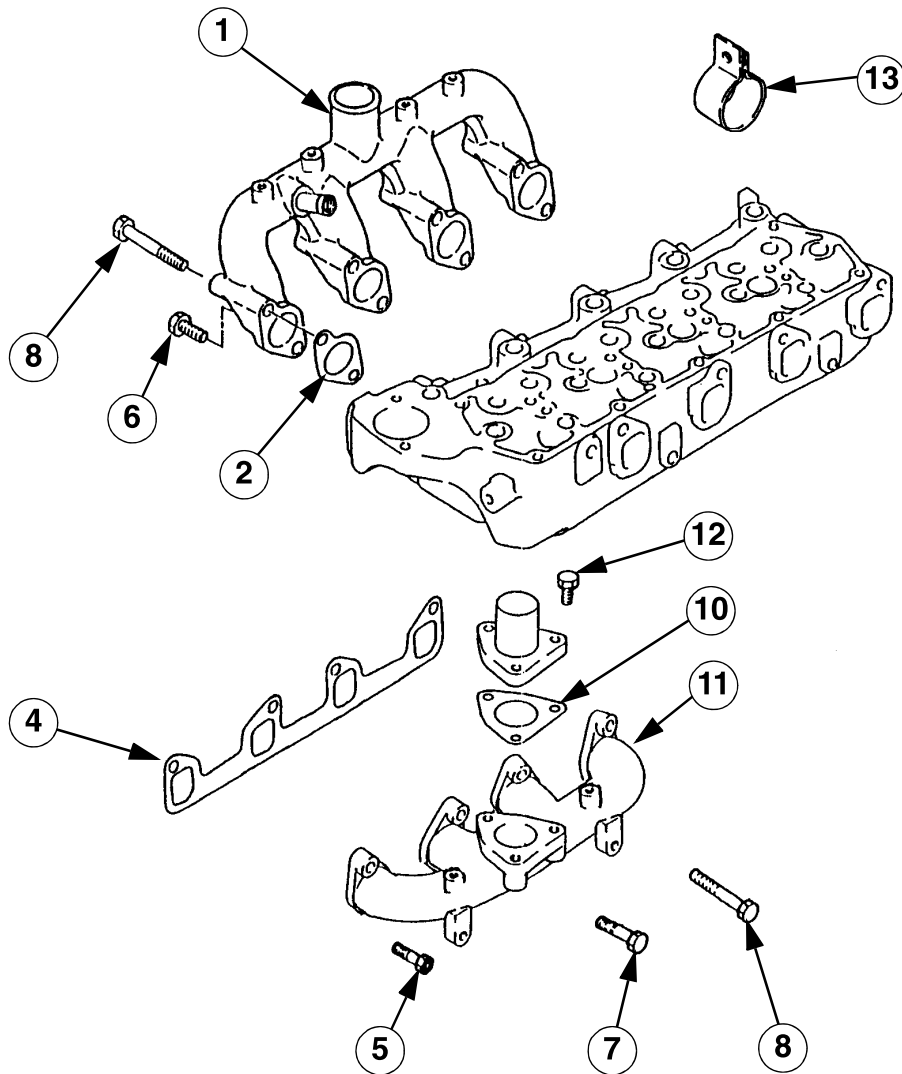
- A WEAR AND BLOCKED ORIFICES
- B WEAR AND DAMAGE

Replace the parts if necessary.

CS98C239

INTAKE AND EXHAUST MANIFOLDS

Description



1 MANIFOLD
2 GASKET
3 MANIFOLD
4 GASKET
5 SCREW

6 SCREW
7 SCREW
8 SCREW
9 SCREW
10 UNION

11 GASKET
12 SCREW
13 CLAMP

CS98C240

Inspection

- Carry out the following checks and replace parts if necessary.

STEP 1

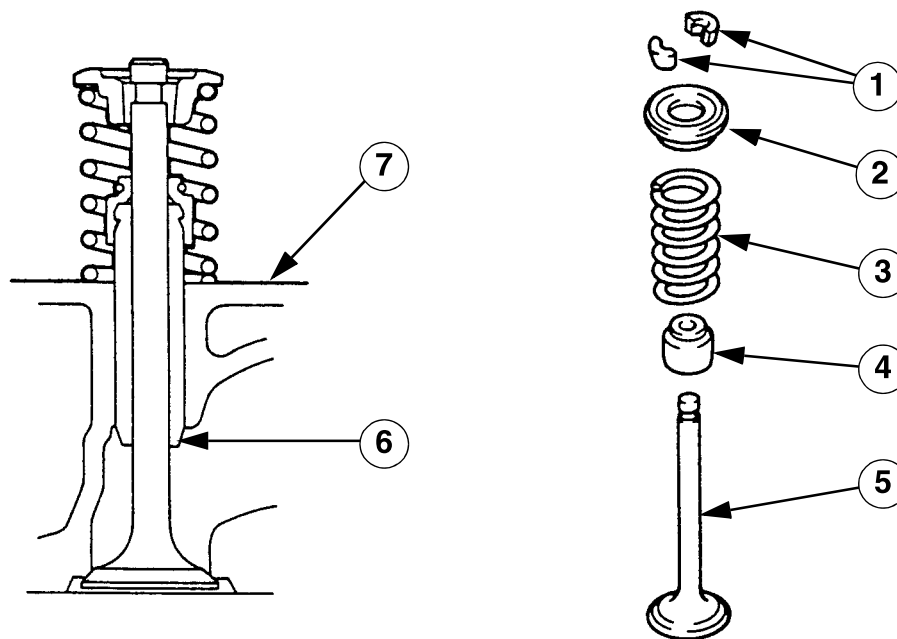
Check that any warpage on the surface which contacts the cylinder head is less than 0.15 mm.

STEP 2

Check for corrosion, cracks or damage to the manifold.

VALVES AND VALVE SPRINGS

Description



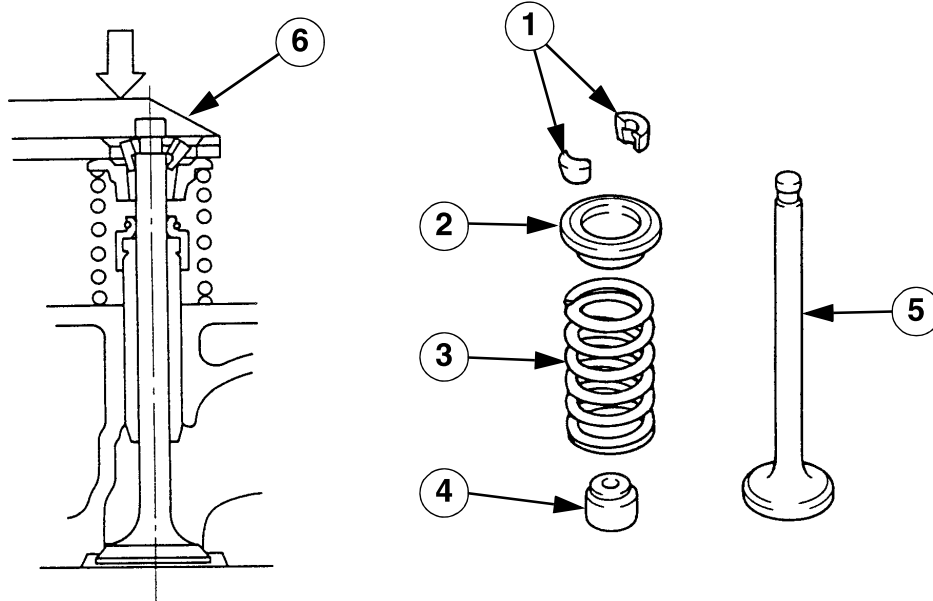
- 1 HALF-COLLETS
- 2 SPRING CUP
- 3 VALVE SPRING
- 4 VALVE STEM SEAL

- 5 VALVE
- 6 VALVE GUIDE
- 7 CYLINDER HEAD

CS98C241

VALVES AND VALVE SPRINGS

Removal



CS98C242

STEP 1

Remove the rocker arm cover.

STEP 2

Remove the rocker arm assembly.

STEP 3

Remove the cylinder head assembly.

STEP 4

Use the valve spring compressor (6) (See "Tools Required" on page 3) to compress the valve spring (3). Make sure that the valve spring is compressed perpendicularly, otherwise the valve stem could be damaged. Remove the two half-collets (1).

STEP 5

Free up the valve spring compressor and remove the spring cup (2), the valve spring (3) the valve stem seal (4) and the valve (5).

STEP 6

Repeat Steps 4 and 5 for all the other valves.



Suggest:

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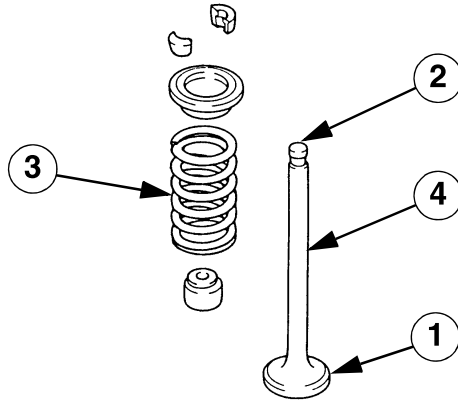
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Thank you so much for reading

Inspection and replacement

Repair and replace the parts if necessary.

Inspection of valves and valve springs

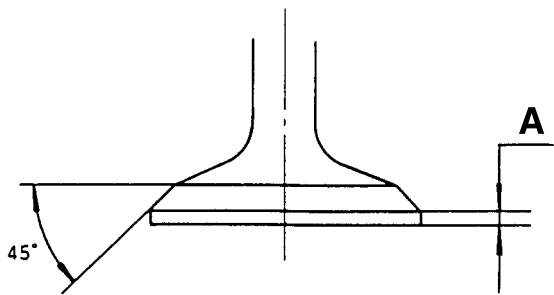


CS98C243

- 1 Wear and incorrect contact
- 2 Wear and cracking
- 3 Fatigue and damage
- 4 Irregular wear and damage

STEP 1

Valve grinding



CS98C244

Description	Original dimension	Wear limit
Margin (A)	1.0	0.5

If the valve contact face is worn, grind the face with a valve grinder. If the dimension of the contact face (A) exceeds the wear limit, replace the valve.

STEP 2

Inspection of valve spring

Description	Original dimension	Wear limit
Free length (mm)	45.5	-1.0
Compressed (Nm)	142 to 158 Nm (at 38mm) 280 to 320 Nm (at 30.5 mm)	-15%
Perpendicularity	2' or less	3'

Check for cracks or damage to the spring. Measure the free length, the tension and the perpendicularity of the valve spring in relation to the axis.

STEP 3

Grinding the end of the valve stem

If the end of the valve stem is nicked or worn, grind it with a valve grinder or with an oil stone. If the wear limit is exceeded following on these operation, replace the valve.

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