Service Manual

Crawler Excavators

CX160

Cre 7-29061

Service Manual

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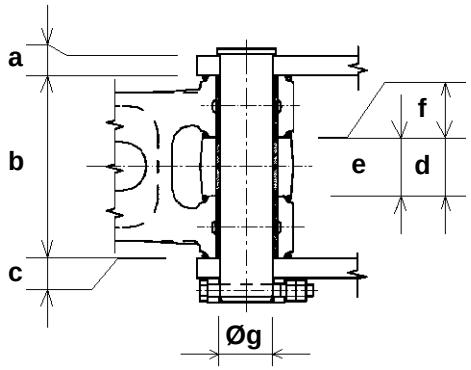
NOTES

	CX130	CX160
Attachment		
Break-out force	9740 daN	11 790 daN
Penetration force		
2.10 m dipper	8020 daN	
2.50 m dipper	6740 daN	
3.00 m dipper	5610 daN	
2.20 m dipper		9300 daN
2.70 m dipper		8010 daN
3.10 m dipper		7400 daN
Weight of components		
Engine	361 kg	
Hydraulic pump	90 kg	
Attachment control valve	140 kg	
Swing motor/reduction gear assembly	99 kg	221 kg
Travel motor/reduction gear assembly	204 kg	247 kg
Boom cylinder	108 kg	157 kg
Dipper cylinder	157 kg	210 kg
Bucket cylinder	93 kg	117 kg
Counterweight	2300 kg	2930 kg
Cab	254 kg	
Turnable bearing	188 kg	244 kg
Upperstructure	5820 kg	6780 kg
Hydraulic swivel	27 kg	
Undercarriage	3880 kg	5760 kg
Machine without attachment	9830 kg	12 540kg
Attachment	2140 kg	3030 kg
Boom	1200 kg	1470 kg
Dipper	542 kg	729 kg
Radiator and cooler set	48 kg	
Fuel tank	72 kg	
Hydraulic tank	106 kg	106 kg
Idler wheel	65 kg	82 kg
Upper roller	13 kg	17 kg
Lower roller	20 kg	36 kg
Shock absorber	63 kg	85 kg
Track 500 mm	728 kg	1061 kg
Track 600 mm	816 kg	1164 kg
Track 700 mm	970 kg	1374 kg

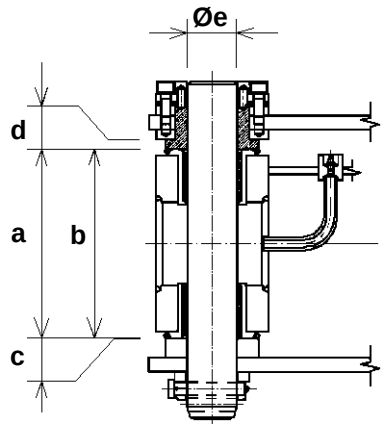
10. Connecting rod/Compensator/Bucket cylinder head



CS01B531

Marking		Dimension (mm)	
		CX130	CX160
a	Standard	32	32
	Limit	30	30
b	Standard	254	260
	Limit	252	258
c (play)	Standard	1 to 1.5	1 to 1.5
	Limit	Shims	Shims
d	Standard	92	86
	Limit	94	88
e	Standard	91	85
	Limit	93	83
f (d - e)	Standard	0.5 to 2	0.5 to 2
	Limit	Shims	Shims
Ø g (pin)	Standard	70	75
	Limit	69	74
Ø g (compensator)	Standard	70	75
	Limit	71.5	76.5
Ø g (cylinder)	Standard	70	75
	Limit	71.5	76.5

11. Dipper/Bucket



CS01B532

Marking		Dimension (mm)	
		CX130	CX160
a	Standard	255	301
	Limit	261	317
b	Standard	255	301
	Limit	253	299
c (a - b)	Standard	0 to 2.5	0 to 2.5
	Limit	Shims	Shims
d	Standard	16	16
	Limit	8	8
Ø e (pin)	Standard	65	80
	Limit	64	79
Ø e (dipper)	Standard	65	80
	Limit	66.5	81.5
Ø e (bucket)	Standard	65	80
	Limit	66.5	81.5

STEP 19

Remove the engine retaining hardware.

NOTE: *When installing, check visually the condition of the rubber flexible mountings and change them if necessary. Tighten the engine retaining screws to the torque specified in Section 1002.*

STEP 20

When nothing interferes with the removal of the engine, raise the engine carefully and install it on a suitable repair bench.

NOTE: *To install the engine, proceed in the reverse order from that of removal.*

Before using the machine carry out the following operations:

- Bleed and prime the fuel system (see Operator's Manual).
- Fill and bleed the engine cooling system (see Operator's Manual).
- Check the hydraulic system, fuel system and cooling system for leaks.
- Check the level of fluid in the hydraulic reservoir. Top up if necessary.

Installation

NOTE: *The numbers in brackets refer to the figures on pages 5 and 6.*

STEP 1

Using a hoist, position the fuel reservoir (1) on the machine.

STEP 2

Install the shims (24) as well as the four screws (23), tighten the screws to a torque, see specifications. Install the valve (3) and tighten the valve (3) to a torque of 14.7 Nm.

STEP 3

Install a new seal (22), then the fuel probe (20) using the five screws (21), reposition the plastic protection correctly (19).

STEP 4

Install the fuel oil filter (14) on the reservoir using screws (13). Install the two hoses (15) and (16) taking help of the tags installed during removal. Tighten using circlips (18) and (17).

STEP 5

Install the reservoir protection (12) using screws (10) and (11). Tighten the screws (10) and (11).

STEP 6

Install the protective plate (9) on top of the fuel reservoir (1). Tighten the screws (8).

STEP 7

Install the protective housing (7) on top of the front boot using the screws (6) then put back the screw mask.

STEP 8

Install the access ramp (5) using screws (4). Close the front boot.

STEP 9

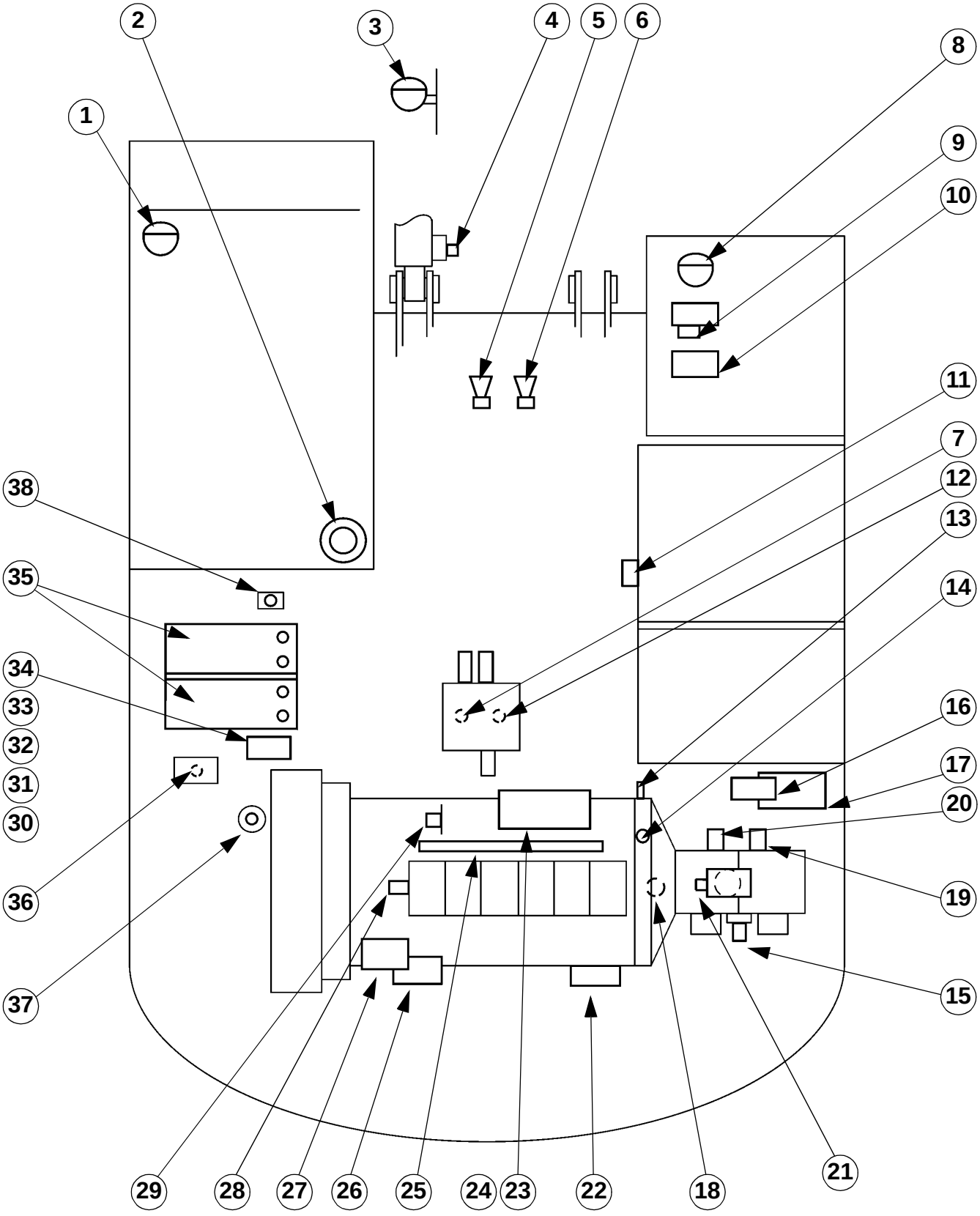
Fill the fuel reservoir (see the operator’s manual) and make sure that there are no leaks.

STEP 10

Reinstall the protective plate on top of the machine.

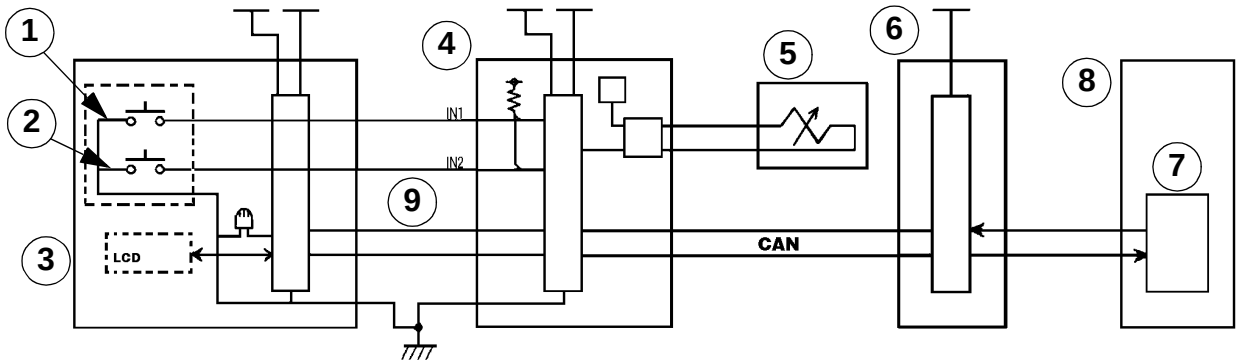
General location of components (outside the cab)

Model CX210/CX240



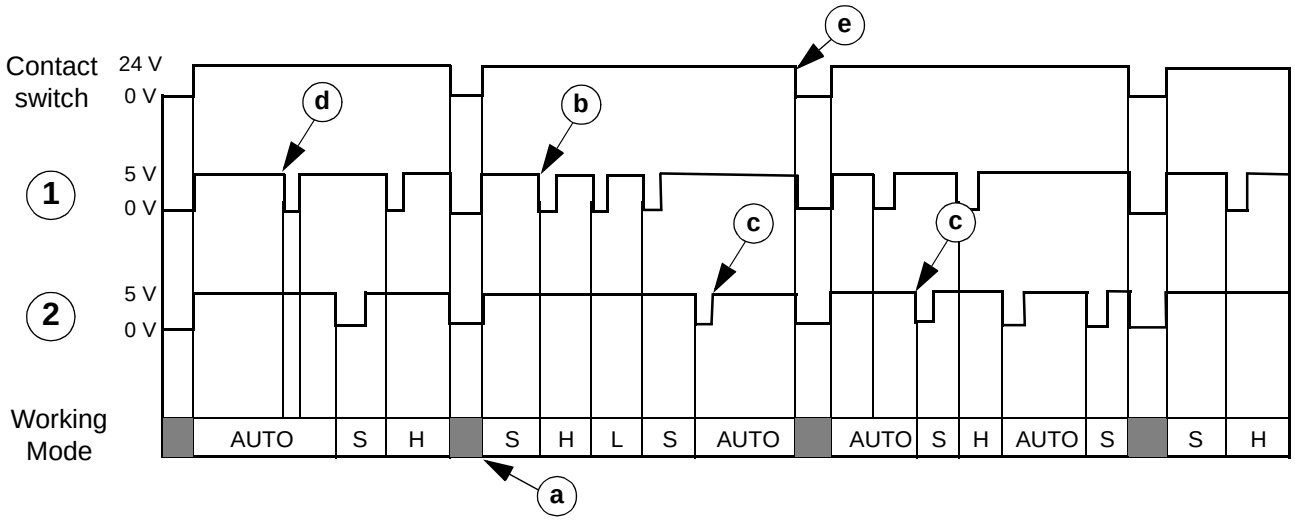
Working mode selection

1) Circuit configuration



CS00F505

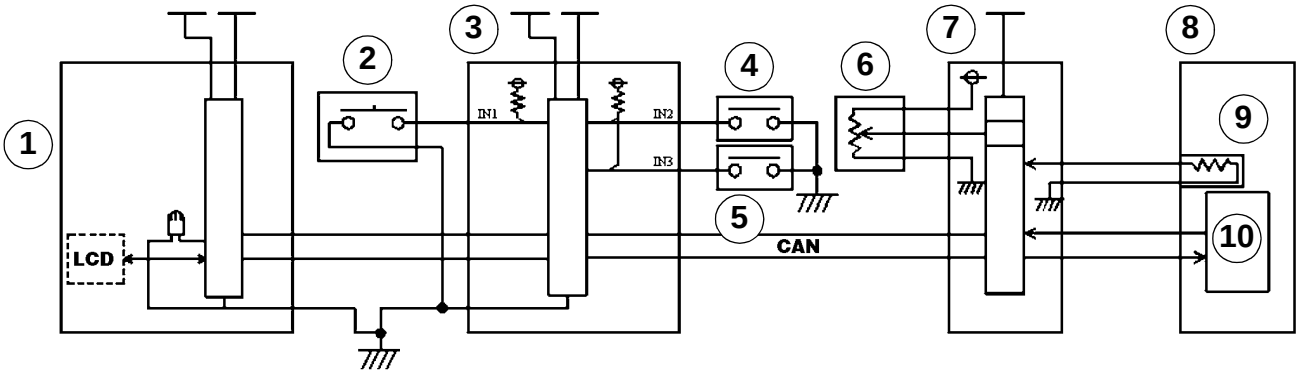
2) Timing diagram



1. Working mode switch
2. Automatic mode switch
3. Instrument panel
4. Main electronic control box
5. Proportioning valve
6. Engine electronic control box
7. Electronic acceleration
8. Engine
9. SERIES communication

Automatic engine warm-up

1) Circuit configuration



CS00F515

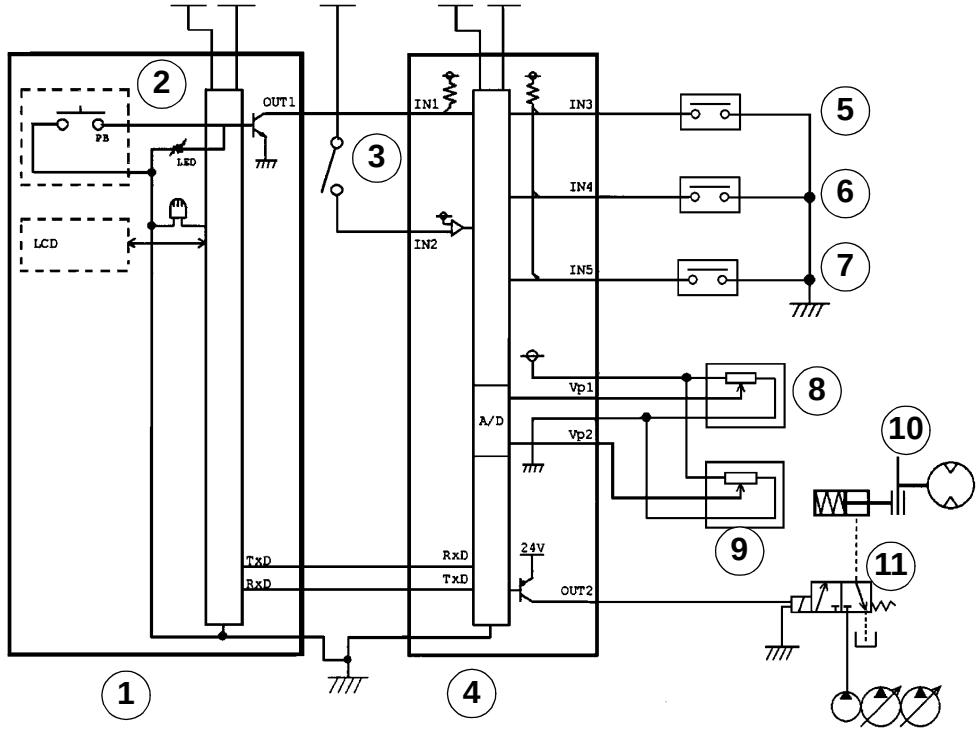
1. Instrument panel
2. Return to idle control
3. Main electronic control box
4. Pilot pressure switch
5. Travel pilot pressure switch
6. Engine throttle control
7. Engine electronic control box
8. Engine
9. Engine coolant temperature sender
10. Electronic acceleration

2) Operation

1. When the engine is started, if the coolant solution temperature is equal to or lower than 50°C, the main electronic control box (3) transmits an automatic engine warm-up signal to the engine electronic control box (7).
2. The engine electronic control box (7) manages the automatic engine warm-up.
3. Automatic engine warm-up conditions:
   - Coolant solution temperature (9) equal to or lower than 50°C.
   - Pilot pressure switch (4) and travel pilot pressure switch (5) not on.
   - Return to idle control (2), not on.
   - Position of engine throttle control (6), unchanged.
   - Engine speed not higher than 1800 rpm for 3 minutes.
4. If one of the above conditions is not present, the automatic engine warm-up does not operate. To perform the engine warm-up again, the engine has to be shut down and re-started.
5. When automatic engine warm-up is operating, "AUTO WARM UP" is displayed on the control screen (LCD).

Swing brake

1) Circuit configuration



CS00F503

1. Instrument panel
2. Swing brake switch
3. Starter motor switch
4. Main electronic control box
5. Swing pilot pressure switch
6. Pilot pressure switch
7. Travel pilot pressure switch
8. Pressure detector P1
9. Pressure detector P2
10. Swing brake
11. Swing brake solenoid valve

2) Swing brake control operation

When the swing brake switch (2) is operated, the red LED comes on and the swing brake locks.

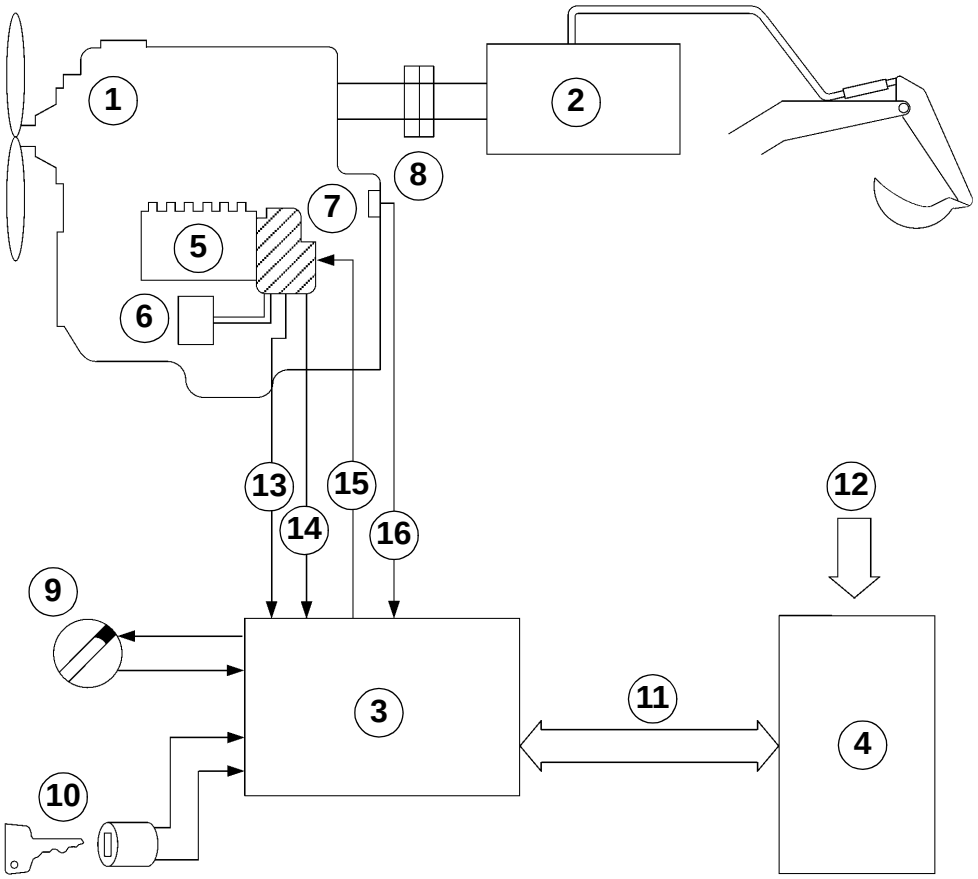
When the swing brake switch is operated again, the red LED goes out, the swing brake unlocks and changes to automatic control (see paragraph 4).

While the swing is locked, the transistor OUT2 output is activated and the swing brake (10) is locked.

The swing brake remains in the previous state even when the ignition is switched off.

Engine fuel injection pump electronic regulator

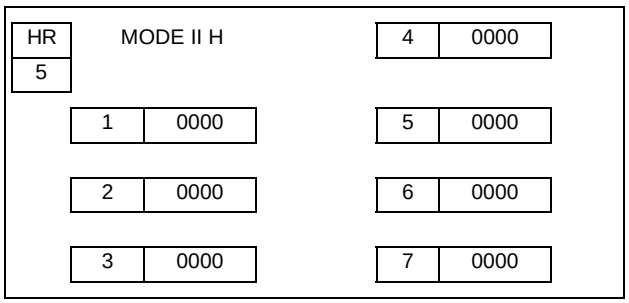
1) Circuit configuration



CM00F010

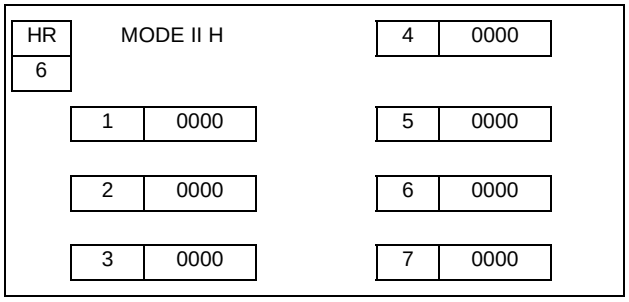
1. Engine
2. Hydraulic system
3. Engine electronic control box
4. Main electronic control box
5. Fuel injection pump
6. Fuel flow regulating resistance
7. Electronic regulator
8. Engine speed detector
9. Throttle control
10. Starter motor switch
11. CAN connection
12. Detector and sender information input
13. Engine speed signal
14. Rack position detector signal
15. Rack control signal
16. Engine speed detector signal

5. Screen HR5, operating time of the various P2 pressures



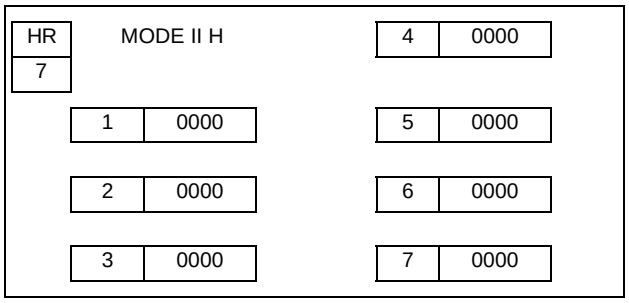
1: 100 bar (10 MPa) or lower
2: Between 100 bar (10 MPa) and 150 bar (15 MPa)
3: Between 150 bar (15 MPa) and 200 bar (20 MPa)
4: Between 200 bar (20 MPa) and 250 bar (25 MPa)
5: Between 250 bar (25 MPa) and 300 bar (30 MPa)
6: Between 300 bar (30 MPa) and 350 bar (35 MPa)
7: 350 bar (35 MPa) or above

6. Screen HR6, operating time of the various engine speeds



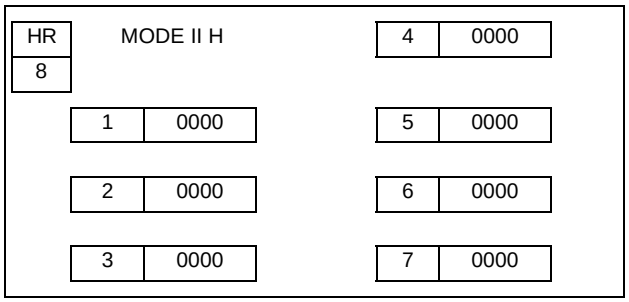
1: 1200 rpm or lower
2: Between 1200 rpm and 1400 rpm
3: Between 1400 rpm and 1600 rpm
4: Between 1600 rpm and 1800 rpm
5: Between 1800 rpm and 2000 rpm
6: Between 2000 rpm and 2200 rpm
7: 2200 rpm or higher

7. Screen HR7, operating time of the various engine water temperatures



1: 77°C or lower (1st and 2nd bar)
2: 77°C to 82°C (3rd bar)
3: 82°C to 97°C (4th bar)
4: 97°C to 100°C (5th bar)
5: 100°C to 103°C (6th bar)
6: 103°C to 105°C (7th bar)
7: 105°C or higher (8th bar)

8. Screen HR8, operating time of the various hydraulic oil temperatures



1: 45°C or lower (1st and 2nd bar)
2: 45°C to 60°C (3rd bar)
3: 60°C to 80°C (4th bar)
4: 80°C to 88°C (5th bar)
5: 88°C to 95°C (6th bar)
6: 95°C to 98°C (7th bar)
7: 98°C or higher (8th bar)

Reading the organisation charts

Error code and description of problem

The error code and the description of the problem are shown in the organisation charts

Error code	Description of the problem
1	The message is still displayed even after refuelling
2	The message is still displayed even after adding coolant solution

Prior checks

Before identifying the cause of the problem, always make prior checks.

Procedure method

After checking or measuring the items described in one step, depending on the results, choose YES or NO and pass on to the next step.

The description in the YES or NO refers directly to the cause of the problem as the result of checks or measurements made. Refer to the description of the cause and carry out the repair procedures described on the right-hand side.

The inspection methods/measurements are described in one step. YES should be chosen if the criteria or questions meet the situation; NO if they do not meet it.

The necessary preparation work, operating method and the criteria are described under one step. This should be carefully read before starting the inspection and the measurements and the procedures should be followed, starting by Step (1) since negligent preparation work or incorrect operating methods can cause damage to the machine.

Wire colour

When troubleshooting, refer to the table below for the wire colours. (For connector numbers, refer to the following pages).

Table showing wire colours

Symbol	Wire	Symbol	Wire
B	Black	R	Red
W	White	Y	Yellow
Br	Brown	Lg	Light green
P	Pink	Sb	Sky blue
V	Violet	L	Blue
G	Green	Gr	Grey
O	Orange		

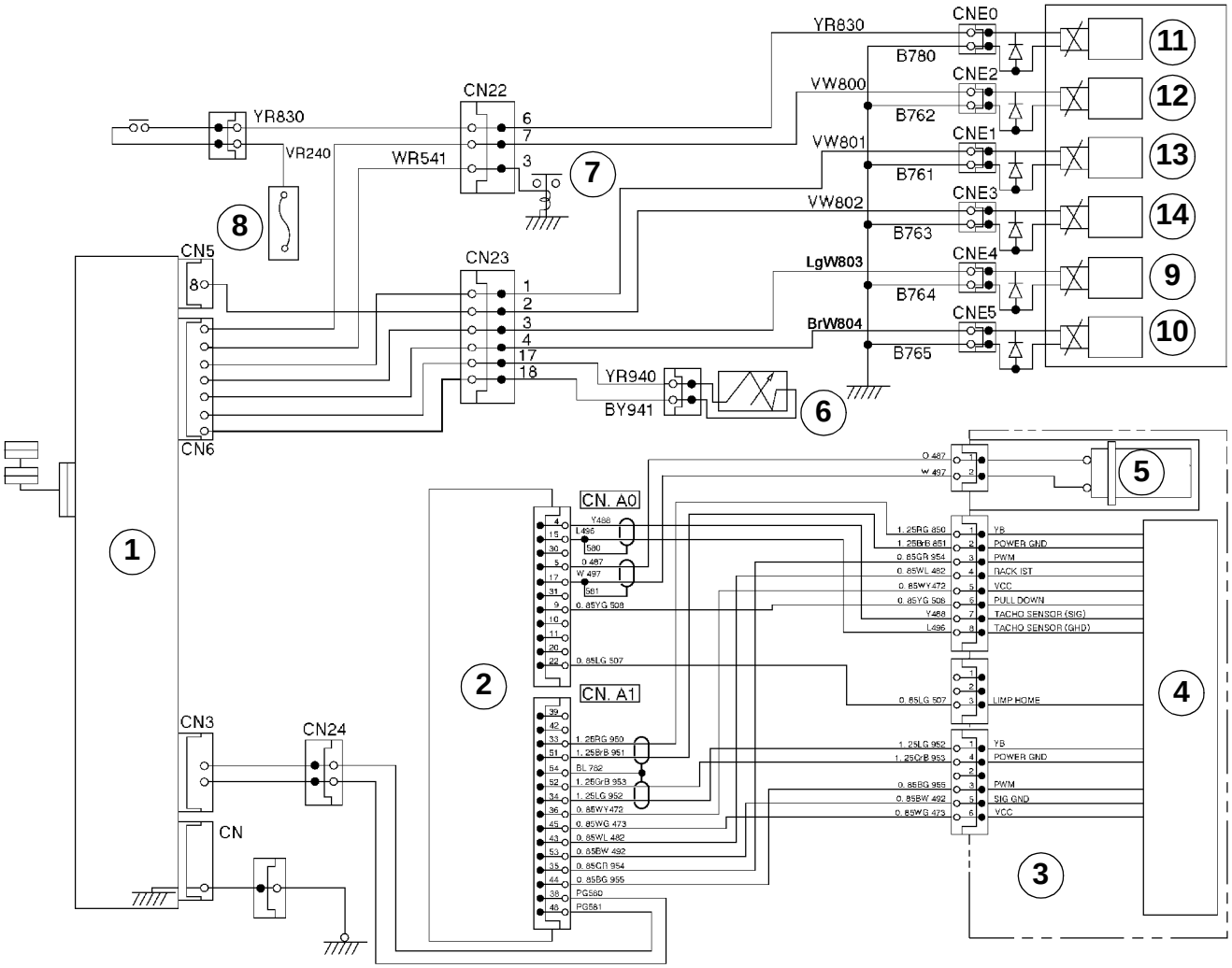
BR indicates colour B striped with R.
Example: BR indicates a black wire with red stripes

IMPORTANT: *Before removing or installing a connector, always turn the ignition key to OFF.*

Electrical system troubleshooting

Description of problem No. 6

- The message is still displayed

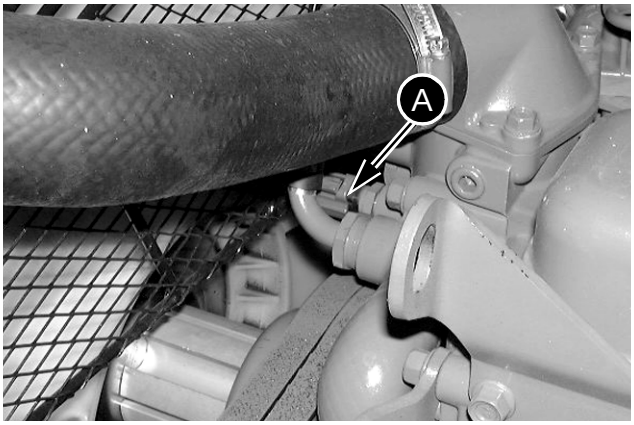


CS00F528

1. Main electronic control box
2. Engine electronic control box
3. Engine
4. Electronic regulator
5. Engine speed detector
6. Proportioning valve
7. Battery relay
8. Fuse
9. Shock absorbing solenoid valve
10. Swing cancellation solenoid valve
11. Function locking solenoid valve
12. Swing brake solenoid valve
13. Travel 2nd speed solenoid valve
14. Power boost solenoid valve

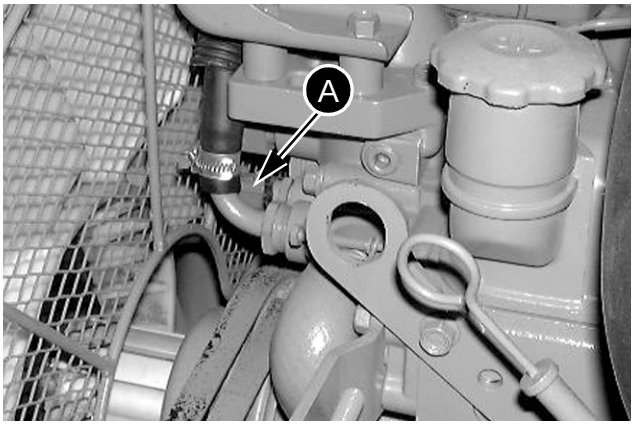
Engine coolant and hydraulic oil temperature senders

CX130/CX160

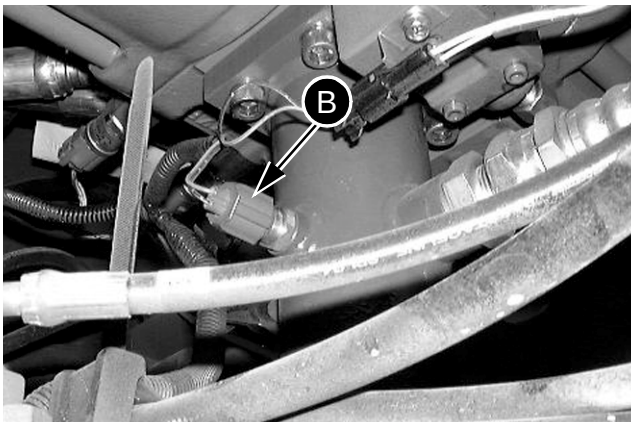


CD00F026

CX210/CX240



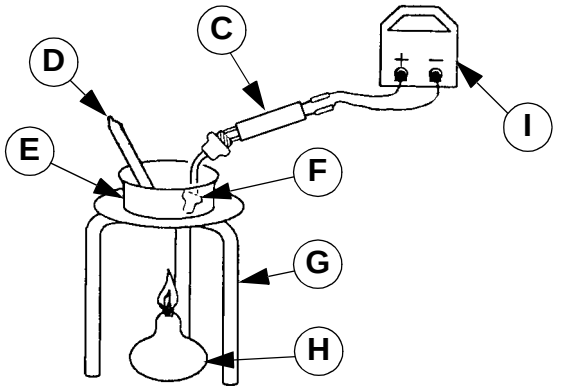
CD00F027



CD00F028

A. Coolant temperature sender
B. Oil temperature sender

1. Remove the coolant temperature sender (A) or the oil temperature sender (B) from the machine.



CS99A851

C. Service connector (2P)
D. Thermometer
E. Beaker
F. Temperature sender
G. Tripod
H. Spirit lamp
I. Meter

2. Connect the appropriate service connector (2P) to the temperature sender and install the meter.

3. When the connection has been made, place the sender in the beaker and gradually increase the temperature in the beaker using the spirit lamp and check the resistance value.

Temperature	Coolant temperature sender	Oil temperature sender
20°C	6.08 kΩ	2.45 kΩ
30°C	4.24 kΩ	1.66 kΩ
40°C	3.02 kΩ	1.15 kΩ
50°C	2.18 kΩ	0.81 kΩ
60°C	1.61 kΩ	0.58 kΩ
70°C	1.20 kΩ	0.43 kΩ
80°C	0.91 kΩ	0.32 kΩ

BATTERY CHARGING GUIDE

Recommended rates* and duration for a completely discharged battery.

Capacity of the battery **See "Reserve" in the specifications on page 3**	**Slow charging**	**Quick charging**
80 minutes maximum	10 hours at 5 amps 5 hours at 10 amps	2.5 hours at 20 amps 1.5 hour at 30 amps
Between 80 and 125 minutes	15 hours at 5 amps 7.5 hours at 10 amps	3.75 hours at 20 amps 1.5 hour at 50 amps
Between 125 and 170 minutes	20 hours at 5 amps 10 hours at 10 amps	5 hours at 20 amps 2 hours at 50 amps
Between 170 and 250 minutes	30 hours at 5 amps 15 hours at 10 amps	7.5 hours at 20 amps 3 hours at 50 amps
In excess of 250 minutes	24 hours at 10 amps	6 hours at 40 amps 4 hours at 60 amps
* Initial rate for a standard charger.		

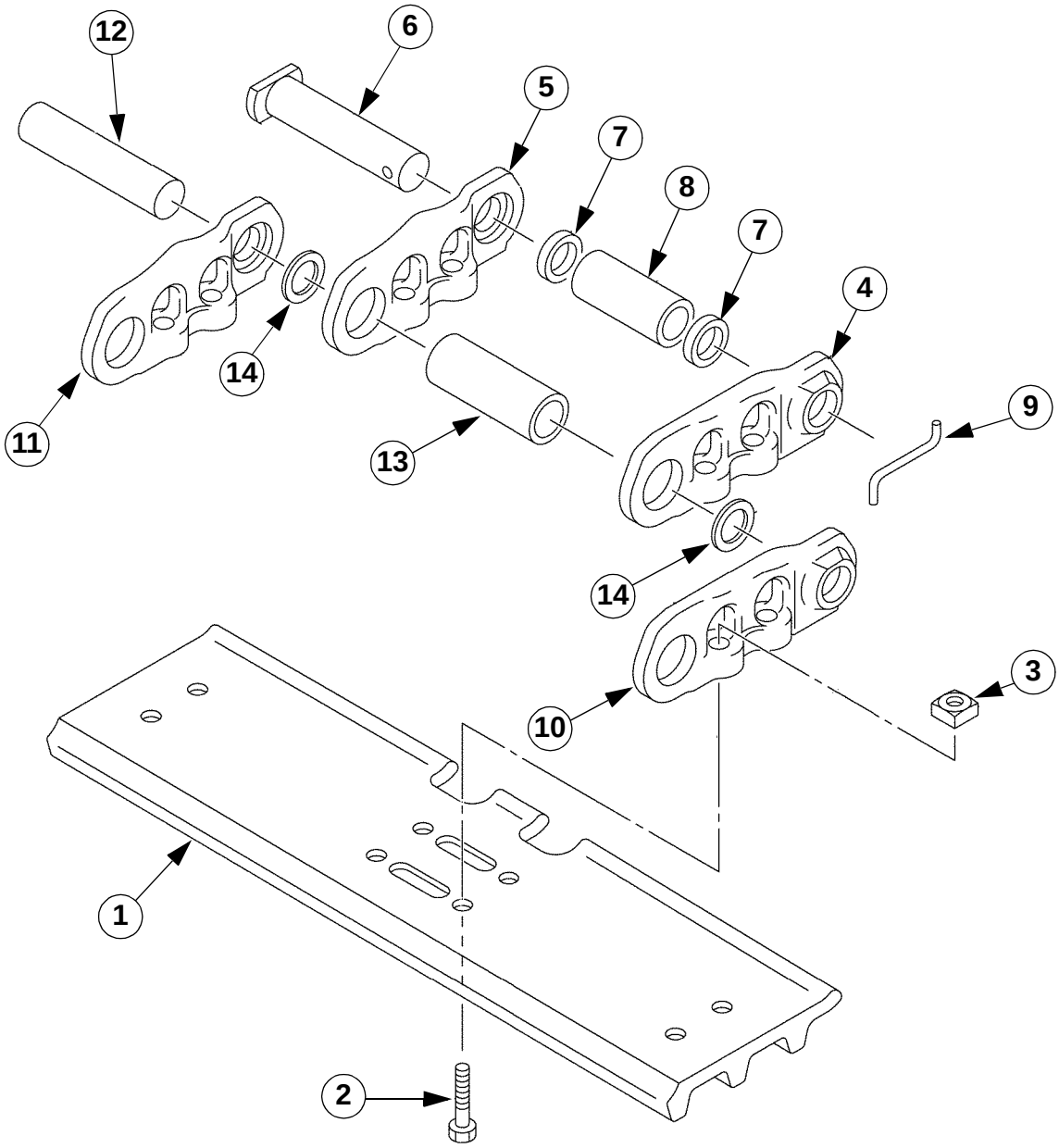
PREPARING A DRY CHARGED BATTERY FOR USE

1. Remove the plugs from the battery.
2. Fill each cell with electrolyte, up to the top of the separators. This is because the electrolyte volume can increase when it is heated by being on charge.
3. Install the plugs on the battery.
4. Connect the battery charger to the battery.
5. Charge the battery at 30 amps until the specific gravity reaches 1.250 minimum and the temperature of the electrolyte reaches at least 15.5°C.
6. If necessary, add electrolyte to each cell until the maximum level indicator is reached (uppers) which corresponds to a value of 10 to 15 mm above the battery polarity plates.

TRACKS SET

Description

Lower mechanism



CI00E511

1 TRACK PAD
2 SCREW
3 NUT
4 END OF CHAIN PIN HALF-LINK
5 END OF CHAIN HALF-LINK
6 END OF CHAIN PIN
7 SHIM
8 END OF CHAIN PIN SPACER
9 RETAINER PIN
10 RH STANDARD TRACK PIN HALF-LINK
11 LH STANDARD TRACK PIN HALF-LINK
12 STANDARD TRACK PIN
13 STANDARD TRACK PIN SPACER
14 UNION

TABLE OF CONTENTS

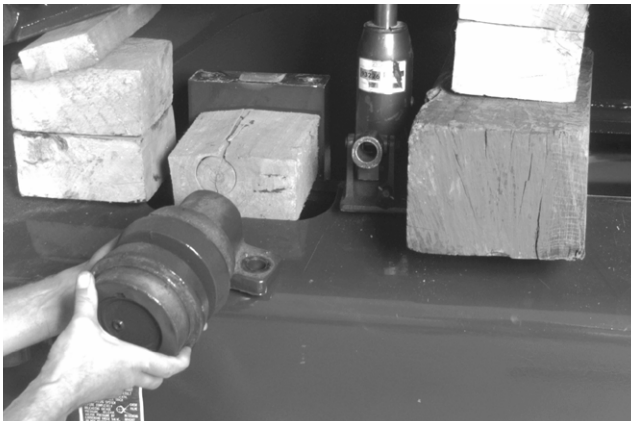
WARNING: *This symbol is used in this manual to indicate important safety messages. Every time you see this symbol, read carefully the message that follows, as it indicates that there is a risk of serious injury.*

STEP 5

JD00319A

Loosen the two screws (1) holding the upper roller to the undercarriage. Using a soft peening hammer, tap gently on the upper roller to separate it from the undercarriage.

STEP 6



JD00320A

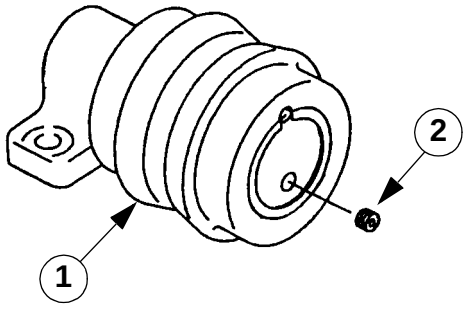
Support the upper roller. Remove the two screws holding the upper roller to the undercarriage. Remove the upper roller.

Reconditioning

When the upper roller is worn or is leaking, it must be reconditioned or a new upper roller installed. See Section 1002 for wear limits.

Disassembly

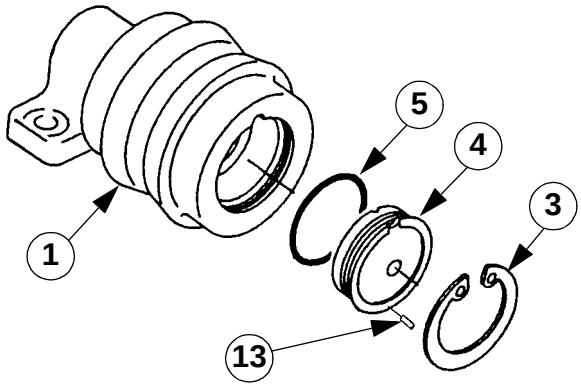
STEP 1



JS00322A

Clean the upper roller (1) using a suitable solvent. Remove the drain plug (2) and drain the oil.

STEP 2

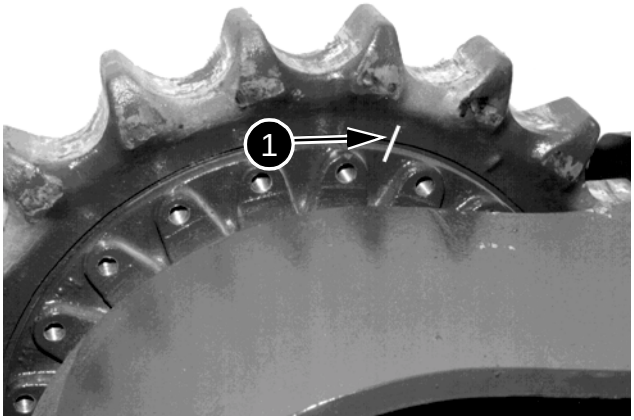


CS01B538

Remove the snap ring (3), the cover (4) and the roll pin (13) from the upper roller (1). Remove and discard the O-ring (5) from the cover.

Installation

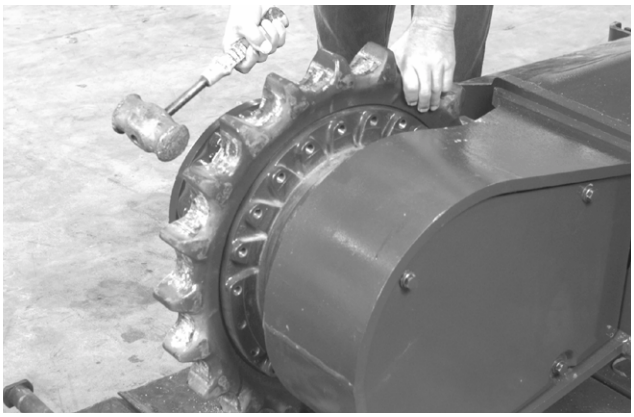
STEP 1



JD00292A

Install the sprocket on the drive reduction gear, ensuring that the alignment marks (1) are lined up correctly.

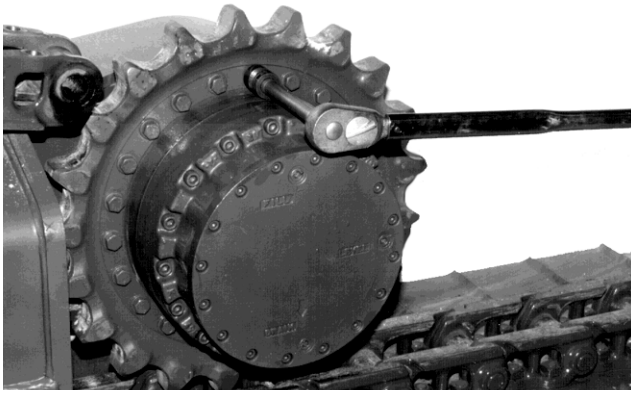
STEP 2



JD00295A

If necessary, use a soft-faced hammer to seat the sprocket correctly on the reduction gear flange.

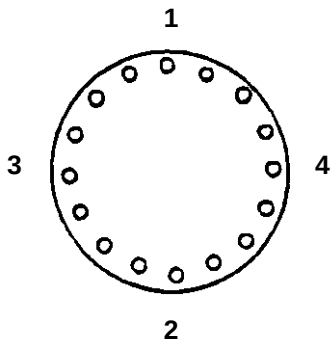
STEP 3



JD00293A

Apply Loctite 262 to the screw threads (2). Assemble the hardened washers and the screws.

STEP 4



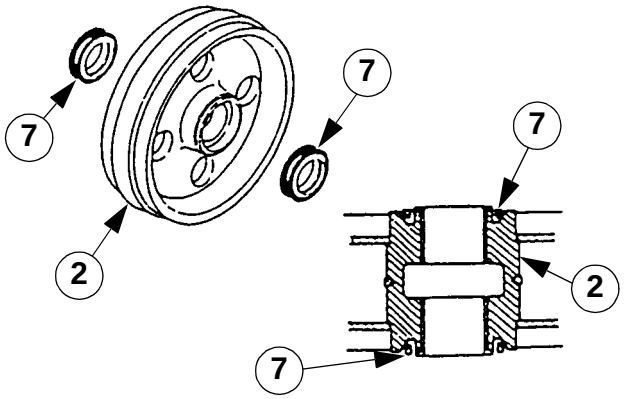
JS00296A

Tighten the four screws in the order shown to the specified torque, see "specifications". Then progressively tighten the remaining screws to the same torque setting.

STEP 5

See "Removing and installing a set of tracks" for installing the tracks.

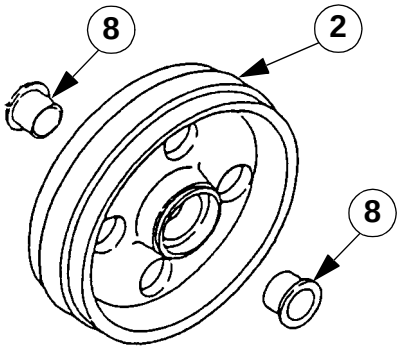
STEP 6



JS00353A

Remove and scrap the face seal (7) from the idler wheel (2) using a screwdriver or suitable tool. Make sure you do not damage the idler wheel seal bore.

STEP 7



JS00354A

NOTE: *Carry out this step only if the inspection in step 3 reveals that the bushings (8) have to be changed.*

Using a hammer and a brass drift, drive the bushings (8) out of the idler wheel (2). Make sure you do not damage the idler wheel seal bore.

Inspection

STEP 1

Clean all the components with cleaning solvent. Also clean the cavity in the idler wheel. Dry all the components with compressed air at low pressure and apply clean oil to all the components.

STEP 2

Inspect the bushing surfaces on the shaft for scoring, pitting, and other damage. Measure the diameter of the shaft at four opposing points. Compare the values with the specifications. Change them if necessary.

STEP 3

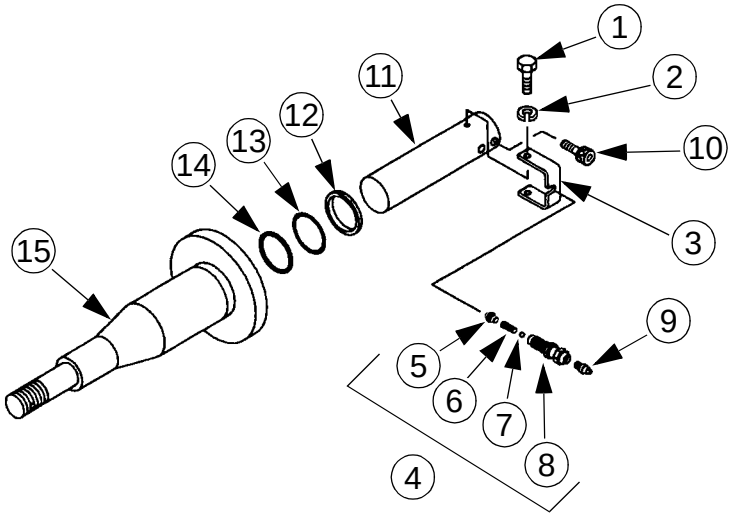
Check for wear and damage to the bushings. Measure the inner diameter and width of the bushing. Compare the values with the specifications. Change them if necessary.

STEP 4

Check for damage which could give rise to leaks at the hub seal and idler wheel bores. Replace the components with new components as required. Measure the depth of the hub seal bores. Compare the values with the specifications. Change them if necessary.

TRACK TENSION CYLINDER (CX210)

Description



5002-108

1 SCREW
2 LOCKING WASHER
3 BRACKET
4 NON-RETURN CHECK VALVE ASSEMBLY
5 POPPET
6 SPRING
7 BALL
8 BODY
9 GREASE FITTING
10 SCREW
11 CYLINDER ROD
12 WIPER SEAL
13 THRUST RING
14 O-RING
15 CYLINDER BARREL

Removal

STEP 1

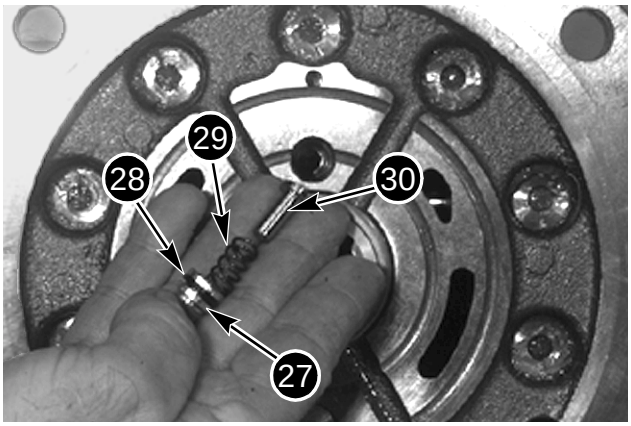
Carry out the procedure for the removal of the idler wheel and the tension shock absorber.

STEP 2

Carry out the procedure for the removal of the tension shock absorber.

NOTES

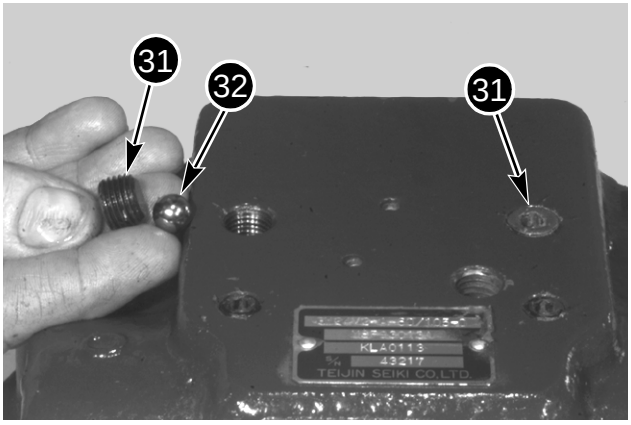
STEP 18



JD00852A

Remove the valve seat (27) using a suitable tool. Remove the spring (29) and the check valve (30). Remove and scrap the O-ring (28) from the valve seat.

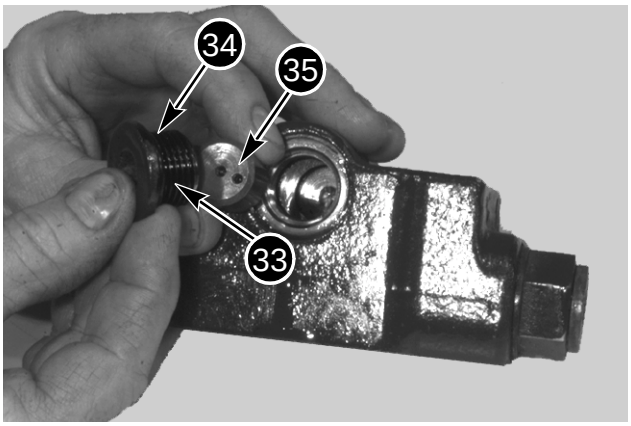
STEP 19



JD00853A

Remove the plugs (31). Turn the motor the other way up (6) and remove the balls (32).

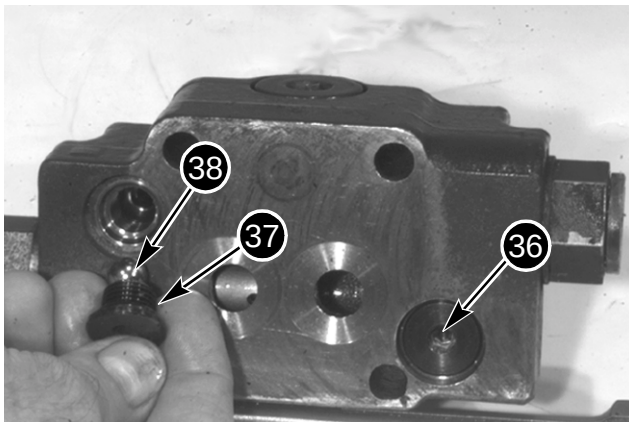
STEP 20



JD00854A

Remove the plug (33) and the piston (35) from the safety valve block (3). Remove and scrap the O-ring (34) from the plug (33).

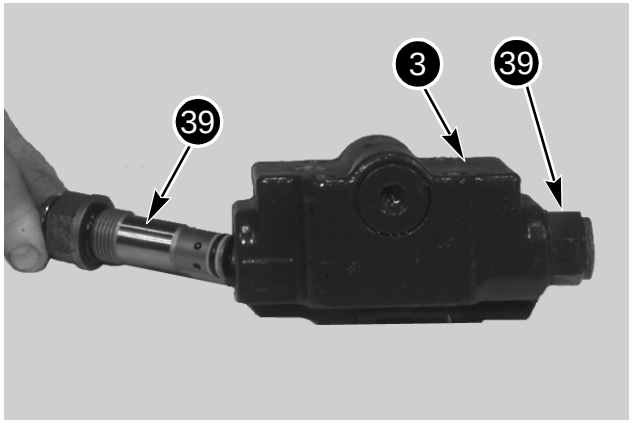
STEP 21



JD00855A

Remove the plugs (36). Turn the safety valve block the other way up (3) and remove the balls (38). Remove and scrap the O-ring (37) from each plug.

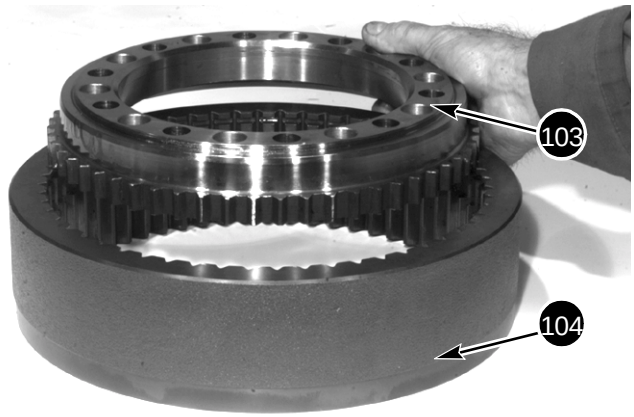
STEP 22



JD00856A

Remove the safety valve (39) from the safety valve block (3).

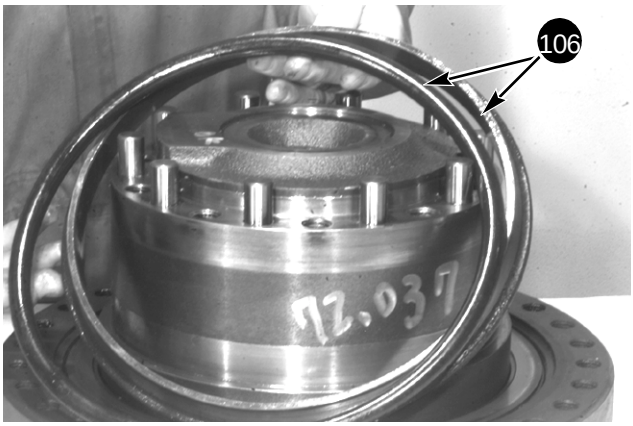
STEP 66



JD00901A

Remove the retaining crown (103) from the crown wheel (104).

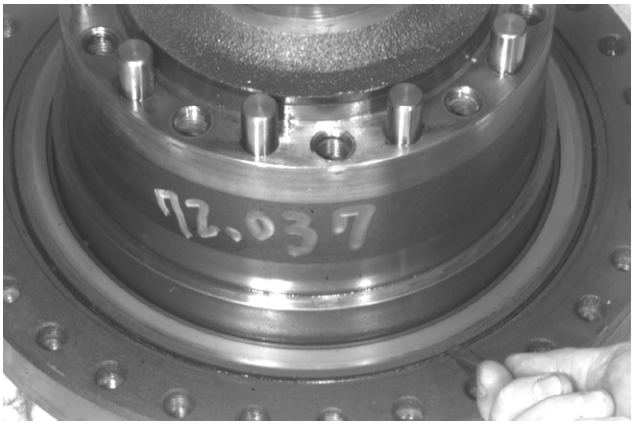
STEP 67



JD00902A

Remove the floating seal (106). Remove and scrap the O-ring from the metal ring.

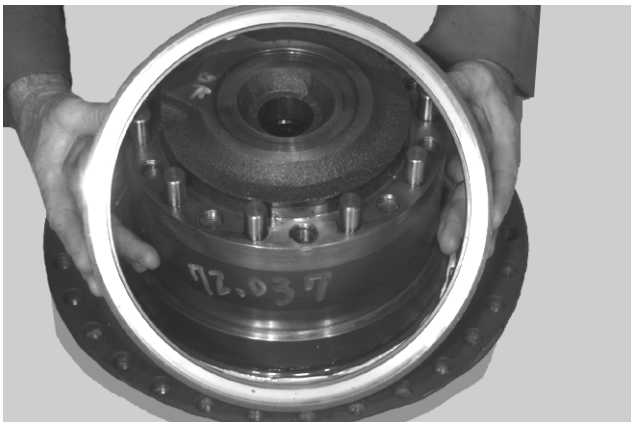
STEP 68



JD00903A

Using a screwdriver, raise the metal ring (107).

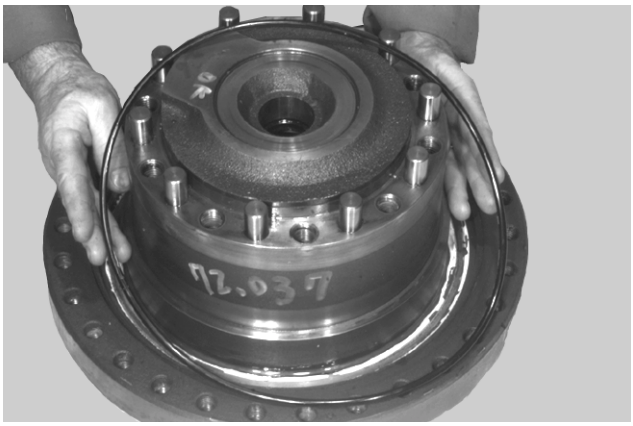
STEP 69



JD00904A

Remove the metal ring (107) from the knuckle (101). Scrap the metal ring.

STEP 70



JD00905A

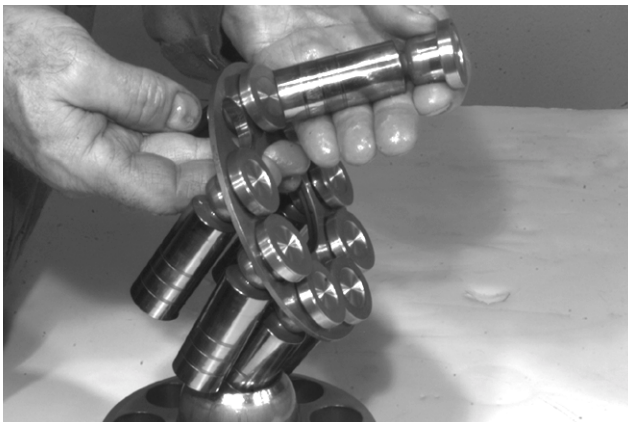
Remove the O-ring (108) from the knuckle (101). Scrap the O-ring.

STEP 71

JD00906A

Using a screwdriver, remove the lip seal (81) from the knuckle (101).

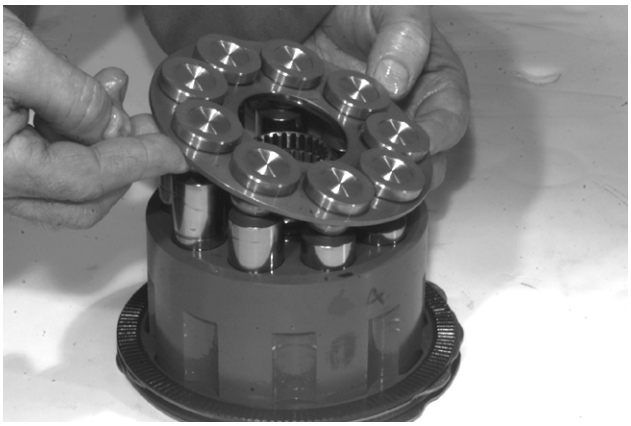
STEP 28



JD00866A

Install the pistons (64) in their original orifices on the thrust plate (63).

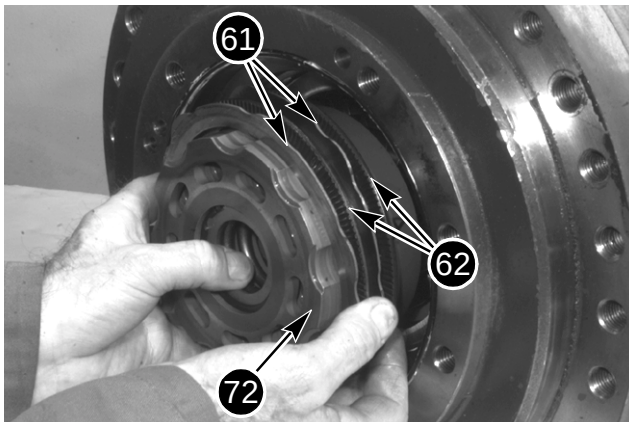
STEP 29



JD00865A

Install the piston (64) / thrust plate (63) assembly in the original orifices in the cylinder block (72).

STEP 30

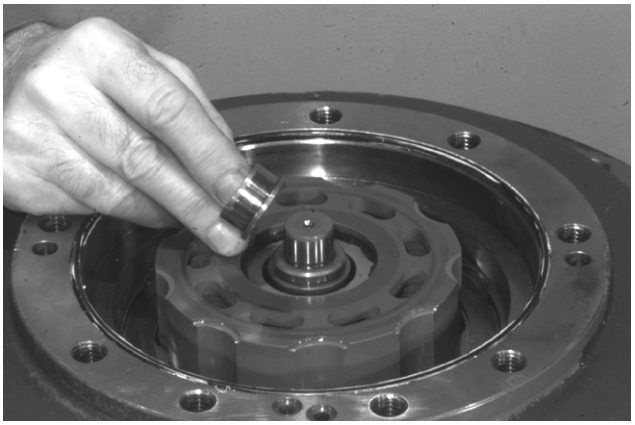


JD00864A

Install cylinder block (72) assembly in the knuckle (101). Orient the knuckle/hub assembly so that the motor mounting surface is facing upwards. Turn the cylinder block (72) assembly by hand and check there is no play. If there is play, disassemble the cylinder block assembly again and correct the assembly. Then repeat this step.

NOTE: *Perform step 31 only if the bearing inner race (8) has been removed, otherwise, pass on to step 32.*

STEP 31



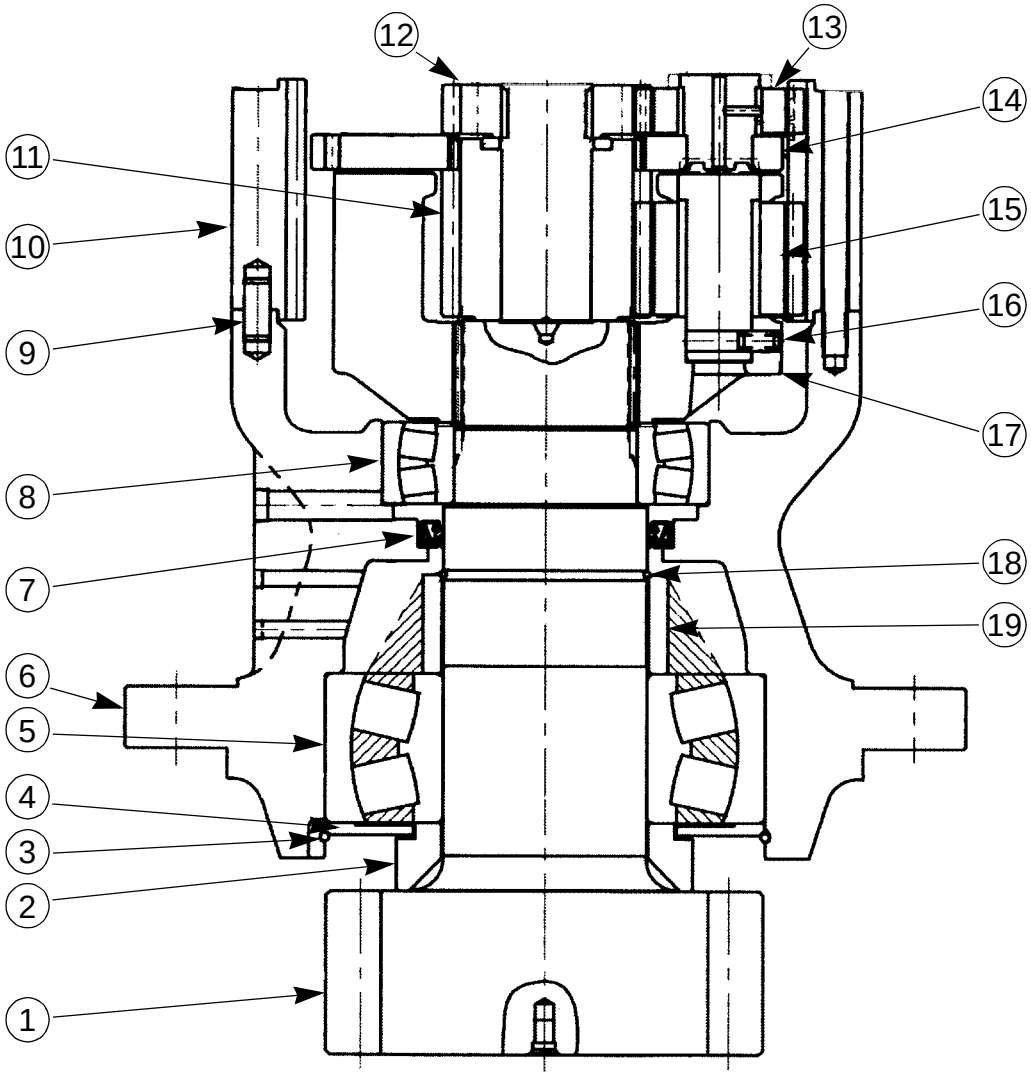
JD00863A

WARNING: *Use thermally insulated gloves when handling hot parts.*

Heat the bearing inner race (8) to a temperature of between 90 and 110°C. Using a suitable sleeve, install the bearing inner race (8) on the shaft (79).

SWING REDUCTION GEAR

Description



CI00K508

1 PINION SHAFT
2 STOP
3 SNAP RING
4 RETAINING PLATE
5 SPHERICAL ROLLER BEARING
6 HOUSING
7 LIP-SEAL
8 SPHERICAL ROLLER BEARING
9 DOWEL PIN
10 RING GEAR
11 SECOND STAGE SUN GEAR
12 FIRST STAGE SUN GEAR
13 PLANETARY GEAR
14 FIRST STAGE PLANET WHEEL CARRIER
15 PLANETARY GEAR
16 ROLL PIN
17 SECOND STAGE PLANET WHEEL CARRIER
18 SNAP RING
19 SPACER

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PREPARATION BEFORE INSPECTION

WARNING: *Hydraulic fluid output under pressure can penetrate the skin. Hydraulic fluid can also cause or infect a slight skin cut. In the event of being injured by hydraulic fluid under pressure, consult a doctor immediately. Any delay in obtaining treatment for an injury can cause a serious infection or reaction. Before pressurising the circuits, make sure that all the outlets are correctly tightened and that the hoses and pipes are in good condition. Release pressure in the circuits completely before disconnecting pipes or carrying out any operation on the hydraulic system. Always use a small piece of cardboard or wood to detect leaks of fluid under pressure. Never use your hands.*

WARNING: *Any incorrect use or maintenance of a construction machine can cause accidents. Only persons who have read, understood and who observe the instructions in the operator's manual are accredited to use or maintain this machine.*

WARNING: *The accumulator of this machine is charged with nitrogen under pressure. In the event of incorrect operation of the circuit, change the accumulator. Never try to repair it. Non-observance of these instructions and the procedure shown below can cause serious or fatal injury.*

Releasing pressure in the hydraulic system

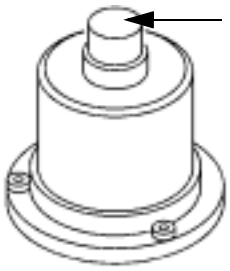
NOTE: *Process to be followed before every operation on the hydraulic circuit.*

1. Position the machine on hard, flat ground.
2. Open the bucket until the cylinder rod is completely retracted.
3. Extend the dipper until the cylinder rod is completely retracted. Lower the boom so that the end of the dipper is resting on the ground. Lower the tool to the ground.
4. Check in "S" mode on the diagnostic screen that the following values are respected.

CHK	MODE II S			ENG	1950	rpm
1						
	P1	030.0	MPa	I	0450	mA
	P2	030.0	MPa	WT	0080	°C
	N	03.00	MPa	OT	0055	°C

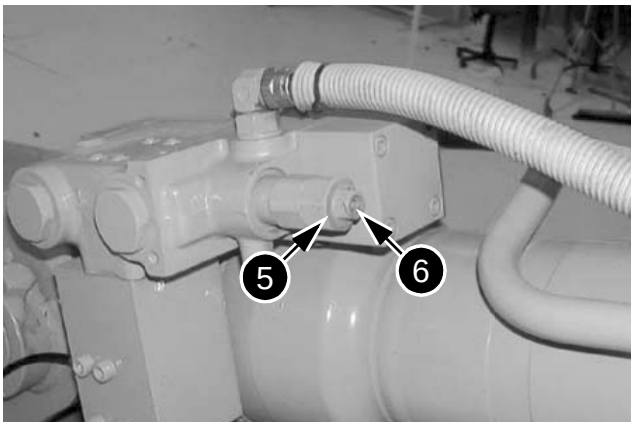
	CX130	CX160	CX210	CX240
Engine speed	1950 rpm	2050 rpm	1800 rpm	2000 rpm
Amperage	450 mA	490 mA	292 mA	307 mA

5. Lower the engine speed to idle for 30 seconds, then shut down the engine.
6. Turn the starter key switch to "ON", without starting the engine.
7. Lower the pilot control cancellation lever.
8. Operate each control 10 times in both directions to release pressure in the circuits.



CS00E544

9. Press the button located on the hydraulic reservoir breather to release pressure in the reservoir.

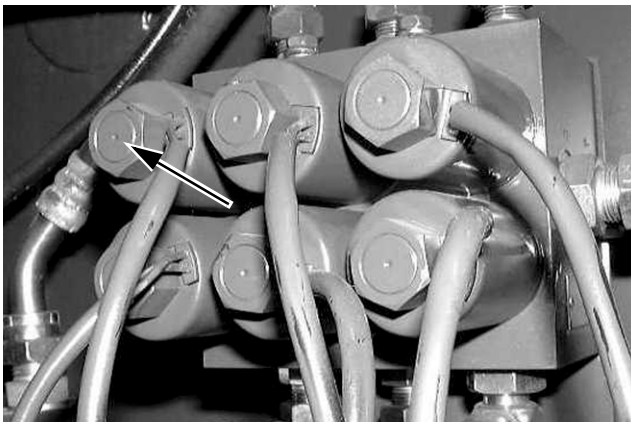


CD01B016

If the value is not correct, loosen the lock nut (5) and turn the setting screw (6) in order to adjust the pressure. Tighten to increase, loosen to reduce the pressure. While turning the dipper retracting control, tighten the lock nut again (5). Shut down the engine. To decompress the small chamber dipper cylinder, first reconnect the pilot hose (1). Start the engine in order to fill the accumulator. Shut down the engine. Decompress the hydraulic system. Disconnect the pressure detector union (4). Fit the plug again (3).

Swing secondary relief valves (I, J)

Test



CD00E143

1. Disconnect the swing solenoid valve connector (green).
2. Display the diagnostic screen "CHK1".
3. Start the engine and select the mode "S".
4. Switch on the swing brake control on the instrument panel (indicator lamp ON).
5. Slowly operate the swing lever to the right, then gradually increase engine speed to full speed to ensure that the swing is locked.
6. Repeat Step 5 for the LH swing, the pressures should be:

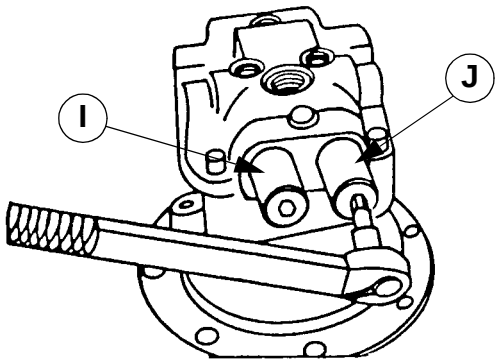
Function	CX130/CX160	
RH swing	P2	**279±4 bar** (27.9±0.4 MPa)
LH swing	P2	**279±4 bar** (27.9±0.4 MPa)

Function	CX210		CX240	
RH swing	P1	**279±4 bar** (27.9±0.4 MPa)	P1	**290±4 bar** (29±0.4 MPa)
LH swing	P1	**279±4 bar** (27.9±0.4 MPa)	P1	**290±4 bar** (29±0.4 MPa)

For the machines CX130, CX160 and CX210, note down the pressures if they are not correct in order to determine the number of shims required for adjustment. **One 0.1 mm shim corresponds to 5 bar of pressure**.

Adjustment

CX130/CX160/CX210



CS99B596

(I) RH swing secondary relief valve
(J) LH swing secondary relief valve

1. Remove the secondary relief valve concerned from the swing motor. If both secondary relief valves have to be removed, mark them ready for reassembly.

No movement on any function

(Control cancellation lever in the low position)

No.	Tests	Results	Repairs
1	Check the hydraulic oil level	Lack of hydraulic oil	Top up as required
2	Check the pilot pressure at P3	Pressure below 30 bar (3.0 MPa)	Adjust the pilot circuit secondary relief valve, change it if necessary
3	Check the pilot pressure at outlet port B on the 6 solenoid valve block	Pressure below 30 bar (3.0 MPa)	Check electrical supply and the solenoid valve coil (No. 4 and 5)
4	Check the voltage at the pilot solenoid valve connector (blue)	Voltage < 24 V	Check the electrical supply and mechanical adjustment of the controls cancellation contact switch. Check the harness between the contact switch and the solenoid valve
5	Check the pilot solenoid valve coil	Infinite or 0 Ohm	Change the solenoid valve
		About 40 Ohm	Change the solenoid valve coil

Lack of power or speed on one of the attachment movements

(No problems with other movements)

No.	Tests	Results	Repairs
1	Check the P1 or P2 pressure	Pressure too low	Incident on the secondary relief valve of the faulty movement, adjust or change
2	With the engine at full speed (in mode "H"), and the hydraulic oil at 50°C, check the speed of the movement concerned	Lower than the specifications. See section 1002	Leak at the non-return check valve, adjust or change
3	With a load on the end of the attachment and 1 m above the ground, check the retracting and extending of the cylinder rods	Greater than the specifications. See section 1002	Leak at attachment cylinders, change the piston seals or change the cylinder
4	Manually check the movement of the pilot spool in the control valve for the faulty movement	Difficult to move	Spool stuck or scratched, spring broken
5	Check the pilot pressure of the control valve spool	Pressure below 30 bar	Check the operation of the control lever spool, change or repair

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SPECIFICATIONS

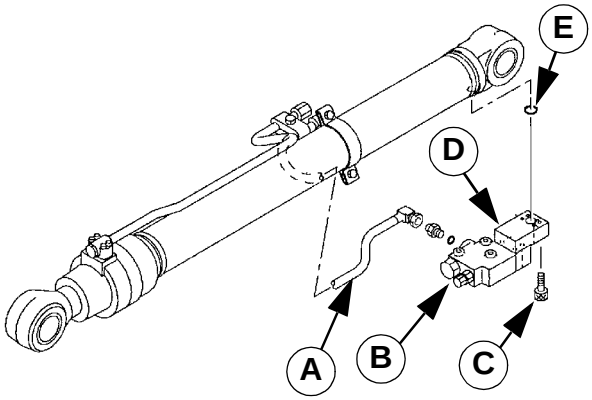
Weight of the control valve ..... See Section 1002

SPECIAL TORQUE SETTINGS

For the hardware which fastens the control valve to the upperstructure frame ..... See Section 1002
Retaining screws for central frame and the upper access panel ..... 88 to 107 Nm

STEP 12

(Only if the machine is equipped with cylinder safety valves)



CS00G502

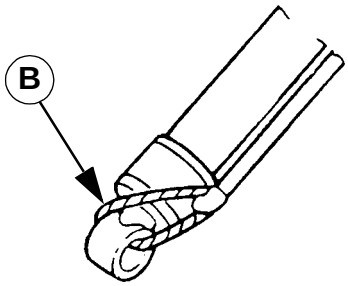
Disconnect the pipe (A) from the safety valve (B). Remove the screws (C), the base (D) and the safety valve (B) from the boom cylinder. Scrap the O-ring (E).

STEP 13

Repeat steps 1 to 13 to remove the other cylinder.

Installation

STEP 1

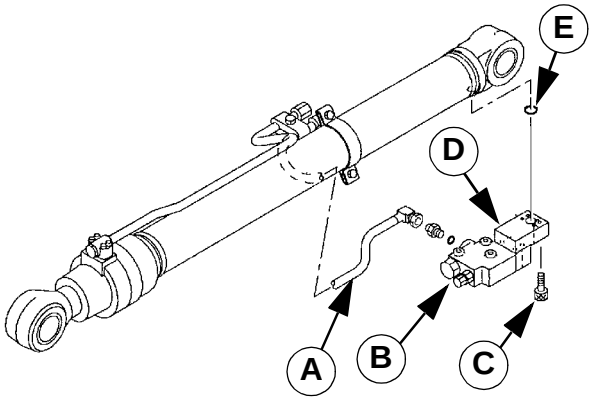


JS00586A

Attach a suitable strap (B) to the boom cylinder to hold the cylinder rod to the cylinder barrel.

STEP 2

(Only if the machine is equipped with cylinder safety valves)

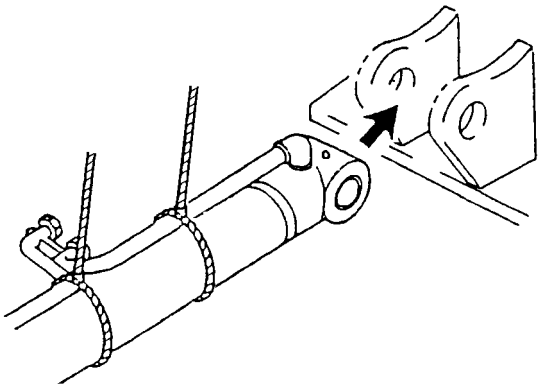


CS00G502

Install a new O-ring (E) on the boom cylinder and install the safety valve (B) and the base (D) with the screws (C). Connect the pipe (A).

NOTE: *Carefully raise the cylinder. The cylinder is heavy, the weight must be carefully distributed over the slings during lifting.*

STEP 3

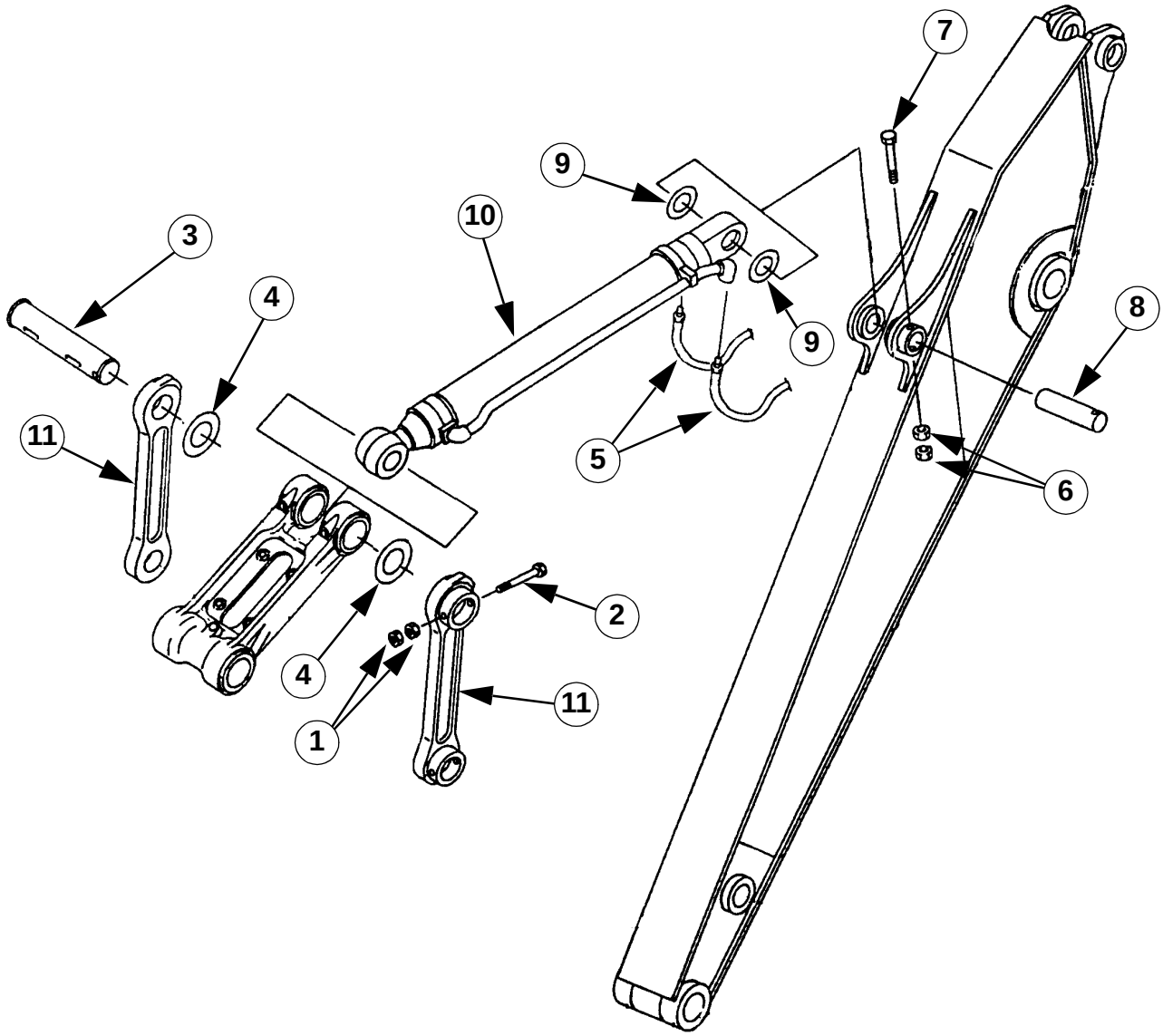


JS00587A

Using a suitable lifting device, raise the boom cylinder. Align the boom cylinder with the chassis mounting brackets. Place a suitable stand under the boom cylinder to support it.

BUCKET CYLINDER

Description



CS00F534

1 NUT
2 SCREW
3 PIN
4 SHIM
5 HYDRAULIC HOSE
6 NUT
7 SCREW
8 PIN
9 SHIM
10 BUCKET CYLINDER
11 CONNECTING ROD

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SPECIAL TORQUE SETTINGS

Control stick locknut of the control lever block ..... 41 Nm

Cushion control valve

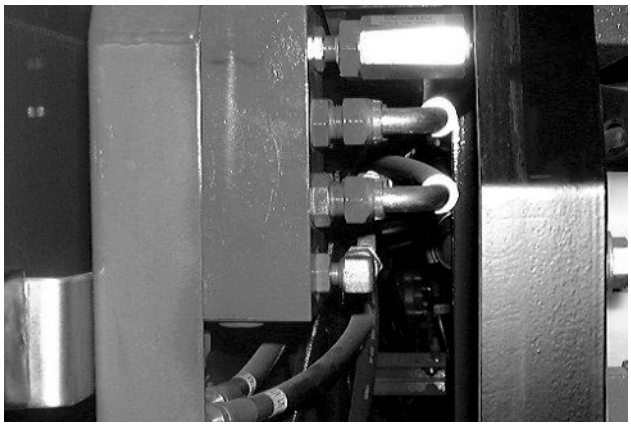
Removal and installation

NOTE: *Refer to page 3 and carry out steps 1 to 4.*

STEP 1

Open the left-hand side doors.

STEP 2



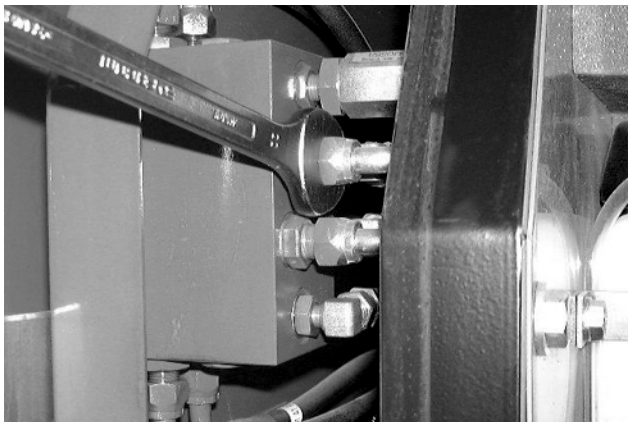
CD00F053

To aid installation, put identification tags on the hydraulic hoses. Seal the ports of the cushion control valve and the ends of the hydraulic hoses.

STEP 3

Start the vacuum pump.

STEP 4



CD00F054

Disconnect the hydraulic hoses from the cushion valve. Seal the hydraulic hoses and the ports of the cushion control valve.

STEP 5

Shut off the vacuum pump.

STEP 6

Loosen the retaining screws of the cushion control valve behind the partition. Remove the cushion control valve (raise it until the screws and flat washers are clear of the key hole slots in the bracket then pull it from the bracket).

NOTE: *When installing, proceed in the reverse order to that of removal. Start the engine, operate the control levers, stop the engine, check the circuit for leaks and the hydraulic oil level in the reservoir, top up if necessary.*

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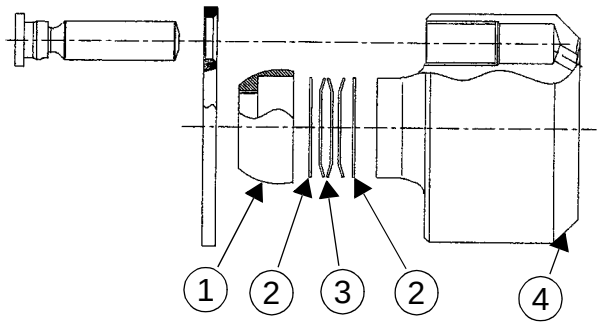
WARNING: *This symbol is used in this manual to indicate important safety messages. Whenever you see this symbol, carefully read the message which follows. Your safety depends on it.*

SPECIFICATIONS

See section 1002.

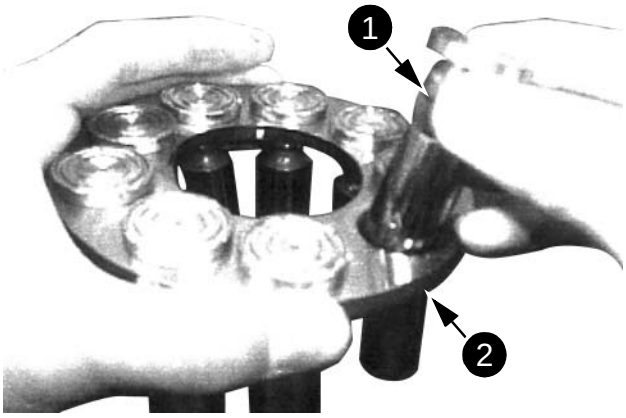
STEP 29



CI01E526

Remove the spherical bushing (1), the shims (2) and the spring washers (3) from the cylinder block (4).

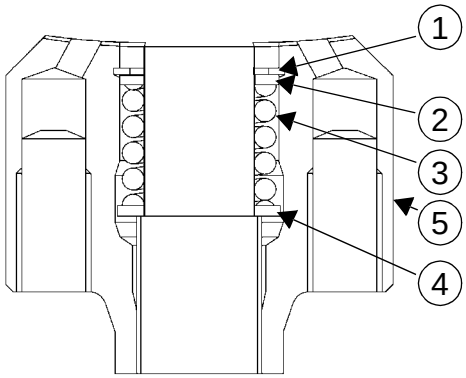
STEP 30



CD01F026

Identify and remove the pistons (1) from the retaining plate (2).

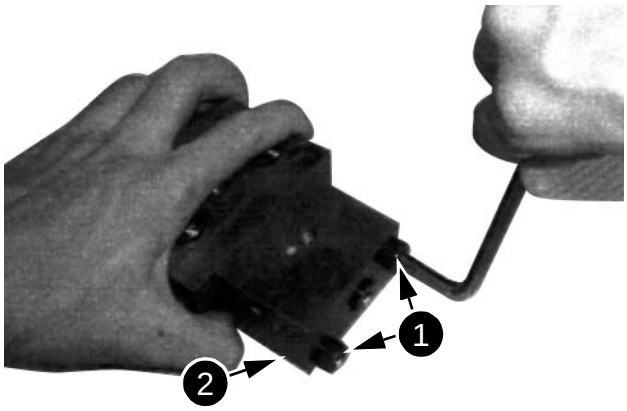
STEP 31



CD01E529

Remove the snap ring (1), remove the shim (2), the spring (3) and the shim (4) from the cylinder block (5).

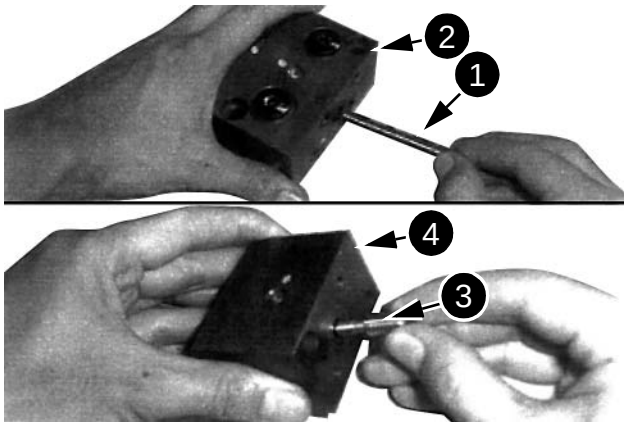
STEP 32



CD01F027

Removing the dual pressure balance valve. Remove the retaining screws (1) and remove the cover (2).

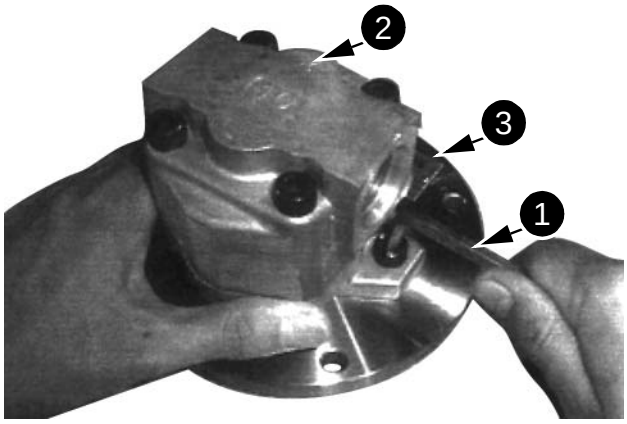
STEP 33



CD01F028

Remove the spool (1) from the body (2). Remove the piston (3) from the cover (4).

STEP 34



CD01F029

Removal of the gear pump. Remove the screws (1) and separate the pump (2) from the flange (3).

NOTES

Installing the option plate (27)

STEP 1

Install a new O-ring on the option plate.

STEP 2

Install the option plate on the control valve.

Installing the non-return check valves (13), (14), (15), (16), (17)

STEP 1

Install the non-return check valve for RH travel on the control valve. Tighten to a torque of 98 Nm.

STEP 2

Install the swing non-return check valve on the control valve. Tighten to a torque of 98 Nm.

STEP 3

Install the boom (2) non-return check valve on the control valve. Tighten to a torque of 98 Nm.

STEP 4

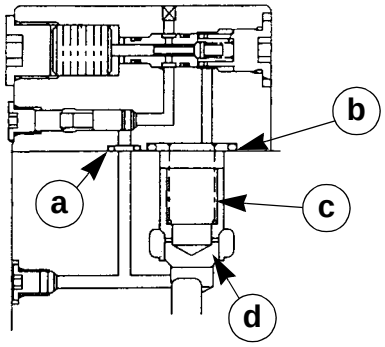
Install the option non-return check valve on the control valve. Tighten to a torque of 98 Nm.

STEP 5

Install the dipper non-return check valve on the control valve. Tighten to a torque of 98 Nm.

Installing the dipper load holding block (3)

STEP 1



CI00H501

Install new O-rings (a) and (b) on the load holding block.

STEP 2

Install, the non-return check valve (d) and then the spring (c) on the control valve.

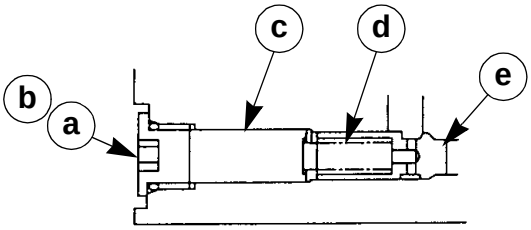
STEP 3

Install the load holding block dipper on the control valve. Tighten to a torque of 50 Nm.

Boom non-return check valve (33)

Disassembly

STEP 1



CI00H523

Remove the plug (a). Scrap the O-ring (b).

STEP 2

Remove the spacer (c), the spring (d) and the check valve (e) from the control valve.

Inspection

See "Inspection" chapter page 31.

Assembly

STEP 1

Install the check valve (e) the spring (d) and the spacer (c) on the control valve.

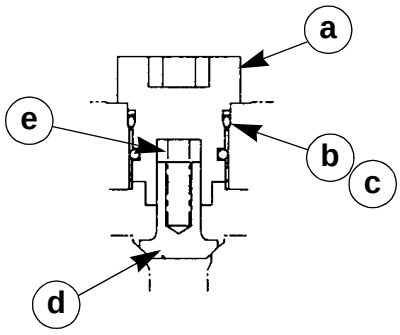
STEP 2

Install the O-ring (b) on the plug (a). Install the plug (a) on the control valve. Tighten to a torque of 30 Nm.

Main relief valve non-return check valve (22)

Disassembly

STEP 1



CI00H527

Scrap the O-ring (b) and the back-up ring (c) from the body (a).

STEP 2

Remove the non-return check valve (d) and the spring (e).

Inspection

See "Inspection" chapter page 31.

Assembly

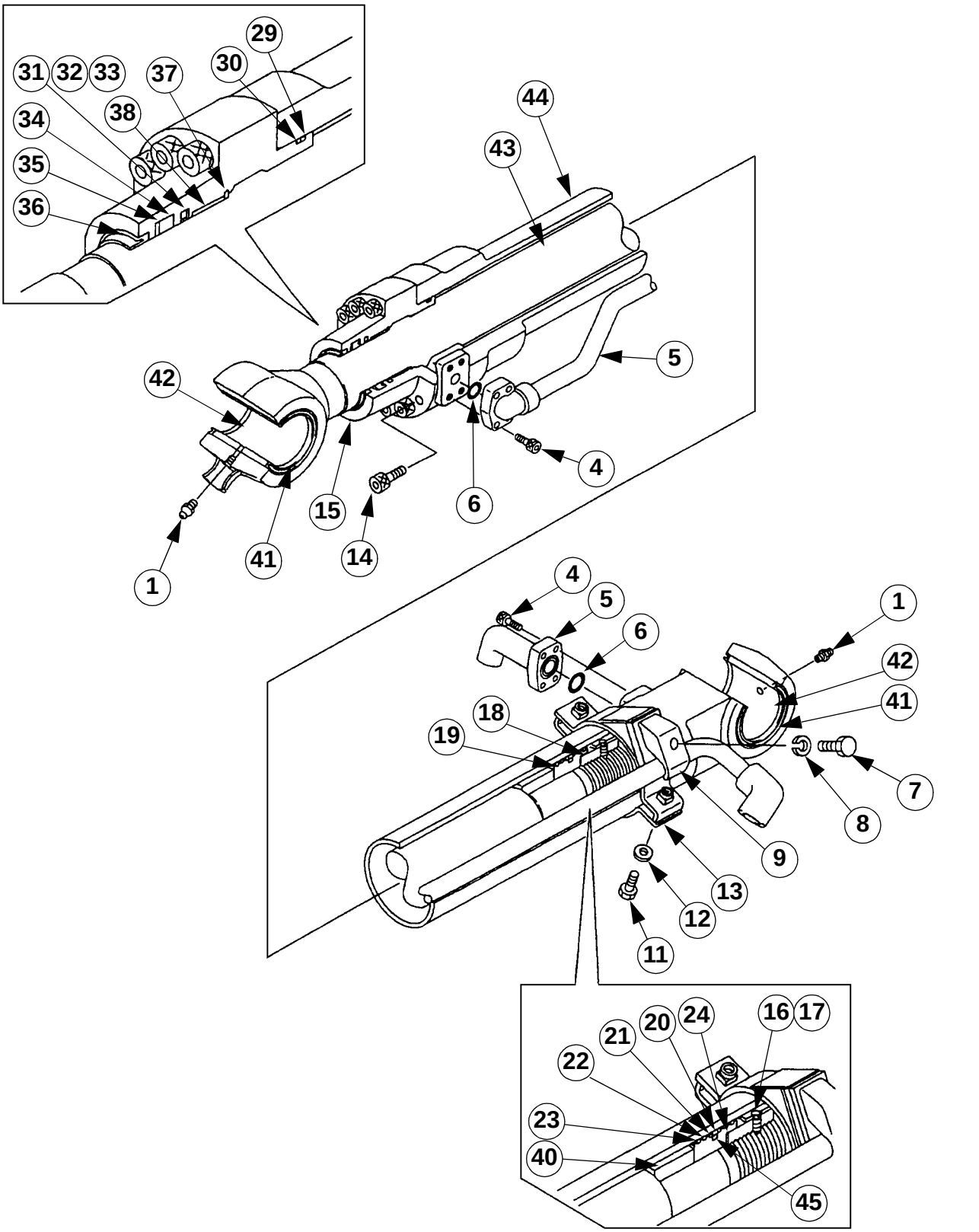
STEP 1

Install the spring (e) and the non-return check valve (d) in the non-return check valve body (a).

STEP 2

Install a new O-ring (b) and back-up ring (c) on the non-return check valve body (a). Install and tighten the non-return check valve assemble on the control valve.

Bucket cylinder description



JS00658A

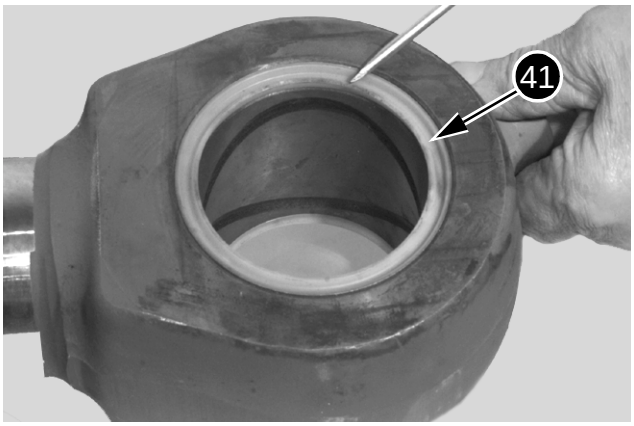
STEP 34

NOTE: *The bucket cylinder does not incorporate a seal on the cushion ring.*

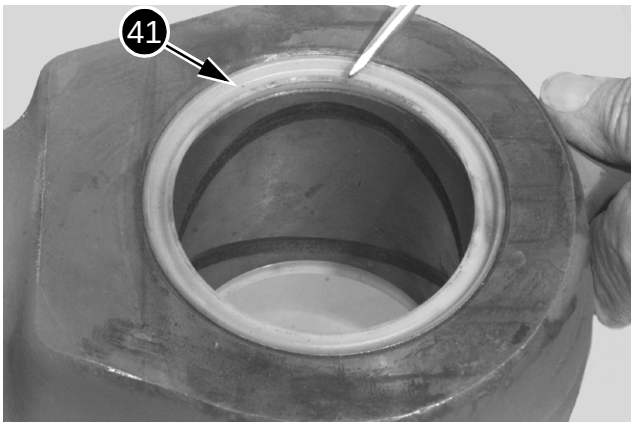
Remove the seal (39) from the cushion ring (40) and discard the seal. Remove the cushion ring (40).

STEP 35

NOTE: *Do the following step only if inspection indicates that the bushings (42) require replacement.*



JD00654A



JD00655A

Remove the four wipers (41) from the cylinder rod and cylinder barrel. Use a suitable press and driver and remove the two bushings (42) from the cylinder rod and cylinder barrel.

Inspection

STEP 1

Inspect the seals, U-rings, back up rings, and O-rings prior to installation for any imperfections, tears, or other damage. If the seals or the bushings are worn out or damaged, replace the component(s). Ensure seals and bushings are installed correctly with no twisting of the seal or bushing. Install all new seals and rings wet with hydraulic oil.

STEP 2

Check the sliding parts for wear or damage such as scratches, dents, or bent parts. Small scratches can be removed with a hone or crocus cloth.

STEP 3

Check for cracks in the welding or other damage.

STEP 4

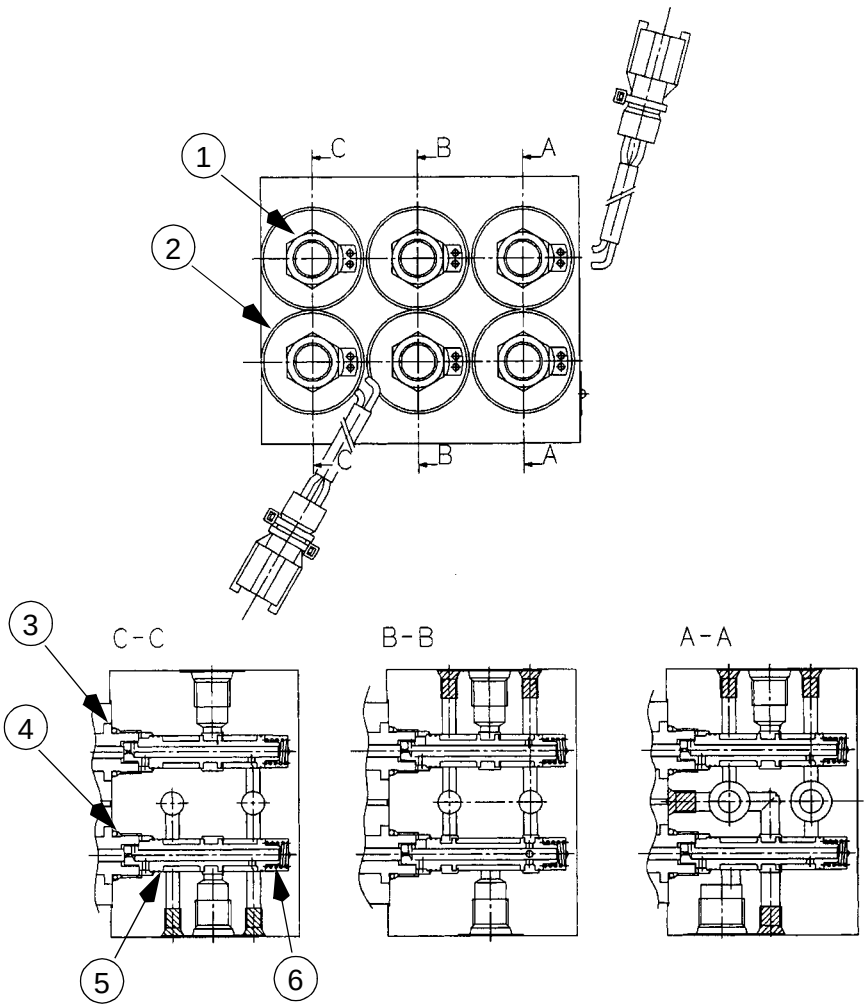
Measure the internal diameter of the bushings (42). If the internal diameter of the bushings is greater than the specifications, replace the bushing(s).

TABLE OF CONTENTS

SPECIFICATIONS

Torque settings
- Orifice plate retaining screws ..... 29.4 ± 1.5 Nm
- Universal joint on control lever ..... 47.1 ± 2.9 Nm
- Lock-nut on universal joint ..... 68.6 ± 4.9 Nm

Section



CS01C521

1 NUT
2 COIL
3 CORE
4 O-RING
5 SPOOL
6 SPRING

STEP 10

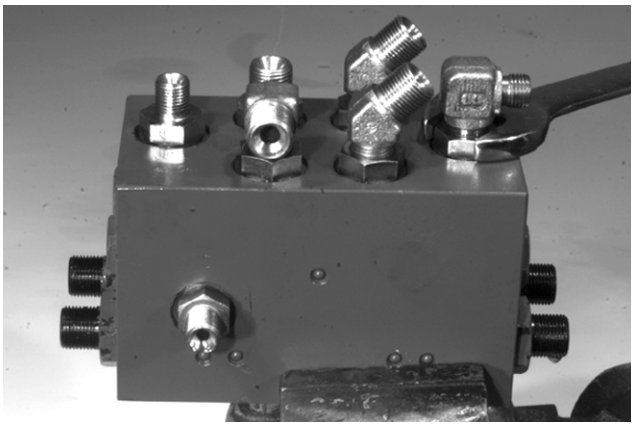
JD00566A

Install a new O-ring (9) on the plug (8). Install the plug and O-ring in the housing.

STEP 11

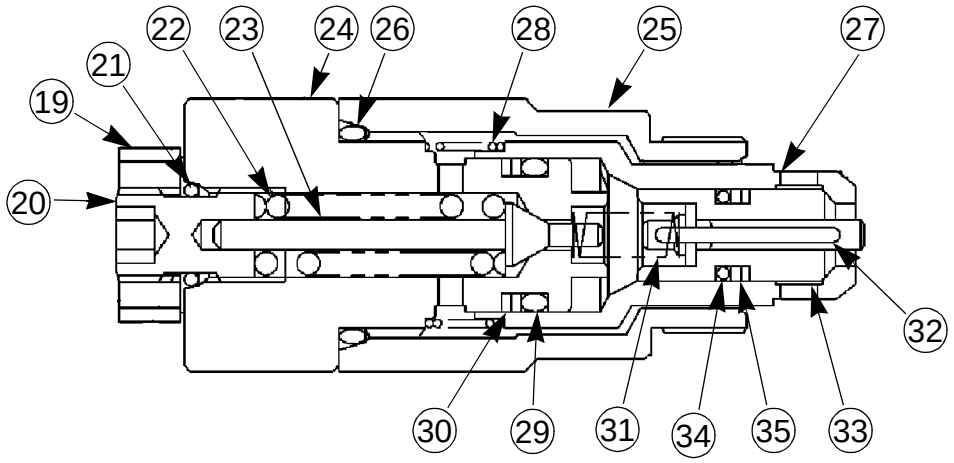
Repeat steps 6 through 10 for the other spool.

STEP 12



JD00549A

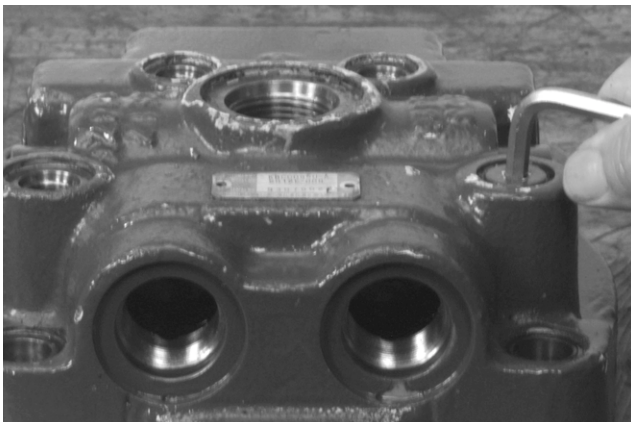
If removed, install the adapters and elbows on the control valve.



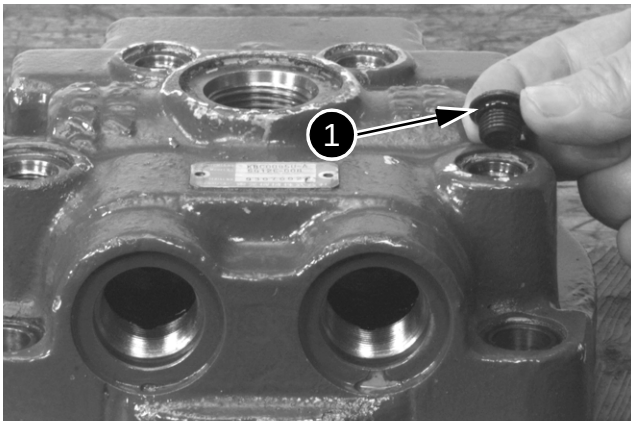
CI00K504

11. Remove the locknut (19), and the pressure setting screw (20) and discard the joint (21).
12. Remove the spring (22) and the check valve (23).
13. Remove the valve cap (24) from the sheath (25) and discard the joint (26).
14. Remove the valve nose (27) and remove the spring (28).
15. Discard the joint (29) and the back up rings (30).
16. Remove the spring (31) and the check valve (32).
17. Remove the awl (33), discard the joint (34) and the back up rings (17).

STEP 22



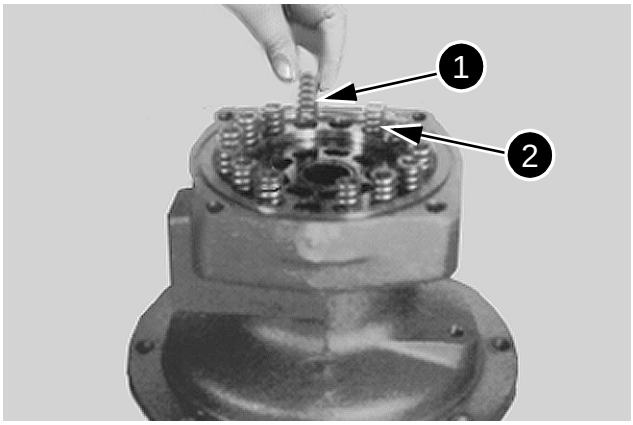
JD00409A



JD00410A

Remove the plug (1) from cover. Remove O-ring from plug. Discard the O-ring.

STEP 23

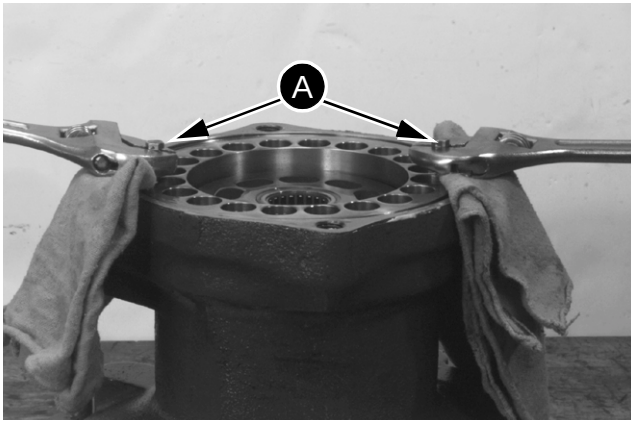


JD00411A

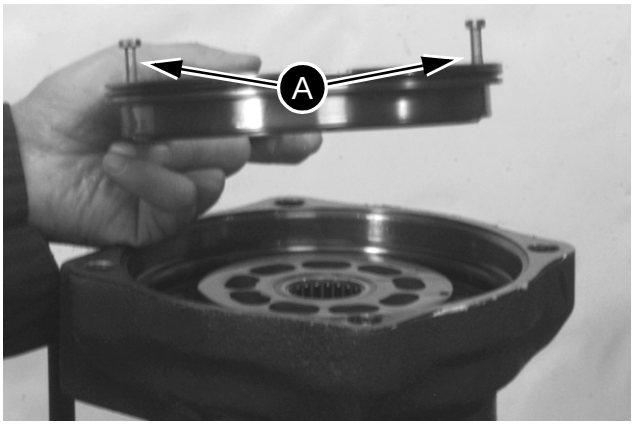
Remove the springs (1) from the brake piston (2).

STEP 24

NOTE: *Protect the housing and the piston surfaces with rags when you lever the piston out of the housing.*



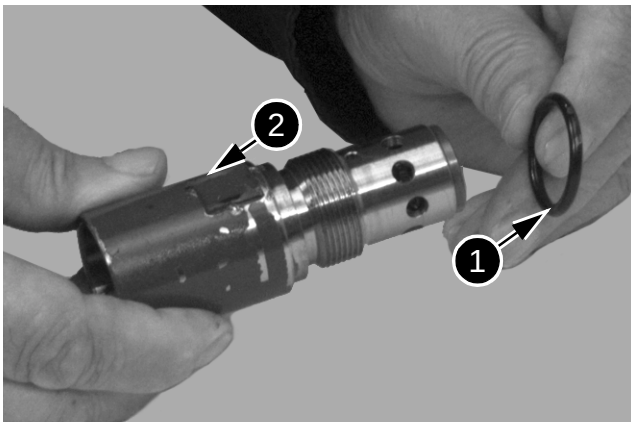
JD00412A



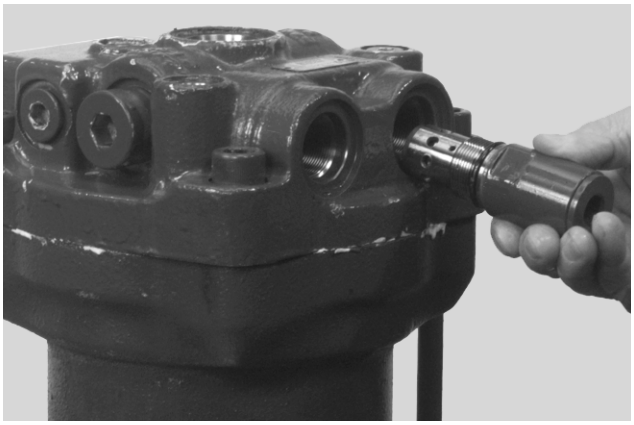
JD00413A

Install two M6 screws (A) in tapped holes in piston. Lever these screws and free the piston from the housing.

STEP 32



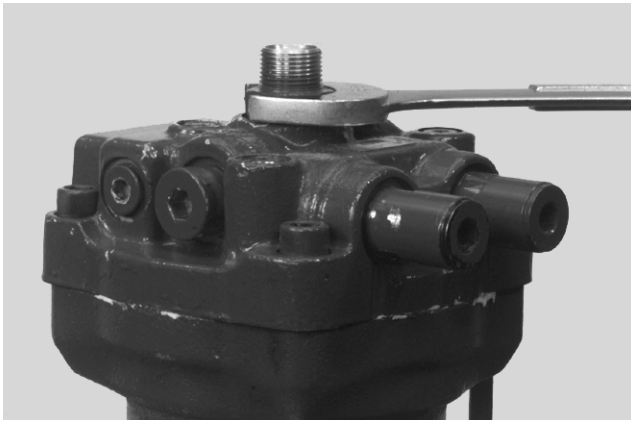
JD00435A



JD00392A

Install a new O-ring (1) on the safety valve assembly (2). Install the safety valve assemblies in the cover and tighten to a torque.

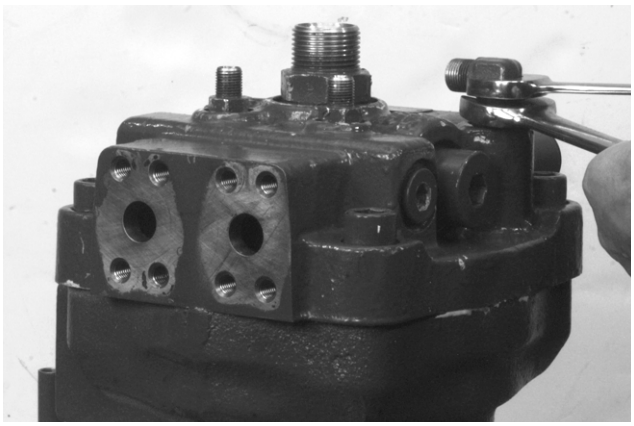
STEP 33



JD00390A

Install a new O-ring on the large fitting and install the fitting in the swing motor cover.

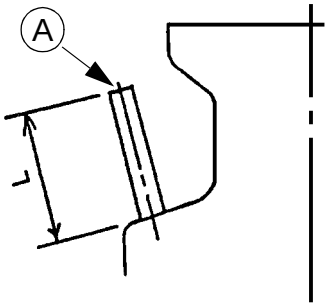
STEP 34



JD00388A

Install new O-rings on elbows. Install the elbow unions in the motor cover.

STEP 35



JS00436A

Install the oil level gauge tube (A) (L = 116 mm), and the oil level gauge.

STEP 36

Apply a pilot pressure of 30 bar at the brake port. Check that the drive shaft can be rotated smoothly at least one full revolution by applying a torque of approximately 39 Nm.

NOTE: *If the shaft does not turn, the unit has not been assembled correctly. Disassemble and repeat assembly steps.*

Controls in Neutral

Pump minimum output mode

If the A1 flow from the P1 pump or the A2 flow from the P2 pump is not used then the pumps go into minimum output mode to save energy.

When the controls are in neutral, with the engine running, a part of the flow coming from the low pressure pump arrives at Ps1 and is divided by a battery of restrictors. Part of the flow goes through the travel control valves and the other part goes to the remaining control valves before returning to the tank. When the spools are moved, these circuits are closed, thereby closing the travel or upperstructure pressure switch contact points and transmitting the electronic information.

The two flows from the HP pumps cross the control valve via the free passages. They are controlled by two pressure limiters set at 370 psi for a flow of 13.2 gpm and two flow restrictors. Both pressures are sent to the PZ1 and PZ2 ports on the pumps to regulate them to deliver minimum flow.

Variable Priority Valve Circuit

After going through the selector the swing pilot pressure arrives at Pi2 and pilots the cancellation valve, there by causing the variable priority valve to discharge oil. This makes it possible to have the maximum swing torque with high swing pressure, even if the dipper is being used at the same time.

When the machine is digging, the boom raising pressure pilots the swing priority valve. Flow for the swing function is then in parallel with the dipper via the priority valve and dipper speed is improved. Digging speed is more constant, even if the free passage is closed by the boom (2) spool.

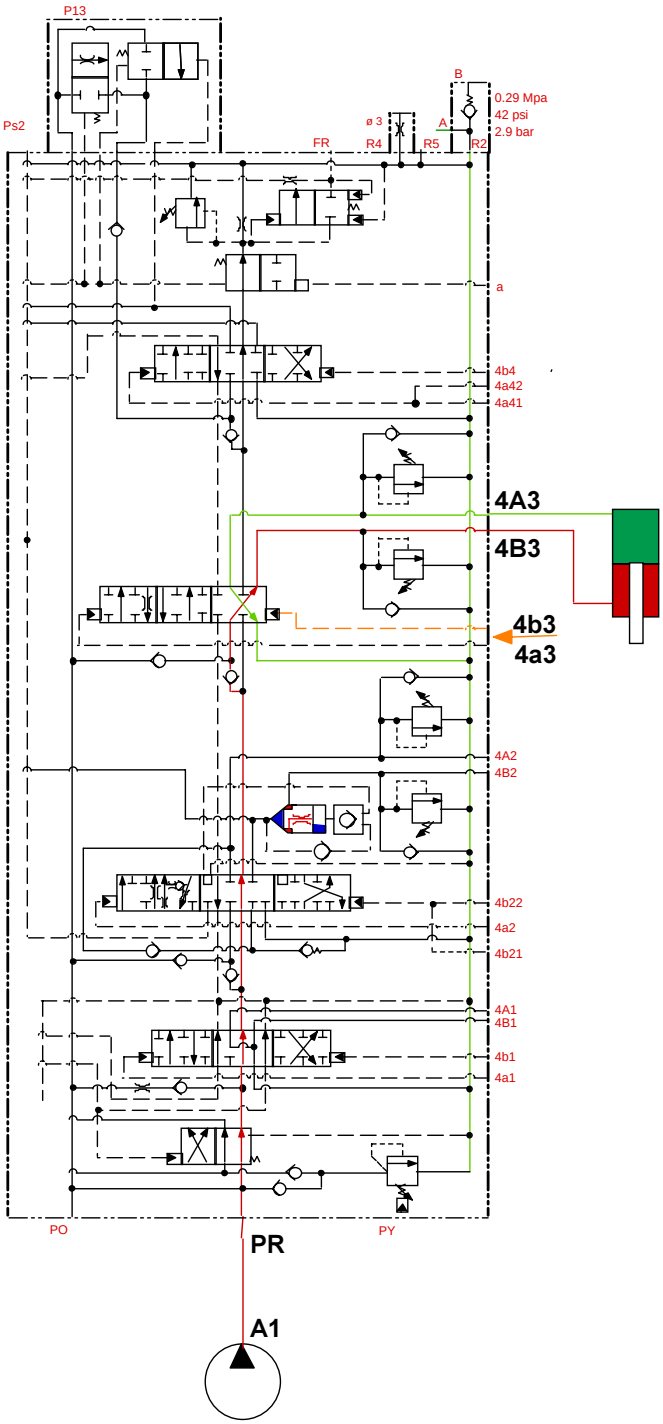
When the swing function and the dipper retracting or boom raising functions are operated simultaneously, parallel working is reduced and swing pressure is maintained.

4a41/4b4. Dipper spool 2
5a2/5A2. LH swing
5b2/5B2. RH swing
5a52/5A5. Dipper out
5b52/5B5. Dipper in
5a32. Boom spool 2
Pi2. Priority to swing

Bucket Opening Circuit

The bucket uses one supply flow which arrives from pump A1 via the parallel working passage.

4a3/4A3. Bucket closing
4b3/4B3. Bucket opening



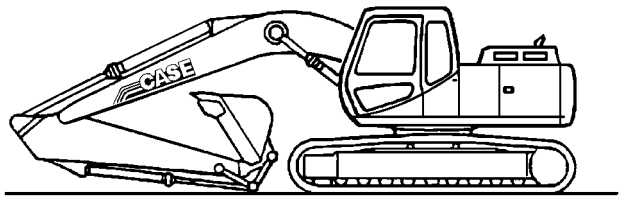
CM00K027

STEP 8

Install the lower housing on the machine using screws and flat washers.

Removal

STEP 1



JS00163A

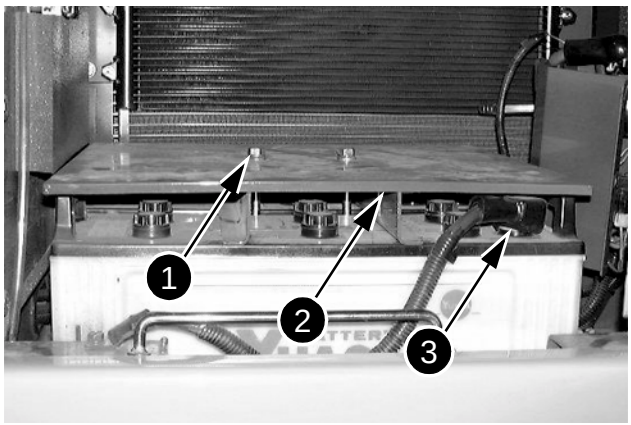
Park the machine on hard, level ground. Lower the attachment to the ground.

STEP 2

Release pressure in hydraulic system in the hydraulic reservoir (see Section 8000).

STEP 3

(CX130/CX160)

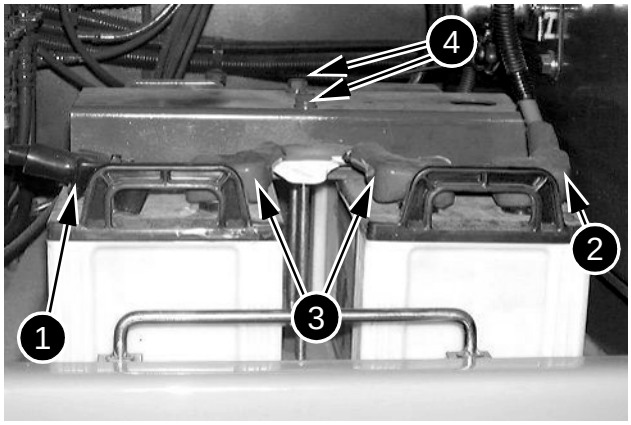


CD00F052

Open the left-hand side door. Remove the two screws (1), lock washers and flat washers that retain the battery housing (2). Remove the housing. Disconnect the negative cable from the battery (3) then the positive cable. Remove the batteries from the machine. Close the left-hand side door.

STEP 7

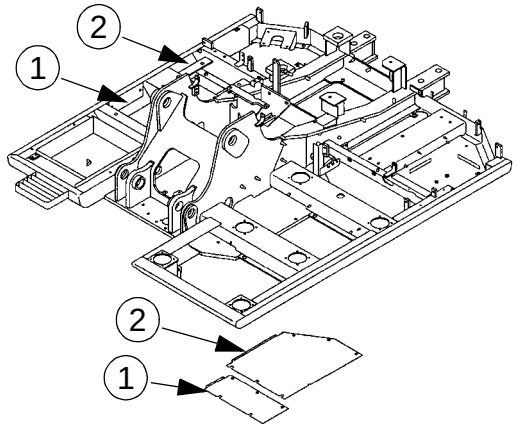
(CX210/CX240)



CD00G002

Open the left-hand side doors. Disconnect the earth cable (1) from the battery, then the positive cable (2). Disconnect and remove the battery cable (3). Remove the two screws (4), lock washers and the flat washers that fasten the battery protective cover. Remove the cover and remove the battery. Close the side doors.

STEP 8

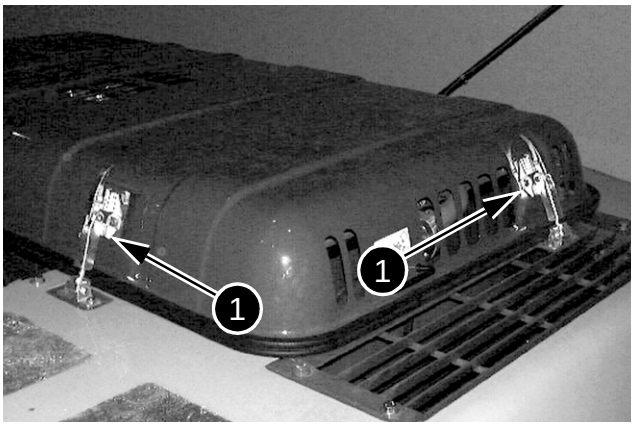


CI00F508

1 FUEL TANK LOWER ACCESS PANEL
2 HYDRAULIC RESERVOIR LOWER ACCESS PANEL

Remove the lower access panel from the fuel tank (1) located at the front and to the right. Place a receptacle under the fuel tank drain valve. Open the drain valve and drain the fuel.

STEP 11

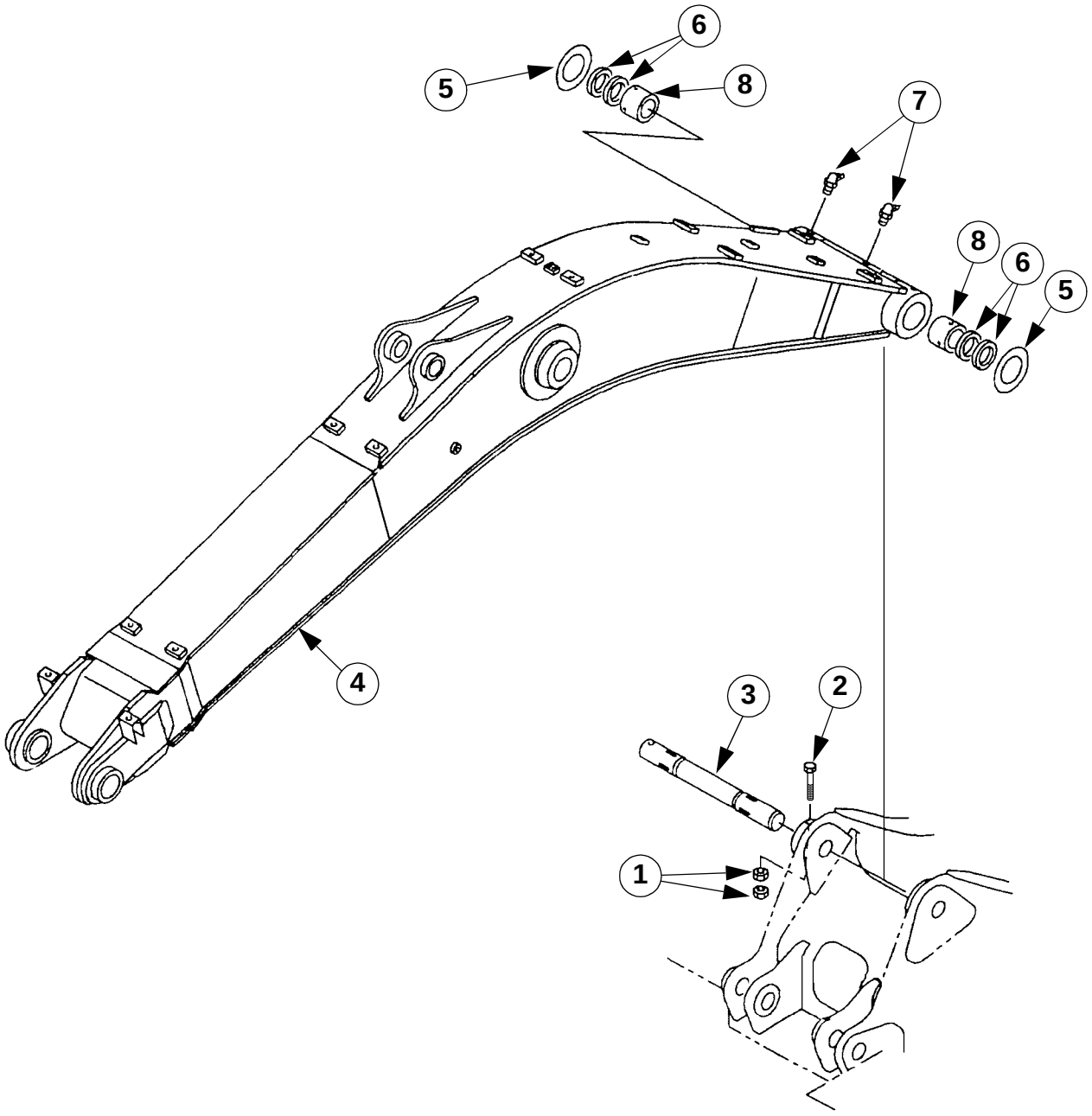


CD00F099

Lock the two engine hood locking latches (1).

BOOM

Description



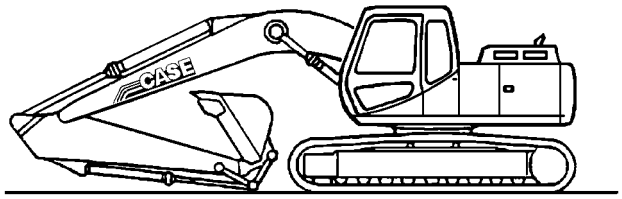
JS01275A

1 NUT
2 SCREW
3 PIN
4 BOOM
5 SHIM
6 DUST SEAL
7 GREASE FITTING
8 BUSHING

SAFETY BELT

Removal

STEP 1



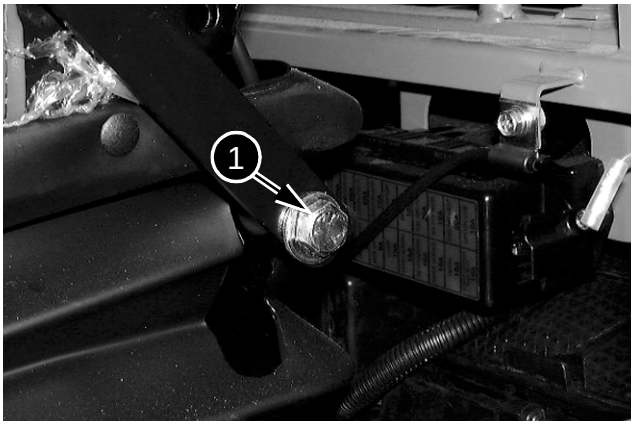
JS00163A

Park the machine on hard, flat ground. Lower the tool to the ground.

STEP 2

Reduce the engine speed to idle for 30 seconds, then shut down the engine.

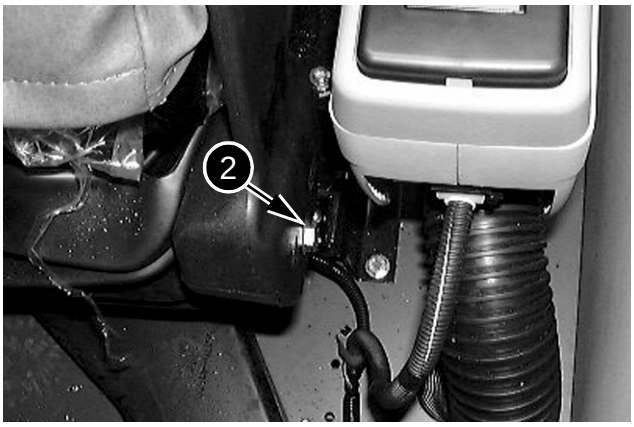
STEP 3



CD00G124

Loosen then remove the retaining screw (1) and the washer. Remove the seat fastener.

STEP 4



CD00G125

Loosen then remove the screw (2) and the washer. Remove the inertia-reel.

Installation

To install, proceed in the reverse order from that of removal.

STEP 8

CD00G003

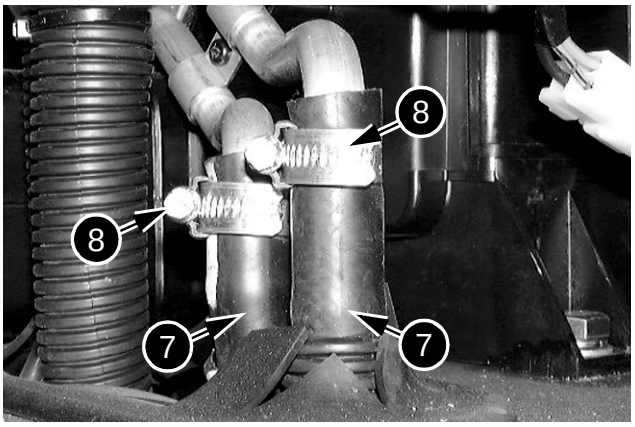
Remove the trim panel at the rear of the cab, taking care to disconnect the connector for the cigarette lighter and the solar radiation detector (only on air-conditioned models).

STEP 9

Disconnect the electric blower supply harness.

STEP 10

NOTE: *The numbers in brackets refer to the schematic on page 8.*



CD00G044

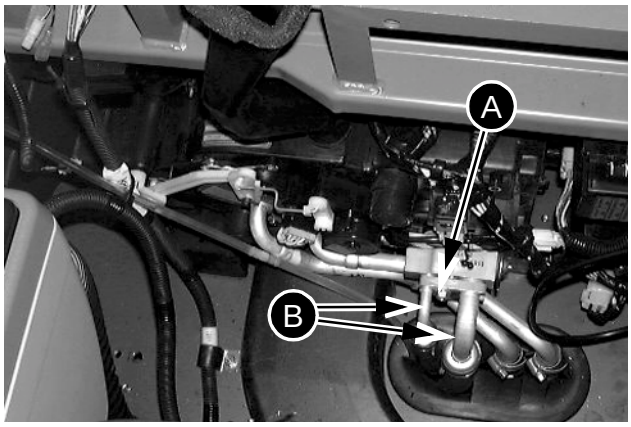
Unscrew the hose clips (8) and disconnect the heater hoses (7).

NOTE: *Carry out Steps 11 and 12 only for air-conditioned machines.*

STEP 11

Empty the air-conditioning system, contact an authorised engineer.

STEP 12



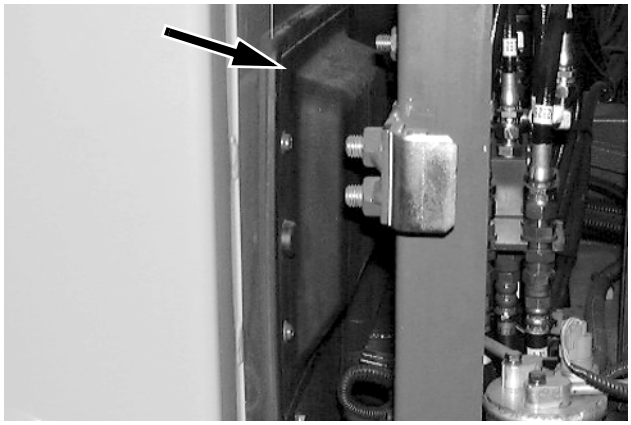
CD00G006

Remove the screw (A) and remove the hoses (B) from the air-conditioner. Discard the O-rings. Block the air-conditioner and the hoses with plugs in order to avoid any risk of contaminating the system.

STEP 13

Remove the ventilation conduits (1-2-3) from the cab.

STEP 14



CD00G007

Remove the pollen filter guard, remove the filter (4) and remove the conduit (5).

STEP 15

Remove the screws (6) that secure the heating or air-conditioning block to the cab. Remove the block from the cab.