Service Manual

JS200
from machine no. 705001
JS210
from machine no. 705648
JS220
from machine no. 705001
JS240
from machine no. 708001
JS260
from machine no. 708501

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Contents Page No.

Contents Page No.

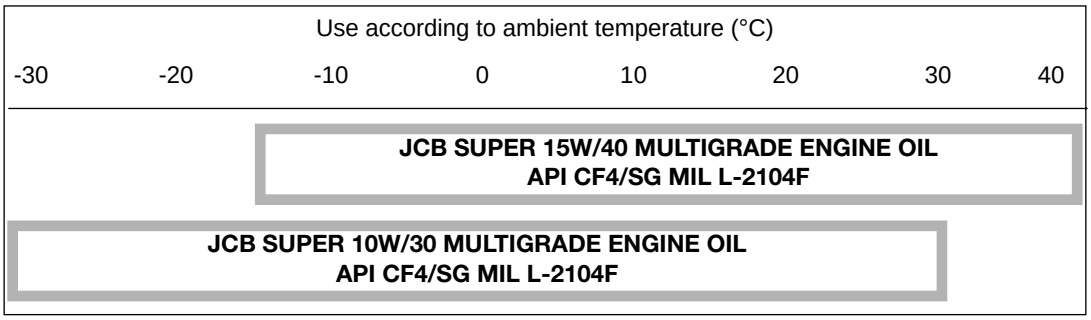
LUBRICANTS AND CAPACITIES

*

JS200/JS210/JS220/JS240/JS260 and Variants

Item	Lubricant	International Specification	Capacity JS200, JS210,JS220, JS240, JS260 and Variants
ENGINE	(see separate chart)		21.5 litres (4.72 UK gal) (5.67 US gal)
TRACK GEARBOX	JCB HD90 Gear Oil	API-GL-5, MIL-L-2105	2 x 3.5 litres (2 x 0.77 UK gal) (2 x 0.92 US gal)
SLEW GEARBOX	JCB HD90 Gear Oil JCB HP Grease	API-GL-5, MIL-L-2105 Lithium complex (NLGI 2)inc. extreme pressure additives	5 litres (1.09 UK gal) (1.31 US gal) 1 litres (0.22 UK gal)
TRACK ROLLERS AND IDLER WHEEL	JCB HD90 Gear Oil	API-GL-5, MIL-L-2105	--
RECOIL SPRING CYLINDER	JCB HP Grease	Lithium complex (NLGI 2)inc. extreme pressure additives	--
HYDRAULIC SYSTEM	JCB Hydraulic Fluid 46	ISO VG46	203 litres (44.64 UK gal) (53.6 US gal)
SLEW RING - BEARING	JCB HP Grease	Lithium complex (NLGI 2)inc. extreme pressure additives	-- JS 200, JS210, JS 220
- GEAR TEETH	JCB HP Grease	Lithium complex (NLGI 2)inc. extreme pressure additives	17 kg (37.48 lb) JS 240, JS 260 20 kg (44.10 lb)
ALL OTHER GREASE POINTS	JCB HP Grease	Lithium complex (NLGI 2)inc. extreme pressure additives	--
COOLING SYSTEM	see ***Coolant Mixtures***		25.5 litres (5.6 UK gal) (6.7 US gal)
FUEL TANK	see ***Type of Fuel***		310 litres (68.19 UK gal) (81.19 US gal)

ENGINE LUBRICATION CHART



It is most important that you read and understand this information and the publications referred to. Make sure that all of your colleagues who are concerned with lubricants read it too.

First Aid - Oil

Swallowing

If oil is swallowed you should not induce vomiting. Get medical advice.

Skin

In the case of excessive skin contact you should wash with soap and water.

Eyes

In the case of eye contact, flush with water for 15 minutes. If irritation persists, get medical attention.

Fires

Extinguish with carbon dioxide, dry chemical or foam. Fire-fighters should use self contained breathing apparatus.

⚠ WARNING

Do not use water to put out an oil fire. This will only spread it because oil floats on water.

Extinguish oil and lubricant fires with carbon dioxide, dry chemical or foam. Fire fighters should use self contained breathing apparatus.

7-3-1-3/1

Hygiene

JCB lubricants are not a health risk when used properly for their intended purposes.

However, excessive or prolonged skin contact can remove the natural fats from your skin, causing dryness and irritation.

Low viscosity oils are more likely to do this, therefore particular care is necessary in handling used oils which can be diluted with fuel contamination.

Whenever you are handling oil products you should maintain good standards of care and personal and plant hygiene. For details of these precautions we advise you to read the relevant publications issued by your local health authority, and note the following:

Storage

Always keep lubricants out of the reach of children.

Never store lubricants in open or unlabelled containers.

Handling

New Oil

There are no special precautions need for the handling or use of new oil, beside normal care and hygiene practices.

Used Oil

Used engine crankcase lubricants contain harmful contaminants. In laboratory tests it was shown that used engine oils can cause skin cancer.

Here are precautions to protect your health when handling used engine oil:

1. Avoid prolonged, excessive or repeated skin contact with used engine oils.
2. Apply a barrier cream to the skin before handling used engine oil.
3. Note the following when removing engine oil from skin:
   - **a.** Wash your skin thoroughly with soap and water.
   - **b.** Using a nail brush will help.
   - **c.** Use special hand cleansers to help clean dirty hands.
   - **d.** Never use petrol, diesel fuel or gas oil.
   - **e.** Avoid skin contact with oil soaked clothing.
   - **f.** Don't keep oily rags in pockets.
   - **g.** Wash dirty clothing before re-use.
   - **h.** Throw away oil-soaked shoes.

Waste Disposal

All waste products should be disposed of in accordance with all the relevant regulations.

The collection and disposal of used engine oil should be in accordance with any local regulations. Never pour used engine oil into sewers or drains.

Spillage

Absorb on sand or a locally approved brand of absorbent granules. Scrape up and remove to a chemical disposal area.

* Service Intervals for Hydraulic Oil and Filters when using a Breaker, Crusher or Pulveriser

When using a breaker, crusher or pulveriser contamination and degradation of the hydraulic oil occurs much more quickly than in normal excavating use. If the machine is used with increasingly degrading oil it can cause problems in the control valve, premature wear of the hydraulic pump and damage to the hydraulic system as a whole.

Servicing of the hydraulic oil and filters must be done more frequently according to the percentage of total operating hours involving use of the breaker, crusher or pulveriser. When a breaker, crusher or pulveriser is fitted, ensure that the oil and filters are changed at the intervals shown in the table below.

The hydraulic oil must be sampled and checked for contamination and degradation at the intervals shown.

		Use Frequency 100%			Use Frequency 40%			Use Frequency 20%			Use Frequency 10%		
Item	**Time (hrs)**	**10**	**100**	**600**	**10**	**300**	**1500**	**10**	**600**	**3000**	**10**	**800**	**4000**
Hydraulic Oil		○		●	○		●	○		●	○		●
Return Filter			●			●			●			●	
Suction Filter			[1]	●		[1]	●		[1]	●		[1]	●
Drain Filter			●			●			●			●	
Servo Filter			●			●			●			●	
Plexus Filter			●			●			●			●	
Breaker In-Line Filter			●			●			●			●	
Hydraulic Oil Sampling		Every 200 hrs			Every 300 hrs			Every 600 hrs			Every 800 hrs		

○ Check oil level and top up as required ● Change [1] Clean

Note: The filters must be changed whenever the period of breaker/crusher use exceeds 100hrs, regardless of the total number of hours the machine has worked.

* Initial Precautions for New Machine Usage

⚠ CAUTION

If the machine is operated at full load, before its initial run-in procedure is complete it may cause scuffing and seizing which can adversely effect the life of the machine.

8-3-1-5

A new machine is only dispatched when it has completed all its inspection procedures, but operating it under severe conditions from new will affect its performance and shorten its service life.

1. Carry out the Daily inspection procedure
2. Always warm up the machine sufficiently
3. Hold the engine speed to 80% of the maximum
4. Check to see if the machine is running normally
5. Avoid running or swinging the machine rapidly
6. Avoid sudden shocks e.g. suddenly stopping the boom when lowering
7. Where applicable, grease the front pins daily
8. At 50 hrs carry out servicing

Every 10 Operating Hours or Daily
Whichever occurs first

1. **Clean**
   - **a.** Machine generally.
2. **Grease**
   (If operating in very wet or severe conditions)
   - **a.** Boom/bucket/dipper pivot points.
3. **Check (Engine Stopped)**
   - **a.** Generally for damage.
   - **b.** For oil and coolant leakage.
   - **c.** Security of bolts and nuts ††.
   - **d.** For disconnected or shorted wiring, loose terminals.
   - **e.** Hydraulic fluid level.
   - **f.** Engine oil level.
   - **g**. Track tension.
   - **h.** Windscreen washer fluid level.
   - **j.** Fuel system for leaks.
   - **k.** Fuel level.
   - **l.** The auxiliary circuit hydraulic oil filter visual indicator (if using a rockbreaker)

†† Tapping with a hammer will identify any loose nuts and bolts which should then be tightened to the specified torque.

4. **Check (Engine Running)**
   - **a.** Operation of warning lights and audible alarm.
   - **b.** Operation of other electrical equipment.
   - **c.** Exhaust for excessive smoke.
   - **d.** Excavator operation.
   - **e.** Transmission operation.
   - **f.** Operation of track and slew brakes.
   - **g.** Operation of hour meter.

Every 50 Operating Hours or Weekly
Whichever occurs first

1. **Do the daily jobs plus:**
2. **Clean**
   - **a.** Drain water and sediment from fuel tank.
   - **b.** Drain fuel water separator.
3. **Grease**
   - **a.** All pivot pins.

Every 100 Operating Hours or 2-Weekly
Whichever occurs first

1. **Do a 50 hour service plus:**
2. **Clean**
   - **a.** Battery terminals.
   - **b.** Fuel lift pump strainer†.
3. **Change**
   - **a.** Engine oil main filter element †.
   - **b.** Engine oil †.
   - **c.** Servo oil filter element †.
   - **d.** Engine oil filter by-pass element †.
   - **e.** Return filter element†.
   - **f.** Drain filter element †.
   - **g.** Track and slew gearbox oil level †.
   - **h.** Fuel filter element†.
4. **Check (Engine Stopped)**
   - **a.** Hoses and pipework for chafing or damage.
   - **b.** Condition of ram piston.
   - **c.** Bucket pivot pin grease seals†.
   - **d.** Track plate condition and bolt torque.
   - **e.** Track and running gear.
   - **f.** Top and bottom track rollers for oil leaks †.
   - **g.** Track idler wheels for oil leaks †.
   - **h.** Security of major unit mounting bolts and nuts†. If loose, tighten to specified torque.
   - **i.** Wiring for chafing.
   - **j.** Fan belt adjustment.
   - **k.** Accumulator operation.
   - **l.** Radiator for damage.

* **m.** Oil cooler for damage.

   - **n.** Battery electrolyte level†.
   - **p.** Exhaust system security†.
   - **r.** Teeth and sidecutters†.
5. **Check (Engine Running)**
   - **a.** Operation of throttle system†.
   - **b.** Operation of overload warning†.
   - **c**. Operation of stop control†.

† These procedures are only to be carried out after the first 100 hours use of a new machine. Thereafter they are to be carried out as detailed in the following periodic checks.

Every 250 Operating Hours or Monthly

Whichever occurs first

1. **Do a 100 hour service plus:**
2. **Clean**
   - **a.** Drain water and deposits from hydraulic oil tank.
   - **b.** Air cleaner dust valve.
   - **c.** Pre-cleaner
3. **Grease**
   - **a.** Door and canopy hinges.
   - **b.** Slew ring bearing.
4. **Check (Engine Stopped)**
   - **a.** Battery electrolyte level.
   - **b.** Security of major unit mounting bolts and nuts. If loose, tighten to specified torque.
   - **c.** Track and slew gearbox oil level.
   - **d.** Fan belt adjustment.
   - **e.** Air inlet system security

Every 500 Operating Hours or 3-Monthly

Whichever occurs first

1. **Do a 250 hour service plus:**
2. **Clean**
   - **a.** Radiator, grille and oil cooler fins.
3. **Grease**
   - **a.** Slew ring teeth.
4. **Change**
   - **a.** Engine oil.
   - **b.** Engine oil full flow filter element.
   - **c.** Fuel filter element.
   - **d.** Engine oil filter by-pass element.
5. **Check (Engine Stopped)**
   - **a.** Exhaust system security.
   - **b.** Top and bottom track rollers for oil leaks.
   - **c.** Track idler wheels for oil leaks.
   - * **d.** Hydraulic oil (check the degradation and cleanliness by sampling).
   - **e.** Seat belt condition and security.
   - **f.** Teeth and sidecutters.
   - * **g.** Engine oil (check the degredation and cleanliness by sampling).
6. **Check (Engine Running)**
   - **a** Operation of throttle system.
   - **b.** Operation of overload warning.
   - **c** Operation of stop control.

Every 1000 Operating Hours or 6-Monthly

Whichever occurs first

1. **Do a 500 hour service plus:**
2. **Clean**
   - **a.** Fuel lift pump strainer.
   - **b.** Hydraulic fluid suction strainer.
3. **Grease**
   - **a.** Pivot pins.
4. **Change (Engine Stopped)**
   - **a.** Engine air filter element (outer).
   - **b.** Hydraulic tank air breather element.
   - **c.** Track and slew gearbox oil.
   - **d.** Return filter element.†††
   - **e.** Nephron filter.†††
   - **f.** Servo oil filter element.†††
   - **g.** Drain filter.†††
5. **Check (Engine Stopped)**
   - **a.** Track wear.

Every 2000 Operating Hours or Yearly

Whichever occurs first

1. **Do a 1000 hour service plus:**
2. **Check (Engine Stopped)**
   - **a.** Sample hydraulic oil and replace if necessary.
3. **Change**
   - **a.** Hydraulic fluid suction strainer.
   - **b.** Engine air filter element (inner).
   - * **c.** Hydraulic Oil (for machines with biodegradable oil).

Every 4000 Operating Hours or 2 Years

Whichever occurs first

1. **Do a 2000 hour service plus:**
2. **Change**
   - **a.** Long life coolant.
   - **b.** Fuel hose (fuel tank - engine).
   - **c.** Fuel hose (fuel filter - injection pump).
   - **d.** Hydraulic pump exit hose (pump - operation valve).
   - **e.** Boom ram line hose.
   - **f.** Dipper ram line hose.
   - **g.** Bucket ram line hose.

†††If using a breaker, crusher or pulveriser, see page 2-1 for revised servicing schedules.

Every 5000 Operating Hours or 2 Years
6 Months

Whichever occurs first

1. Do a 1000 hour service plus:

2. Change

Hydraulic oil.

Hydraulic tank air breather element.

Hydraulic suction filter†††.

†††If using a breaker, crusher or pulveriser, see page 2-1 for revised servicing schedules.

General Notes

For the type of grease to use at each point, *see* ***Lubricants and Capacities***.

Do not mix different types of grease. Keep them separate.

⚠ WARNING

You will be working close into the machine for these jobs. Lower the attachments if possible. Remove the starter key and disconnect the battery. This will prevent the engine being started.

8-3-1-3

Slew Ring Bearing

1. The three grease nipples are grouped together on the front of the machine**.**

Slew Ring Teeth and Slew Pinion

Ensure slew ring is kept full of grease. Always grease whenever the machine has been steam-cleaned.

For location of the slew ring gear refer to ***component Location Diagrams*** .

1. Make the Machine Safe
Stop the engine and remove the starter key.

2. Grease the Slew Ring

* **a.** Remove the inspection port cover **A** (on the lower centre section).

* **b.** Remove the grease discharge port cover **B** (on the lower inner side).

c. Remove contaminated grease.

* **d.** Replace the discharge port cover.

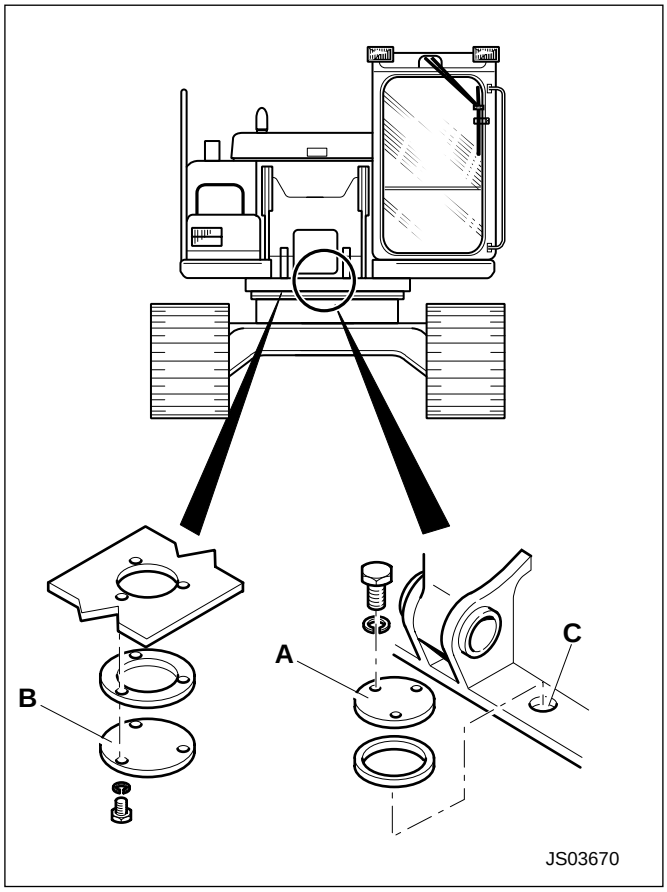
e. Apply grease to the slew ring via aperture **C**.

3. Slew the Machine
Start the engine and slew the machine a few degrees. Stop the engine, remove the starter key and apply grease again.

Repeat until the whole ring is greased. Check that grease exudes around the entire circumference.

4. Refit the Cover

*



Excavator End

* 16 Grease Points - plus 3 for Triple Articulating Boom (if fitted). See also next page.

⚠ WARNING

You will be working close into the machine for these jobs. Lower the attachments if possible. Remove the starter key and disconnect the battery. This will prevent the engine being started.

8-3-1-3

*

Greasing Points	(No.) Drawing reference	Number of greasing points
Boom	1	3.
Boom ram, eye end pin		2. * Centralised greasing (total of 6 points)
Dipper ram, dump end pin		1.
Boom ram, dump end pin	2	2.
Bucket ram to Bucket linkage pin	3	2.
Bucket linkage to Bucket pin		1. (total of 5 points)
Dipper to Bucket Linkage pin		1.
Dipper to Bucket pin		1.
Bucket ram, dump end pin	4	1.
Dipper ram, eye end pin		1. (total of 3 points)
Boom to Dipper connecting pin		1.
Triple articulating boom positioning ram, dump end pin	5	1.
Triple articulating boom positioning ram, eye end pin		1. (total of 3 points)
Triple articulating boom - upper/lower boom pivot pin		1.

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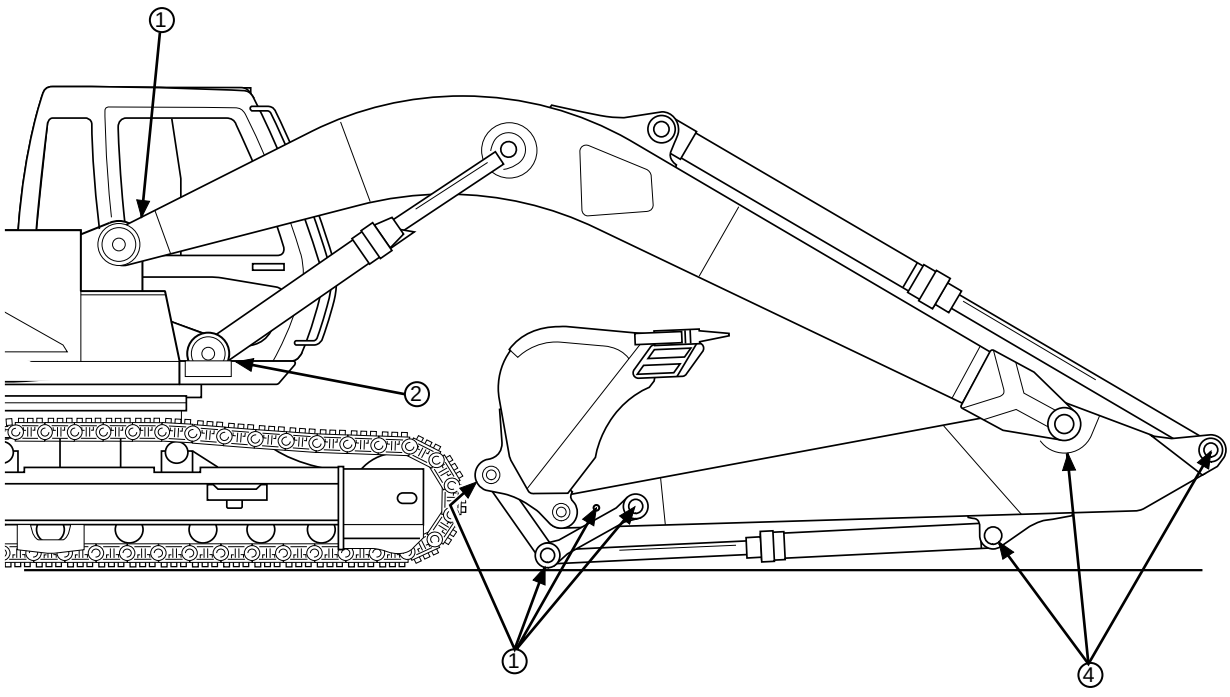

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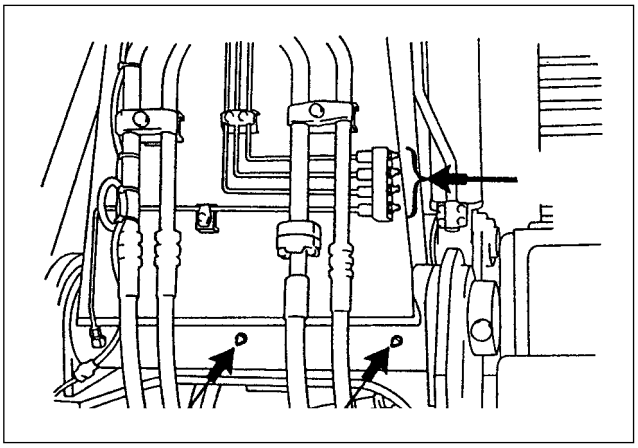
Excavator End



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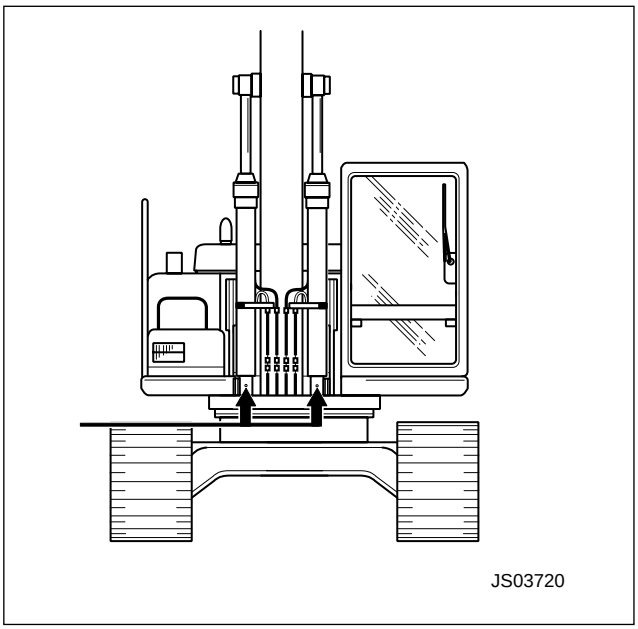

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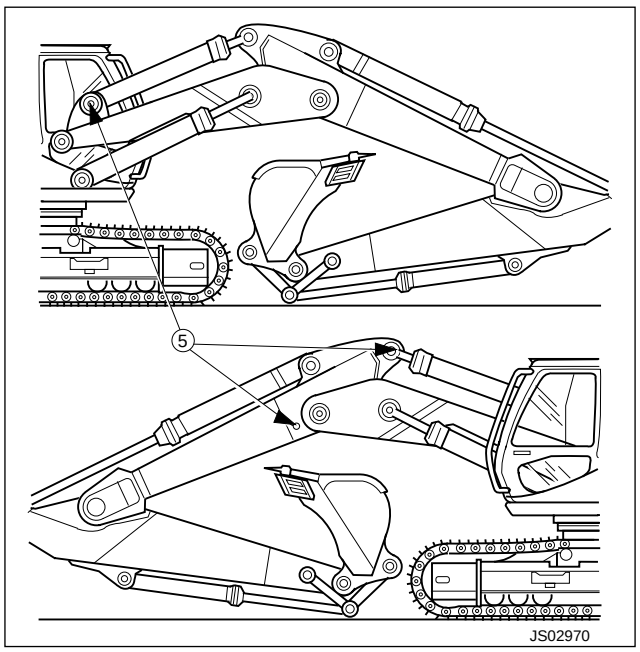

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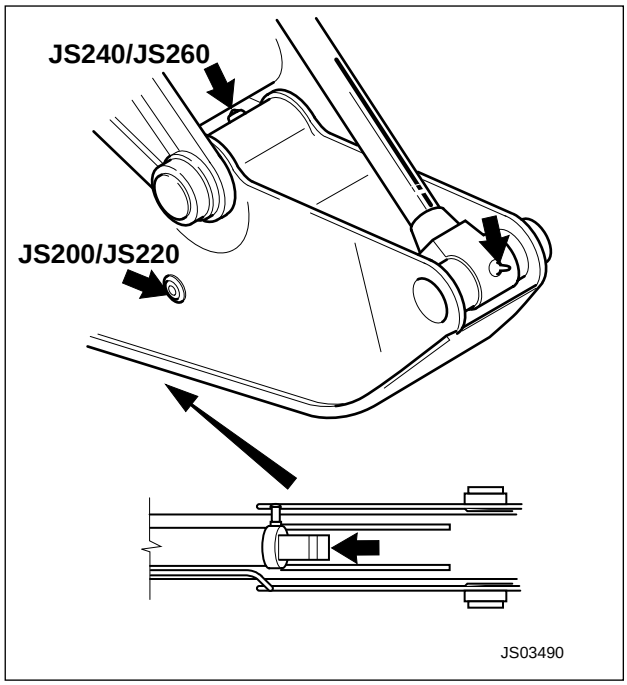

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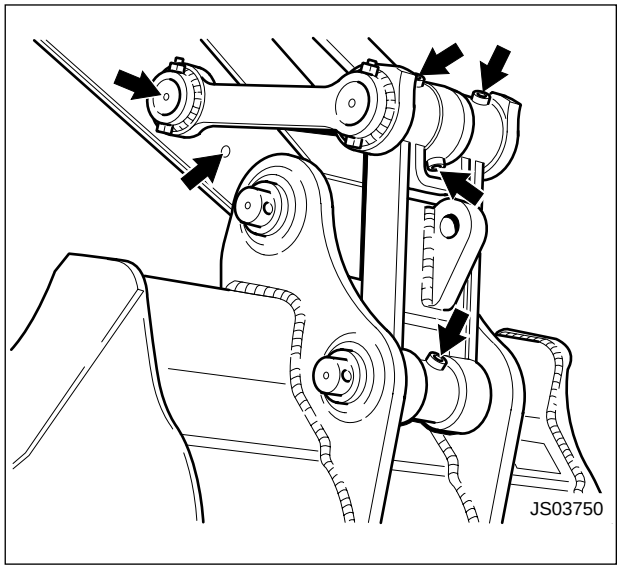


First Aid - Electrolyte

EYES

FLUSH WITH WATER FOR 15 MINUTES. GET MEDICAL HELP FAST.

IF SWALLOWED

DO NOT INDUCE VOMITING. DRINK LARGE QUANTITIES OF WATER OR MILK. Then drink milk of magnesia, beaten egg or vegetable oil.

SKIN

FLUSH WITH WATER. REMOVE AFFECTED CLOTHING.

⚠ WARNING

Batteries give off an explosive gas. Do not smoke when handling or working on the battery. Keep the battery away from sparks and naked flames.

Battery electrolyte contains sulphuric acid. It can burn you if it touches your skin or eyes. Wear goggles. Handle the battery carefully to prevent spillage.

Keep metallic items (watches, rings, zippers etc) away from the battery terminals. Such items could short the terminals and burn you.

Set all switches in the cab to OFF before disconnecting the battery. When disconnecting the battery, take off the earth (-) lead first.

When reconnecting, fit the positive (+) lead first.

Re-charge the battery away from the machine, in a well-ventilated area. Switch the charging circuit off before connecting or disconnecting the battery. When you have installed the battery in the machine, wait five minutes before connecting it up.

5-3-4-3

⚠ CAUTION

Do not disconnect the alternator, the battery, or any part of the charging circuit with the engine running.

8-3-4-1

Charge Rate Depending on the Battery specific Gravity

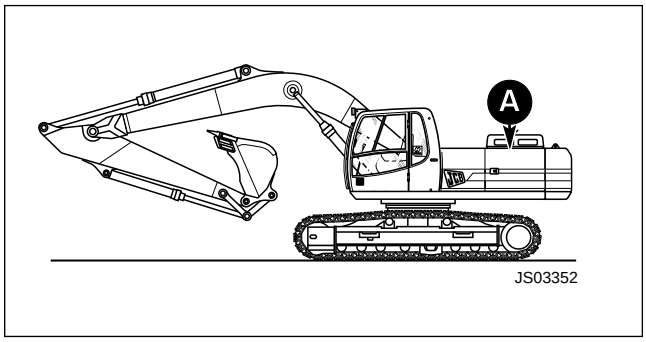
Temperature / Charge Rate	20°C	0°C	-10°C
100% (satisfactory)	1.26	1.27	1.28
90% (satisfactory)	1.24	1.25	1.26
80% (charge)	1.22	1.23	1.24
75% (charge)	1.21	1.22	1.23

If the battery is charged and the charge rate is less than 75%, replace the battery.

Checking the Electrolyte Level

Maintenance free batteries used in normal temperate climate applications should not need topping up. However, in certain conditions (such as prolonged operation at tropical temperatures or if the alternator overcharges) the electrolyte level should be checked as described below.

1. **Open the Battery Compartment A**
   Remove the bolts securing the metal plate above the batteries. Remove the plate.



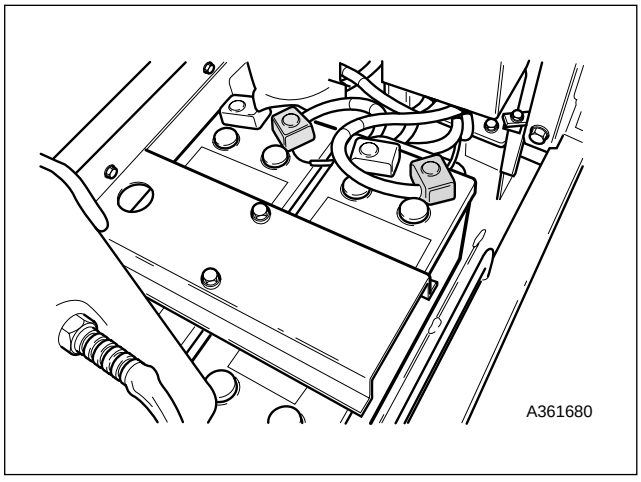
2. **Check the Level**
   Remove the covers and check the electrolyte level in each cell. The electrolyte should be 15 mm (0.6 in) above the plates.
   Top-up if necessary with distilled water or de-ionised water.

⚠ WARNING

Do not top the battery up with acid. The electrolyte could boil out and burn you.

2-3-4-6

3. **Check the Connections**
   Make sure that the terminals are tight and clean. Coat them with petroleum jelly to prevent corrosion.



Air Bleeding Procedures

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

	Air Bleeding Sequence			
	Air Bleeding from pump	Air Bleeding from ram	Air Bleeding from slew motor	Check
Hydraulic oil or pump replacement	O →	O →	O →	O
Ram replacement		O →		O
Slew motor replacement			O →	O

Releasing Tank Pressure

⚠ WARNING

DO NOT remove the hydraulic tank filler cap or cover plate when the engine is running. The hydraulic system is under pressure. You or others could be injured. First stop the engine and then release the pressure.

8-3-4-4/1

⚠ WARNING

The temperature of the hydraulic oil will be high soon after stopping the engine. Wait until it cools down (less than 40°C) before beginning maintenance.

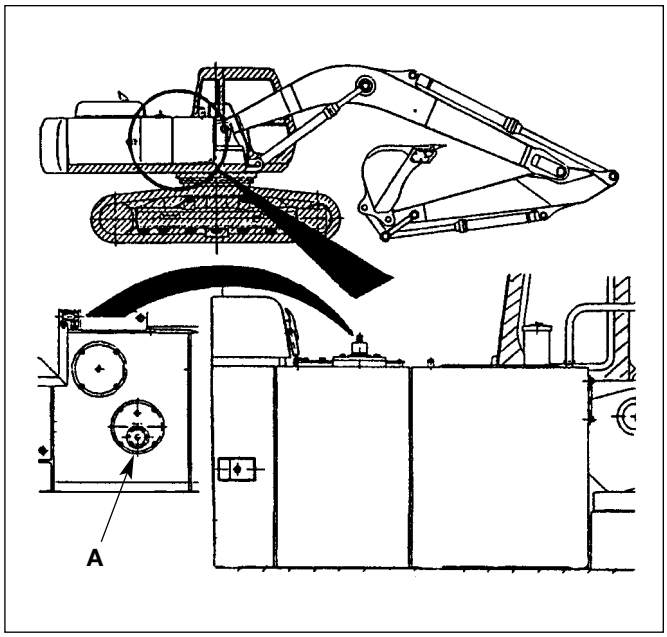
8-3-4-10

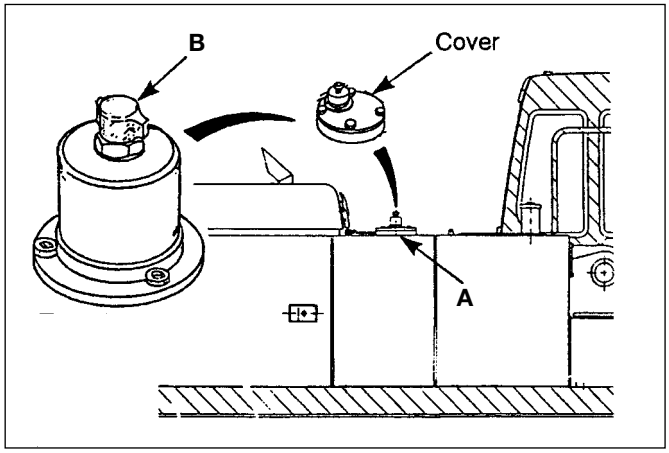
1. Prepare the Machine

a. Position the machine on level ground. Stop the engine. Remove the Starter Key.

b. Locate the Hydraulic Oil Tank Filler Cap **A** or Filler Plate.

c. Remove the box Nut of the breather **B** top of the hydraulic oil tank, press the projection and release the pressure from the Tank.





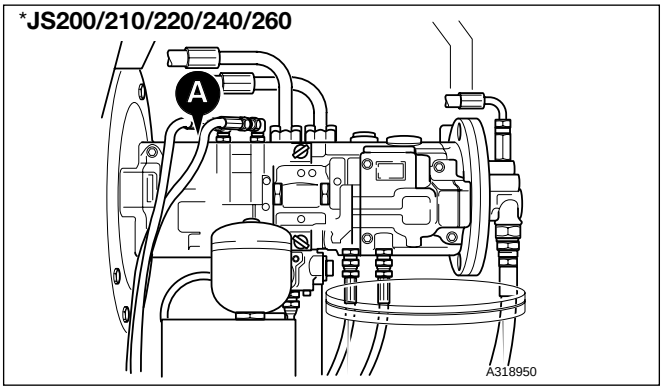
Air Bleeding from Hydraulic Pump

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1



1. **Prepare the Machine**
   - **a.** Position the Machine on level ground. Stop the engine. Remove the starter key.
   - **b.** Loosen the air bleeding plug **A** to check that oil comes from the air bleeding port.
   - **c.** If oil does not come out, remove the air bleeding plug **A** and fill hydraulic oil into the pump case through the air bleeding port.
   - **d.** Temporarily tighten the air bleeding plug **A**.
   - **e.** Idle the engine at low speed, slightly loosen the air bleeding plug and continue to run the engine until oil comes out from the air bleeding port.
   - **f.** Completely tighten the air bleeding plug **A.**
   - **g.** After bleeding is completed, stop the engine for 5 minutes or more and release the bubbles from the oil in the hydraulic oil tank

Air Bleeding from Ram

⚠ WARNING

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

⚠ WARNING

The temperature of the hydraulic oil will be high soon after stopping the engine. Wait until it cools down (less than 40°C) before beginning maintenance.

8-3-4-10

1. **Prepare the Machine**
   - **a.** Position the Machine on level ground.
   - **b.** Idle the engine at low speed and retract each ram 4 or 5 times without reaching the stroke end (about 100mm (4 in.) before the end of the ram.
   - **c.** Operate each ram 3 or 4 times to the stroke end to completely bleed the air.
   - **d.** After bleeding is completed, stop the engine for 5 minutes or more and release the bubbles from the oil in the hydraulic oil tank.

Air Bleeding from the Slew Motor

⚠ WARNING

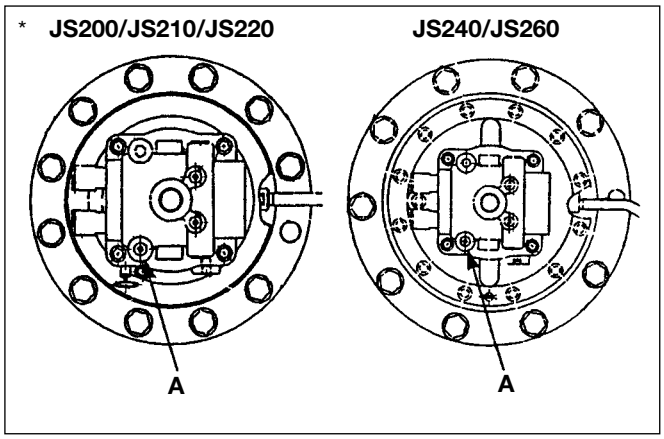
DO NOT remove the hydraulic tank filler cap or cover plate when the engine is running. The hydraulic system is under pressure. You or others could be injured. First stop the engine and then release the pressure.

8-3-4-4/1

⚠ WARNING

The temperature of the hydraulic oil will be high soon after stopping the engine. Wait until it cools down (less than 40°C) before beginning maintenance.

8-3-4-10



1. Prepare the Machine

a. Position the machine on level ground.

b. Idle the engine at low speed, loosen the air bleeding plug **A** and check that oil comes out from the air bleeding port.

DO NOT SLEW THE MACHINE.

c. If no oil comes out, stop the engine, remove the air bleeding plug **A** and fill the motor case with hydraulic oil.

d. Temporarily tighten the air bleeding plug.

e. Idle the engine at low speed and continue to run until oil comes out from the air bleeding port.

f. Completely tighten the air bleeding plug.

g. Idle the engine at low speed and slowly slew the machine left to right evenly more than 2 turns.

h. After bleeding is completed, stop the engine for 5 minutes or more and release the bubbles from the oil in the hydraulic oil Tank.

For location of hydraulic oil tank *see* ***Component Location Diagram*****.**

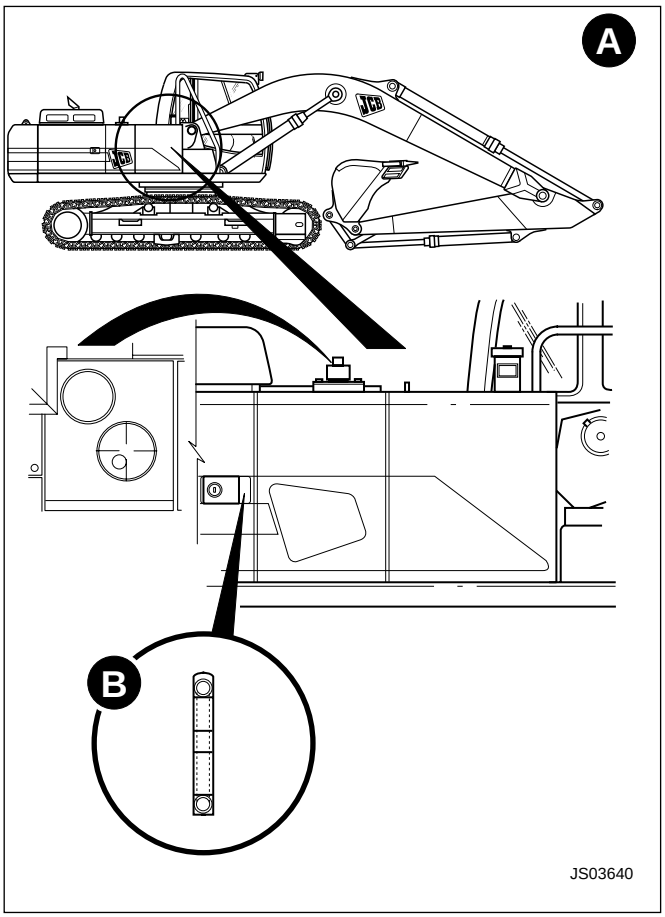
⚠ WARNING

Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin get medical help immediately.

INT-3-1-10/1

Checking the Fluid Level

1. **Prepare the Machine**
   Position the machine on level ground with the bucket and dipper rams fully extended and the boom lowered to rest the attachment on the ground, as at **A.**
2. **Check the Level**
   Look at the fluid level in the sight tube **B**. The level should be between the two marks on the tube. If the fluid is cloudy, water or air has entered the system. Water or air in the system could damage the hydraulic pump.



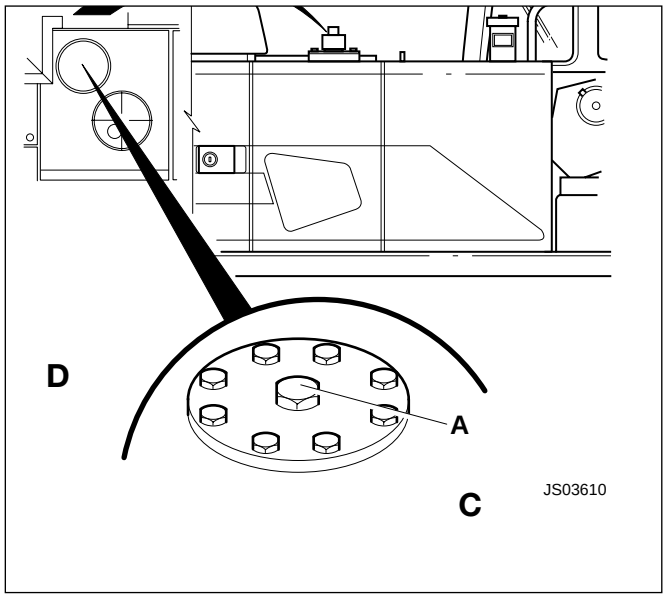
Topping up Fluid Level

⚠ WARNING

DO NOT remove the hydraulic tank filler cap or cover plate when the engine is running. The hydraulic system is under pressure. You or others could be injured. First stop the engine and then release the pressure.

8-3-4-4/1

1. **Prepare the Machine**
   Position the Machine on level ground as at **A**. Stop the engine. Remove the starter key.
2. **Locate the Hydraulic Oil Tank Filler Plate**
   See ***Component Location Diagrams***.
3. **Release Tank Pressure**
   See ***Releasing Tank Pressure.***
4. **Add Fluid.**
   - **a.** Remove plug **C** (later machines) or cover **D** (earlier machines).
   - **b.** Refill oil through the filler port using a suitable funnel.
   - **c.** Check the level through the level gauge on the side of the tank.
   - **d.** Refit plug **C** (or cover **D**).



Changing the Hydraulic oil

⚠ WARNING

DO NOT remove the hydraulic tank filler cap or cover plate when the engine is running. The hydraulic system is under pressure. You or others could be injured. First stop the engine and then release the pressure.

8-3-4-4/1

⚠ WARNING

Hydraulic Pressure

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

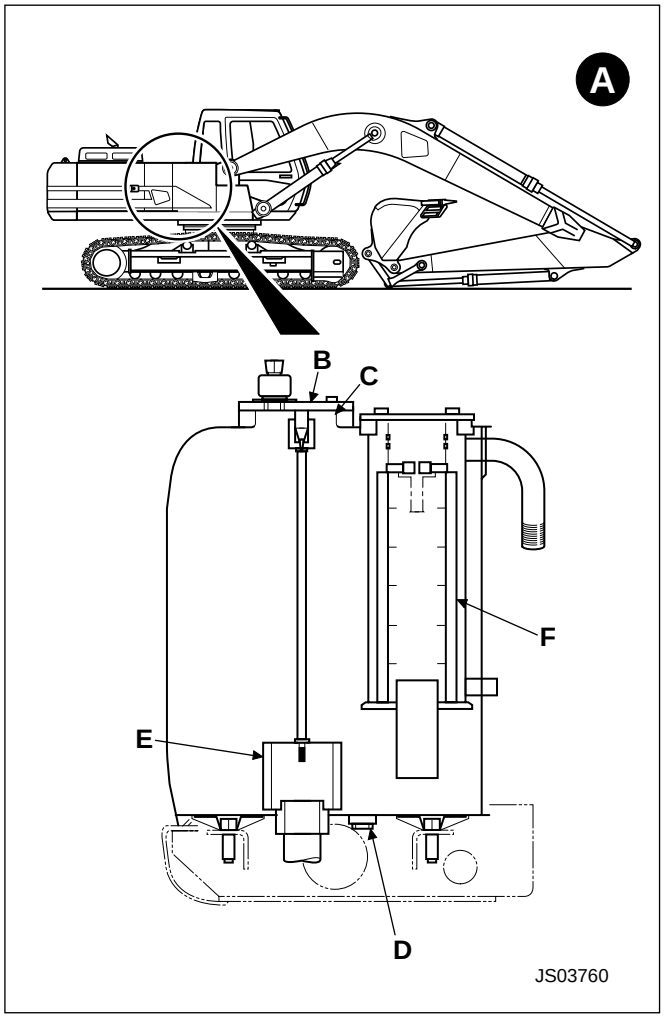
INT-3-2-3

1. **Prepare the Machine**
   Position the machine on level ground as at **A**. Stop the engine. Remove the starter key.
2. Locate the Hydraulic oil tank or Filler Plate. *See **Component Location Diagrams*** at the end of the section.
3. **Release Tank Pressure**
   *See **Releasing Tank Pressure**.*
   - **a .** Remove the filler port cover **B** and 'O'-ring **C.**
   - **b.** Use a pump and discharge the hydraulic oil into an empty waste container.
   - **c.** Remove the drain plug **D** on the bottom of the Tank and drain the remaining oil from the tank (have a drain pan ready).

* 4. **Replace the Suction Strainer E**
   *See **Changing the Suction Strainer.***
5. **Replace the Return Filter F**
   *See **Changing the Return Filter.***
6. **Seal the system**
   - **a.** Refit Drain plug **D.**
   - **b. Refill the Tank**
     Refill the Tank with Hydraulic oil *(See **Lubricants and Capacities** for the type of fluid)* to the specified level *see **Checking the Fluid Level.***
   - **c.** Install the 'O'-ring **C** and filler port cover **B.**

***Note:** If the 'O'-Ring **C** is damaged, replace it with a new one.*

*



Changing the Hydraulic Oil *(continued)*

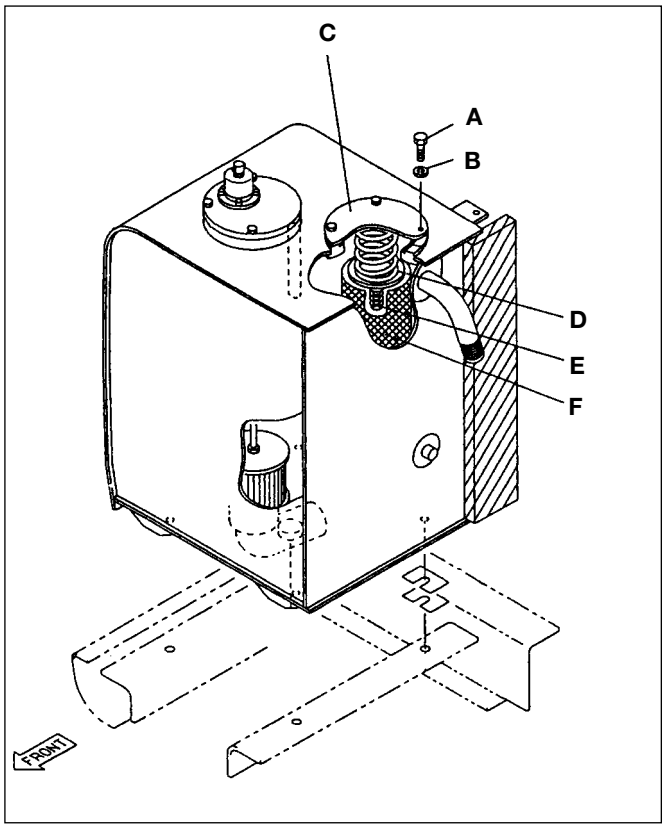
7. **Bleed the Hydraulic Components**
   *See **Air Bleeding Procedures***

8. **Check for leaks**
   a. Start the engine and run it for around 5 minutes without load.
   b. Slowly operate the Travel, slew and cylinders several times.

9. **Check the fluid level**
   *See **Checking the Fluid Level.***

Changing the Return Filter Element

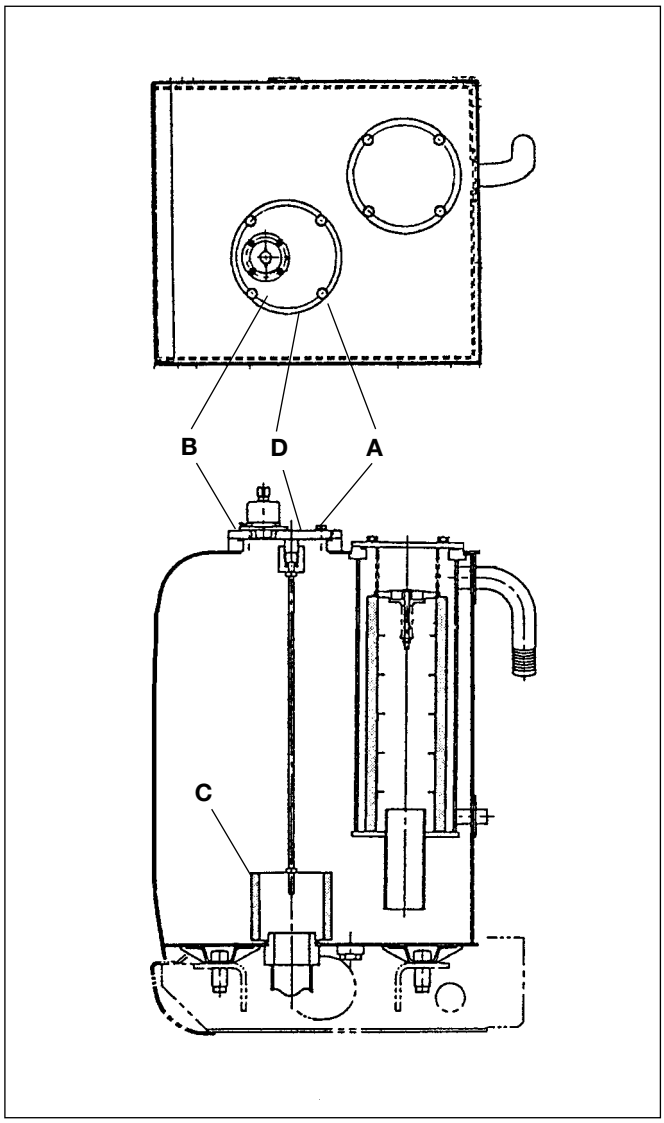
1. **Prepare the Machine**
   Position the machine on level ground. Stop the engine. Remove the starter Key.
2. **Locate the Return filter.** *See **Components Location Diagram*** at the end of this section.
3. **Release Tank Pressure.**
   *See **Releasing Tank Pressure**.*
4. **Removing the Element**
   a. Remove the retaining bolts **A** and washers **B** and take off the cover plate **C** complete with its 'O'-ring seal.
   b. Remove the spring **D**, bypass valve **E** and element **F.**
5. **Fit a New Element**
   Re-assemble in reverse order, using a new filter element **F** and replace the 'O'-ring with a new one if the one removed is worn or damaged.
6. **Seal the system**
   Refit the cover plate **C** and secure with bolts **A** and washers **B.**



Cleaning/Changing the Suction Strainer

1. **Prepare the Machine**
   Position the machine on level ground
   Stop the engine. Remove the starter key.
2. **Locate the suction Strainer**
   See ***Component Location Diagrams*** at the end of the section.
3. **Release Tank Pressure**
   See ***Releasing Tank Pressure.***
4. **Remove the suction Strainer**
   a. Remove the retaining bolts **A** and washers **D**, lift off cover plate **B.**
   b. Remove the suction strainer **C** and clean with a suitable solvent or, if renewing discard.
5. **Fit the Suction Strainer**
   Fitting is a reversal of removal.
6. **Check the Hydraulic fluid Level**
   See ***Checking the Fluid Level****.*
7. **Seal the System**
   Refit the cover plate **B** together with its 'O'-ring.

Note: *Check the 'O'-ring, if it is worn or damaged replace it with a new one and secure with bolts* ***A*** *and washers* ***B.***



Changing the Air Breather Element

1. Prepare the Machine
Position the machine on level ground. Stop the engine. Remove the Starter Key.

2. Release Tank Pressure
*See **Releasing Tank Pressure**.*

* **3. Locate the Air Breather Element**
*See **Identification of Machine Components**.*

* **4. Replace the Air Breather Element**

* **a.** Remove first the hexagonal nut **A**, seal washer **B** and cover **C**.

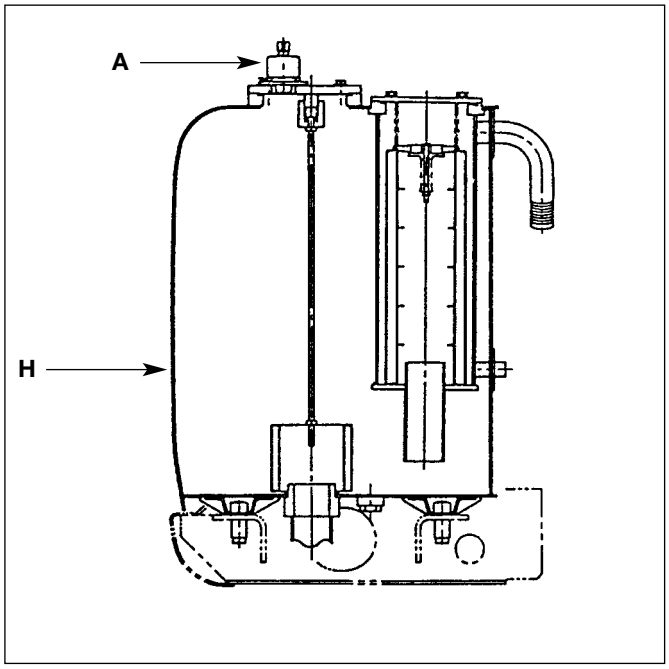
* ***Note:** The cover **C** can only fit in one of two positions because of the slot **G** in the cover which locates over a similar shaped protrusion on the mounting stud.*

* **b.** Remove the old filter element **D** together with the sponge packing **E**.

* **c.** Replace the old filter element **D**, with a new one. When installing the new filter element **D** place the sponge packing **E** on the element.

* **5. Refit the Filter cover C**

* **a.** Adjust the cover so that it fits over the stud, and install in the following order: Seal washer **B**, hexagonal nut **A** and box nut **F**.



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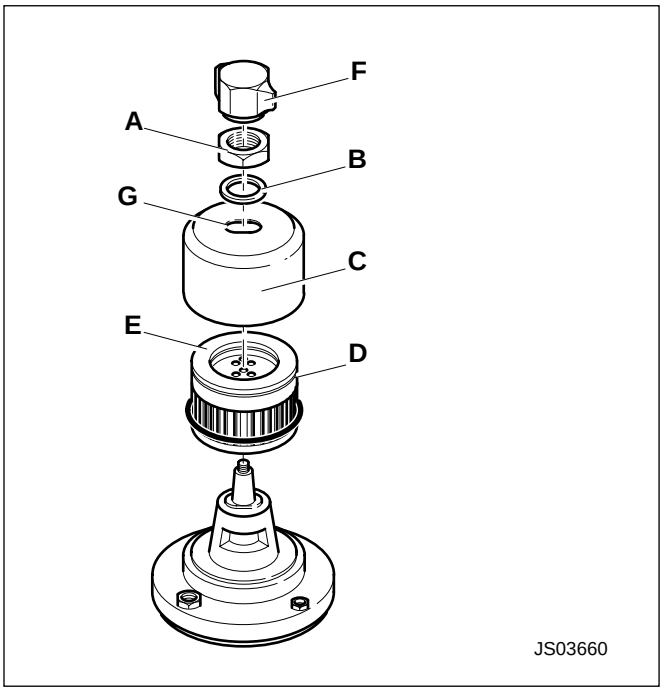


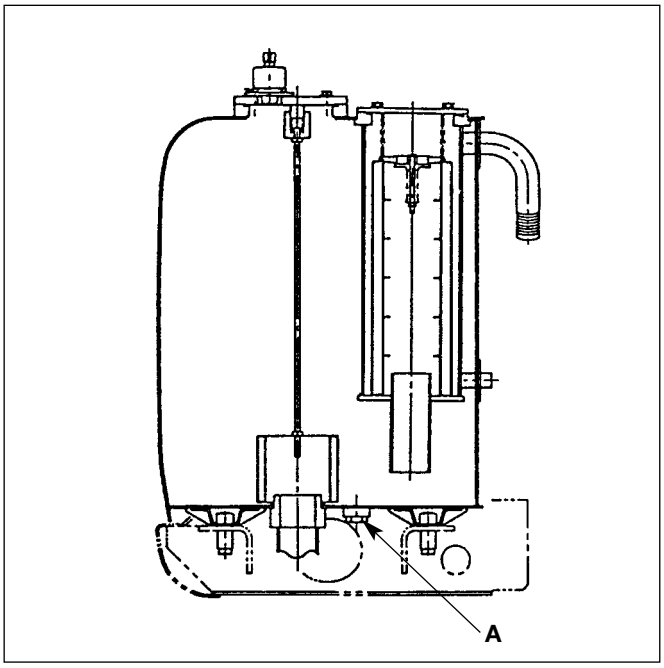
Draining Tank Impurities

* **⚠ WARNING**

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.

INT-3-2-3

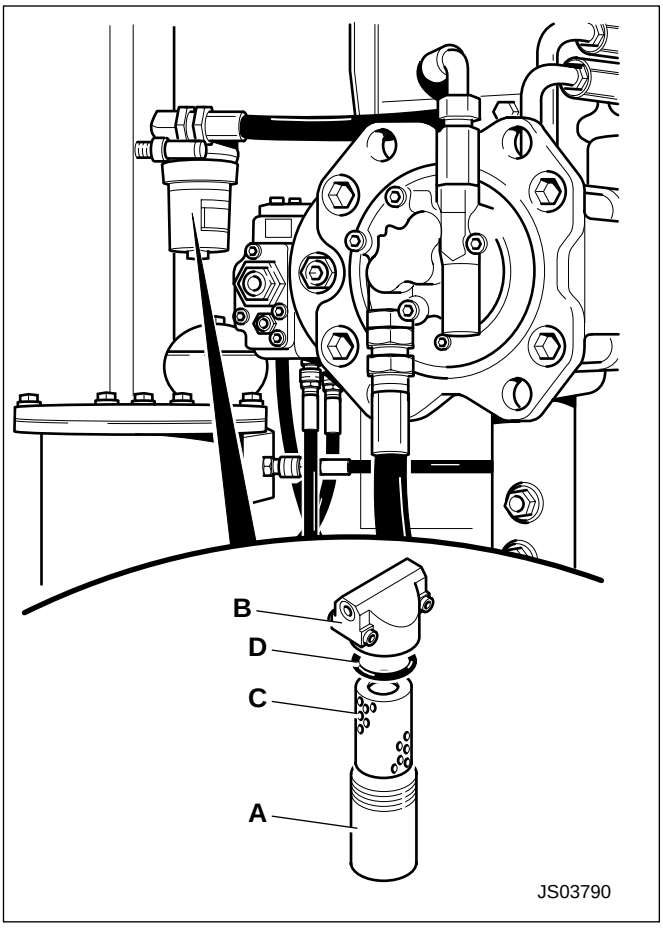
1. **Prepare the Machine**
   Position the machine on level ground. Stop the engine. Remove the Starter Key.
2. **Release Tank Pressure**
   *See **Releasing Tank Pressure**.*
3. **Drain the Tank Impurities**
   Remove the tank drain plug **A** and drain off accumulated water and other deposits (Have some means of collecting the impurities ready) the task is complete when clean hydraulic fluid flows out.
4. **Seal the System**
   Refit the drain plug **A.**



Changing the Pilot Oil Filter

1. **Prepare the Machine**
   Position the machine on level ground. Stop the engine. Remove the starter key.
2. **Release Tank Pressure**
   *(See **Releasing Tank Pressure**).*
3. **Locate the Pilot Oil Filter**
   *(Refer to **Identification of Machine Components**).*
4. **Dismantle the Filter**
   a. Using a wrench on the case, unscrew the filter case **A** from the filter head **B**.
   Take care not to spill the oil it contains.
   b. Remove and discard the element **C** and O-ring **D**.
5. **Clean the Filter Base and Case**
   Discard any fluid in the filter case. Clean out the case and the underside of the head.
6. **Fit New Filter Components**
   a. Coat the new O-ring **D** with hydraulic fluid and locate in the filter head **B**.
   b. Coat the seal area of the new element **C** and install it in the filter case **A**.
   c. Screw the filter case **A** to the head **B** and tighten with the wrench.

*



Changing the Breaker In-line Filter

Note: This filter should be changed at the intervals stated in **Service Schedules** or when the visual indicator **X** has popped up. DO NOT USE THE BREAKER WITH A BLOCKED FILTER.

1 Prepare the Machine
Position the machine on level ground. Stop the engine. Remove the starter key.

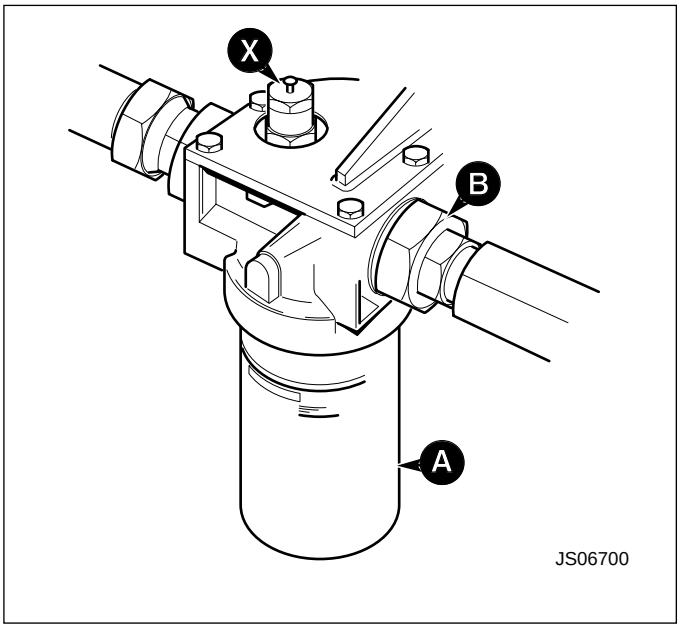
2 Release Tank Pressure
(See **Releasing Tank Pressure**).

3 Locate the Filter

4 Remove the Oil Filter
Unscrew and remove filter **A** from head **B**.

5 Fit the New Filter
Coat the seal of the new filter with clean hydraulic fluid. Screw the new filter into head **B** and tighten. Check and top up the hydraulic fluid level.

*



Changing the Drain Line Filter

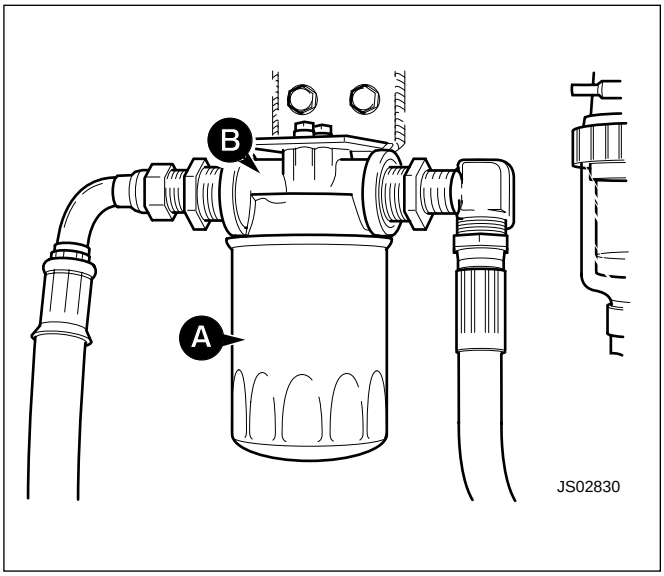
1 Prepare the Machine
Position the machine on level ground. Stop the engine. Remove the starter key.

2 Release Tank Pressure
(See **Releasing Tank Pressure**).

3 Locate the Filter

4 Remove the Oil Filter
Unscrew and remove filter **A** from head **B**.

5 Fit the New Filter
Coat the seal of the new filter with clean hydraulic fluid. Screw the new filter into head **B** and tighten. Check and top up the hydraulic fluid level.



* Changing the Nephron Filter

⚠ WARNING

The temperature of the hydraulic oil will be high soon after stopping the engine. Wait until it cools down (less than 40°C) before beginning maintenance.

8-3-4-10

1. **Prepare the Machine**
   Position the machine on level ground. Stop the engine. Remove the starter key.
2. **Release Tank Pressure**
   See Releasing Tank Pressure.
3. **Remove the Nephron Filter A**
   - **a.** Close the two stop cocks **B** of the nephron filter case **C**.
   - **b.** Remove the retaining bolts **D**, washers **E** and lift the cover **F**, together with the 'O'-ring **G** and spring **H.**
   - **c.** Slowly lift the Nephron filter **A** and remove.

Note: *Be careful not to drop any dirt from the nephron filter A.*

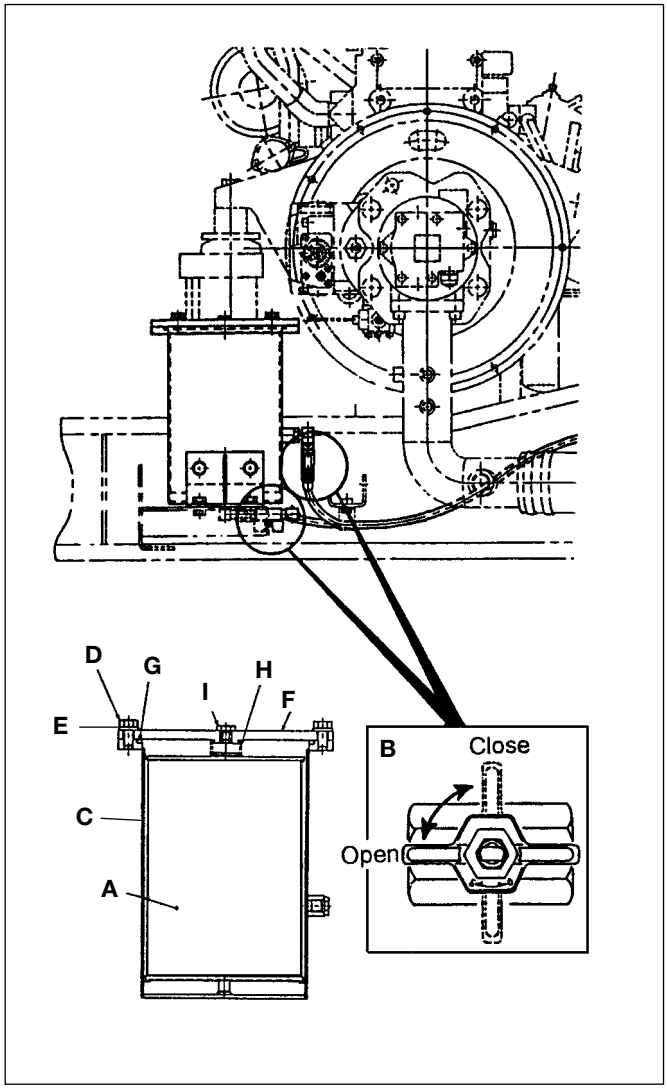
4. **Replace the Nephron filter A**
   - **a .** Peel off the 4 foil seals of the new nephron filter (one on the upper and lower side, and the other two on the sides).

Note: *If the foil is not removed, the filter will not function properly.*

   - **b.** Slowly sink the new nephron filter **A** into its case.
   - **c.** Install the spring **H**, 'O'-ring **G** and cover **F**, secure with bolts **D** and washers **E**.
   - **d.** Open the two stop cocks **B** on the nephron filter case **C**.

5. **Air Bleeding**
   - **a.** Start the engine and set at low idling, loosen the plug **I**, tighten the plug when hydraulic oil flows out.
   - **b.** Stop engine and Check the hydraulic oil level.

   *See **Checking the Fluid Level**.*



* ***Note:*** *There are three alternative configurations of filler, level and drain plugs as shown in figures **X, Y** and **Z**. The following text covers all configurations.*

Checking the Track Gearbox Oil Level

1 Prepare the Machine
Position the machine on level ground with the level and drain plugs as illustrated.

2 Check the Level on One Side
Clean the area around filler/level plug **A** or filler plug **C**/level plug **D** and remove one or both plugs. Oil should run from plug **A** or **D**. Top up through plug **A** or **C** if necessary. (See ***Lubricants and Capacities*** for oil types).

3 Clean and Refit the Plug(s)
Make sure they are tight.

4 Check the Level on the Other Side
Repeat steps 1 to 3.

Changing the Track Gearbox Oil

1 Prepare the Machine
See ***Checking Track Gearbox Oil Level.***

2 Drain the Oil on One Side

a Place a container below the drain plug to catch the oil. The container must be large enough to hold the maximum gearbox capacity (see ***Lubricants and Capacities***).

⚠ CAUTION

Oil will gush from the hole when the drain plug is removed. Keep to one side when you remove the drain plug.
2-3-4-2

b Remove filler/level plug **A** or filler plug **C** and drain plug **B**. Allow the oil to drain out.

c Wipe the plugs clean. Make sure you remove all metal particles.

d Wrap seal tape on the drain plug and refit.

3 Fill with New Oil
See ***Lubricants and Capacities*** for oil type and volume.

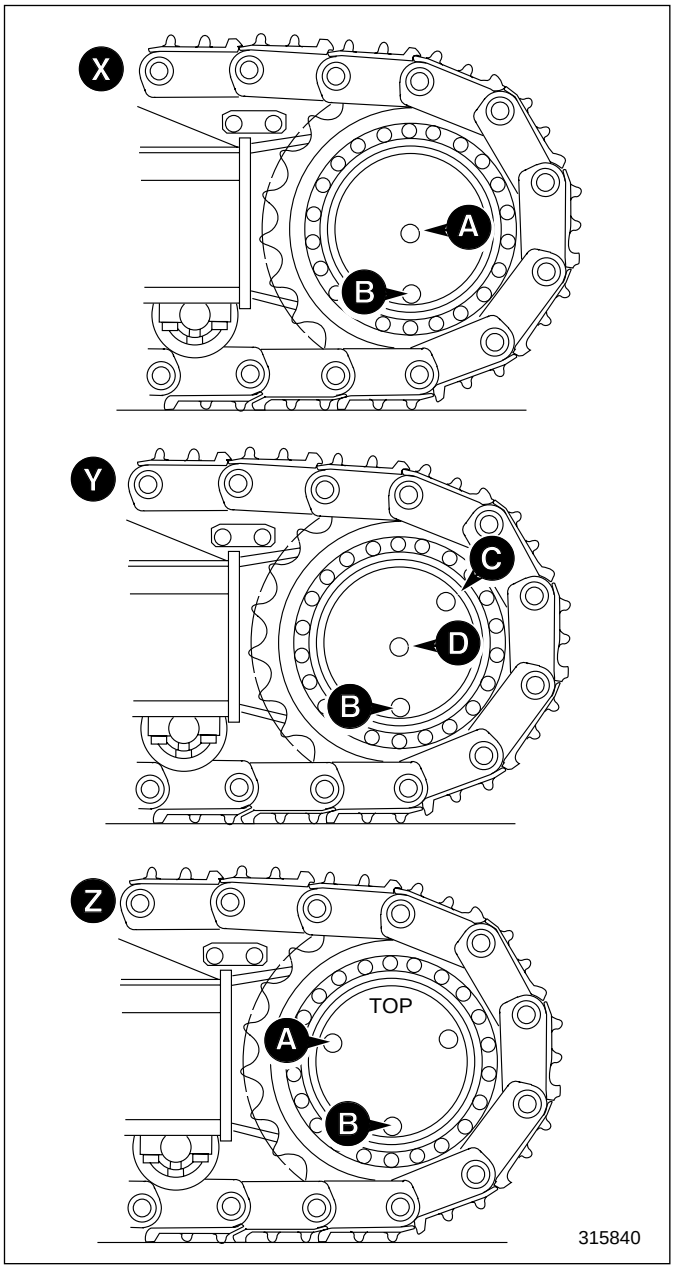
a Pour new oil through filler/level plug **A** or filler plug **C** until oil runs out of plug **A** or **D**.

b Clean and wrap seal tape around the plugs. Tightly refit filler/level plug **A** or filler plug **C**/level plug **D**.

4 Change the Oil on the Other Side
Repeat steps **1** to **3**.**Key**

5 Check for Leaks
Run the machine, operate the tracking controls and then make sure there are no leaks.

*



Key

A filler/level plug
B drain plug
C filler plug
D level plug

Checking the Slew Gearbox Oil Level

1. **Prepare the Machine**

   Position the machine on level ground. Stop the engine and remove the starter key.

2. **Locate the Slew Gearbox**

   *See C**omponent Location Diagrams*** at the end of this section.

3. **Check the Level**

   a. Remove the dipstick **A**, wipe it clean and re-fit.

   b. Remove the dipstick again and check that the oil level is within the range **B.**

   c. If necessary, top up through filler port **C**. *(See **Lubricants and Capacities** for oil type)*.

4. **Refit the Dipstick.**

Changing the Slew Gearbox Oil

1. **Prepare the Machine**

   Position the machine on level ground. Stop the engine and remove the starter key.

2. **Drain the Oil**

   a. Remove the drain plug **D**. Allow the oil to drain out.

   b. Wipe the drain plug clean. Remove any metallic particles, if foreign matter is found, contact local dealer.

   c. Refit the drain plug. Make sure it is tight.

3. **Fill with New Oil**

   *See **Lubricants and Capacities*** for oil type and volume.

   Fill with new oil through filler port **C** until it reaches the full mark on the dipstick when settled. refit the dipstick.

4. **Check for Leaks**

   Run the machine, operate the slew controls and make sure there are no leaks.

Replenishing Slew Gearbox Grease

1. **Prepare the Machine**

   Position the machine on level ground. Stop the engine and remove the starter key.

2. **Remove Air Bleed Plug E.**

⚠ CAUTION

Failure to remove the bleed plug before adding grease could damage the inner seal.

8-3-4-7

3. **Fill Up with Grease**

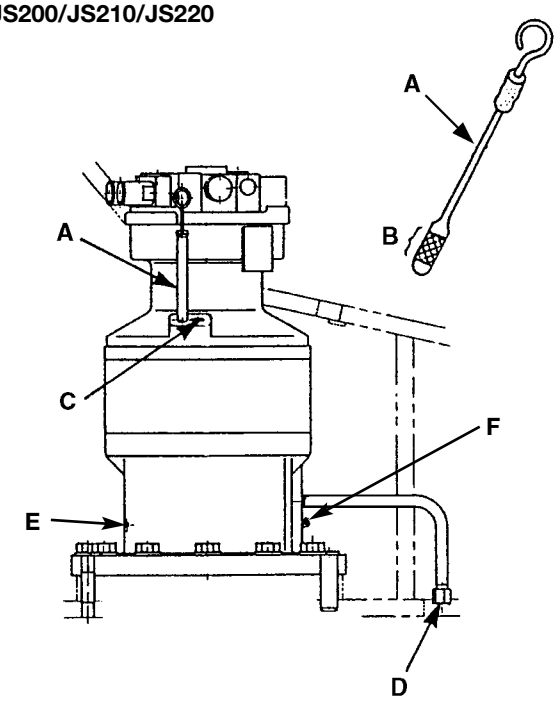
   *See **Lubricants and Capacities*** for grease type.

   Pump in grease through nipple **F** until the grease starts to ooze from bleed plug **E**. Refit and tighten the bleed plug.

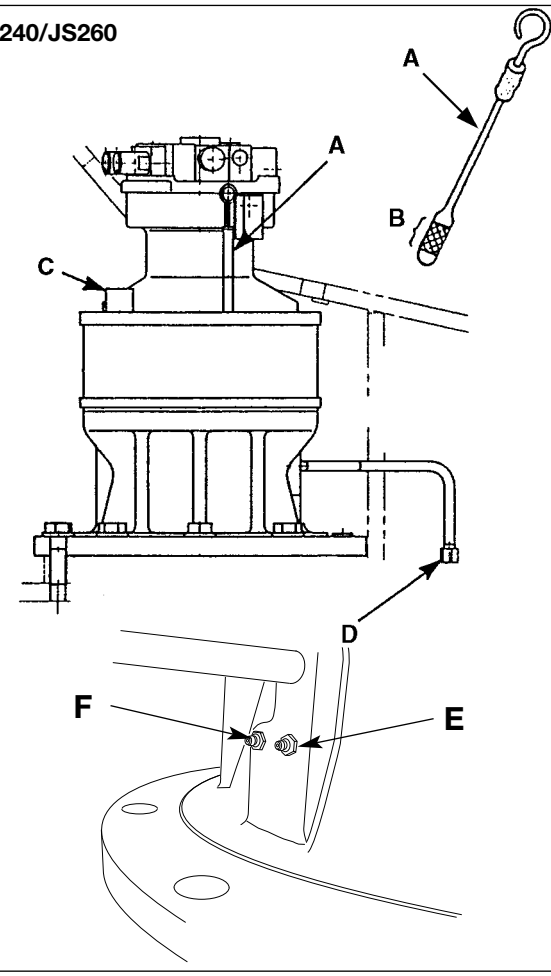
* On later machines, the slew gearbox bearing (normally lubricated at point **F** has changed to a sealed for life type bearing and no longer requires lubrication.

Note: All machines that have a grease nipple at **F** still require lubricating every 1000 hours.

***JS200/JS210/JS220**



***JS240/JS260**



Cleaning the Tracks

⚠ WARNING

If two people are doing this job make sure that the person working the controls is a competent operator. If the wrong control lever is moved, or if the controls are moved violently, the other person could be killed or injured.

If you will be working with another person, make sure you both understand what the other will be doing. Learn and use the recognised signalling procedures. Do not rely on shouting - he will not hear you.

To clean the tracks you must turn them. When the tracks are turning, keep clear of rotating parts.

Before starting this job, make sure that you have no loose clothing *(cuffs, ties, etc)* which could get caught in rotating parts.

Keep people not involved with the job well away!

8-3-3-1

1. **Prepare the Machine**
   Park the machine on level ground. Open the bucket and slew the boom until it is at 90° to the track. Lower the bucket to the ground.
2. **Raise the Track**
   Operate the boom and dipper controls so that the track on the side nearest the bucket is lifted up clear of the ground.
3. **Rotate the Track**

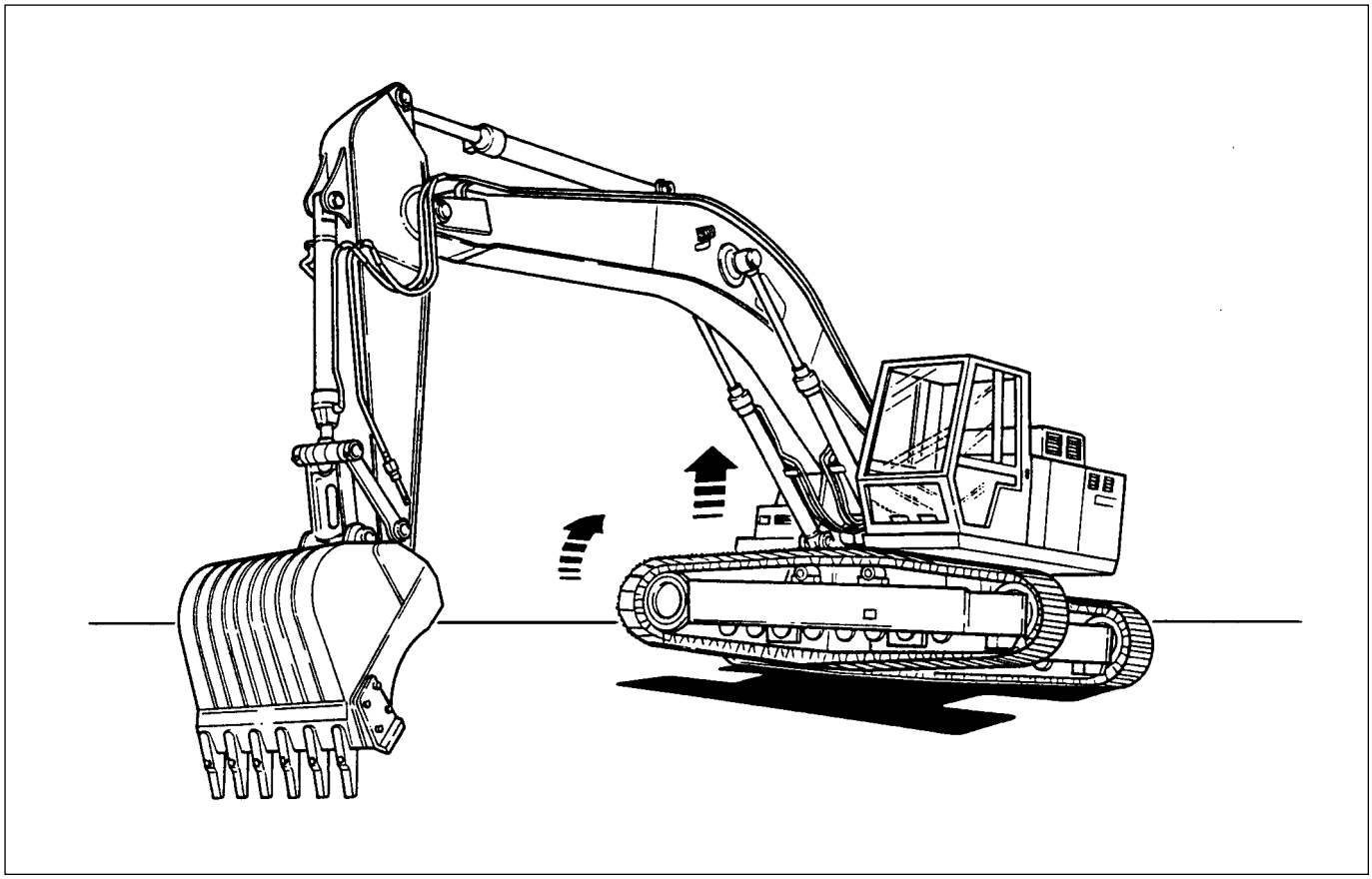
⚠ WARNING

Rotating the tracks off the ground may cause stones and other debris to be thrown with considerable force. If you are on the outside, keep well clear. Keep other people well clear.

8-3-3-2

* When it is safe to do so and you are sure that everyone is clear of the machine, operate the controls to rotate the track which is off the ground. Rotate it first one way and then the other to shake off the mud. If necessary, the person outside may use water to get the mud off.

4. **Inspect the Track**
   When you have finished, inspect the track rollers, sprockets and idler wheels for damage and oil leaks.
5. **Lower the Track**
   Operate the boom and dipper controls to lower the track to the ground.
6. **Repeat for the Opposite Track**
   Slew the boom round to the other side and repeat steps 2 to 5 inclusive for the other track.



Checking/Adjusting the Track Tension

1. Prepare the Machine

Position the machine on level ground. Run it backwards and forwards several times. Stop after running it forwards.

Carry out steps 1 to 3 of **Cleaning the Tracks**. Block up the undercarriage frame. Finish track rotation by running the track forwards. Stop the engine and remove the starter key.

⚠ WARNING

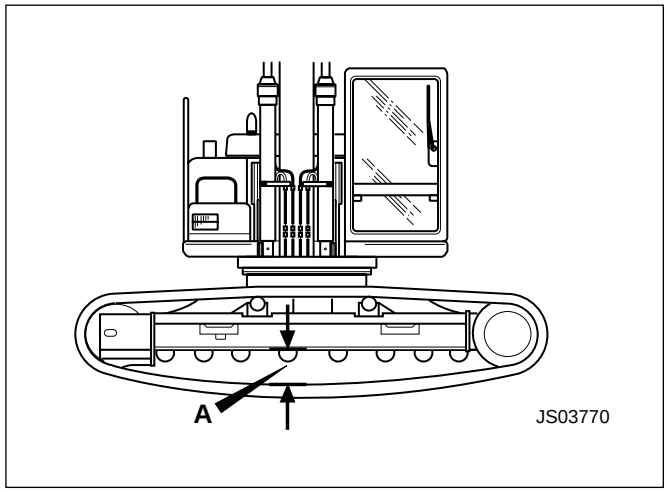
NEVER position yourself or any part of your body under a raised machine which is not properly supported. If the machine moves unexpectedly you could become trapped and suffer serious injury or be killed.

INT-3-3-7

2. Check the Tension

Measure gap **A** in line with the fourth roller from the front and between the lower surface of the track frame and the upper surface of the shoe. The dimension should be 275-295 mm for hard ground conditions. For operation on soft sand or sticky mud it should be 320-340 mm.

*



3. Adjust the Track Tension

Adjustment is made by either injecting or releasing grease from the check valve **B**. Inject grease to reduce the gap (increase the tension) or open to release grease and increase the gap.

⚠ WARNING

When opening the check valve always stand to one side and loosen a little at a time until grease starts to come out. If you over-loosen too much grease could spurt out or the valve cover fly out and cause serious injury.

8-3-4-5

⚠ WARNING

Under no circumstances must the check valve be dismantled or any attempt made to remove the grease nipple from the check valve.

8-3-4-9

If gap **C** exists between the idler wheel shaft and the track frame, you may use pressure to apply the grease. If there is no gap **C** after the application of grease, then the necessary repairs must be carried out.

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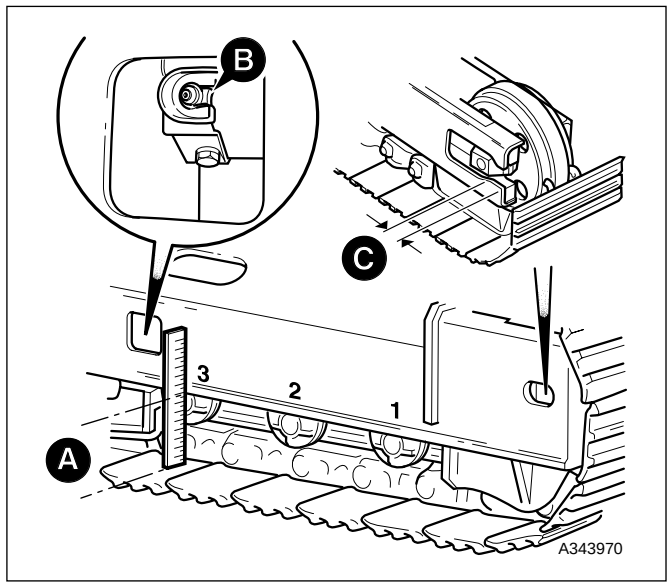


Note: *Excessive tension can cause the track rail to wear the drive rollers and sprocket, insufficient tension can cause wear to the drive sprocket and track rail.*

4. Lower the Track

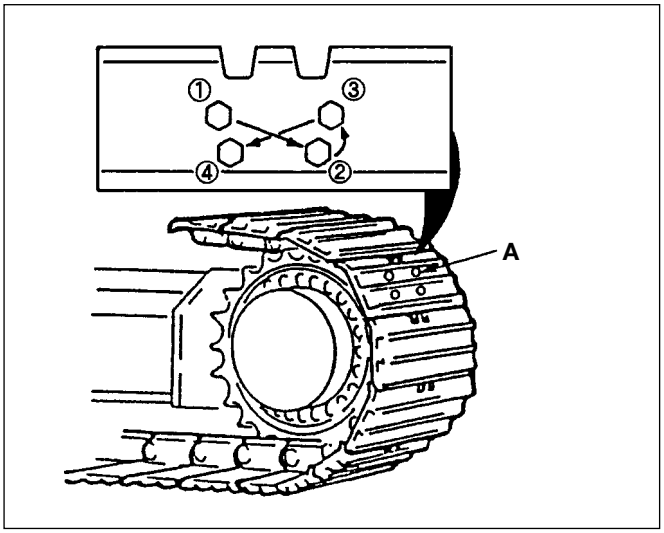
Remove the blocks from beneath the undercarriage and lower the track to the ground using the boom and dipper controls.

5. Repeat for the Opposite Track

Slew the boom round to the other side and repeat steps 1 to 4 above.

Checking the Shoe Plate

1. **Prepare the Machine**
   a. Position the machine on level ground. Run it backwards and forwards several times. Stop after running it forwards.
   b. Stop the engine and remove the starter key.
2. **Checking the Shoe Bolts A**
   Check to see if any are loose or damaged.
* 3. **Tightening the Shoe Bolts A**
   Tighten the Shoe bolts **A** in the sequence shown to the correct torque. *See* ***Bolt Torque Specifications***.



Checking the Rollers and Idler Wheels for Oil Leaks

1. **Prepare the Machine**
   See ***Checking/Adjusting the Track Tension,*** step 1.
2. **Look for Oil Leaks**
   Check the top and bottom rollers and the idler wheels for oil leaks.

⚠ CAUTION

Do not run the machine if you discover oil leaks in the top or bottom rollers or idler wheels. Failure to rectify such leaks could cause damage to the machine.
8-3-4-6/1

3. **Lower the Track**
   See ***Checking/Adjusting the Track Tension,*** step 4.
4. **Repeat for the Opposite Track**
   Slew the boom to the other side and repeat steps 1 to 3 above.

* Changing the Air Filter Elements

1. Prepare the Machine
Put the machine on level ground. Lower the bucket to the ground.

2. Stop the Engine
Remove the starter key.

Note: *Renew the inner element every second time you renew the outer element. As a reminder, mark the inner element with a felt tip pen when you renew only the outer element.*

Outer element must be changed sooner if the filter warning light on the instrument panel lights up.

DO NOT run engine with end cover or dust valve removed.

DO NOT attempt to wash or clean elements they must be renewed.

3. Locate the Air Filter
*(See **Identification of Machine Components**).*

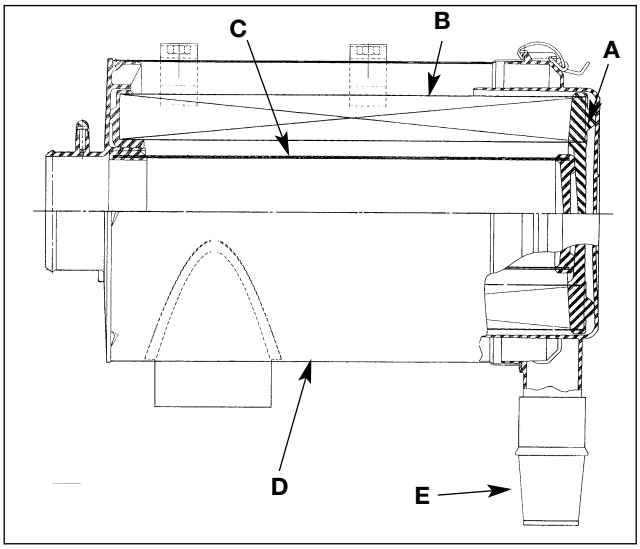
* **4. Open the Hydraulic Compartment**

* **5. Remove the Elements**
Remove end cover **A**. Remove the outer element **B**. Remove the inner element **C**.

* **6. Clean the Filter**
Clean the pre-cleaner, the inside of the canister **D**, the end cover **A**, and dust valve **E**.

* **7. Fit the New Elements**
Carefully insert the new inner element into the canister. Make sure it seats correctly. Carefully insert the new outer element **B**. Make sure it seats correctly.

* **8. Assemble the Filter**
Fit the end cover **A** onto the canister. Make sure the dust valve **E** is fitted, then fasten the retaining clips. Fit the pre-cleaner. Make sure the air filter blocked switch connector is fitted.



Checking the Oil Level

1. **Prepare the Machine**
   Park the machine on level ground. Lower the bucket to the ground.
2. **Stop the Engine**
3. **Open the Engine Compartment**
4. **Check the Oil Level**
   Remove the dipstick **A**. The correct oil level should be between the two indicator marks add oil if necessary through filler **B**.
   Use the recommended oil (*see **Lubricants and Capacities***).
   Make sure that the dipstick and filler cap are secure.

Changing the Oil and Filters

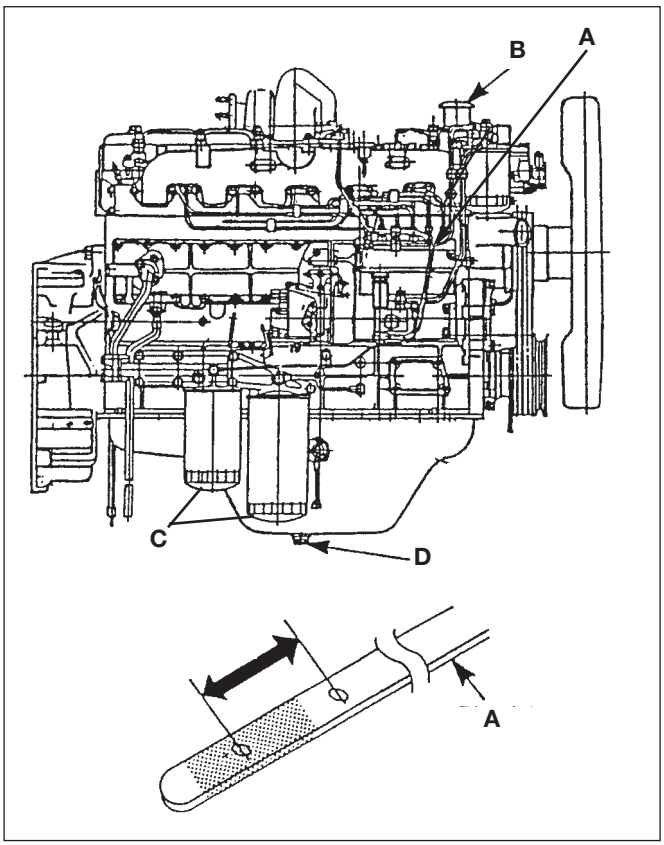
1. **Do steps 1-3 of checking the Oil Level**
2. **Drain the Oil**
   Place an oil collecting container of suitable size beneath the engine sump drain point. Remove drain plug **D**.

⚠ WARNING

Hot oil and engine components can burn you. Make sure the engine is cool before doing this job.
2-3-3-2

3. **Change the Filters**
   a. Unscrew the filters **C**.
   b. Clean the filter heads.
   c. Smear the seal on each new filter with oil. Tighten the filter until the seal bites onto the filter housing. Tighten the filter a minimum of one more turn.
4. **Fill the System**
   Securely tighten the drain plug **D** and refill the engine with new oil through filler cap **B** *(See **Lubricants and Capacities**)*.
   * Wipe off any spilt oil. Make sure the filler cap **B** is secure.
5. **Check for leaks**
   a. Before starting the engine, turn the engine over with the Engine Shutdown control pressed down until the oil pressure warning light goes out.
   b. Start the engine and let it idle for a few minutes
   c. Stop the engine, and let it stand for a few minutes, remove the key.
   d. Check the engine for any leaks, and check the oil level. *See **Checking the Oil Level***.

***Note:** Check the oil level only after about 20 minutes. If you check it straight after the engine has stopped, the oil level indicated will be false as the oil is still distributed around the engine and needs to fall.*



Checking the Coolant Level

1. **Park the Machine on Level Ground**
   Stop the engine and let it cool down. Open the engine compartment.

! WARNING

The cooling system is pressurised when the coolant is hot. Hot coolant will burn you. Make sure that the engine is cool before checking the coolant level or draining the system.

2-3-3-3

2. **Release System Pressure**
   For location of engine cooling radiator, *see* ***Component Location Diagrams*** at the end of this section.

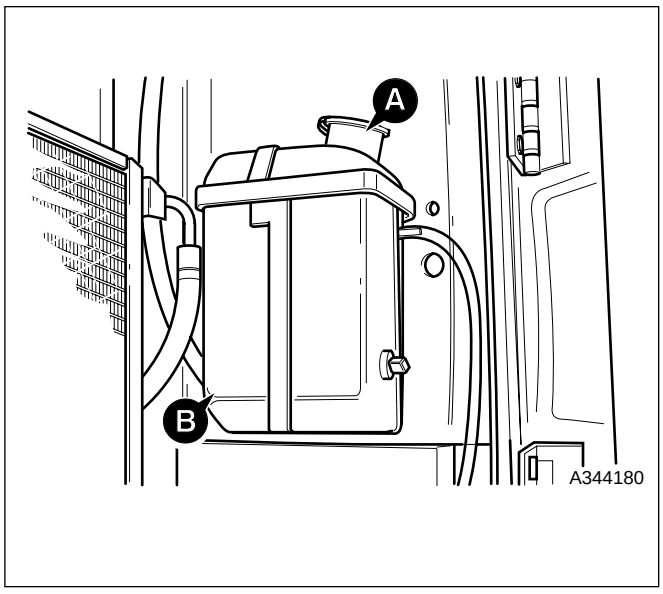
   Carefully slacken cap **A**. Let any pressure escape. Remove the cap.

3. **Check the Level**
   The level should be between the FULL and LOW marks on the expansion bottle **B**. Top up the bottle with pre-mixed water/anti-freeze if necessary. See ***Coolant Mixtures.***

4. **Refit the Pressure Cap A**
   Make sure it is tight.

Note: *Check the quality of the antifreeze mixture every year - before the cold weather starts. Change it every two years.*

*



* Coolant Mixtures

To prevent the coolant freezing in cold conditions, antifreeze must be added. **JCB Four Seasons Antifreeze and Summer Coolant** will give protection down to the temperatures shown in the table.

Antifreeze Solution	**Starts to freeze at**
55%	-36°C (-33°F)

Never use less than a 50% solution, otherwise there will not be enough corrosion protection.

Never use more than 60% solution, otherwise the cooling system may be damaged.

Leave the antifreeze in all the year round as it gives protection against corrosion.

Check the strength of antifreeze solution at least once a year, preferably at the start of the cold period. Always renew the antifreeze every two years.

A 50% antifreeze mixture should be used even if frost protection is not needed. This gives protection against corrosion and raises the coolant's boiling point.

Changing the Coolant

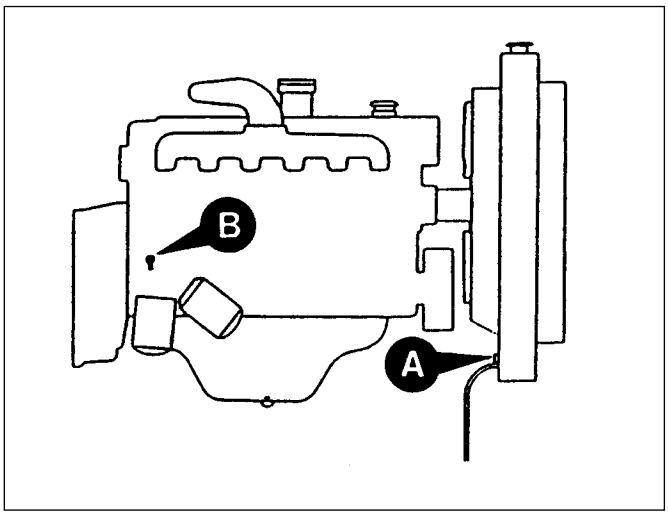
1. **Do Steps 1 and 2 of '*Checking the Coolant Level*'**
2. **Drain the System**
   Open the radiator drain tap **A**. Remove the cylinder block drain plug **B**. Remove the expansion bottle cap (see ***Checking the coolant Level***). Let the coolant drain out.

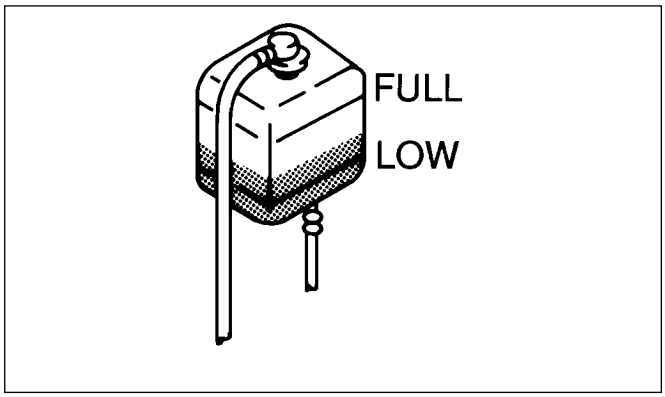
⚠ CAUTION

Keep your face away from the drain hole when removing the drain plug.

2-3-3-4

3. **Flush the System**
   If necessary. Use clean water.
4. **Refit the Drain Plug**
   Clean and refit the drain plug **B**, making sure it is tight. Close the radiator drain tap **A**.
5. **Fill the System**
   Using the necessary mix of clean, soft water and antifreeze, (see ***Coolant Mixtures***) fill via the expansion bottle cap until the level in the bottle is between the FULL and LOW marks.
6. **Refit the Radiator Pressure Cap**
   Make sure it is tight.
7. **Refit the Expansion Bottle Cap**
   Make sure it is tight.
8. **Check for Leaks**
   Run the engine for a while to raise the coolant to working temperature and pressure. Stop the engine.
   Check for leaks. Re-check the level in the expansion bottle and top up if necessary.





Adjusting the Fan Belt

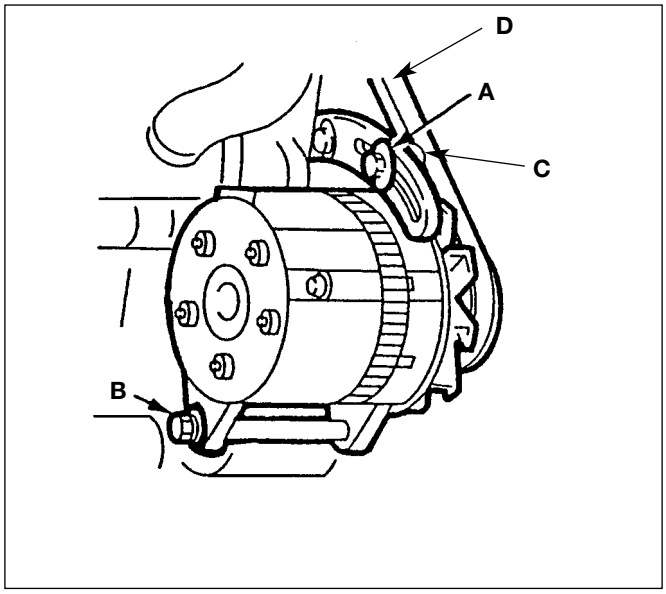
⚠ WARNING

Make sure the engine cannot be started. Disconnect the battery before doing this job.

2-3-3-5

1. **Check the Fan Belt Tension**
   There must be 10 mm (0,4 in) slack at **D** on the belt.
2. **Loosen the Alternator**
   Slacken bolts **A** and **B**.
3. **Adjust the Fan Belt**
   Use tension bolt **C** to adjust the alternator so that there is 10 mm (0.4 in) slack at point **D** on the belt.

   Note: *If the fan belt is stretched so much that it cannot be adjusted correctly, fit a new belt (see below).*
4. **Secure the Alternator**
   Re-tighten bolts **B**. Then re-tighten bolt **A**.



Fitting a New Fan Belt

1. **Loosen the Alternator**
   Slacken bolts **A** and **B** and adjust tensioner **C** so that the fan belt can be removed.
2. **Fit a New Fan Belt**
   With the alternator located as in **1**, fit a new belt, making sure its 'V' profile locates in the pulleys correctly.

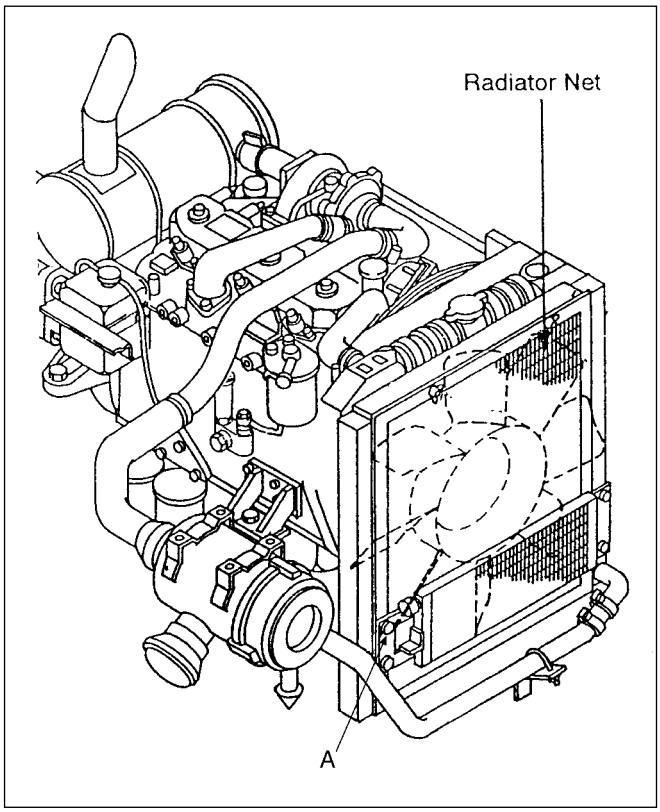
   Note: *It may be necessary to apply slight leverage to the new belt to get it over the pulleys.*
3. **Adjust the Fan Belt**
   Carry out steps **3** and **4** of ***Adjusting the Fan Belt.***
4. **Re-check the Fan belt Tension**
   After about 1 hour's running re-check the belt tension.

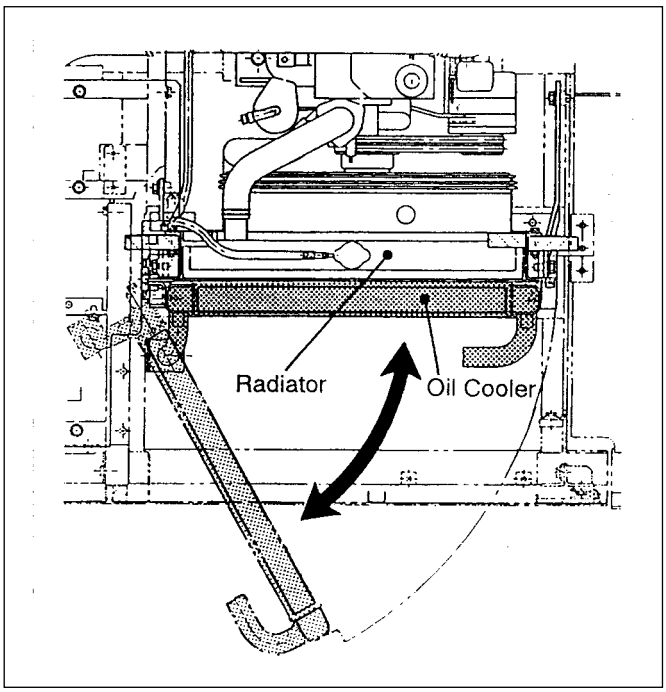
Cleaning the Radiator and Oil Cooler

A clogged radiator and/or oil cooler can lead to engine overheating. Regularly check for a build-up of dirt and debris and, if necessary, use compressed air to clean out the grille. At the same time check all hoses for damage or perishing, and replace if necessary.

Note: *Do not use high-pressure steam as it can deform the radiator.*

1. **Cleaning the Radiator Net**
   Remove the net for cleaning. When using the machine in dusty conditions, inspect the net for clogging every day, then replace.
2. **Swing Out type Oil Cooler *(if fitted)***
   - **a.** Remove the Oil Cooler mounting bolts **A**, washers **B**, Housing Cover **C** and stays **D**, then swing the cooler out.
   - **b.** Clean the oil cooler and then return it to its normal position.
   - **c.** Fasten securely.
   - **d.** Start the engine and check for leaks.
3. **Non-Swing Oil Cooler**
   - **a.** Remove the oil cooler mounting bolts **A** with washers **B.**
   - **b.** Remove the oil cooler.
   - **c.** Clean the oil cooler and then return it to its normal position.
   - **d.** Fasten securely.
   - **e.** Start the engine and check for leaks.





Draining Fuel Tank Impurities

Stop the engine and remove the key.

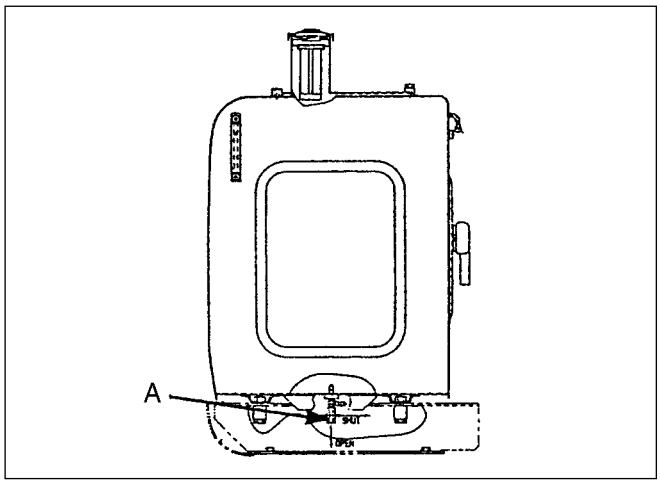
Loosen the drain tap **A** on the underside of the fuel tank. Drain the water and deposits until clean diesel oil flows out.

Close the drain tap firmly.

⚠ WARNING

Fuel oil is highly inflammable. Completely wipe off any spilt fuel which could cause a fire.

8-3-4-3



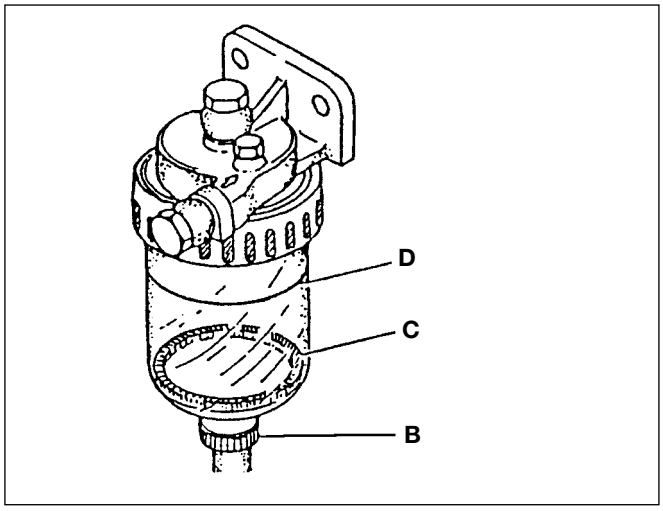
Draining the Water Separator

The water separator should be drained at least every 50 hours, but more often if necessary.

Stop the engine and remove the key.

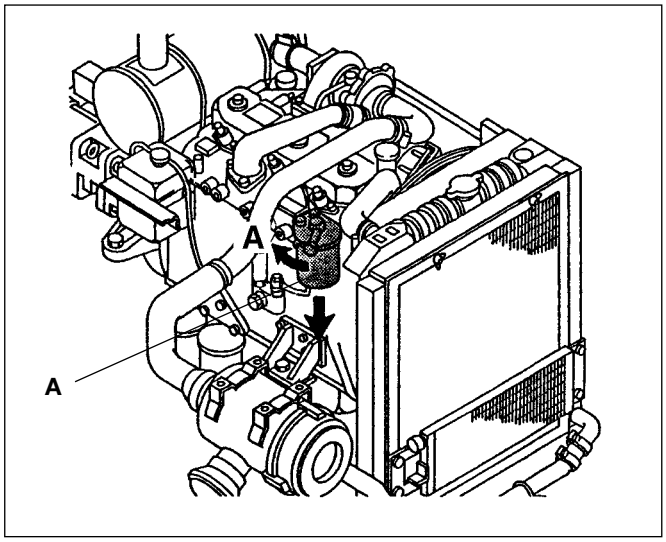
Open the drain plug **B** to release the accumulated water in the bowl.

Under no circumstances should the float **C** be allowed to rise above the red line **D** or water could get taken further into the system with serious consequences.



Changing the Fuel Filter Element

1. **Stop the Engine**
   Stop the engine and remove the key.
2. **Disconnect the Battery**
3. **Open the Engine Compartment**
   Locate the fuel filter (see ***Component Location Diagrams*** at the end of this section).
4. **Remove the Element A**
   Using a chain wrench, unscrew the filter element from the filter head. Avoid spilling the fuel retained in the element.
5. **Fit the New Element**
   - **a.** Smear the new filter element sealing ring with fuel oil and hand tighten onto the filter head. Use a chain wrench to tighten by a further $^{2}/_{3}$ turn.
   - **b.** After installation, bleed the air.
   - **c.** Wipe up any spilled fuel.



Bleeding the Fuel System

Air in the fuel system could cause misfiring or failure to start.

Air will enter the system if any part of it is disconnected or emptied.

Note: *Running the engine with air in the system could damage the fuel injection pump. After maintenance, remove air from the fuel system as detailed below.*

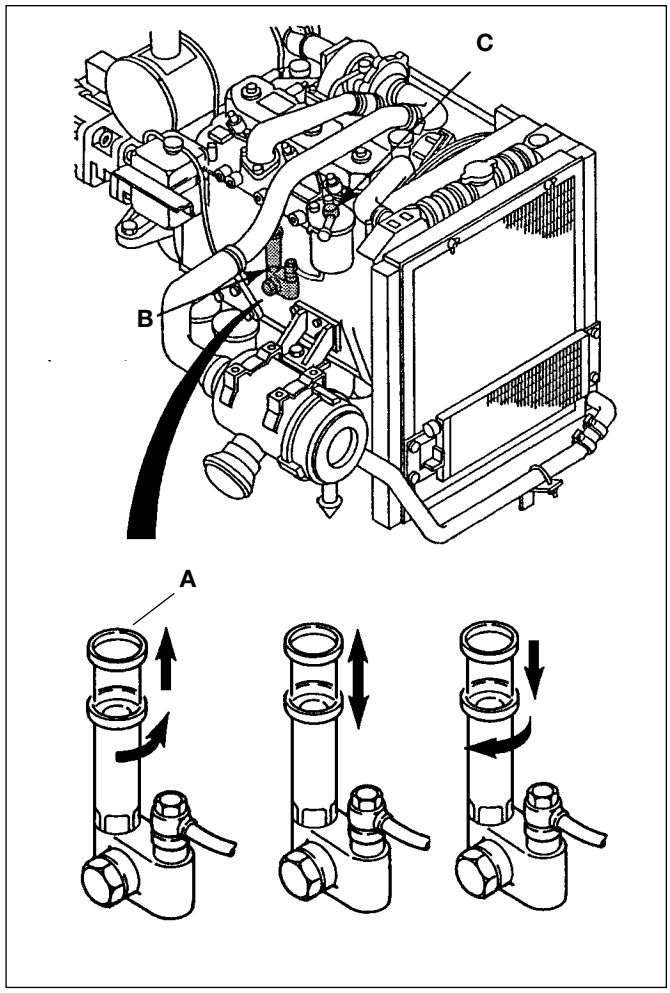
1. **Stop the Engine**
   Switch off the engine and remove the key.
2. **Disconnect the Battery**
   Remove the - ve lead to chassis.
3. **Open the Engine Compartment**
   Locate the priming pump and bleed point *(see Illustrations)*.
4. **Prepare for Bleeding**
   Loosen the knob **A** on the priming pump **B** by turning it anti-clockwise. The knob will be lifted by spring pressure.
5. **Bleed the System**
   Loosen bleed plug **C**. Depress knob **A** to bleed air from filter.
6. **Restore the System to Normal**
   Tighten bleed plug **C**. Depress knob **A** and turn clockwise to lock into priming pump **B**.
7. **Check for Leaks**

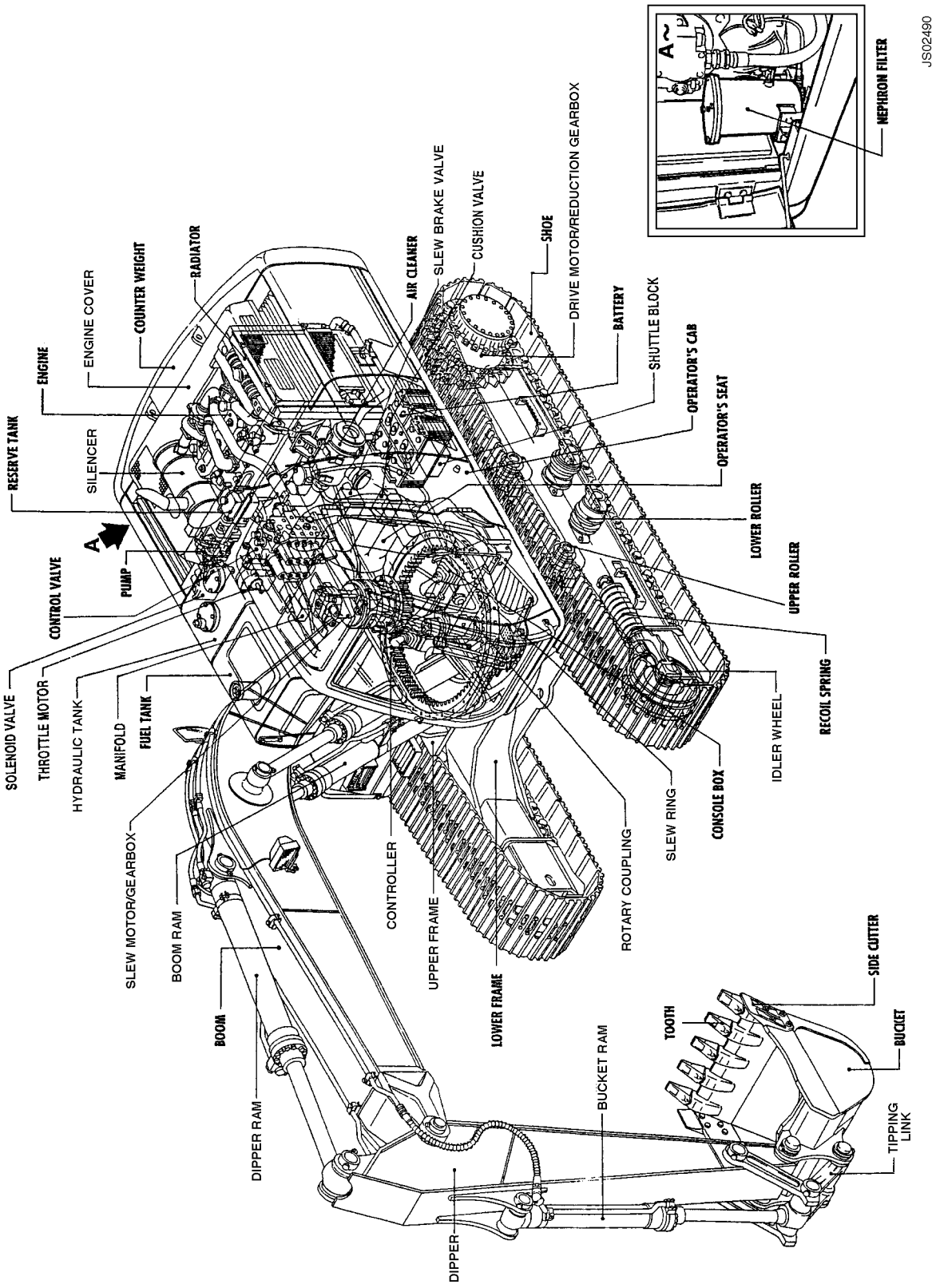
⚠ WARNING

Fuel oil is highly inflammable. Completely wipe off any spilt fuel which could cause a fire.

8-3-4-3

Wipe up any spilled fuel. Then start the engine and check for leaks.




JS02490
NEPHRON FILTER
RESERVE TANK
ENGINE
ENGINE COVER
COUNTER WEIGHT
RADIATOR
AIR CLEANER
SLEW BRAKE VALVE
CUSHION VALVE
SHOE
DRIVE MOTOR/REDUCTION GEARBOX
BATTERY
SHUTTLE BLOCK
OPERATOR'S CAB
OPERATOR'S SEAT
LOWER ROLLER
UPPER ROLLER
RECOIL SPRING
IDLER WHEEL
CONSOLE BOX
SLEW RING
ROTARY COUPLING
CONTROLLER
UPPER FRAME
LOWER FRAME
SLEW MOTOR/GEARBOX
BOOM RAM
BOOM
DIPPER RAM
DIPPER
BUCKET RAM
TOOTH
SIDE CUTTER
BUCKET
TIPPING LINK
SILENCER
PUMP
CONTROL VALVE
SOLENOID VALVE
THROTTLE MOTOR
HYDRAULIC TANK
MANIFOLD
FUEL TANK
A

Introduction

It is important before taking measurements that control conditions are maintained.

- **a.** Position the machine on a level safe site.
- **b.** Adhere strictly to the safety operation.
- **c.** Confirm the setting when an adjustment is made.

The items to prepare are:-

- **a.** The check sheet
- **b.** Tape measure
- **c.** Dial gauge with magnetic stand
- **d.** Angle gauge
- **e.** Chalk
- **f.** Stop watch

Basic Measurement Conditions

When checking the performance value, certain conditions should be fulfiled:-

- **a.** The machine should be in the **S**. Mode.
- **b.** The hydraulic oil temperature should be 45°C-55°C.
- **c.** The engine speed should be within ±50 rpm of the Reference Value.
- **d.** The hydraulic equipment should be operated several times before testing.
- **e.** The operation to be measured should be operated three times and an average taken.
- **f.** Measure on level hard ground.

These consist of two basic types of measurement:-

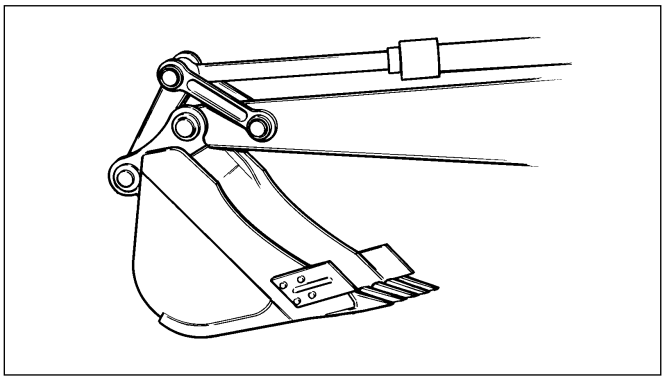
1. Speed Measurements

- **a.** Bucket Ram Speed.
- * **b.** Dipper Ram speed.
- **c.** Boom Ram Speed.
- **d.** Slew Speed.
- **e.** Travel Speed.

2. Other Measurements

- **a.** Travel Linearity.
- **b.** Slew Backlash.
- **c.** Lateral Movement in turntable bearing.
- **d.** Slew Brake.
- **e.** Slew Lock Characteristics.
- **f.** Natural Internal Leakage, Natural Ram Drop.
- **g.** Amount of Hydraulic Oil squeezed out by each ram.

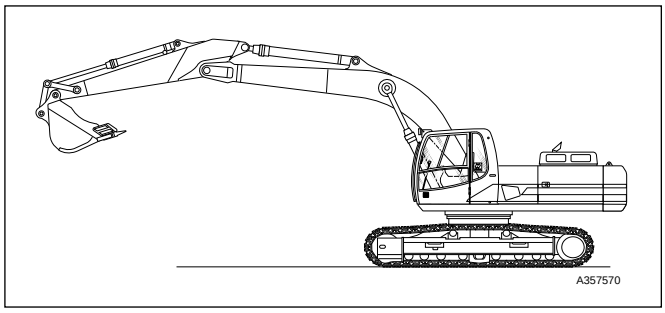
Speed Measurements



a. Bucket Ram speed.

The conditions for checking are that the Dipper should be level.

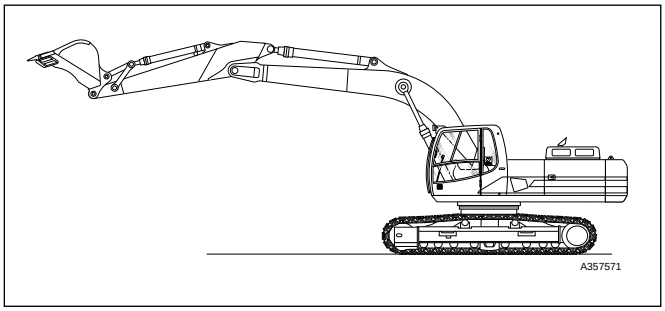
Measurement is of the time it takes the bucket to fully open and close from each end of the stroke



b. Dipper Ram speed

The conditions for checking are that the Dipper should be level with the bucket open.

Measurement of the time it takes the Dipper to open and close from each end of the stroke.

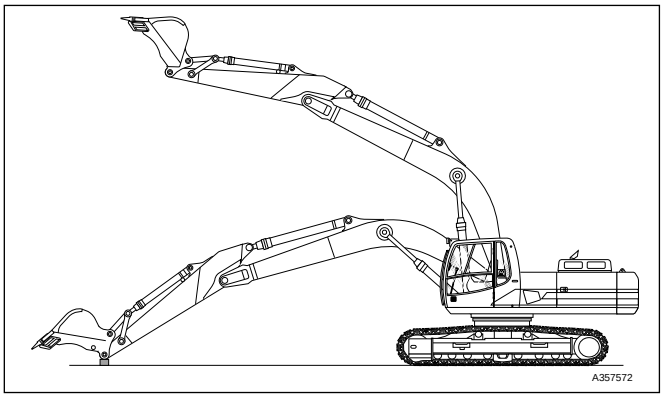


c. Boom Ram speed

The conditions for checking are that the Dipper and the bucket are open.

Measurement of the time it takes for the boom to go from a fully raised to fully lowered position.

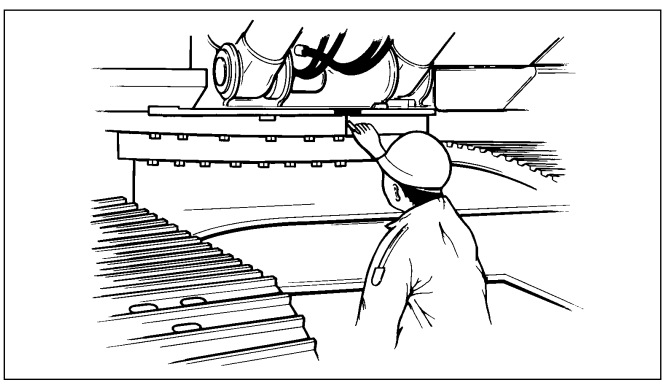
Note: *Place a wooden block where the Dipper would make contact with the ground, so as to prevent a shock loading of the arm, when it is lowered.*



d. Slew Speed

The conditions for checking are that the attachment is facing forwards and that a vertical line is chalked on the turntable bearing and lowering, then place the attachment in the minimum slew position.

Rotate the upper framework and after one complete rotation, then measure the time it takes for the next rotation.



e. Travel Speed

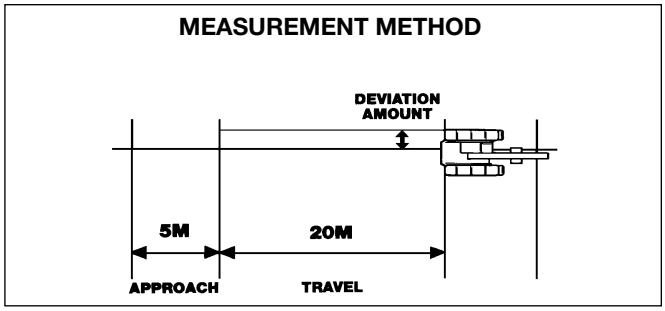
The conditions for checking are that the main unit is jacked up, then marks are made on the Traction Motor and side frame. Rotate the sprocket two times or more to warm the motor then, record the time it takes for the motor to complete ten revolutions.

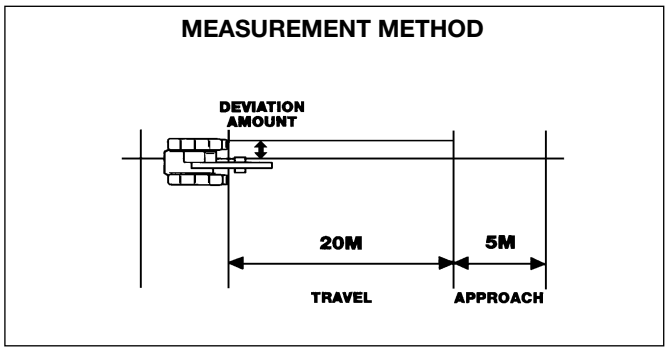
Measurement should be done with the machine in each mode, low, medium and high speed and three measurements in each direction in each mode should be done to obtain an average.

Other Measurements

a. Travel Linearity.

The conditions for checking are that the machine should have an approach of 5 metres and a travel distance of 20 metres; measurement is of the amount of deviation after 20 metres between the reference line and track shoe.
Approach the reference line and adjust the position of the track shoe/travel direction against the reference line in the first 5 metres, then without adjusting, allow the machine to travel 20 metres, then measure the deviation, then complete the same procedure in reverse.

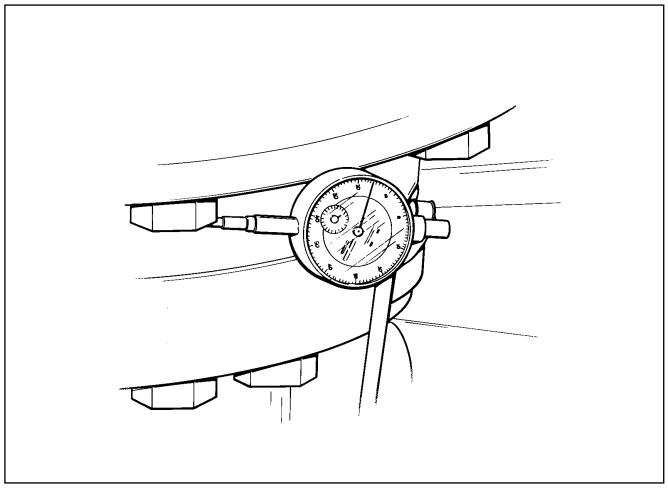




b. Slew Backlash. *

1. The conditions for checking is to position the bucket in the open position slightly above ground and the engine stopped.
2. Gently push the bucket from the side and put a mark on the ground, this becomes the 'Zero Point'.
3. Then do the same for the opposite side of the bucket and make a mark, the distance the bucket has moved is the amount of backlash.

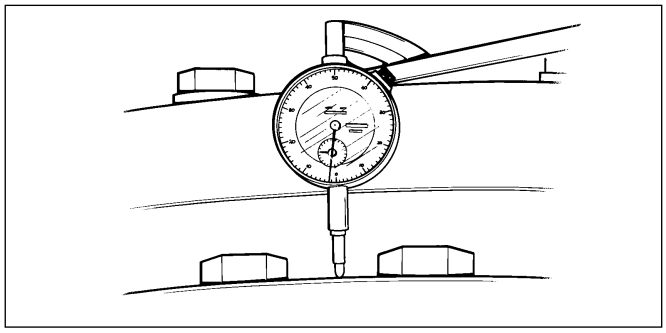
Note: *If the front attachment is pushed from side to side repeatedly or if there is leakage or the attachments are loose, correct measurement will not be possible.*
If the attachments are loose, position a dial gauge on the turntable bearing and measure the movement here.



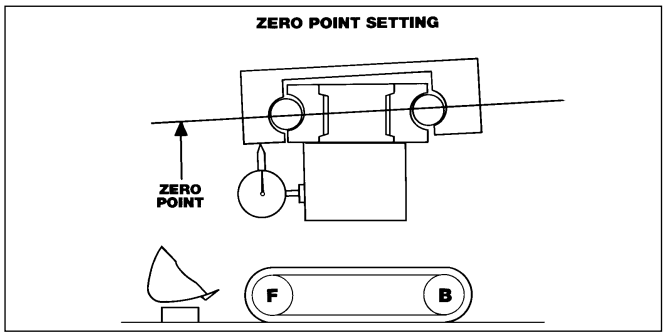
Other Measurements *(continued)*

c. Lateral Movement in turntable bearing.

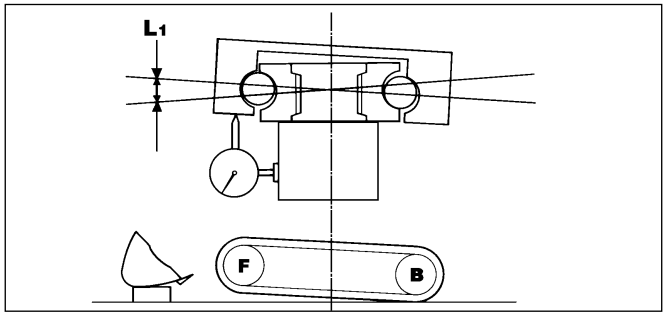
1. First set the Dipper in a perpendicular position and position the bucket 200 mm above the ground, stop the engine.



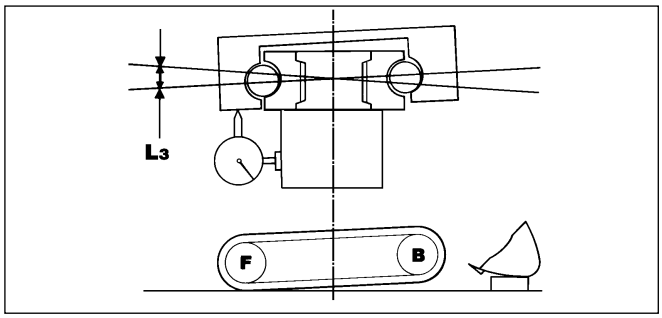
2. Install a dial gauge and set the needle to the Zero Point.



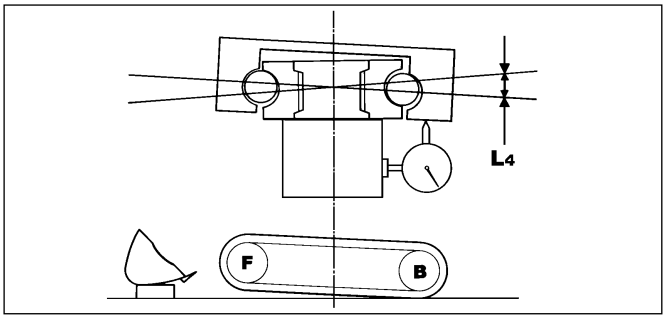
3. Start the engine and lift the main body with the bucket, when the bottom of the shoe is 100 mm above ground, note the reading on the dial gauge. The needle will turn in the counter clock wise direction. This value becomes L1, lower the body to the ground and confirm the needle reads zero.



4. Then rotate the main body 180° and repeat the procedure, this time the needle will rotate clock wise. This value becomes L3.

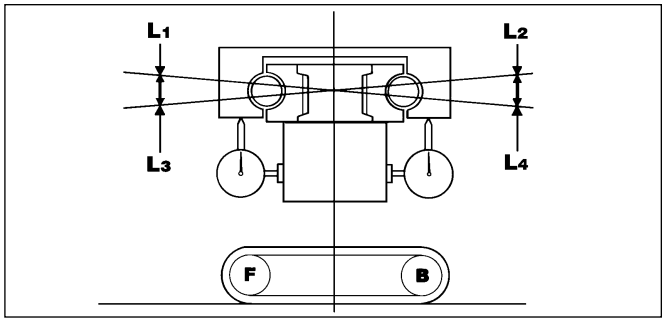


5. Next, place the dial gauge on the rear of the vehicle and repeat the two above procedures to obtain L2 and L4.



6. The lateral movement is shown as the result of the equation.

Note. *Always stop the engine when installing or removing the dial gauge or reading the dial gauge.*



Other Measurements *(continued)*

d. Slew Brake

1. The slew brake performance is measured at the minimum slew position.
Mark the turntable bearing and lower ring.

Note: *The person must stand well out of the machines slew radius on the front side, and also to confirm that no other personnel are in the vicinity.*

2. Rotate the upper body and when the machine has completed its full initial start rotation, indicate to the operator when the two marks will coincide on the next rotation. The operator then moves the lever to neutral.

3. After the swinging has stopped, measure the distance between the two indicating marks.

e. Slew Lock Characteristics.

1. The conditions for checking this is to load the bucket with soil at the maximum working radius. Then drive up a slope of 20° , then set the attachment to a 90° position relative to the direction of travel.

* **2.** Confirm with an angle gauge that the machine is at 20° and mark the turntable bearing and lower ring.

3. Stop the engine and remove the key. Measure the distance the Upper Slew Body has moved relative to the lower frame after 30 minutes.

f. Natural Internal Leakage, natural ram drop.

1. The conditions for checking are that the dipper is fully open with the bucket open.

2. Using a marker pen, mark the wiper seal on the bucket ram piston rod, then mark the wiper seal on the dipper ram rod.

3. Gently raise the dipper till the bucket is 2 m above ground.

4. Make a mark 100 mm from the wiper seal on the boom ram rod.

5. Switch the engine off and remove the key. Wait 10 minutes then measure the distance from the ground to the bucket.

Measure the movement of each:-
Ram Rod
Boom
Dipper
Bucket

Other Measurements *(continued)*

g. Amount of Hydraulic Oil squeezed out by each ram.

1. To check the amount of hydraulic fluid squeezed out by each ram rod, check the oil ring state after moving the rod 100 metres, wipe all the rods and confirm there are no scratches. Refer to the service text for the No. of reciprocations to accomplish the distance.
2. Measure the width of the oil ring on each ram rod to see if it is within specifications.

This completes the measurement procedure for the Performance Evaluation.

Checking the FOPS Structure

All excavators are designed so that an operator's protective structure can be fitted. In certain applications such as demolition, machines must be fitted with the optional Falling Objects Protection Structure (FOPS). It is the operator's responsibility to identify the risk of an application.

⚠ WARNING

If a machine requires a Falling Objects Protection Structure (FOPS), you could be killed or seriously injured if you operate the machine in a dangerous application with a damaged or missing FOPS Structure. If the FOPS has been in an accident, do not use the machine until the structure has been renewed. Modifications that are not approved by the manufacturer may be dangerous and will invalidate the FOPS certification.

8-3-5-4

Check that all the FOPS mounting bolts are in place and undamaged. Check the FOPS mounting bolts for correct torque tightness.

Torque Setting

A Torque tightness is 78 Nm (57.5 lbf ft)
B Torque tightness is 343 Nm (253 lbf ft)
C Torque tightness is 343 Nm (253 lbf ft)
D Torque tightness is 78 Nm (57.5 lbf ft)
E Torque tightness is 343 Nm (253 lbf ft)
F Torque tightness is 137 Nm (101 lbf ft)