SERVICE MANUAL

Hydraulic Excavator

9007B

7-22241

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL

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TYPE 1-4

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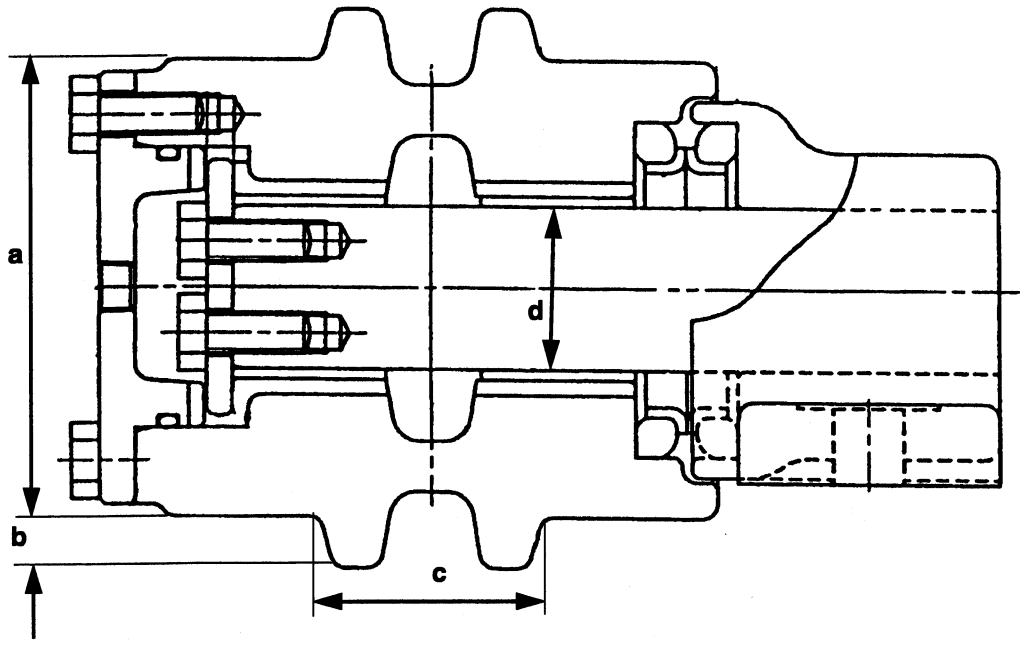


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Upper Roller

Upper Roller:	a	standard value	Ø 90 mm	Ø 3.55 in.
		service limit	Ø 82 mm	Ø 3.23 in.
	b	standard value	10 mm	0.39 in.
		service limit	—	—
	c	standard value	44 mm	1.73 in.
		service limit	—	—
Shaft:	d	standard value	Ø 32 mm	Ø 1.26 in.
		service limit	Ø 31 mm	Ø 1.22 in.
Bushing:	d	standard value	Ø 32 mm	Ø 1.26 in.
		service limit	Ø 32.6 mm	Ø 1.28 in.



CS99A814

Upper Roller

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WARNING: *This symbol is used in this manual to show important safety messages. Whenever you see this symbol, read the message which follows carefully, since there is a risk of serious injury.*

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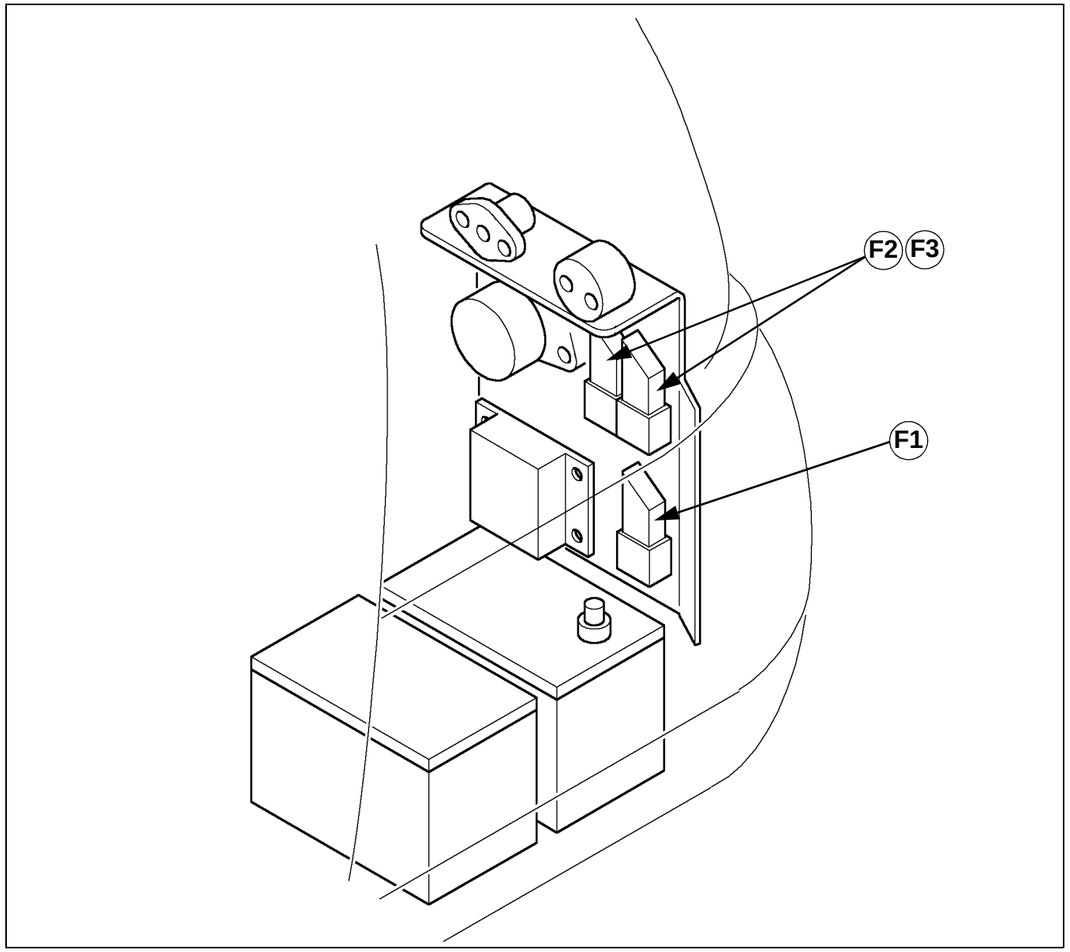
SPECIFICATIONS 3

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- Removal and installation 5

WARNING: *This symbol is used in this manual to show important safety messages. Whenever you see this symbol, read the message which follows carefully, since there is a risk of serious injury.*

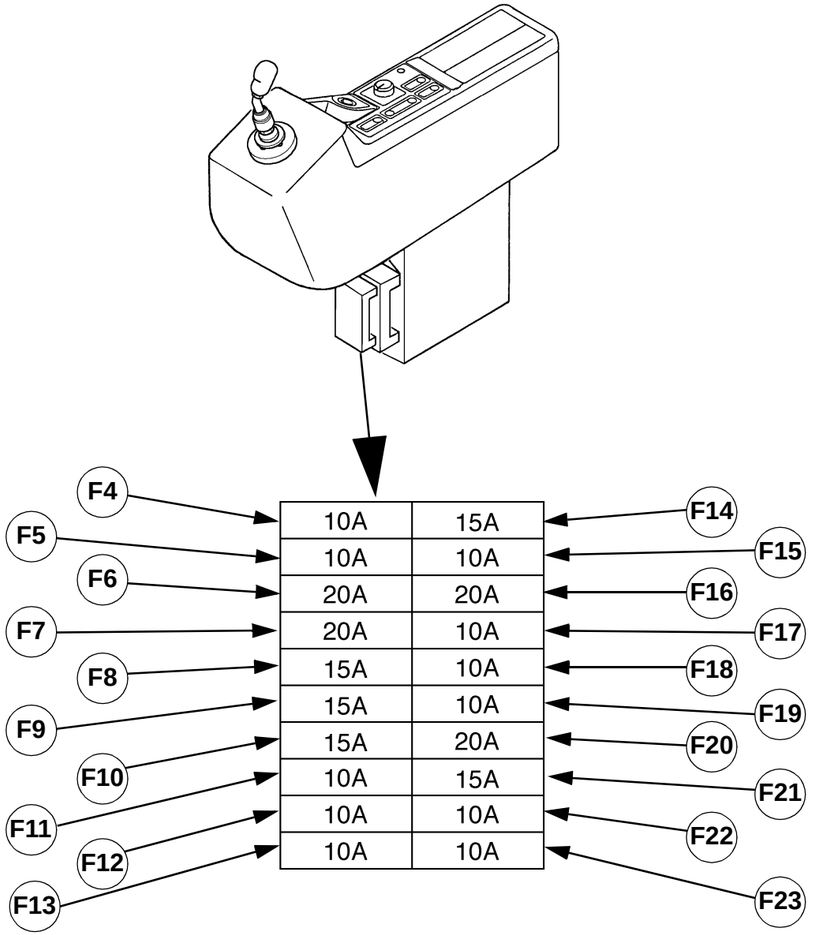
MAXI-FUSES



CI99A503

F1 45A = Maxi-fuse + 24 Volts before battery relay (F4 and F5)
F2 45A = Maxi-fuse + 24 volts after battery relay (F16)
F3 45A = Maxi-fuse + 24 volts after battery relay (alternator charge and F6, F7, F8, F9, F10, F11, F12,F13, F14, F15, F17, F18, F19, F20, F21, F22, F23)

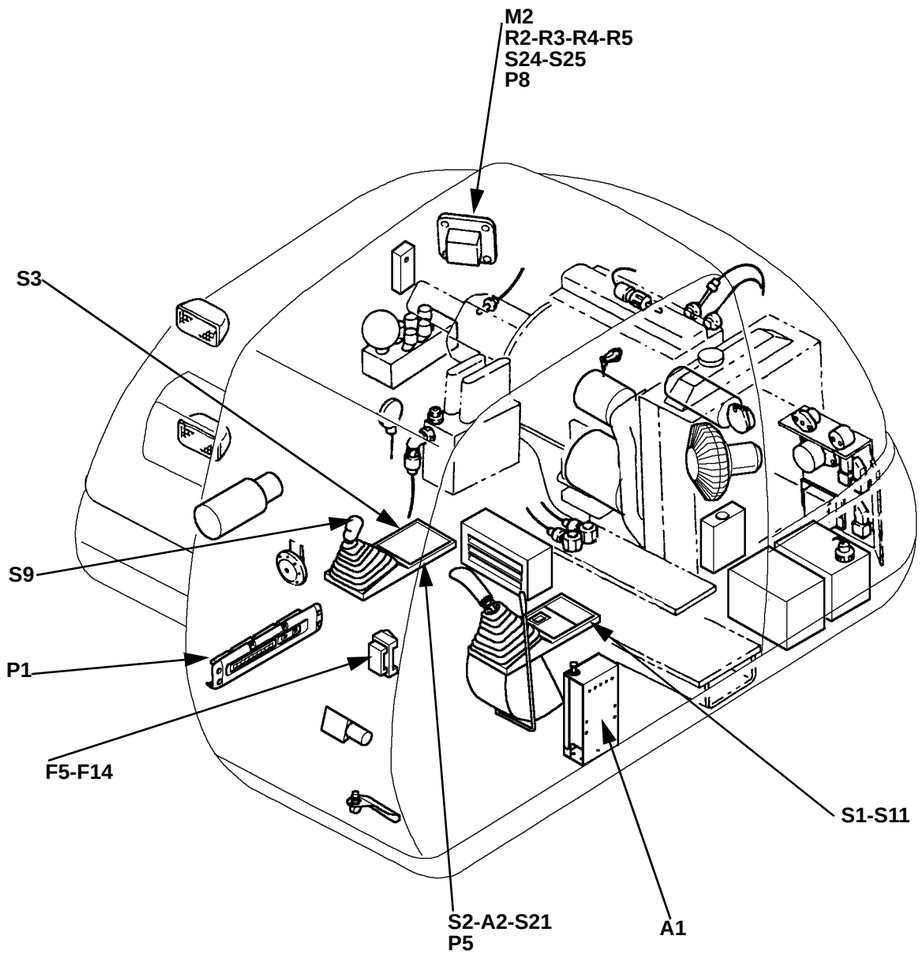
FUSES



CS99B512

CS98M567

F4 10A Left/right-hand switch panel, radio, air conditioner unit.
F5 10A Starter switch
F6 20A Heater, air conditioner
F7 20A Working light (upperstructure and attachment)
F8 15A Not used
F9 15A Not used
F10 15A Not used
F11 10A Wiper and washer pump motor
F12 10A Horn and cab light
F13 10A Radio and cigarette lighter
F14 15A Throttle motor driver
F15 10A Relay K3, left-hand panel, swing lock, swing brake, travel speed and audible travel alarm
F16 20A Engine shut-down solenoid
F17 10A Control lock
F18 10A Not use
F19 10A Beacon
F20 20A Oil pump
F21 15A Option solenoid
F22 10A Not used
F23 10A Not used



CI98N513

ELECTRICAL SCHEMATIC (PLATE D)

CAB

A2 CPU (right-hand switch panel)
S1 Left-hand switch panel
S2 Right-hand switch panel
S3 Key switch
S9 Engine idle switch
P1 Monitor display

RIGHT-HAND ARMREST CONTROL PANEL

P5 Throttle motor potentiometer

ENGINE

M2 Throttle motor

CAB FLOOR

A1 Throttle motor driver
F5 10A Key switch
F14 15A Throttle motor driver

THROTTLE MOTOR

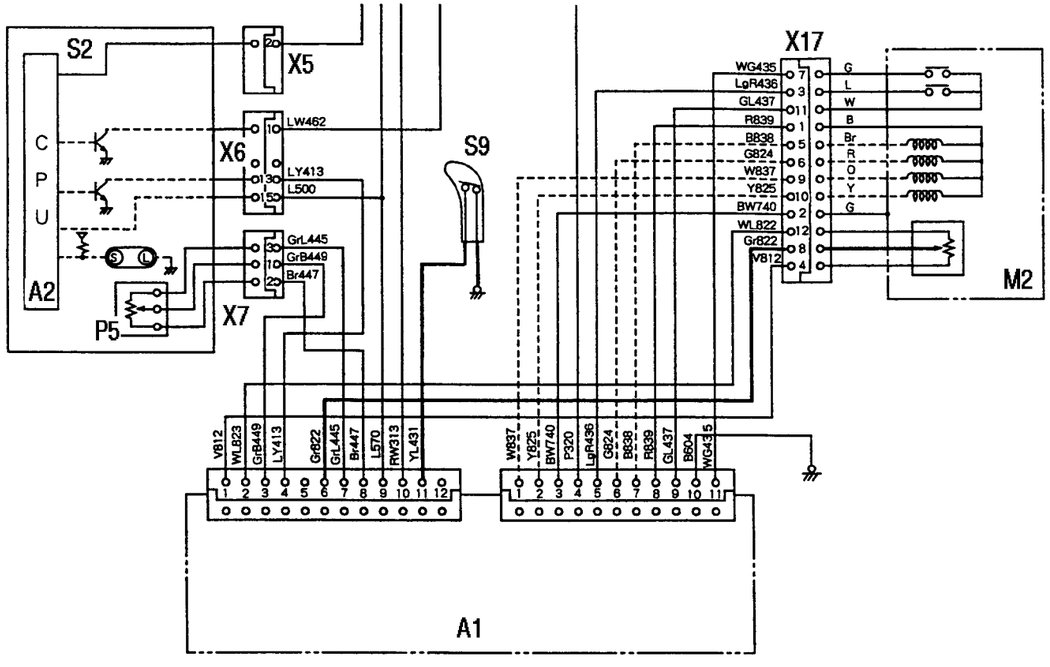
P8 Throttle motor potentiometer
R2 Throttle motor coil A1
R3 Throttle motor coil B1
R4 Throttle motor coil B
R5 Throttle motor coil A
S24 Throttle motor limit switch (cw)
S25 Throttle motor limit switch (ccw)

RIGHT-HAND SWITCH PANEL

S21 Work mode selection switch

LEFT-HAND SWITCH PANEL

S11 Emergency stop switch



CS99A546

A1 Throttle motor driver

A2 CPU (right-hand switch panel)

M2 Throttle motor

P5 Throttle potentiometer

S2 Right-hand switch panel

S9 Engine idle switch

X5 Right-hand switch panel connector (16 way)

X6 Right-hand switch panel connector (16 way)

X7 Right-hand switch panel connector (3 way)

X17 Throttle motor connector (12 way)

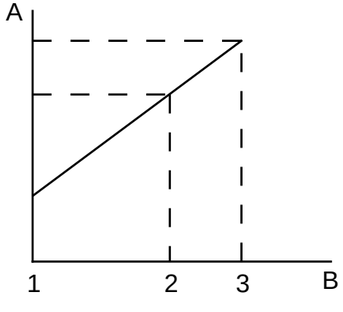
One touch idle control

When the one touch idle switch is pushed, the motor driver senses the idle switch has been actuated. There is a fixed voltage for one touch idle rotation inside the motor driver, so the motor is rotated till the potentiometer voltage of the throttle motor reaches the same voltage as that of the motor driver.

To release the one touch idle, turn the engine key off then turn it on again. There is no monitor display during one touch idling.

Speed control for each mode

When the L mode button on the right-hand switch panel is pushed, the signal enters the CPU and the L mode transistor is activated. The motor driver senses that L mode has been requested.
The throttle volume voltage inside the motor driver is limited to that necessary for L mode engine speed. If you push the L mode button when the throttle is at maximum in S mode, the motor moves till it reaches the L mode voltage.
To release the L mode, turn the engine key off and then turn it on again.
There is no monitor display show the mode, but the lamp beside the switch lights up.



CM99A006

A = VOLTAGE

B = SPEED

1 - MINI

2 - L MODE

3 - S MODE MAXI

COMPONENT ELECTRICAL TESTING

Testing equipment

- Service connector kit assembly :

  P/N CAS 40031

- Digital multimeter

  CAS 1559

Solenoid valve testing (5 spools)

Y1 Solenoid - swing lock

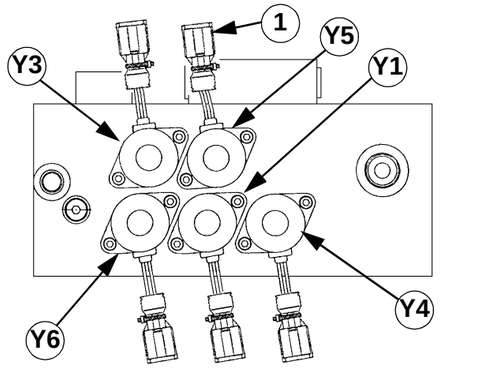
Y3 Solenoid - speed travel

Y4 Solenoid - swing brake

Y5 Solenoid - control lock

Y6 Solenoid - option

1 Connector



CI99A513

STEP 1

Remove connector 1 from the solenoid valve.

STEP 2

Connect the service connector 2P (1) between the removed connectors (solenoid valve (2) side only).

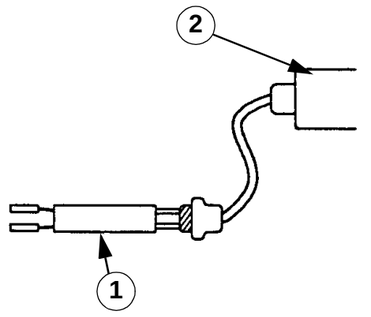
STEP 3

To connect to the tester (2), connect the red/black terminal to the spade terminal of the service connector (1).

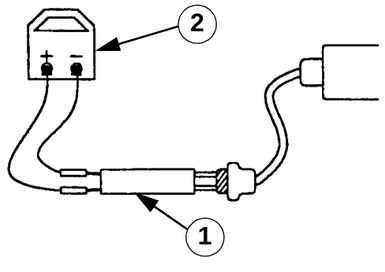
STEP 4

Confirm the resistance after completing the connection.

Resistance 40 Ω (at 68°F)
*Resistance value varies slightly with temperature.



CS99A842



CS99A843

Water temperature sensor, oil temperature sensor

STEP 1

Remove the water temperature sensor and the oil temperature sensor.

STEP 2

Connect the service connector (1) for 2P to the sensor (2) which was removed.

4 Thermometer

5 Metal container

6 Tripod

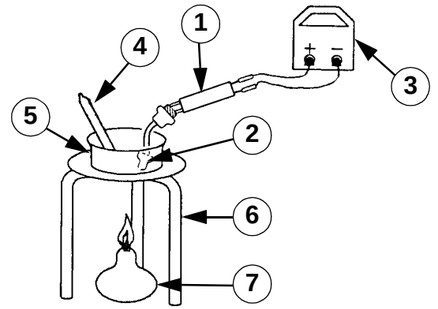
7 Spirit burner

STEP 3

To connect to the tester (3), connect the red/black terminals to the spade terminal of a service connector (1).

STEP 4

After completing the connection, increase temperature gradually, and check the resistance.



CS99A851

Water temp. (Oil temp.)	Lower value	Upper value
68°F	8.00k Ω	10.20k Ω
86°F	5.35k Ω	6.50k Ω
104°F	3.60k Ω	4.55k Ω
122°F	250k Ω	3.10KΩ
140°F	1.70k Ω	2.20k Ω
158°F	1.20k Ω	1.55k Ω
176°F	0.85k Ω	1.15k Ω

BATTERY TEST

NOTE : *To correctly test a battery, do each part of the battery test until you know the condition of the battery.*

Visual Checks

1. Make sure the cable connections are clean and tight. Clean foreign material from the top of the battery.
2. Inspect the battery case, battery posts, and cables for damage.
3. Check the electrolyte level. See page 3.
4. If you added water to the battery, the battery must be charged for 15 minutes at 15 to 25 amperes to mix the water with the electrolyte.

Specific Gravity Check

A hydrometer is used to check the specific gravity (weight) of the electrolyte. The specific gravity is an indication of the level of charge for each cell.

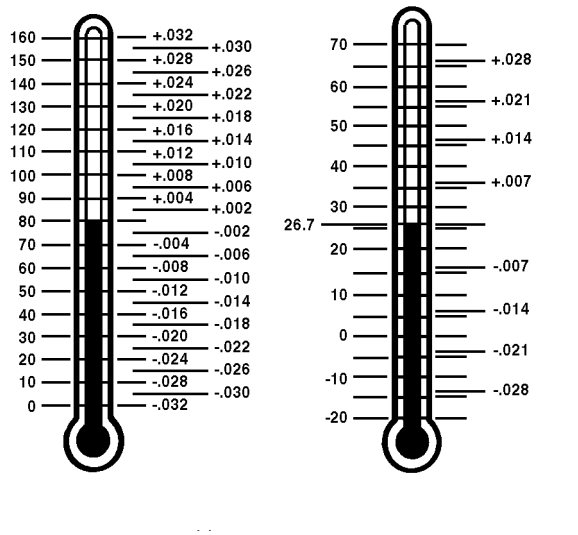
Hydrometers are made to show the correct specific gravity when the temperature of the electrolyte is 26.7°C (80°F).

When you check the specific gravity, you must know the temperature of the electrolyte. If your hydrometer does not have a thermometer, get a thermometer to check the temperature of the electrolyte. The thermometer must indicate a high temperature of at least 52°C (120°F).

1. Remove enough electrolyte from a cell so that the float is free in the tube.

NOTE : *If the specific gravity cannot be checked without first adding water to the cell, the battery must be charged for 15 minutes at 15 to 25 amperes to mix the water with the electrolyte. Then check the specific gravity.*

2. Read the float.
3. Read the thermometer. If the reading is above 26.7°C (80°F) add specific gravity points to the reading for specific gravity. If the reading is below 26.7°C (80°F) subtract specific gravity points from the reading for specific gravity. See the following illustration and add or subtract specific gravity points as needed.



JS00532A

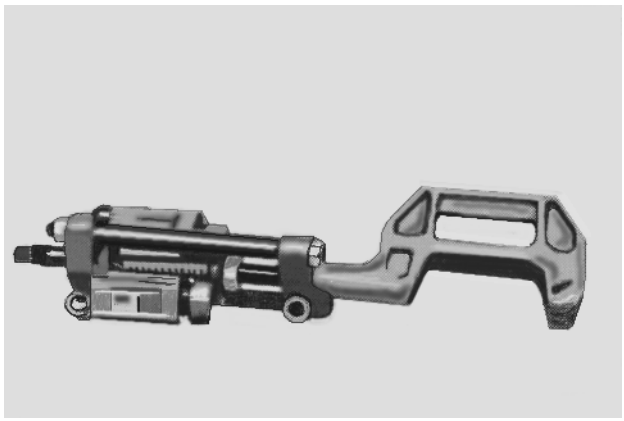
TEMPERATURE IN °F TEMPERATURE IN °C

4. Make a record of the corrected specific gravity reading for each cell.
5. If the difference between the high reading and the low reading is .050 or more, charge the battery and check the specific gravity again. If after charging, the difference is still .050 or more, install a new battery.
6. The corrected specific gravity reading shows the level of charge for the cell. The level of charge must be at least 75% in each of the cells. In maintenance free batteries the level of charge is at least 75% if the corrected specific gravity reading is 1.240 or higher. In all other batteries the level of charge is at least 75% if the corrected specific gravity reading is 1.230 or higher.
7. If the difference between the high reading and the low reading is less than .050, and the level of charge is at least 75% in all of the cells, do the Capacity (Load) Test.
8. If the difference between the high reading and the low reading is less than .050, but the level of charge is less than 75% in any of the cells, charge the battery and check the specific gravity again. If after charging:

   A. The level of charge is less than 75% in any of the cells, discard the battery.

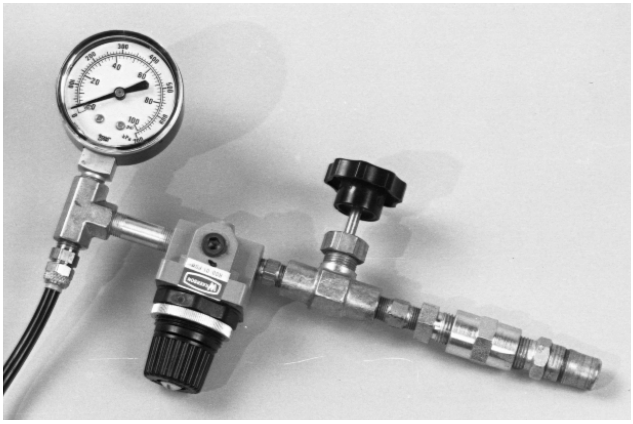
   B. The level of charge is at least 75% in all of the cells, do the Capacity (Load) Test.

SPECIAL TOOLS



926407

1. Track removal press CAS 10044



B407320M

2. CAS - 1450 and CAS - 1682 for the followong leakage test.
3. Loctite 262
4. Hammer
5. Jig

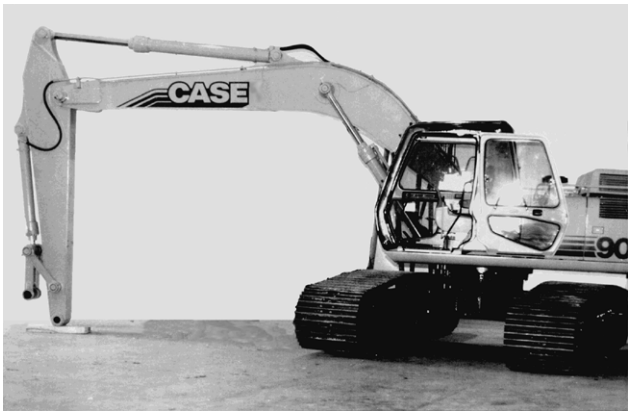
TRACK TENSION ADJUSTMENT

Check the tension of the tracks as required. Adjust the tension for the type of surface the machine will be operating on. Tighten the track for operation on hard surfaces and loosen the track for operation on soft surfaces.

STEP 1

Park the machine on a hard level surface. Rotate the upperstructure of the machine so that the cab is over the track to be checked.

STEP 2

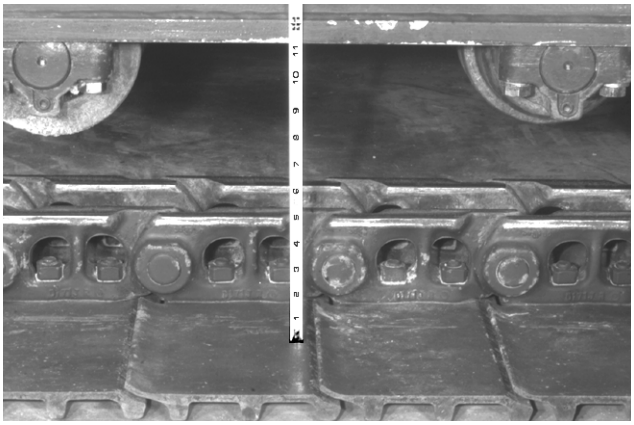


JD00270A

Lower the bucket or tool to raise the machine until the track to be checked is one to two inches from the ground.

NOTE : *If the machine does not have a bucket or tool installed, install wood blocks under the arm and lower the arm onto the wood blocks. Then, lower the arm to raise the machine.*

STEP 3



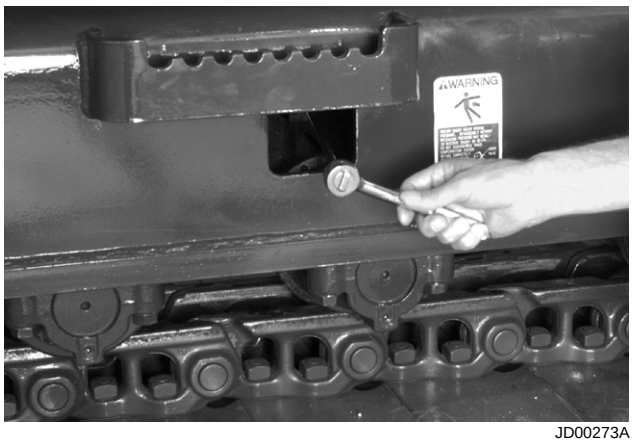
JD01074A

Measure the distance between the bottom surface of the track frame and the top surface of the track shoe. The amount of track deflection must be 180 to 205 mm.

STEP 4

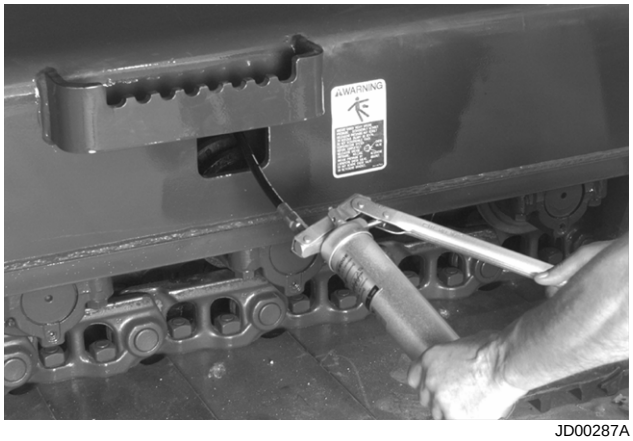
Do the following procedure to increase the track tension :

1. Clean the grease fitting for the track adjustment cylinder.



JD00273A

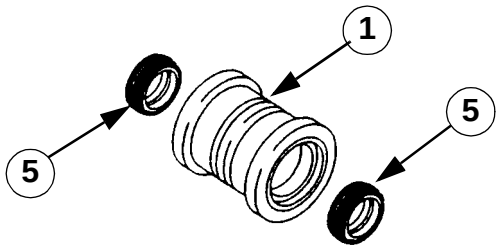
2. Check that the check valve is tight.



JD00287A

3. Inject grease into the track adjustment cylinder until the track tension is correct.

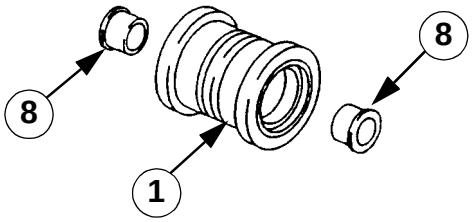
STEP 5



JS00305A

Remove and discard face seal (5) from lower roller (1) or shaft (6).

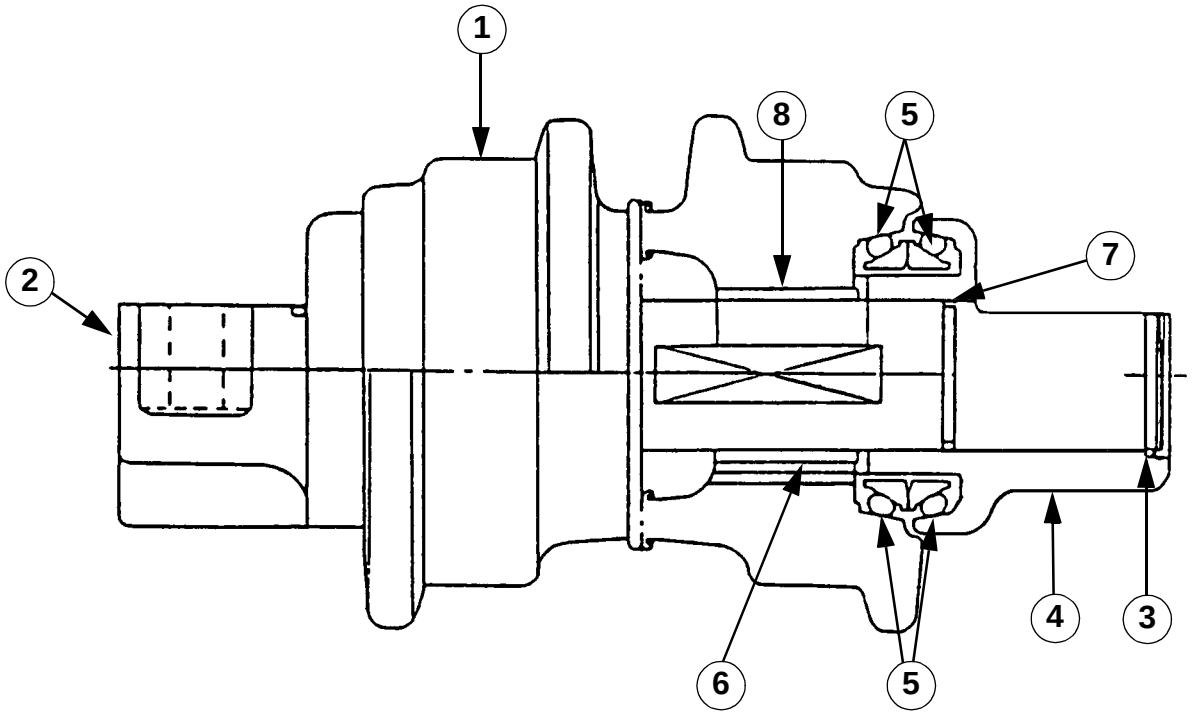
STEP 6



JS00306A

NOTE : *Do this step only if inspection step 3, page 27 indicates bushings (8) require replacement.*

Using a hammer and brass punch, drive the bushings (8) from the track roller (1). Be careful not to damage the seal bore in the track roller. Discard bushings.



JS00307A

Lower Roller (Side View)

1. Lower Roller
2. Drain Plug
3. Retainer Ring
4. End Cap
5. Face Seal
6. Shaft
7. O-Ring
8. Bushing

Inspection

STEP 1

Clean all parts in cleaning solvent.

STEP 2

Inspect the bushing surfaces on the shaft (8) for scoring, pitting, and other damage. Measure the diameter of the shaft in four places diagonally opposite of each other. If the diameter of the shaft is 31 mm or less, replace the shaft.

STEP 3

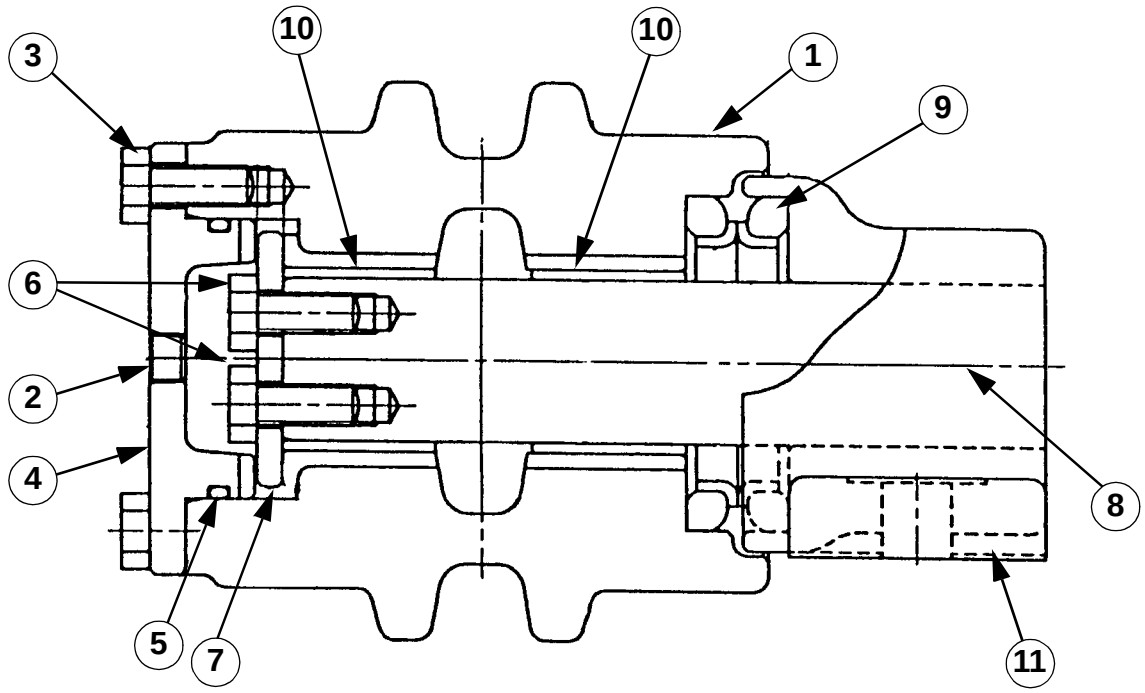
Inspect the bushings for wear and damage. Measure the ID of the bushing. If the ID of the bushing is 32.6 mm or more, replace the bushing. (Disassembly, see page 35, step 7).

STEP 4

Inspect the thrust plate for wear and damage.

STEP 5

Inspect the bore in the bracket (11) and the upper roller (1) for damage that will result in leakage. Use new parts as required.

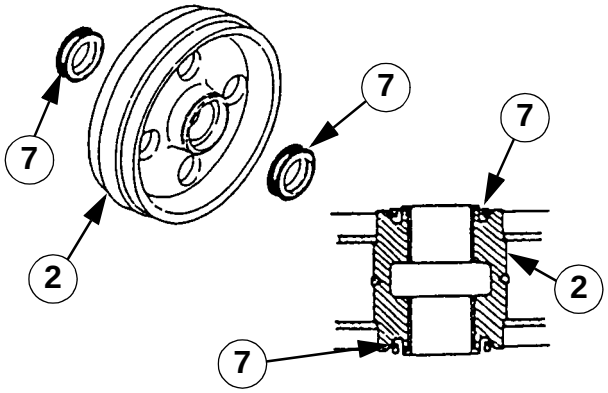


CS99A814

Upper Roller (Side view)

1. Upper roller
2. Drain plug
3. Screw
4. Cover
5. O-ring
6. Screw
7. Thrust plate
8. Shaft
9. Face seal
10. Bushing
11. Bracket

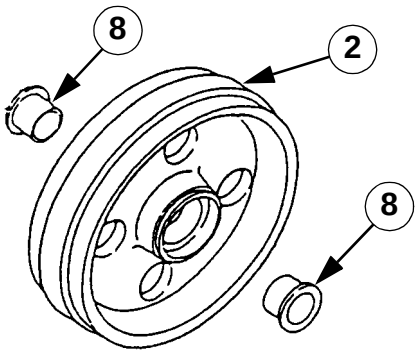
STEP 6



JS00353A

Remove and discard the face seal (7) from the idler wheel (2) using a screwdriver or suitable tool. Be careful not to damage the seal bore in the idler wheel.

STEP 7



JS00354A

NOTE : *Do this step only if inspection (step 3) indicates bushings (8) require replacement.*

Using a hammer and brass punch, drive the bushings (8) from the idler wheel (2). Be careful not to damage the seal bore in the idler wheel.

Inspection

STEP 1

Clean all parts in cleaning solvent. Make sure that the cavity in the idler wheel is clean. Dry all parts using low-pressure compressed air, then apply clean oil to all parts.

STEP 2

Inspect the bushing surfaces on the shaft for scoring, pitting, and other damage. Measure the diameter of the shaft in four places opposite of each other. If the diameter of the shaft is 44 mm or less, replace the shaft.

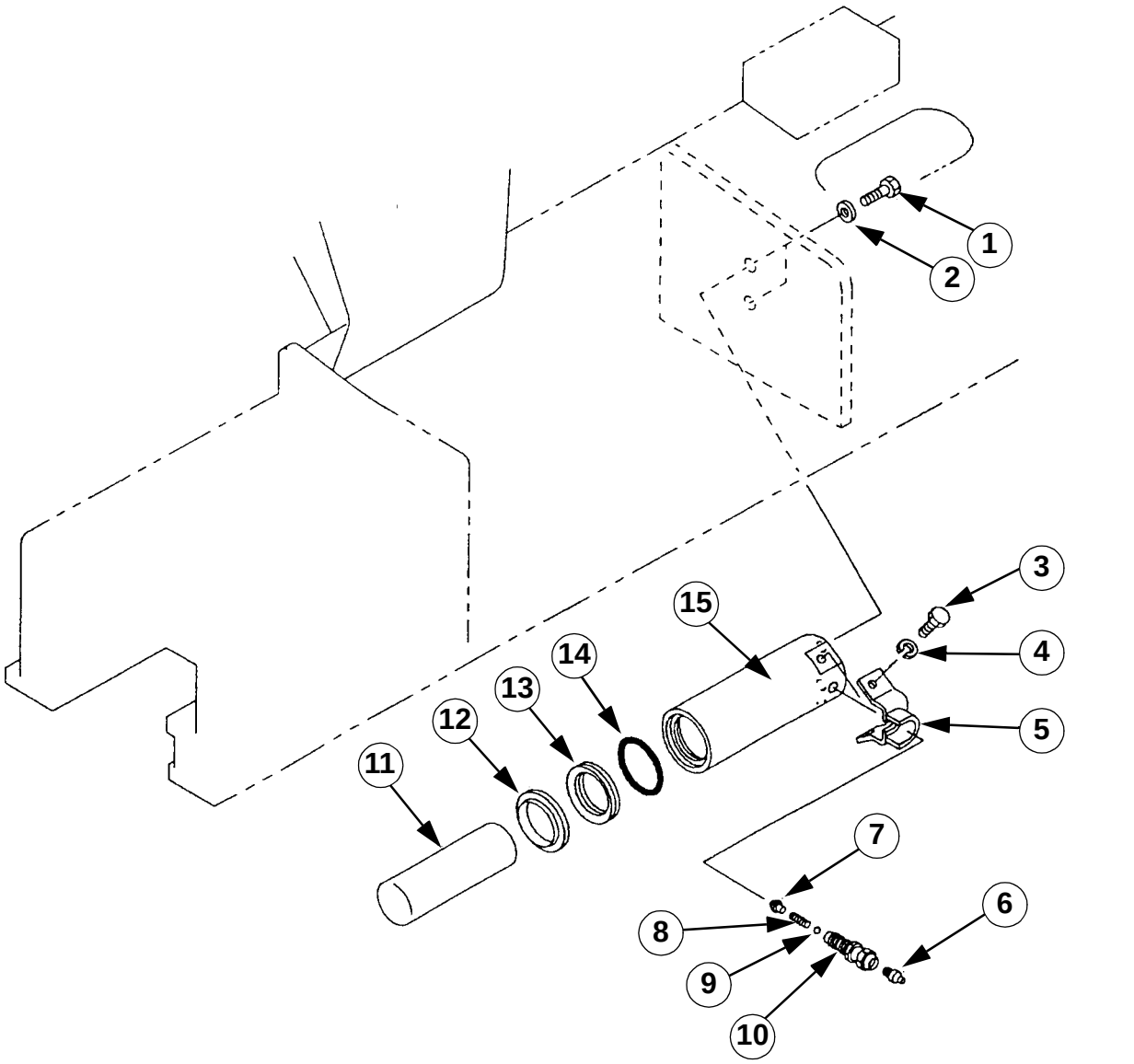
STEP 3

Inspect the bushings for wear and damage. Measure the ID of the bushing. If the ID of the bushing 45 mm or more, replace the bushing. Measure the width of the bushing. If the width of the bushing is 39.6 mm or less, replace the bushing.

STEP 4

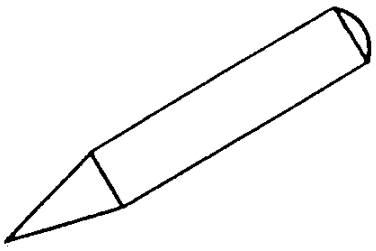
Inspect the seal bore in the hubs and idler wheel for damage that will result in leakage. Replace the parts with new parts as required.

Assembly



Track Adjustment Cylinder

1. Cap screw
2. Flat Washer
3. Cap Screw
4. Lock Washer
5. Bracket
6. Grease Fitting
7. Poppet
8. Spring
9. Ball
10. Check Valve Body
11. Piston Rod
12. Wiper
13. Back-up ring
14. O-ring
15. Cylinder Tube

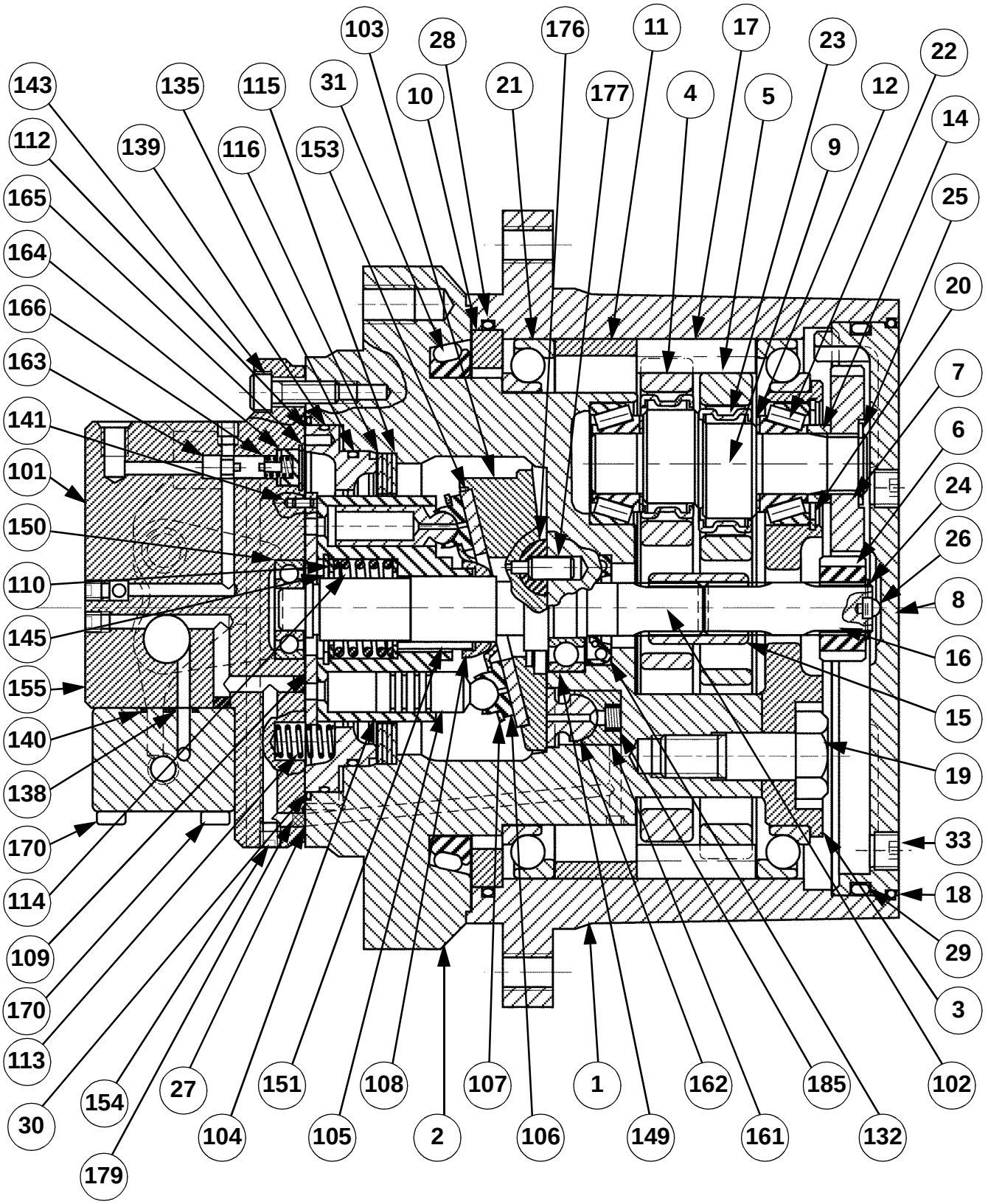


CS99A681

Punch used for removing the ring (165).

NOTE: *The tool reference numbers (CAS XXX) will be made available later.*

Cross-sectional view

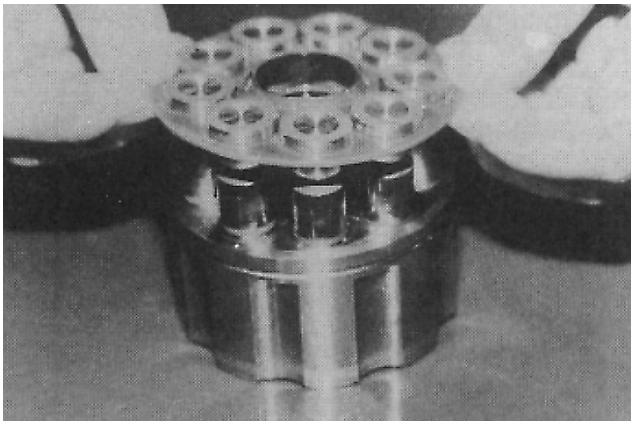


CM98M005

STEP 40

Remove the plates (116) and the friction plates (115) from the barrel (104).

STEP 41



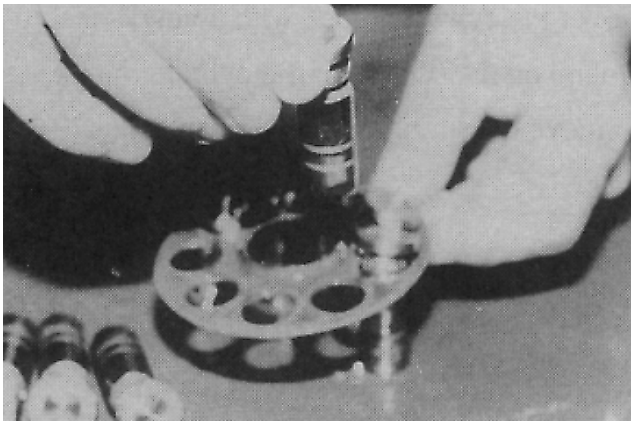
CS99A723

Remove the piston assembly (105) and the pads (106) from the barrel (104).

NOTE: *Remove the piston assembly as one piece with the retaining plate (107), by gripping the retaining plate with both hands.*

NOTE: *It is impossible to separate the piston from the pad without damaging the pad (106), since the pad is attached to the spherical part of the piston. If the pad has to be replaced, the piston and pad have to be replaced as a single unit.*

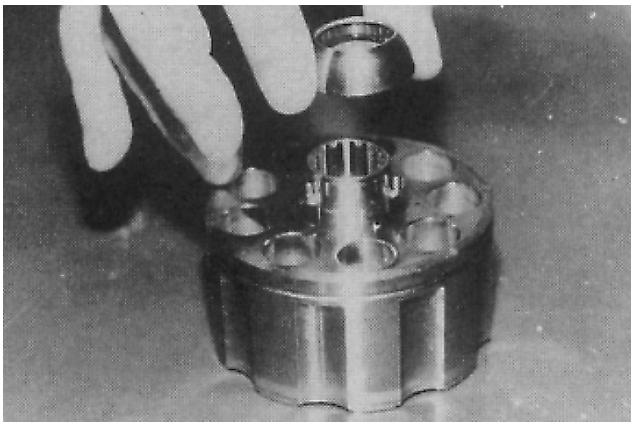
STEP 42



CS99A724

Remove the piston assembly (105) and (106) from the retaining plate (107).

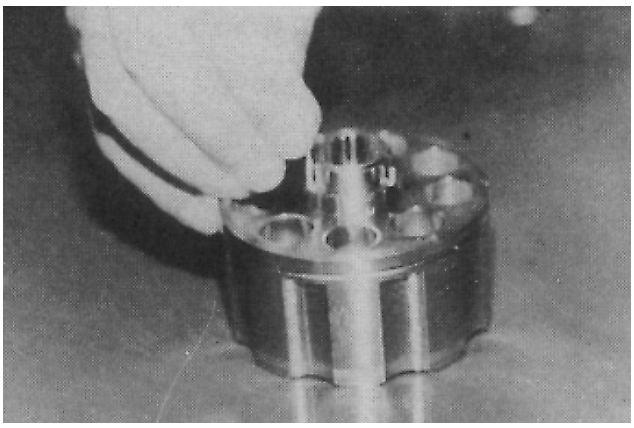
STEP 43



CS99A725

Remove the thrust ball (108) from the barrel (104).

STEP 44



CS99A726

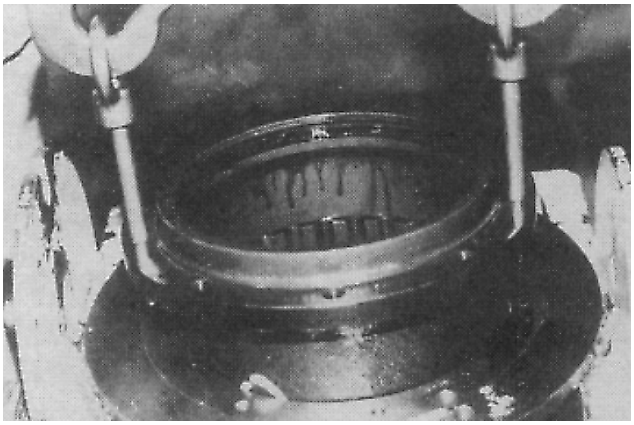
Remove the rollers (151) from the barrel (104).

NOTE: *Carry out Step 45 only if the spring (114) has to be replaced, otherwise pass on to Step 47.*

Assembly

NOTE: *The item number shown in brackets following the description of the part corresponds to the item number shown in the exploded views (see pages 10, 12 and 14).*

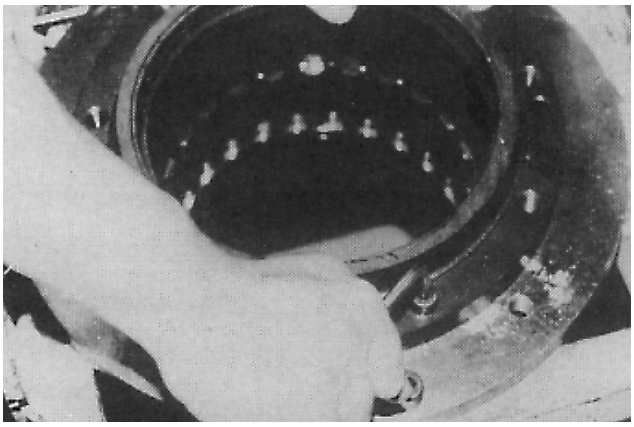
STEP 1



CS99A755

Using a suitable lifting device, place the hub (1) on the bench.

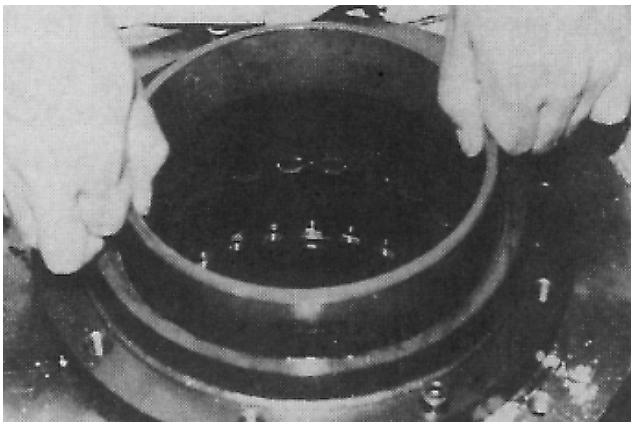
STEP 2



CS99A756

Use two screws to fasten the hub (1) to the bench.

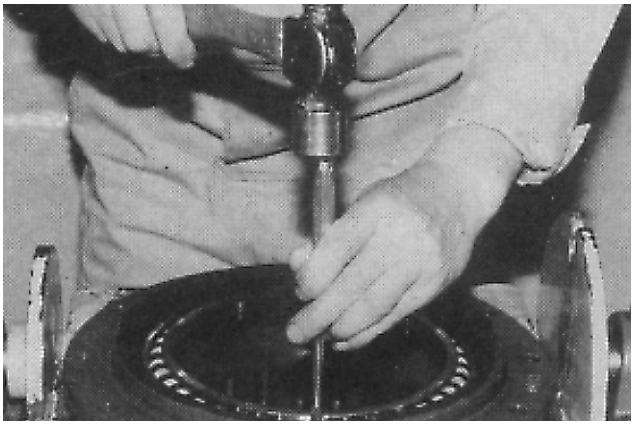
STEP 3



CS99A757

Install the collar (11) in the hub (1).

STEP 4

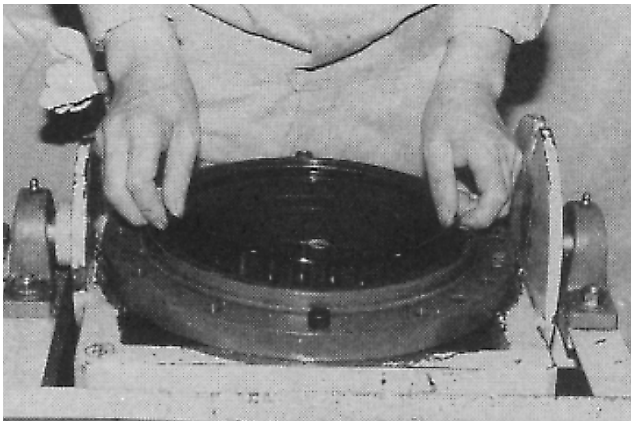


CS99A757

Using a suitable punch and hammer, install the bearing (21) in the hub (1).

NOTE: *Tap all round the bearing, gradually forcing it in.*

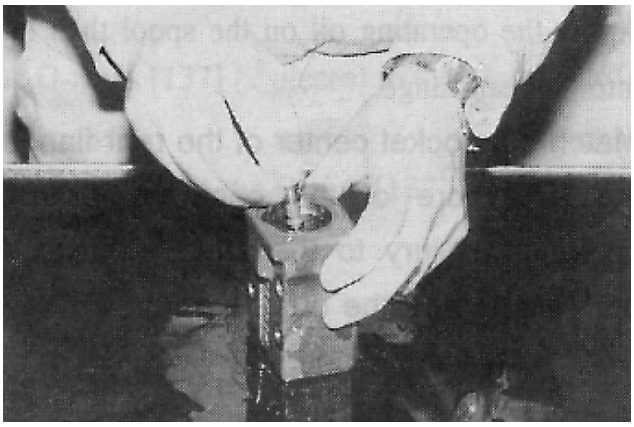
STEP 5



CS99A745

Coat the O-ring (28) with grease, and install it in the hub (1) groove.

STEP 54

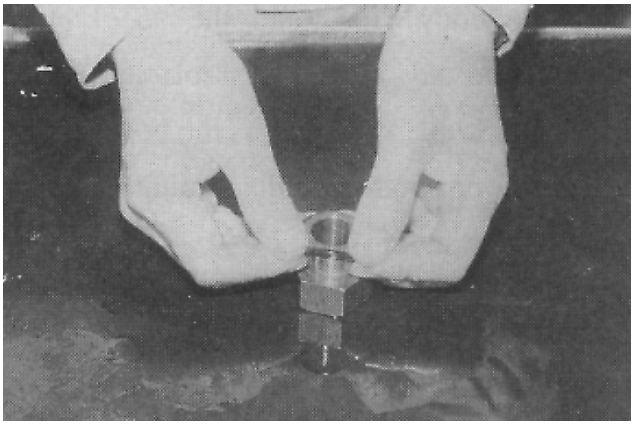


CS99A784

Apply clean hydraulic oil to the spool (156) and install it carefully in the body (155).

NOTE: *Make sure the sliding surface of the spool and of the body are not damaged during installation. Damage to either of these parts will cause incorrect operation of the travel motor.*

STEP 55



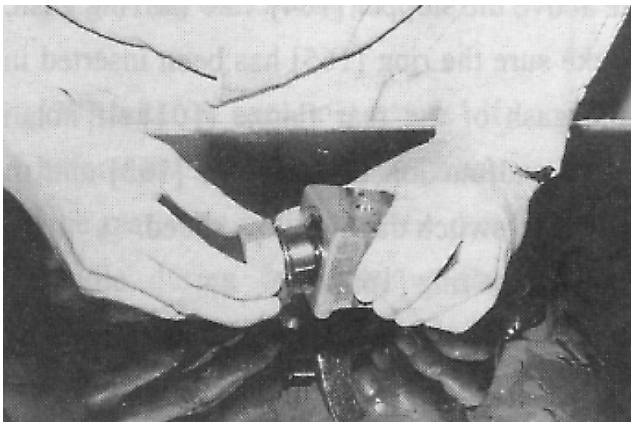
CS99A712

Apply grease to the O-ring (136) and install the O-ring (136) on the plug (160).

STEP 56

Install the stop (157) and the springs (158) and (159) in the plug (160).

STEP 57

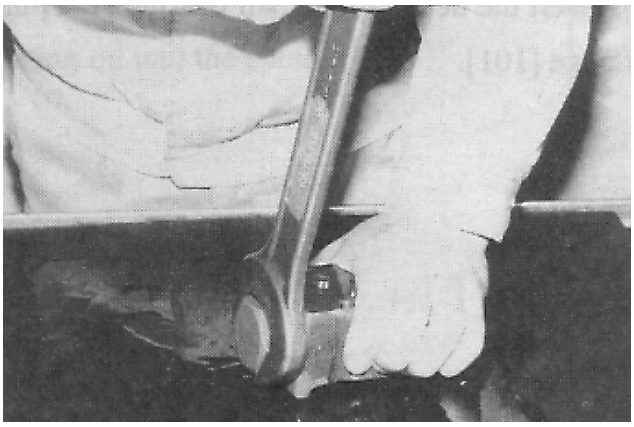


CS99A785

Install the plug (160) in the body (155).

NOTE: *Take care not to deform the springs (158) and (159).*

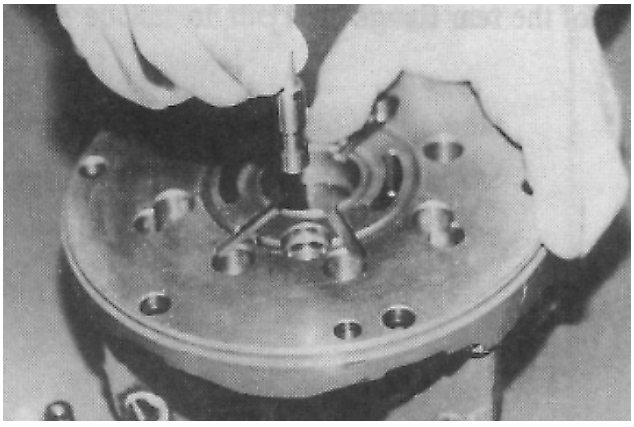
STEP 58



CS99A786

Tighten the plug (160) temporarily.

STEP 59

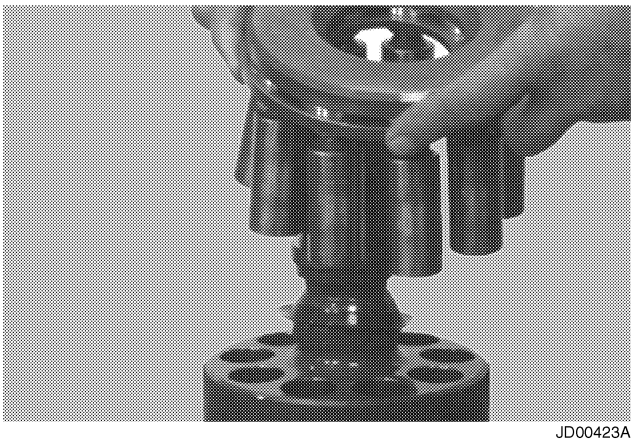


CS99A787

Install the servo valve (163) in the travel motor.

STEP 19

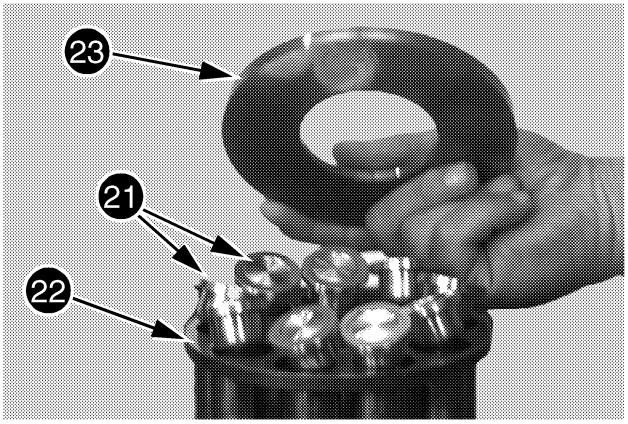
NOTE: *Check and note positions of pistons in retaining plate. Pistons must be installed in same positions during assembly.*



JD00423A

Remove the cam plate, piston assembly and retaining plate as a unit from the cylinder.

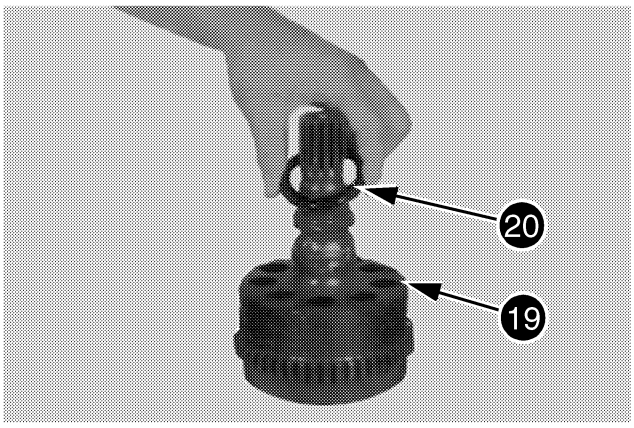
STEP 20



JD00424A

Taking care not to damage the cam plate, slide the cam plate (23) from the sliding faces of the piston assemblies. Remove the pistons (21) from the return plate (22).

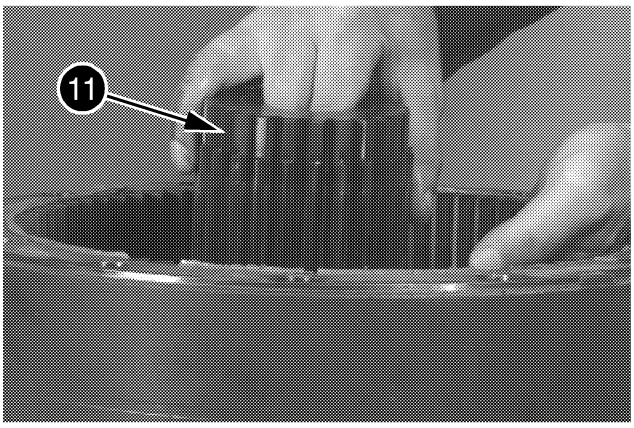
STEP 21



JD00427A

Remove the spring (20) from the cylinder (19).

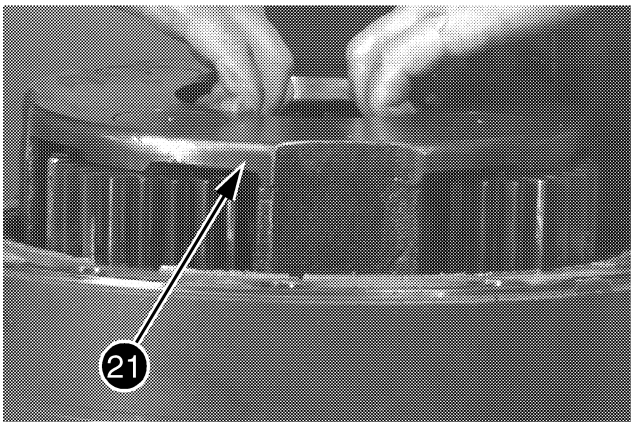
STEP 4



JD00452A

Remove the planetary gear (11).

STEP 5

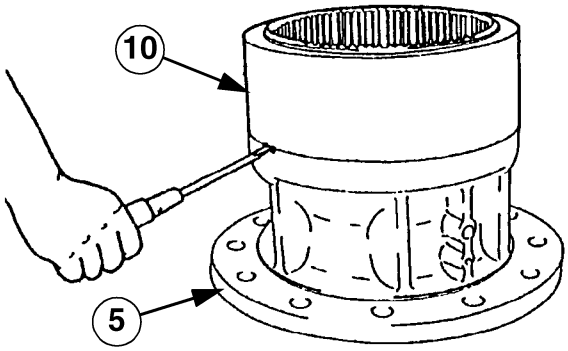


JD00453A

Remove planetary gear assembly (21) from the second stage.

NOTE: *Do not disassemble the second stage planetary gear assembly. If planetary gears are worn or have broken teeth replace the complete assembly.*

STEP 6



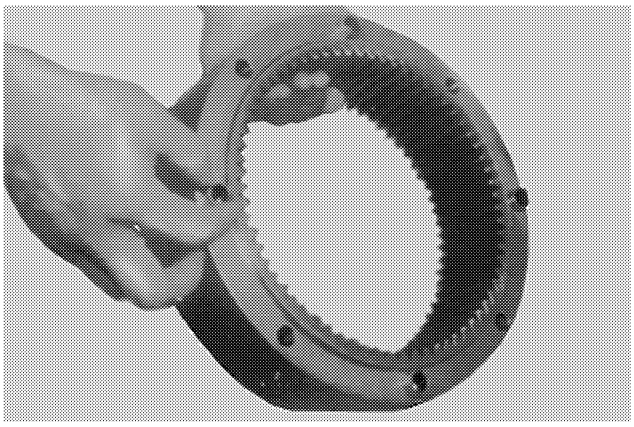
CS98B504

Using a screwdriver, use the notch in the reduction gear housing (5) to lever and remove the ring gear (10).

NOTE: *To aid in assembly, put alignment marks on the ring gear and the gear housing.*

NOTE: *When assembling, apply a liquid sealing product between the contact surface of the ring gear wheel (10) and the contact surface of the reduction gear housing (5), to prevent any oil leaks.*

STEP 7



JD00455A

Remove the two dowel pins from the ring gear.

GENERAL INFORMATION

Contamination in the hydraulic system is a major cause of the malfunction of hydraulic components. Contamination is any foreign material in the hydraulic oil. Contamination can enter the hydraulic system in any of the following ways.

1. When you drain the oil or disconnect any line.
2. When you disassemble a component.
3. From normal wear of the hydraulic components.
4. From damaged or worn seals.
5. From a damaged component in the hydraulic system.

All hydraulic systems operate with some contamination. The design of the components in this hydraulic system permits efficient operation with a small amount of contamination. An increase in this amount of contamination will cause problems in the hydraulic system.

The following list includes some of these problems :

1. Cylinder rod seals leak.
2. Control valve spools do not return to Neutral.
3. Movement of control valve spools is difficult.
4. Hydraulic oil becomes too hot.
5. Hydraulic components wear rapidly.
6. Relief valves or check valves held open by dirt.
7. Quick failure of components that have been repaired.
8. Cycle times are slow; machine does not have enough power.

If you have any of these problems, the hydraulic system has too much contamination. The best way to remove the contamination is to use the CAS-10162A portable filter.

TYPES OF CONTAMINATION

There are two basic types of contamination, microscopic and visible.

1. Microscopic contamination occurs when very fine particles of foreign material are in suspension in the hydraulic oil. These particles are too small to see or feel. Microscopic contamination can be found by identification of the problems that the microscopic contamination can cause or by testing in a laboratory. Examples of the problems caused by microscopic contamination include the following :
   A. Cylinder rod seals leak.
   B. Control valve spools do not return to neutral.
   C. The hydraulic system has a high operating temperature.
   D. Rapid wear of components.
2. Visible contamination is foreign material that can be found by sight, touch, or odor. Visible contamination can cause a sudden failure of a component. Examples of visible contamination include the following :
   A. Particles of metal or dirt in the oil.
   B. Air in the oil.
   C. The oil is dark and thick.
   D. The oil has the odor of burned oil.
   E. Water in the oil.

SPECIFICATIONS

ENGINE

No-load idle speed ..... 875 rpm
High idle in (S) Mode ..... 2225 rpm
(L) Mode ..... 1585 rpm
Power ..... 54.2 HP (40.5 kW) at 2100 rpm
Torque ..... 139 lb ft (188 Nm) at 1600 rpm

HYDRAULIC PUMPS (3 Pumps)

1 Double pump with variable displacement ..... 2 x 2.188 cu/in (2 x 36 cm^3)
No-load ..... 2 x 20 GPM (2 x 75.5 L)
Pressure ..... 4050 to 4120 PSI (28.4 $^{+0}_{-0.5}$ MPa)

2 Fixed flow pump for the blade
Displacement ..... 0.735 cu/in (12.1 cm^3)
No-load ..... 6.7 GPM (25.4 L)
Pressure ..... 3205 to 3350 PSI (22.6 $^{+}_{-0.5}$ MPa)

3 Fixed flow pump for servo-system
Displacement ..... 0.650 cu/in (10.7 cm^3)
No-load ..... 5.9 GPM (22.4 L)
Pressure ..... 493 to 638 PSI (3.9 $^{+}_{-0.5}$ MPa)

PRESSURE SETTING

Travel and attachment control valve
Main relief valve ..... 4050 to 4120 PSI (28.4 $^{+}_{-0.5}$ PMa)
Secondary relief valve
Raising boom (B) ..... 4409 to 4551 PSI (30.4 $^{+0.98}_{-0}$ MPa)
Lowering boom (C) ..... 3698 to 3890 PSI (25.5 $^{+0.98}_{-0}$ MPa)
Bucket opening (D), closing (E) ..... 4409 to 4551 PSI (30.4 $^{+0.98}_{-0}$ MPa)
Arm extending (F), retracting (G) ..... 4409 to 4551 PSI (30.4 $^{+0.98}_{-0}$ MPa)

Swing motor:
To the right (H), to the left (I) ..... 2915 to 3060 PSI (20.6 $^{+}_{-0.5}$ MPa)
Servo-control valve block:
Pressure limiter (J) ..... 493 to 638 PSI (3.9 $^{+}_{-0.5}$ MPa)
Dozer blade control valve:
Main relief valve ..... 3205 to 3350 PSI (22.6 $^{+}_{-0.5}$ MPa)
Secondary relief valve: raising (L), lowering (M) ..... 3625 to 3770 PSI (25.5 $^{+}_{-0.5}$ MPa)

SWING MOTOR REDUCTION

Displacement ..... 2.76 cu/in (45.5 cm^3)
Gear ratio 19.464/1
Braking torque (brake only) ..... 121.6 lb ft (164.8 Nm)

TRAVEL MOTO-REDUCTION GEAR

Displacement ..... 2.262/1.56 cu/in (37.22/25.75 cm^3)
Gear ratio 52.8/1
Braking torque (brake only) ..... 60.8 lb ft (82.4 Nm)

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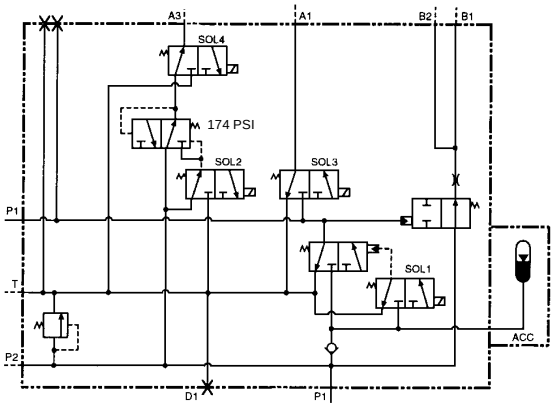
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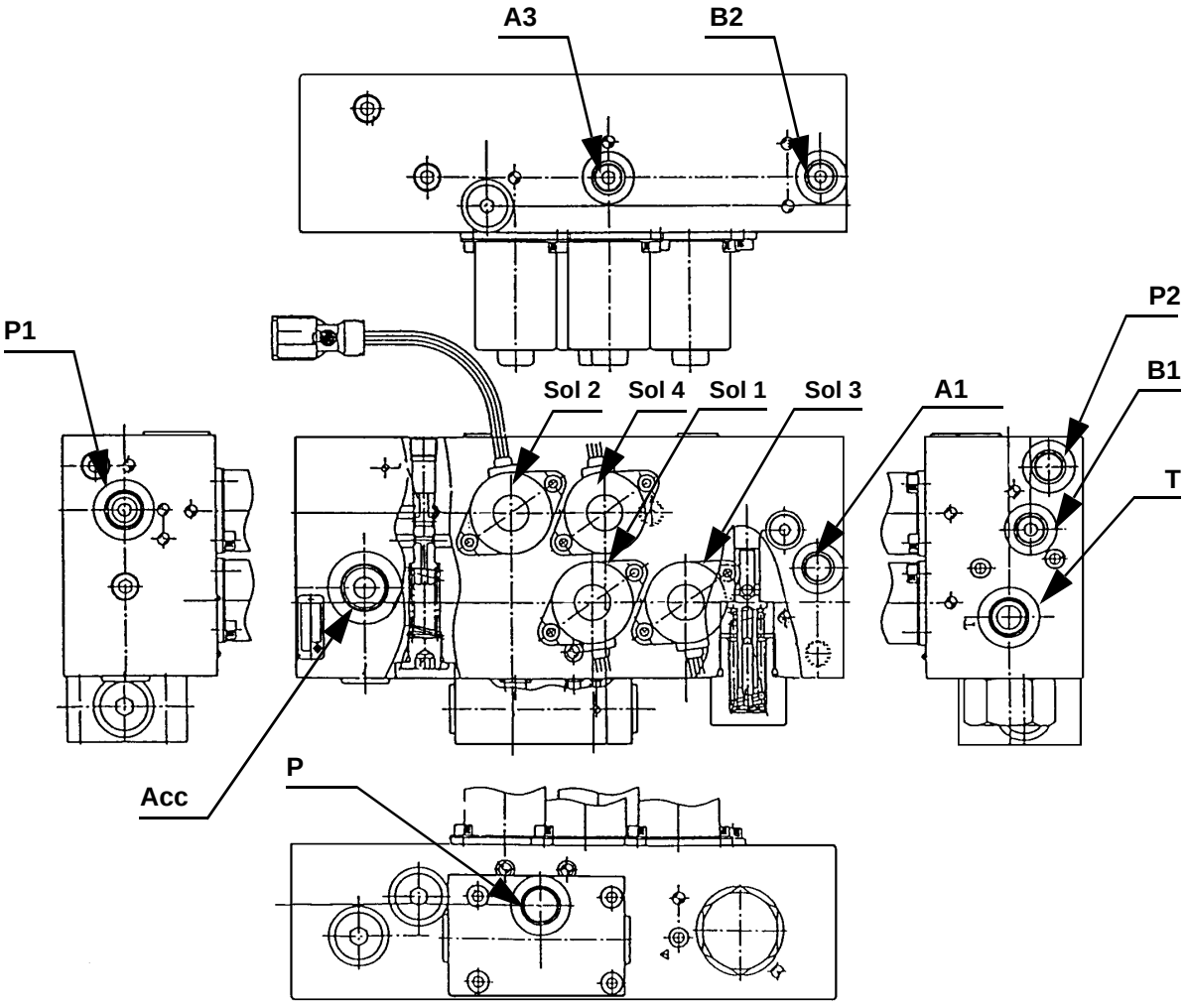
Control block

Solenoid No	Sol 1	Sol 2	Sol 3	Sol 4
Colour	Blue	White	Red	Green
Ref.	Y5	Y4	Y3	Y1

Reference	Ø of Orifice
Acc	G (PF) 1/2
P1-P-T	G (PF) 3/8
A1-A3	G (PF) 1/4
B1-B2	G (PF) 1/4

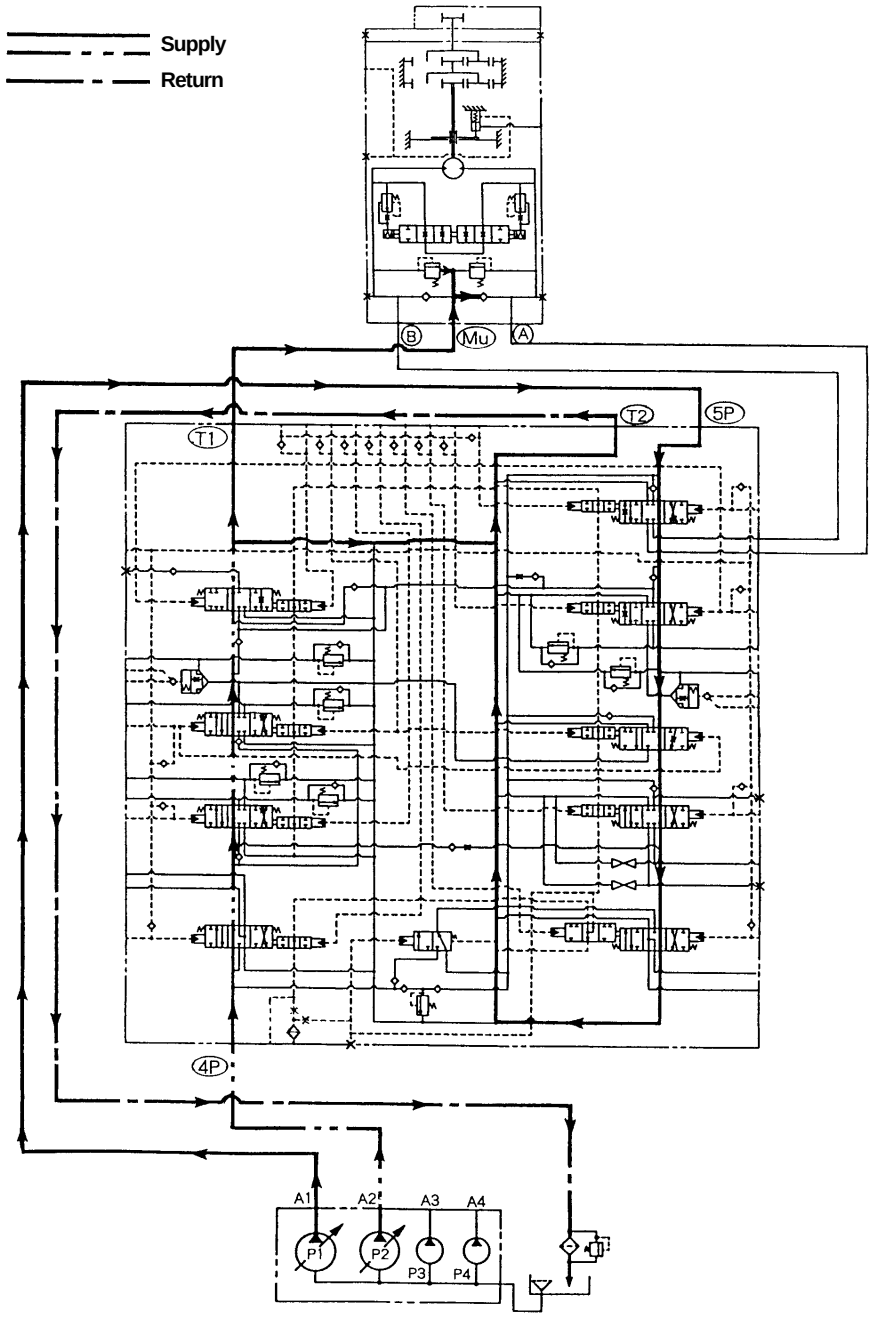


CS99A867



CS99A878

Swing function during braking phase



CS99A527

NOTE : *The 50% mechanical braking system becomes active 5 seconds after releasing the hand control lever.*

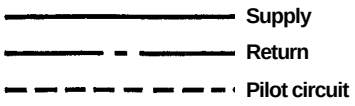
When the swing control is released, the control valve spool returns to the neutral position.

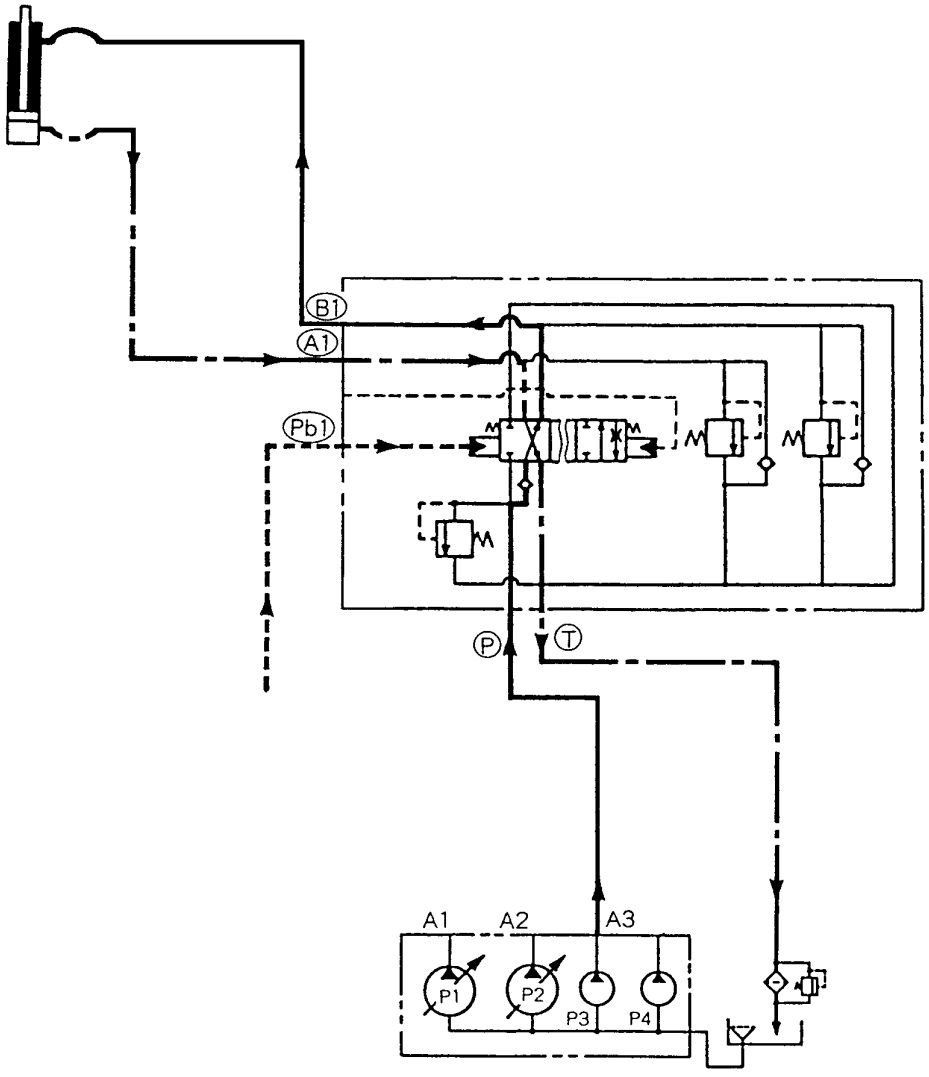
The return oil (B) rises in pressure and escapes through the relief valve until the upperstructure stops.

At the same time, oil flow at port (A) is decreased, and compensated for by the flow of the return circuit arriving at port (MU).

DOZER BLADE CIRCUIT

Raising the dozer blade





CS99A538

Flow (A3) enters the control valve through port (P) when the foot control is used to raise the dozer blade; the servo-oil enters the control valve through port (Pb1) and activates the dozer blade spool, enabling the blade to be raised.

OPERATIONS TO BE CARRIED OUT BEFORE ANY INSPECTION OR ADJUSTMENT

- Park the machine on flat, horizontal ground.
- Completely retract the bucket and dipper cylinder rods.
- Lower the attachment to the ground.
- Stop the engine.
- Check the levels of water and oil in the engine.
- Check the hydraulic oil level.
- Bring the temperature of the hydraulic oil to 50°-55°C (120°-130°F).

IMPORTANT : *Keep the temperature of the hydraulic oil at 50°-55°C (120°-130°F) during all the checking or adjustment operations.*

WARMING THE HYDRAULIC OIL

STEP 1

Start the engine, with the control cancellation lever in the raised position (stops hydraulic functions) - this opens the heating circuit for the machine´s hydraulic oil. Keep the heating going until a temperature of 50°C to 55°C (120°-130°F) is obtained.

STEP 2

Lower the control cancellation lever and operate the attachment controls several times till the cylinders are extended up to the stops (small and large chambers).

STEP 3

Raise one of the tracks using the attachment. Operate the track in both directions for one minute in each direction.

STEP 4

Repeat the operation for the other track.

IMPORTANT : *Keep the temperature of the hydraulic oil at 50°-55°C (120°-130°F) during all the checking or adjustment operations.*

Safety precautions before assembly

Before undertaking any service work on the machine, it is necessary to carry out the following procedure:

- Park the machine on hard, level ground.
- Lower the attachment to the ground.
- Shut down the engine.
- Turn the starter switch key to the “ON” position.
- Operate the control locking switch on the left-hand control arm.
- Make sure the control locking lamp on the instrument console comes on.
- Operate the control levers a dozen times from left to right and from front to rear.
- Turn the starter switch key to the “OFF” position.

WARNING: *When the machine is running, the hydraulic pump components heat up to a high temperature. To avoid being burnt by hot metal or scalded by water or oil, allow the machine to cool down before carrying out any service work.*

- Avoid removing adjustment screws, unless it is absolutely necessary. The horsepower adjustments would be thrown out of setting and damage could be caused to the machine.
- Do not allow components to knock against each other or to fall on the ground.
- The components of the front and rear pump bodies form part of an assembly. Tag the components to facilitate reassembly.

Removal and installation

STEP 1

Remove the engine left-hand side cover.

STEP 2

Remove the counterweight (see Section 9002).

STEP 3

Remove the plate to gain access to the hydraulic reservoir drain plug. Place a clean receptacle with a capacity of 60 litres under the hydraulic reservoir. Install a funnel inside the receptacle, remove the drain plug and allow the hydraulic oil to drain. Install and tighten the drain plug.

NOTE : *When installing, fill the hydraulic reservoir with clean oil. The hydraulic reservoir has a capacity of 56 litres.*

STEP 4

Fasten identification tags to all the hoses on the hydraulic pump, the dozer blade pump and the servo-pump. Disconnect and plug the hoses.

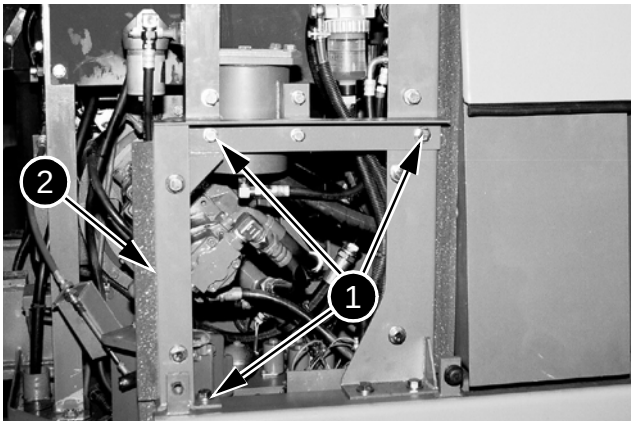
STEP 5

Remove the manifold mounting screws and remove the manifold.

STEP 21

Remove and plug the hoses from the servo-circuit filter and the ultra-clean filter.

STEP 22



CK99D001

Remove the three mounting screws (1) from the cowling frame (2) and remove the cowling frame.

STEP 23

Use suitable lifting equipment to support the pump. Remove the hydraulic pump mounting screws, remove the pump carefully and place it on a clean work bench.

NOTE : *When installing the hydraulic pump, proceed in the reverse order from that at removal. Systematically replace all seals with new ones.*

IMPORTANT : *Before starting up the machine, fill the pump housing with clean oil and bleed the air from the system.*

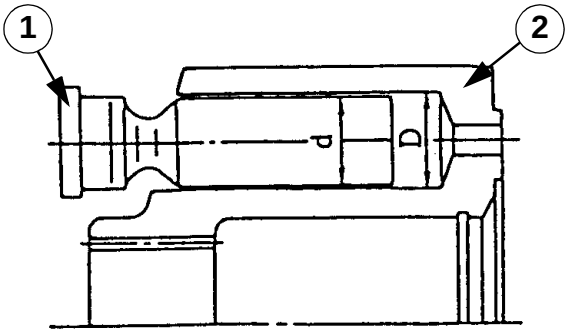
Inspecting and checking

Piston/cylinder block assembly

STEP 1

Carry out a visual inspection and make sure there are no flaws, marks or signs of abnormal wear (especially on sliding surfaces).

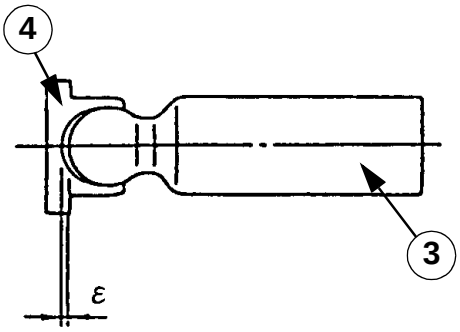
STEP 2



CS99A618

Check the clearance between the outer diameter (d) of the piston (1) and inner diameter (D) of the cylinder (2), (D-d ⩽ 0,050 mm).

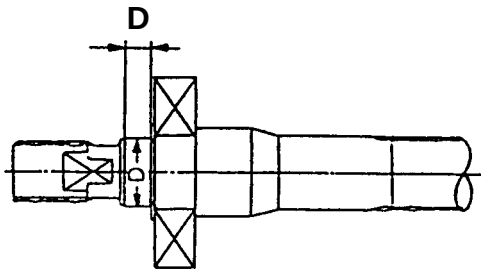
STEP 3



CS99A619

Check the clearance between the piston (3) and the shoe (4) (ε⩽ 0,2 mm).

STEP 4



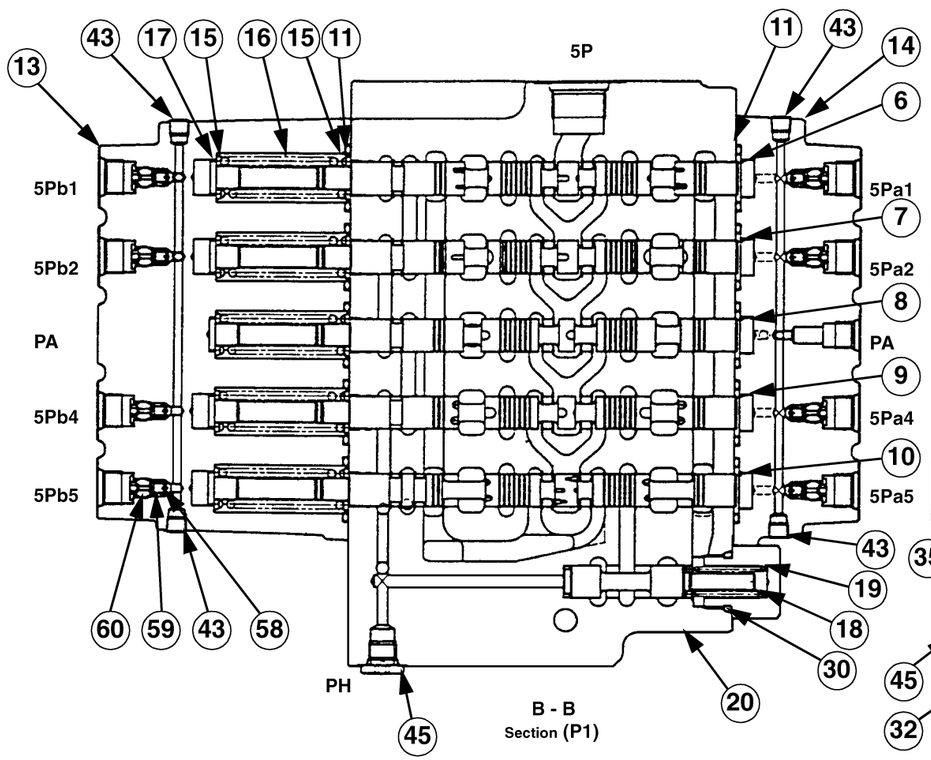
CS99A620

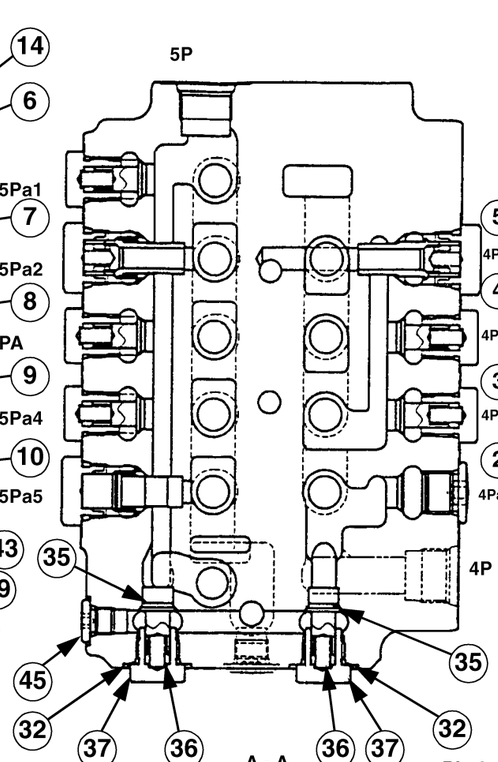
Check the oil seal running surface (D) (D⩽ 0.025 mm).

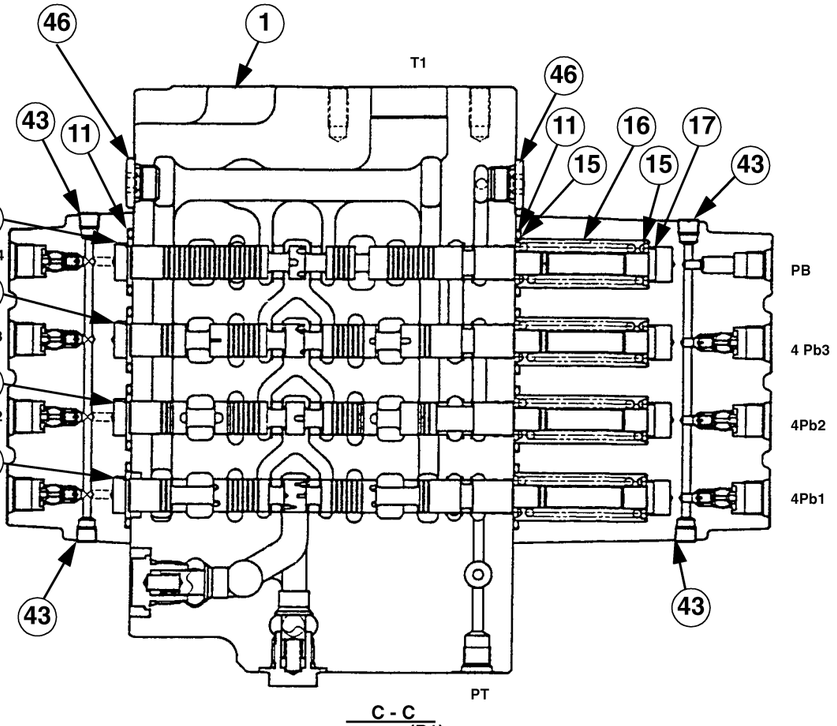
Safety measures

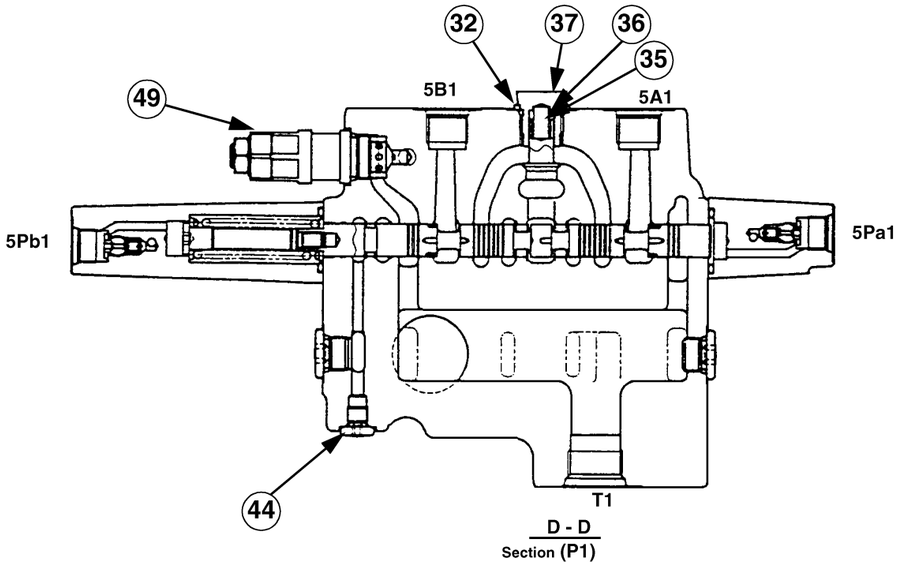
When starting up the machine, remember the following check list:

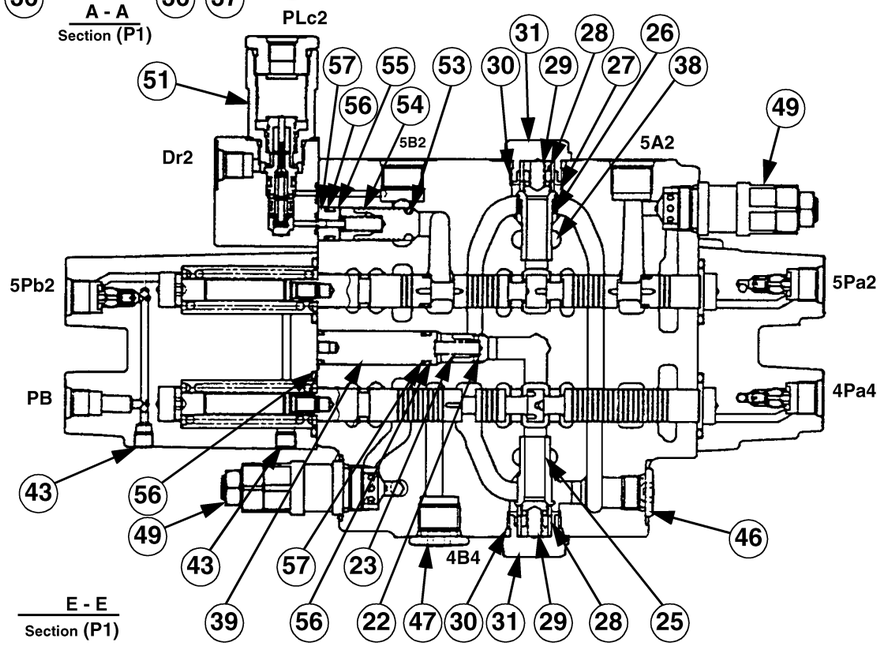
1. Has the hydraulic reservoir been drained and cleaned?
2. Have the lines been cleaned and installed in such a way that they are not exerting pressure on the hydraulic pump?
3. Have the lines been connected correctly, as shown in the hydraulic schematics and illustrations?
4. Have all unions and connectors been properly tightened?
5. Have the flexible drive coupling between pump and engine and the lines been correctly installed?
6. Is the pump rotating in the same directory as the engine?
7. Is the recommended hydraulic oil flowing through the filter and to the hydraulic tank, so that the hydraulic reservoir level remains correct?
8. Does the filter have the correct filtering capacity and characteristics?
9. Is the filter properly installed in relation to the direction of flow?
10. Is the pump case full of oil?
11. Is the regulator in by-pass position?
12. When starting the engine, follow the procedure for bringing the system up to operating temperature at low idle speed.
13. Check that the hydraulic cylinders are functioning correctly before putting the system under load.
14. As soon as the machine reaches its normal operating temperature, place the cylinders under load and check for correct operation.
15. Regularly check all indicators, gauges and instruments.
16. Remain alert and investigate all abnormal noises.
17. Check the oil level in the hydraulic reservoir and add more oil, if necessary.
18. Place the hydraulic cylinders under load and check the relief valve pressure.
19. Make sure there are no leaks from any component.
20. Shut down the engine.
21. Tighten all screws and plugs, even if there are no leaks. (Do this when there is no remaining pressure in the system).


5P
5Pb1
5Pb2
PA
5Pb4
5Pb5
5Pa1
5Pa2
PA
5Pa4
5Pa5
PH
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16
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11
11
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19
18
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20
60
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58
45
B - B
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4Pa4
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4Pa3
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4Pa2
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4P
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4Pb2
4Pb1
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5A1
5Pb1
5Pa1
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Dr2
5B2
5A2
5Pb2
5Pa2
PB
4Pa4
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23
4B4
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22
47
30
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28
25
E - E
Section (P1)

CS99B665

Assembling the spool

STEP 1

Assemble the spool sub-assembly (2), (3), (4) and (5) at the 4 spool end, and (6), (7), (8), (9) and (10) at the 5 spool end.

STEP 2

Assemble the shuttle ball (18) and the spring (19) in the control valve body and assemble the plug (20) complete with its O-ring (30) and tighten to a torque of between 78 Nm and 88 Nm.

NOTE: *Make sure that the spool and the shuttle ball are installed in their original port; assemble them without forcing. After assembling the spool, slide it manually to make sure that it operates correctly.*

Assembling the cap

STEP 1

Assemble the check valve (58) and the spring (59) in each pilot port (other than PA and PB). Apply Loctite to the plug thread (60) then install it and tighten it to a torque of between 13.5 Nm and 17 Nm.

STEP 2

Assemble the O-rings (11) in the cap grooves (13) and (14).

STEP 3

Assemble the caps (13) and (14) and tighten the socket head screws (40), (41) and (42) to a torque of between 8.8 Nm and 10.8 Nm.

NOTE: *Make sure you do not allow the contact face O-ring to fall when installing the cap.*

Assembling the other plugs

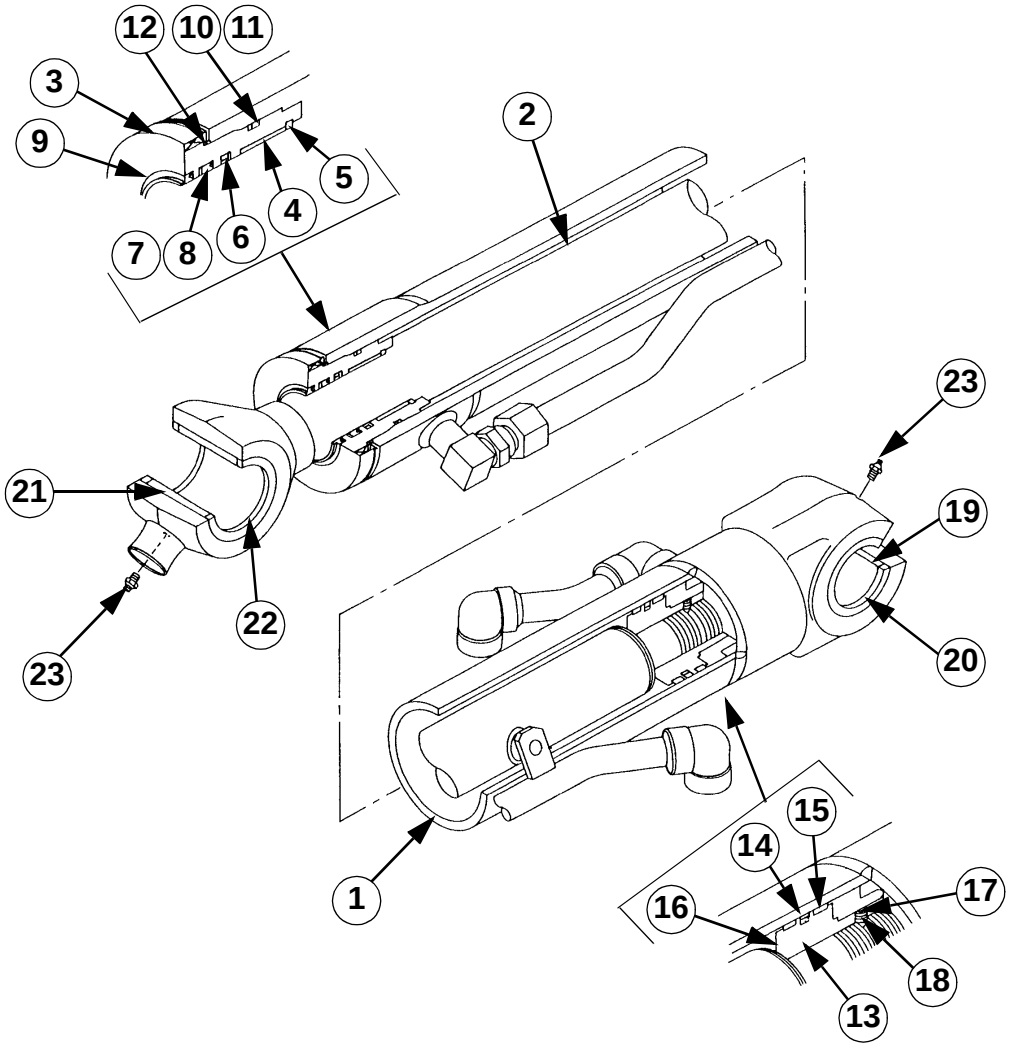
- Tighten the plug assembly (44) complete with its O-ring to a torque of between 13.5 Nm and 17 Nm.
- Tighten the plug assembly (45) complete with its O-ring to a torque of between 30.5 Nm and 41 Nm.
- Tighten the plug assembly (21) complete with its O-ring to a torque of between 49 Nm and 59 Nm.
- Tighten the plug assembly (46) complete with its O-ring to a torque of between 63 Nm and 84 Nm.

NOTE: *After assembly, check that no parts are missing and that the torque settings are correct. Incorrect torques would cause oil leaks.*

NOTE: *The torque setting values shown apply to lubricated parts (using hydraulic oil).*

BUCKET CYLINDER

Description

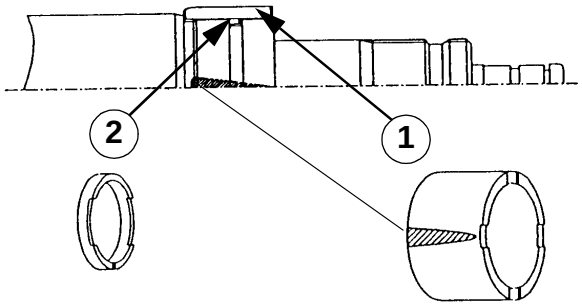


CI99C502

NOTE: *For cylinder disassembly and assembly see page 13.*

1. Cylinder barrel
2. Cylinder rod
3. Gland
4. Bushing
5. Snap ring
6. Stop seal
7. Composite seal
8. Back-up ring
9. Wiper seal
10. O-ring
11. Back-up ring
12. O-ring
13. Piston
14. Seal assembly
15. Carrier seal
16. Spacer
17. Locking screw
18. Steel ball
19. Pin bushing
20. Wiper seal
21. Pin bushing
22. Wiper seal
23. Grease fitting

STEP 10

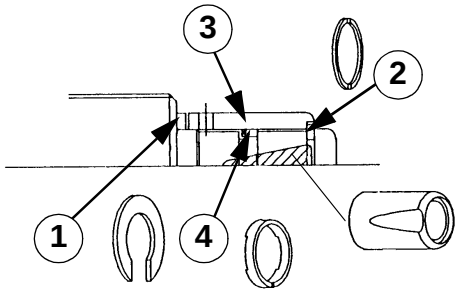


CS99C518

Install the shock absorbing seal (2) and place the shock absorbing ring (1) at the cylinder rod extending end.

NOTE: *The shock absorbing seal (2) and the shock absorbing ring (1) are installed in a precise direction which has to be observed. Place the cut in the direction indicated in the illustration.*

STEP 11



CS99C519

Place the shock absorbing seal (4), the snap ring (1), the shock absorbing ring (3) and the stops (2) at the cylinder rod retracting end.
Place the shock absorbing seal (4) and the shock absorbing ring (3) with the flat in the position shown in the illustration.
Assemble the two stops (2) in the groove. Push the shock absorbing ring (3) into the end of the stop (2) and install the snap ring (1).

NOTE: *Tap the snap ring lightly, without damaging the rod or the shock absorbing ring.*

STEP 12

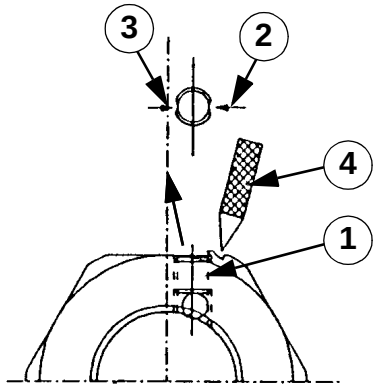
Install the piston on the cylinder rod. Tighten the piston nut to the torque shown on page 3.

NOTE: *Incomplete tightening can cause internal leaks, the nut becoming unscrewed and damage to the threads.*

STEP 13

After tightening the piston nut, insert the steel ball and tighten the locking screw to the torque specified on page 3.

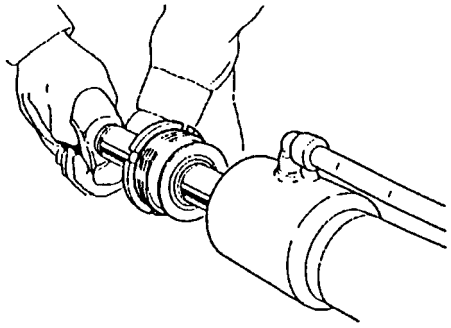
STEP 14



CS99C520

Peen the locking screw (1) in two places (2) and (3), using a punch (4).

STEP 15



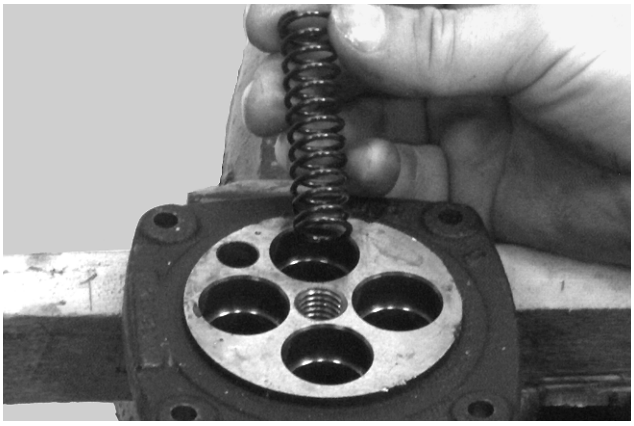
CS98B046

Position the cylinder body horizontally, and insert the cylinder rod assembly. Take care not to damage the various seals.

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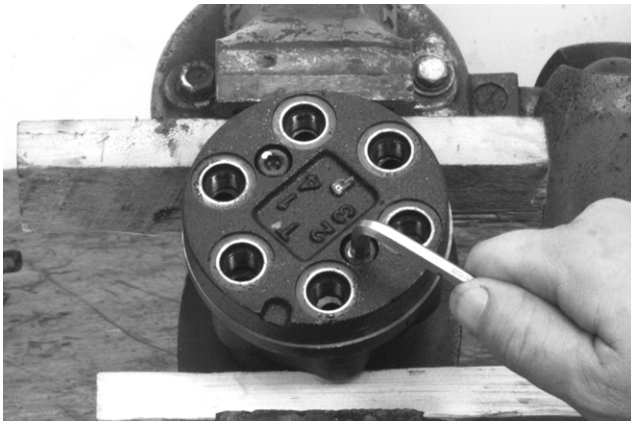
STEP 8



JD00771A

Remove the return spring from the housing.

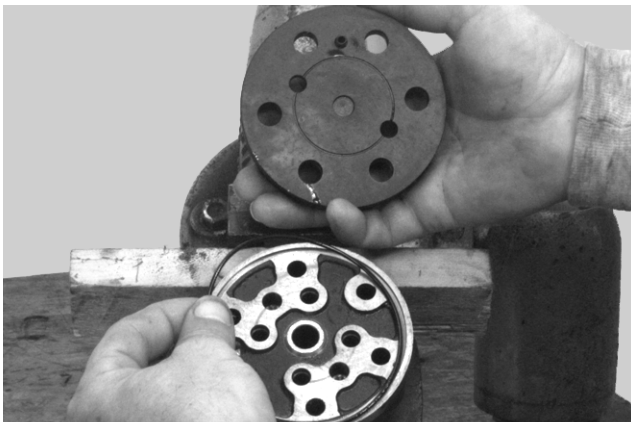
STEP 9



JD00772A

Reposition the valve in the vise and loosen and remove the socket head cap screws and seal washers.

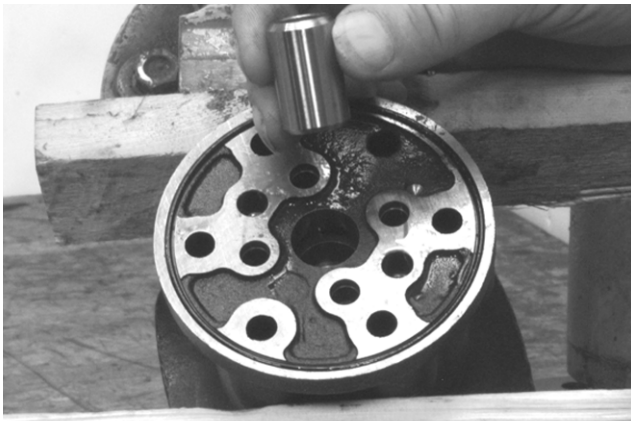
STEP 10



JD00773A

Remove the port plate and O-ring from the housing. Discard O-ring.

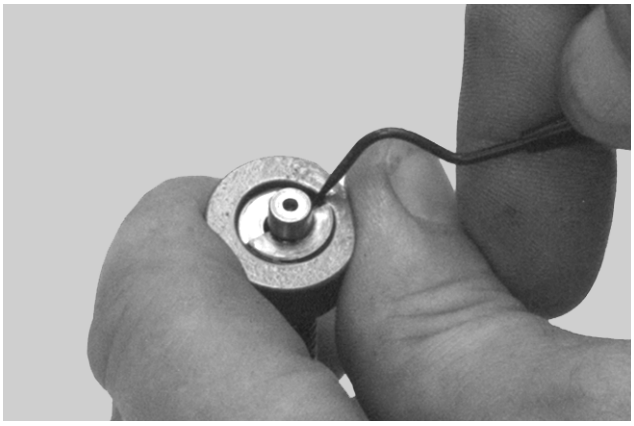
STEP 11



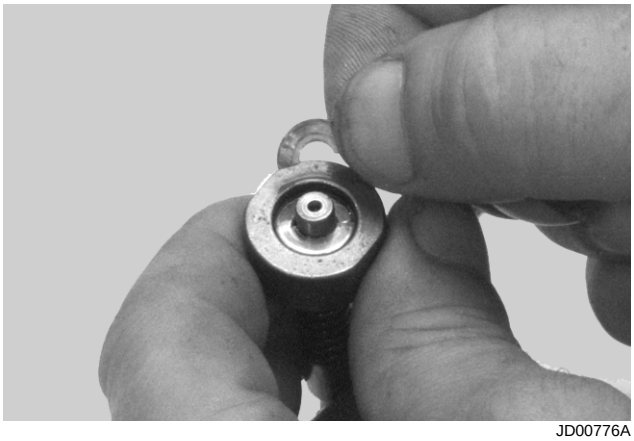
JD00774A

Remove the bushing from the housing.

STEP 12



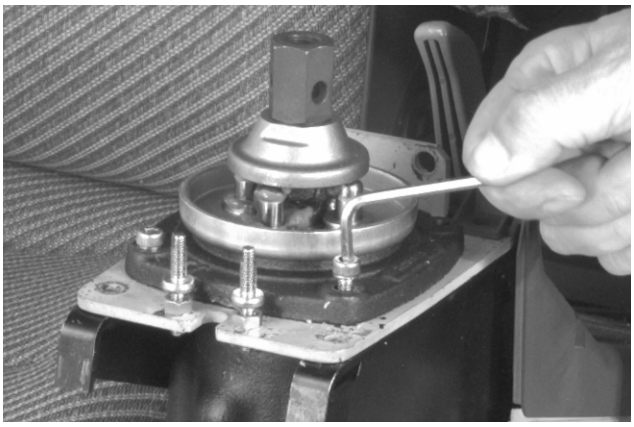
JD00775A



JD00776A

Disassemble the pressure reduction assembly by standing the spool on the work bench. Push the spring seat down (not more than 0.24 inch (6 mm)) and remove the two half washers. Take care not to scratch the surface of the spool.

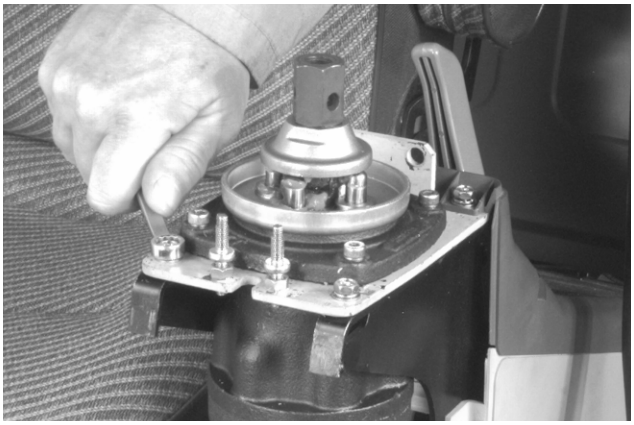
STEP 8



JD00759A

Install the four socket head cap screws to hold the control valve to the bracket.

STEP 9



JD00758A

Install the four flat washers, lock washers and cap screws to hold the bracket to the frame.

STEP 10



JD00757A

Position the lever and handle with the boot installed on the valve stem. Screw the lever and handle to the valve stem.

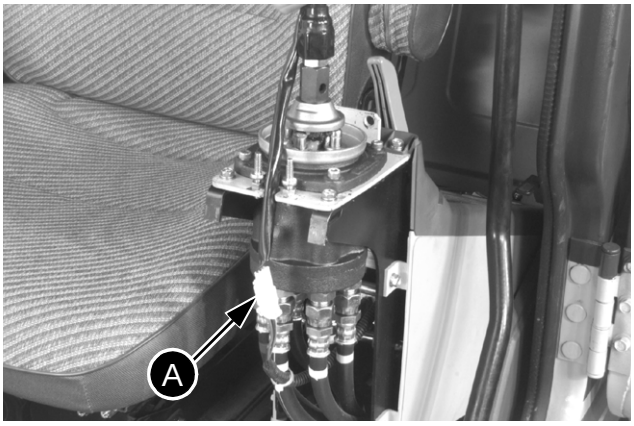
STEP 11



JD00756A

Tighten the nut to hold the lever to the valve stem.

STEP 12



JD00755A

Connect the electrical connector (A).

STEP 13



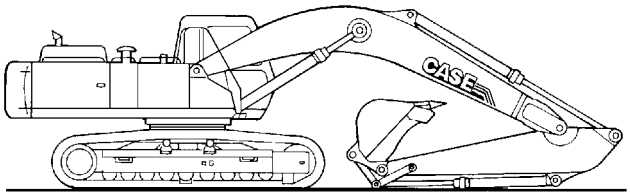
JD00754A

Install the cover over the control valve and in position on the frame.

Removal

NOTE: *Removal and installation instructions for either of the hand control valves are the same.*

STEP 1



JS01204A

Park the machine on a level surface. Lower the attachment to the ground.

STEP 2

Turn the key switch to the OFF position to stop the engine.

STEP 3

Turn the starter switch to the ON position. Check that the CONTROLS LOCK symbol is not displayed on the systems display panel.

STEP 4

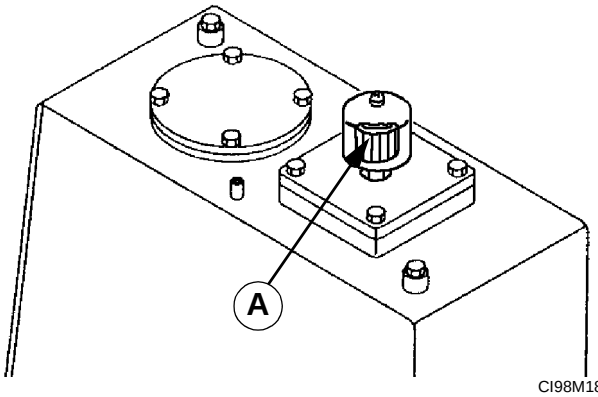
Operate the swing and attachments control levers back and forth, left and right ten times, to release hydraulic system pressure.

STEP 5

Turn the starter switch to the OFF position.

STEP 6

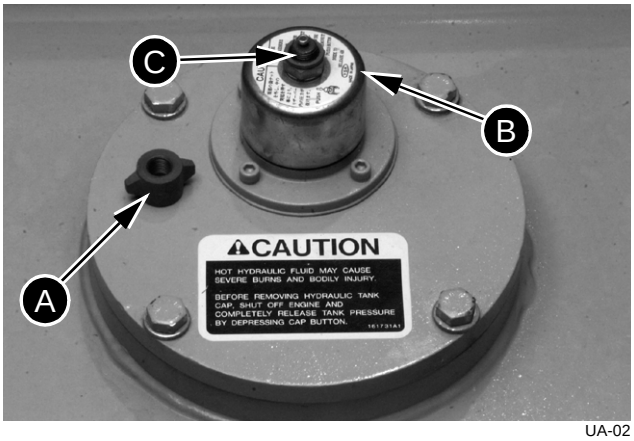
Machine 9007



CI98M182

The reservoir is equipped with a vent filter (A). The reservoir is not pressurised.

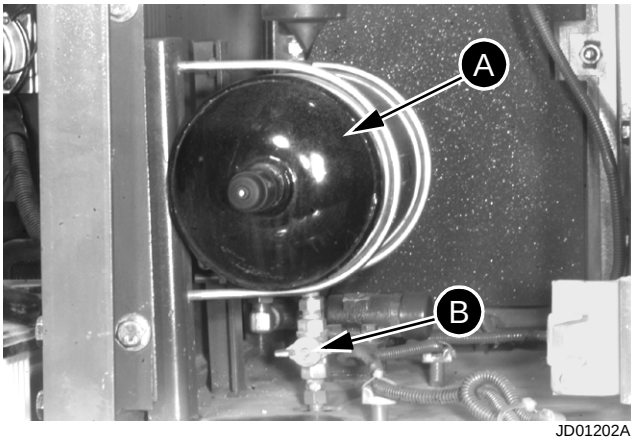
Machine 9013, 9021



UA-02

At the top of the hydraulic, remove the cap (A) from the breather (B). Push down on the button (C) to release the air pressure in the hydraulic reservoir. Install the cap (A) on the breather (B).

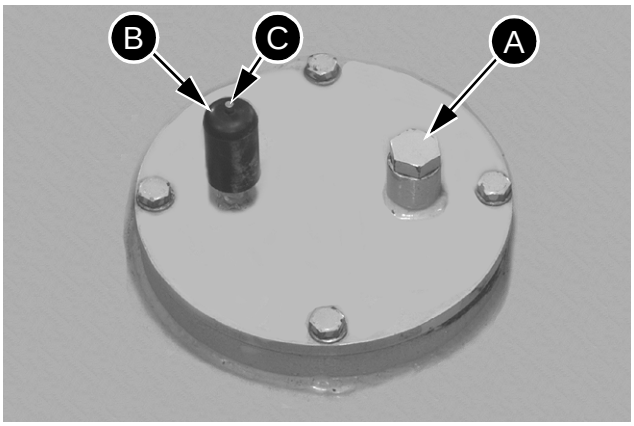
Machine 9033 - 9046



JD01202A

Open the left side access doors. Open the air tank (A) drain valve to release air pressure.

STEP 7



JD01203A

At the top of the hydraulic reservoir, loosen the air relief plug to release air pressure in the hydraulic reservoir. When air pressure release starts, stop loosening the air relief plug (A). Air pressure can also be released by lifting the rubber cover (B) from the breather, raising the rod (C) in the breather and releasing the air pressure. When all air pressure is released, tighten the air relief plug and close the air tank drain valve.

WARNING: *Before doing any maintenance on the hydraulic system, make sure that all hydraulic pressure has been released by operating the control levers several times and the hydraulic reservoir air pressure has been released. Failure to do so could cause serious injury.*

WARNING: *Pressurized hydraulic system; before you replace the hydraulic filters or service the hydraulic system, release the hydraulic reservoir air pressure. If you do not follow these instructions, you can be injured.*

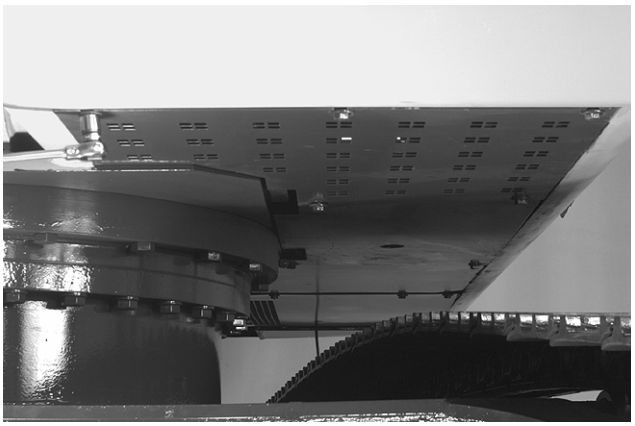
STEP 8

Install a DO NOT OPERATE tag on the ignition key and put the key in the key switch.

STEP 9

To prevent loss of hydraulic oil when disconnecting the hydraulic lines, connect a vacuum pump to the hydraulic reservoir (See Section 8000).

STEP 10



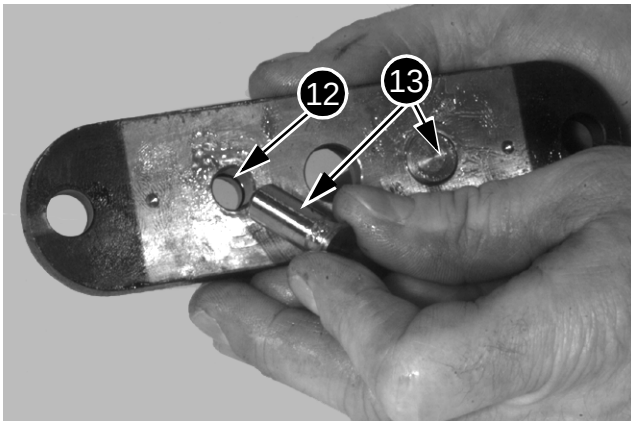
JD00797A

Just below the cab floor, at the front of the bottom access panel, loosen the three cap screws two turns. Then, remove the cap screws and flat washers from the rear of the access panel. Remove the access panel and install the flat washers and cap screws to hold the middle access panel.

STEP 3

Repeat steps 1 through 4 to assemble and install the remaining spool.

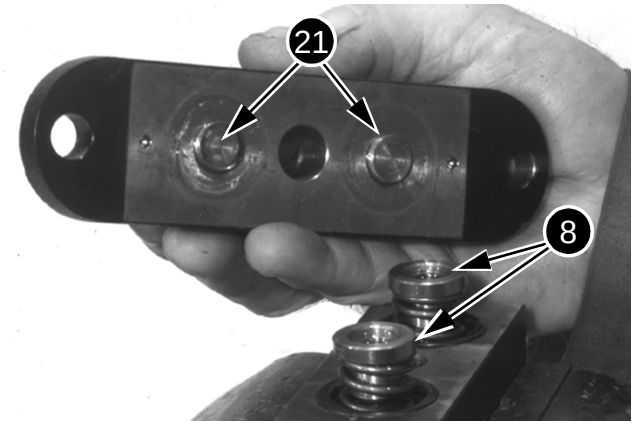
STEP 4



JD00815A

Install a new O-ring (12) in both bores of the valve cover. Install the shuttle assemblies (13) in the valve cover.

STEP 5



JD00814A

Install the same number of shims (21) on the valve sleeves (8) as recorded during removal.

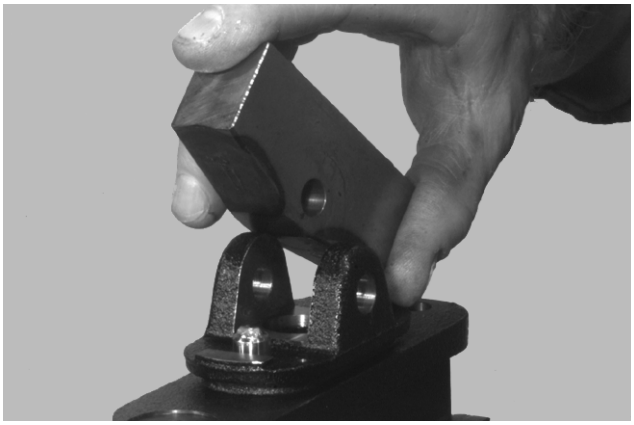
STEP 6



JD00813A

Position the valve cover on the valve housing. Install and tighten the socket head cap screw to secure the valve cover to the valve housing.

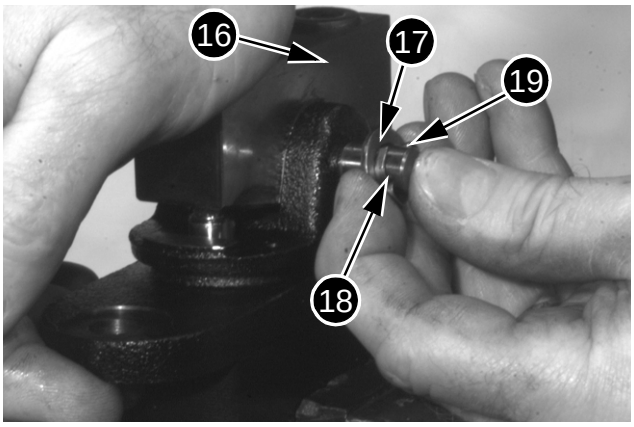
STEP 7



JD00812A

Install the pedal on the valve cover.

STEP 8



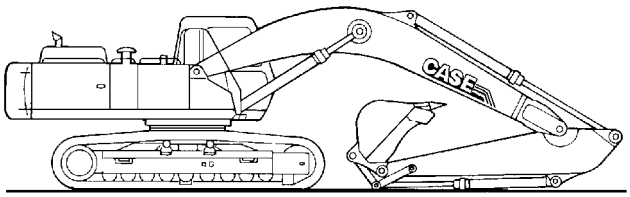
JD00811A

Press down on the pedal (16) and install the pivot pin (19) through the valve cover and the pedal. If both flat washers and cotter pins (19) were removed, install one flat washer (17) and one cotter pin on the pivot shaft.

TRAVEL SHUTTLE VALVE

Removal

STEP 1



JS01204A

Park the machine on a level surface. Lower the attachment to the ground.

STEP 2

Turn the key switch to the OFF position to stop the engine.

STEP 3

Turn the key switch to the ON position. Make sure the left control console is down in the OPERATING position and the gate lock control lever is pushed down to the OPERATING position. Check that the CONTROLS LOCK symbol is not displayed on the systems display panel. If the CONTROLS LOCK symbol is displayed, push and release the CONTROLS OFF button on the left control panel.

STEP 4

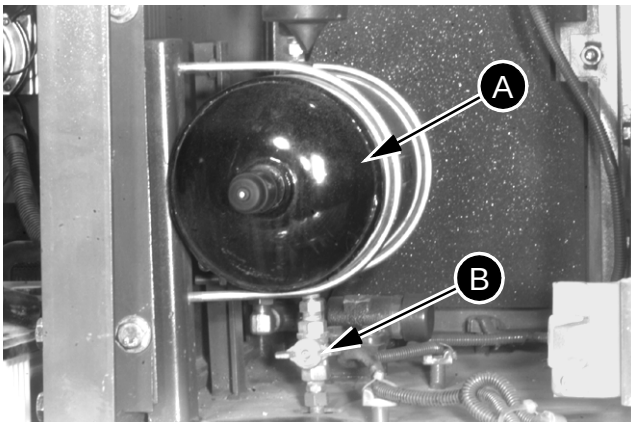
Operate the swing and attachments control levers back and forth, left and right ten times, to release hydraulic system pressure.

STEP 5

Turn the starter switch to the OFF position.

Machines 9033 and 9046 only

STEP 6



JD01202A

Open the left side access doors. Open the air tank (A) drain valve (B) to release air pressure.

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Description 4
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Disassembly 10
Assembly 11
Troubleshooting 13

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

SPECIFICATIONS

Electro-control valve block
Type KAJ3597

SPECIAL TORQUE SETTINGS

- Plug (12) of main relief valve ..... 104 Nm
- Plug (31) of non-return valve ..... 49 Nm
- Plug (31) of system shut-off valve 1 ..... 49 Nm
- Attaching screw (33) of body (17) ..... 7 Nm
- Plug (29) ..... 7 Nm
- Plug (29) ..... 10 Nm
- Plug (31) of pressure reducer ..... 49 Nm
- Seat (2) of shuttle ball ..... 15 Nm
- Attaching screw (32) of solenoid ..... 4 Nm

TOOLS REQUIRED

- Loctite 262

Assembling the solenoid valve

NOTE: *Assemble the solenoid valve in its original position.*

1. Assemble the spool (23) and (24) in the sleeve (11).
2. Assemble the sleeve (11) in the body (15).
3. Assemble the O-ring (39) on the solenoid coil (20).
4. Assemble the solenoid coil in the body (15).

NOTE: *Make sure that the push rod is correctly positioned in the solenoid coil. Make sure you do not allow it to fall during assembly.*

5. Tighten the solenoid coil (20) using the two screws (32) to a torque of 4 Nm.

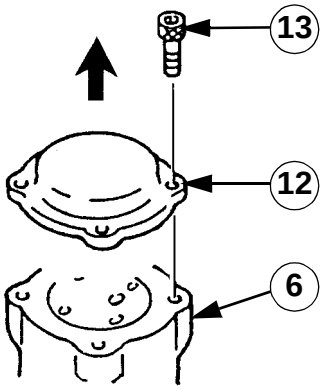
Assemble the optional solenoid valve (Component E)

1. Assemble the O-ring (39) on the stop (3).
2. Assemble the stop (3) in the body (15).
3. Assemble the plate (25) on the body (15) and retain it using the two screws (32).
   Tighten the screws to a torque of 4 Nm.

Disassembly

Be careful when handling parts. Do not force, hit or drop parts. Avoid contamination from dust, water or other foreign matter. Work in a clean area and use clean tools. Always use a press when disassembling the inner shaft and rotor.

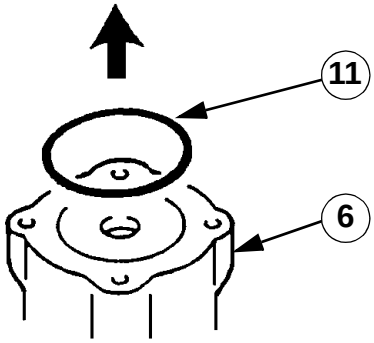
STEP 1



CS99A519

Remove the socket head cap screws (13) and cover (12).

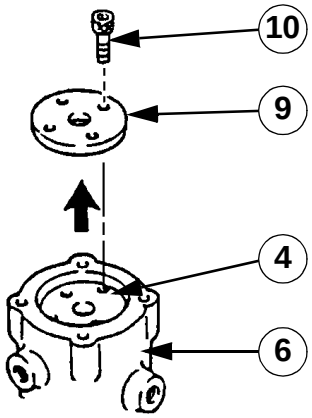
STEP 2



JS00026A

Remove and discard the O-ring (11).

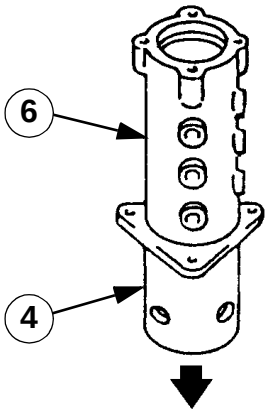
STEP 3



JS00027A

Remove the socket head cap screws (10) and thrust plate (9).

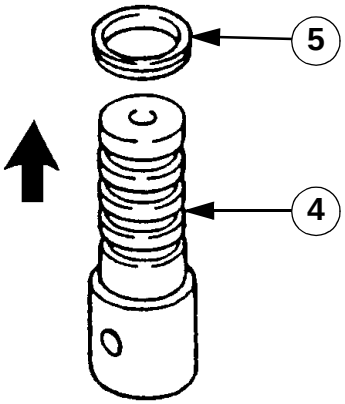
STEP 4



CS99A520

Using a press, remove the inner shaft (4) from the rotor (6).

STEP 5

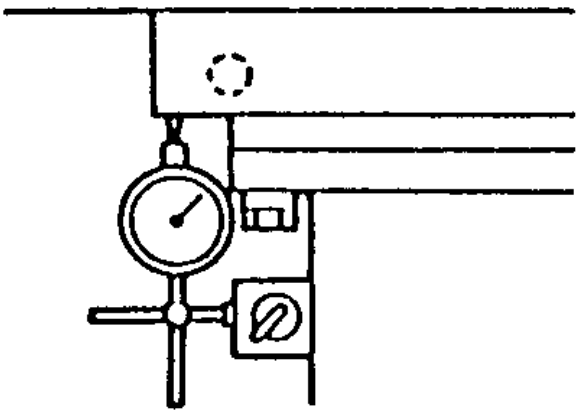


JS00029A

Remove the V-ring (5) from the inner shaft (4) and discard the V-ring.

TURNTABLE WEAR INSPECTION

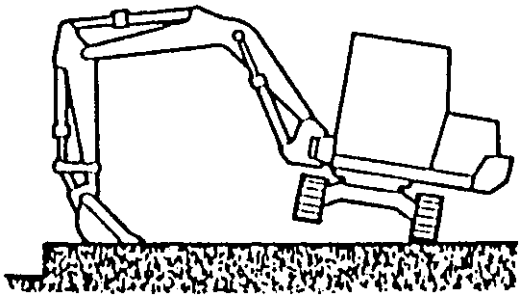
STEP 1



CS98B177

Install a magnetic base and a dial gauge between the underside of the upperstructure and the side of the hydraulic swivel.

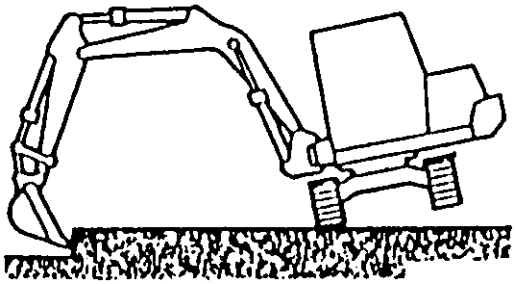
STEP 2



CS98B178

After first turning the upperstructure 90°, raise the undercarriage by means of the attachment. Adjust the dial gauge to zero.

STEP 3



CS98B179

Using the attachment, raise the other side of the machine. The difference noted at the dial gauge corresponds to the turntable play.

Section

9003

BOOM, ARM, BUCKET AND BLADE

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NOTE : *The numbers in parentheses in the following steps refer to the arm illustration on page 10.*

NOTE : *Do steps 1 through 3 only if the bushings (14, 15 or 16) were removed.*

STEP 1

Using a 2.559 inch (65 mm) diameter sleeve or rod, press the bushing (14) in the arm (8) until the bushing bottoms on the lip in the bore of the arm.

STEP 2

Using a 2.165 inch (55 mm) sleeve or rod, press the bushing (15) in the arm (8) until the bushing bottoms on the lip in the bore of the arm.

STEP 3

Using a 2.165 inch (55 mm) diameter sleeve or rod, press the bushing (16) in the arm (8) until the bushing bottoms on the lip in the bore of the arm.

STEP 4

If removed, install the lubrification fittings (17) in the arm (8).

STEP 5

Install two dust seals (13) in the arm (8).

STEP 6

Connect suitable lifting equipment to the arm (8). Move the arm into position near the machine.

STEP 7

Start the engine and operate the machine to position the boom (12) in line with the arm (8). Check and ensure that the mounting holes in the boom and arm are aligned.

STEP 8

Shut off the engine.

STEP 9

Drive the pin (11) through the boom (12) and arm (8).

STEP 10

Using an 0.043 inch (1.1 mm) feeler gauge or shim stock, check the clearance between the boom (12) and the arm (8) at both sides of their attachment point. If the clearance is more than 0.043 inch (1.1 mm), remove the pin (11). Install the necessary number of shim(s) between the boom and arm to obtain a clearance of 0.02 to 0.043 inch (0.5 to 1.1 mm).

STEP 11

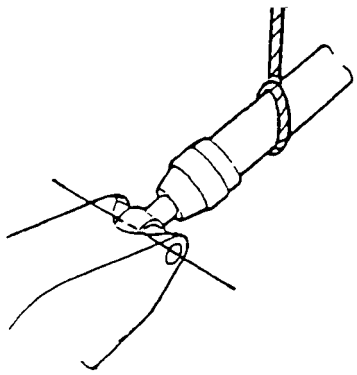
Install the cap screw (10) through the collar and the pin (11). Install the first nut (9) on the cap screw (10) and tighten until the nut makes contact with the collar. Back off the nut 1/4 turn. Using two wrenches, install the second nut (9) and tighten against the first nut.

NOTE : *When installed, the cap screw will have approximately 1/16 inch (1.6 mm) of free play.*

STEP 12

Disconnect the lifting equipment from the arm (8).

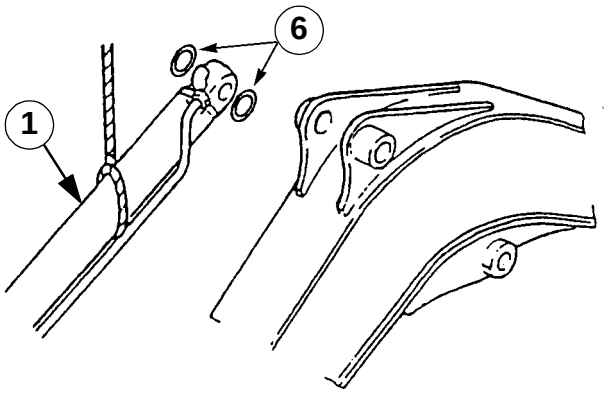
STEP 13



JS00606A

Hoist the end of the arm cylinder to align the cylinder head to the end of the arm.

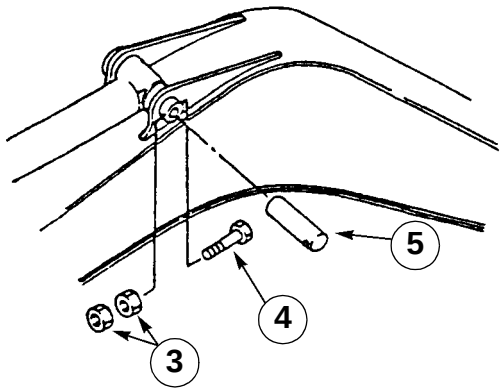
STEP 13



JS00602A

With a sling and hoist attached to the arm cylinder (1), lift the arm cylinder into position. Align the arm cylinder mounting holes with the brackets on the boom. Install the shims (6).

STEP 14

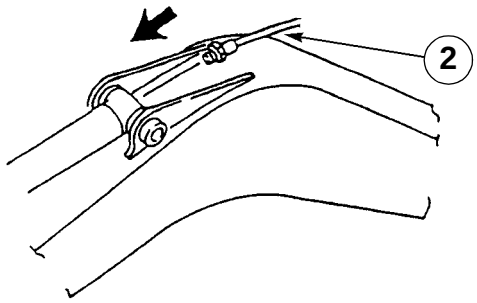


JS00601A

Install the pin (5) through the boom (11), shims (6), and arm cylinder (1). Secure the pin with the cap screw (4). Using a feeler gauge, check that the clearance between the mounting bracket and the cylinder tube mounting eye is between 0.02 to 0.118 inch (0.5 to 3 mm). If necessary, remove the cap screw (4) and pin (5) and add or remove shim(s) (6) as necessary to obtain the correct clearance. Install the pin and cap screw. Install first nut (3) on the cap screw and tighten until the nut makes contact with the boss on the bracket. Back off the nut 1/4 turn and using two wrenches, install the second nut (3) to secure the first nut in place.

NOTE : *Once installed, the cap screw will have approximately 1/16 inch (1.6 mm) of free play.*

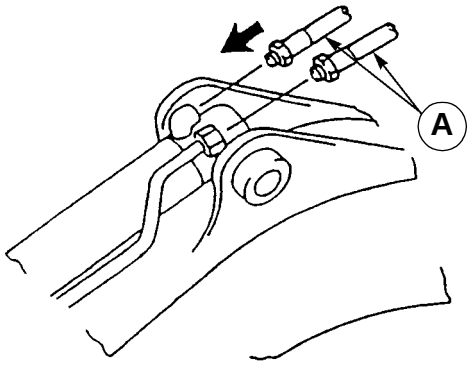
STEP 15



JS00604A

Connect the lubrication tube (2) to the arm cylinder.

STEP 16



JS00605A

Remove the plugs and caps from the hydraulic hoses (A) and fittings. Connect the hydraulic hoses (A) to he arm cylinder fittings. Remove the strap securing the cylinder rod to the cylinder barrel.

STEP 17

Refer to arm installation on page 10 and install the arm.

STEP 18

Start the engine and operate the boom, arm and bucket. Stop the engine. Check for and repair any hydraulic oil leakage.

STEP 19

Check the oil level in the hydraulic reservoir. Top up if necessary.

STEP 20

Grease the linkages.

STEP 9

Remove the six cap screws and flat washers that secure the cab to the frame.

NOTE: *Stay clear of the cab assembly when the cab is elevated. When lifting or lowering the cab, take care not to prevent damage to the cab. Clearances are close tolerances at the rear and sides of the cab.*

STEP 10



CI99G501

Remove the working light from the top of the cab. Install appropriate lifting rings diagonally on top of the cab. Using suitable lifting equipment, raise the cab carefully until it is completely clear of the machine.

The cab weight is 550 pounds (250 kg).

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