SERVICE MANUAL

Crawler

Excavator

CX330

9-53592

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

TYPE 1-4

SERVICE MANUAL

Crawler

Excavator

CX330

9-53592

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

TYPE 1-4

SERVICE MANUAL

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TYPE 1-4

SERVICE MANUAL

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Excavator

CX330

9-53592

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

TYPE 1-4

NOTES

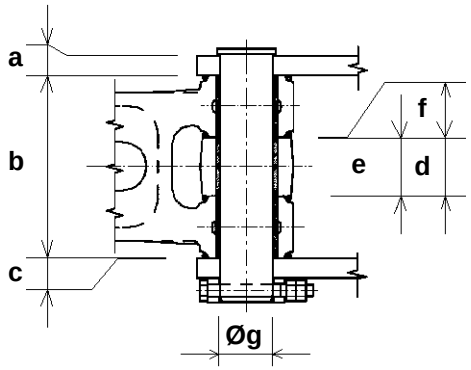
Attachment

Digging force	55842 lbf
Break-out force	
8 ft 8 in dipper	-
10 ft 8 in dipper	-
13 ft 3 in dipper	34305 lbf

Weight of components

Engine	1530 lbs
Hydraulic pump	287 lbs
Attachment control valve	423 lbs
Swing motor and reduction gear assembly	981 lbs
Travel motor and reduction gear assembly	1071 lbs
Boom cylinder	633 lbs
Dipper cylinder	1135 lbs
Bucket cylinder	617 lbs
Counterweight	16336 lbs
Cab	560 lbs
Turntable	1190 lbs
Complete upperstructure	34634 lbs
Hydraulic swivel	119 lbs
Complete chassis	28528 lbs
Machine without attachment	63383 lbs
Attachment	14881 lbs
Complete boom	8620 lbs
Complete dipper	3836 lbs
Radiator and oil-cooler assembly	406 lbs
Fuel reservoir	518 lbs
Hydraulic reservoir	430 lbs
Idler wheel	339 lbs
Upper roller	97 lbs
Lower roller	132 lbs
Tension damper	545 lbs
27.5 inch track	5328 lbs
31.4 inch track	5913 lbs

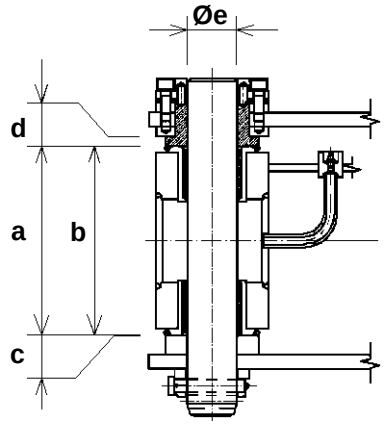
10. Connecting rod/Compensator/Bucket cylinder head



CS01B531

Mark		Dimension (in)
a	Standard	1.96
	Limit	1.88
b	Standard	14.8
	Limit	14.6
c (play)	Standard	0.05 to 0.09
	Limit	Shims
d	Standard	4.17
	Limit	4.29
e	Standard	4.13
	Limit	4.01
f (d - e)	Standard	0.05 to 0.09
	Limit	Shims
Ø g (shaft)	Standard	4.13
	Limit	4.09
Ø g (compensator)	Standard	4.13
	Limit	4.19
Ø g (cylinder)	Standard	4.13
	Limit	4.19

11. Dipper/Bucket



CS01B532

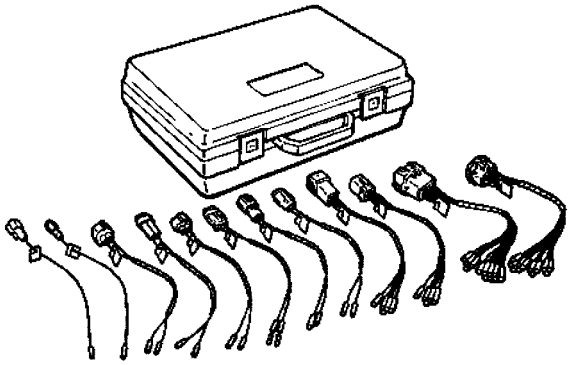
Mark		Dimension (in)
a	Standard	15.7
	Limit	15.9
b	Standard	15.7
	Limit	15.6
c (a - b)	Standard	0.039 to 0.15
	Limit	Shims
d	Standard	0.62
	Limit	0.39
Ø e (shaft)	Standard	3.54
	Limit	3.50
Ø e (dipper)	Standard	3.54
	Limit	3.60
Ø e (bucket)	Standard	3.54
	Limit	3.60

NOTES

SPECIFICATIONS

See section 1002.

SPECIAL TOOLS

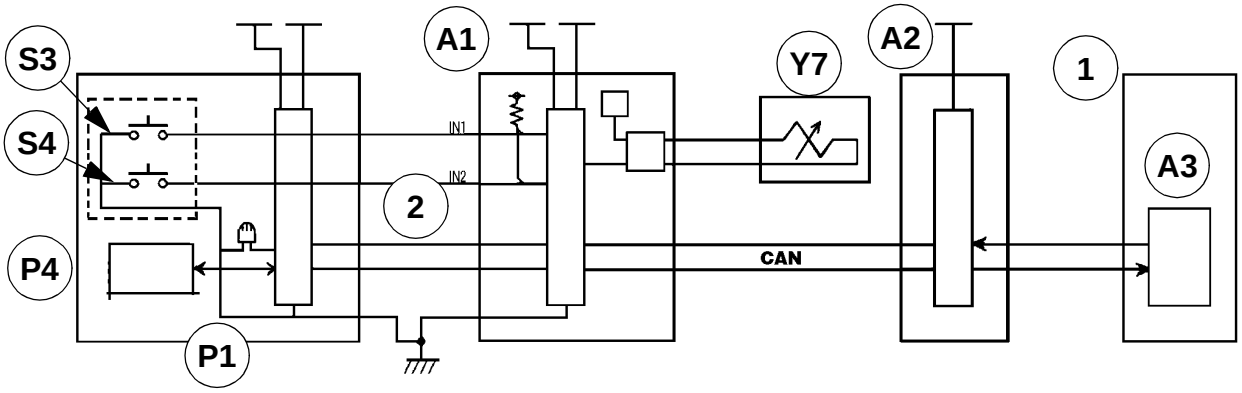


BS98G045

1 Service connector kit CAS-40031
2 Multimeter CAS-1559

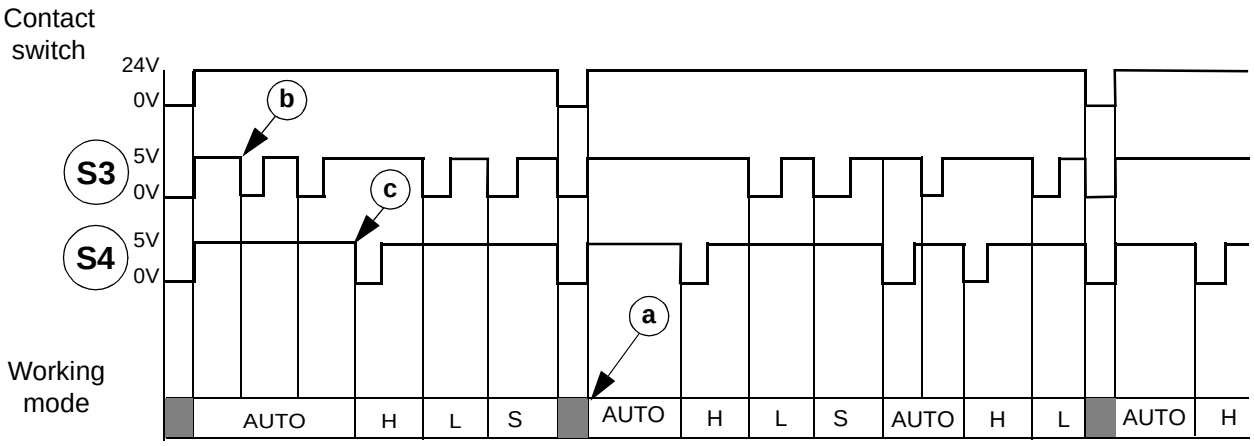
Working Mode Selection

1) Circuit configuration



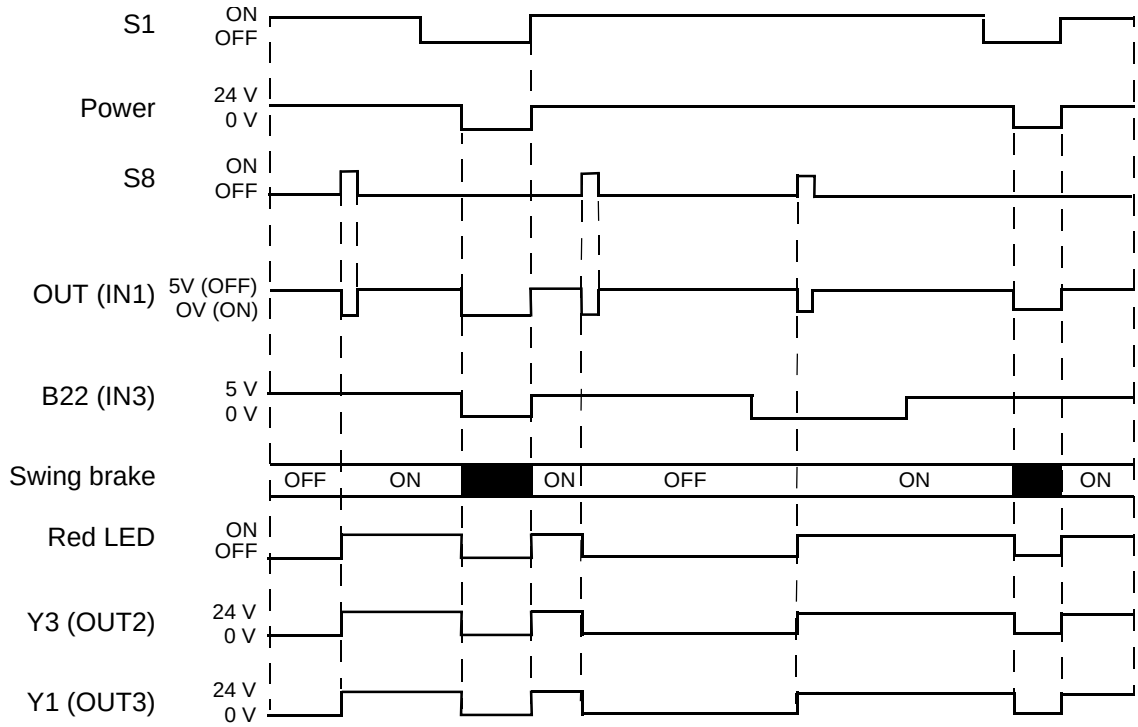
CS00F505

2) Timing diagram



1. Engine
2. Serial communication
A1. Computer
A2. Engine controller
A3. Electronic acceleration
P1. Instrument panel
P4. Monitor display
S3. Work mode switch
S4. Auto mode switch
Y7. Main pump proportional solenoid

3) Timing diagram



4) Automatic swing brake checking

Automatic swing brake checking takes place when the swing brake switch (S8) is off (red LED is off).

The swing brake is automatically deactivated when:

- The swing pilot pressure switch (B22) is activated.
- When the pressure detected by the pressure sensors P1 (B42) or P2 (B44) is greater than 2175 psi.

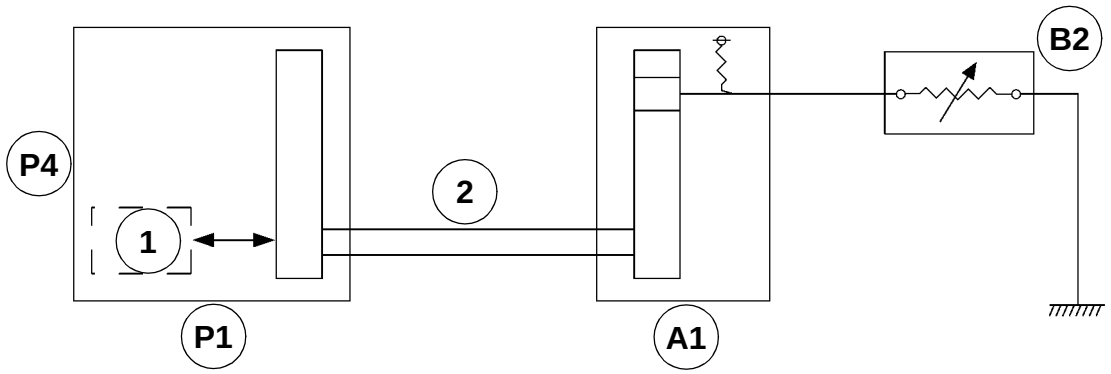
The swing brake is automatically activated when:

- The upper pilot pressure switch (B26) is deactivated for more than 5 seconds.
- The key switch (S1) is in STOP position.

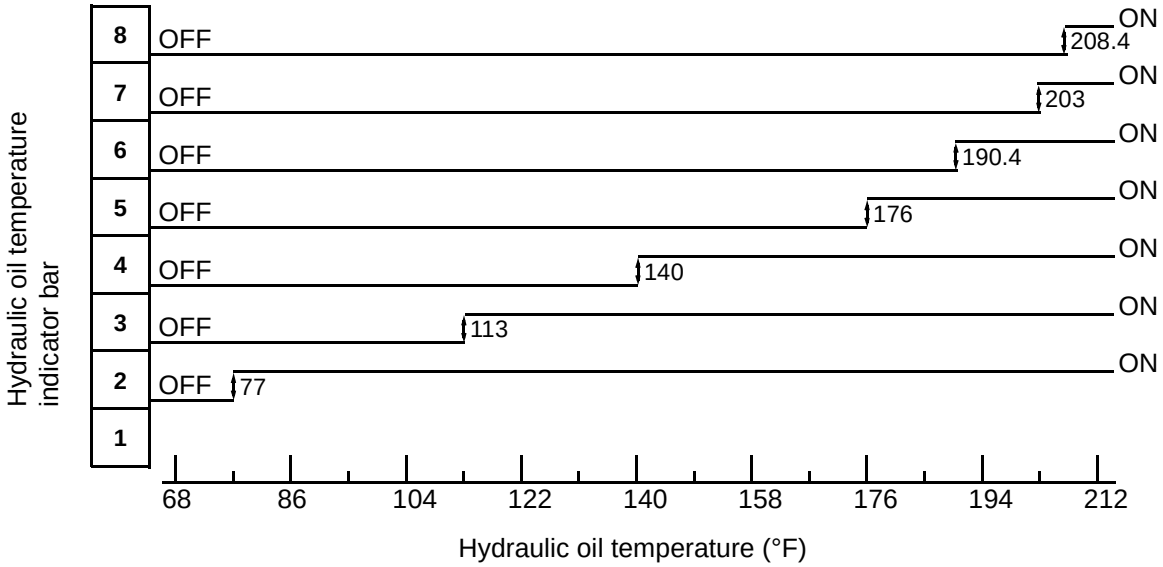
The swing brake will be deactivated once the pump delivery pressure (P1 or P2) exceeds 2175 psi during travel. However, it will only take effect after 5 seconds.

Hydraulic Oil Temperature Indicator

1) Circuit configuration



CM00F008



1. Hydraulic oil temperature indicator
2. Series connection
A1. Computer
B2. Hydraulic oil temperature sensor
P1. Instrument panel
P4. Monitor display

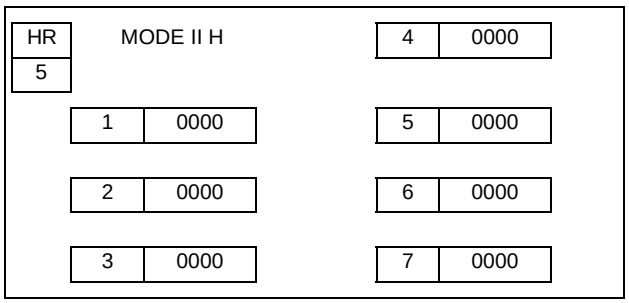
2) Operation

A. The hydraulic oil temperature sensor (B2) attached to the inlet pipe sends a signal to the computer (A1).

B. The computer (A1) calculates the number of bars to be displayed and sends the information to the hydraulic oil temperature indicator (1) via the series connection (2).

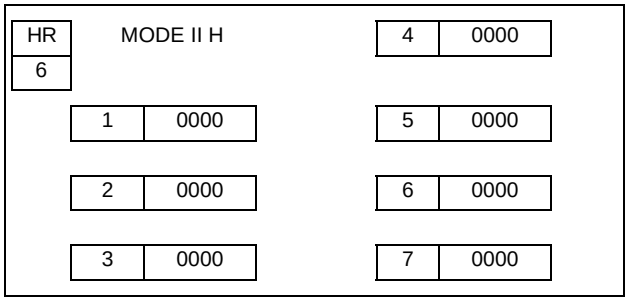
C. When the 8th bar is displayed on the hydraulic oil temperature indicator, the message “OVER HEAT” appears on the monitor display (P4) and the audible warning device sounds.

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



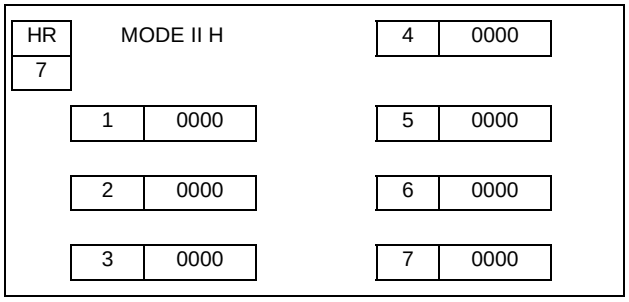
1: 1450 psi or lower
2: Between 1450 psi and 2176 psi
3: Between 2176 psi and 2901 psi
4: Between 2901 psi and 3626 psi
5: Between 3626 psi and 4351 psi
6: Between 4351 psi and 5076 psi
7: 5076 psi or above

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



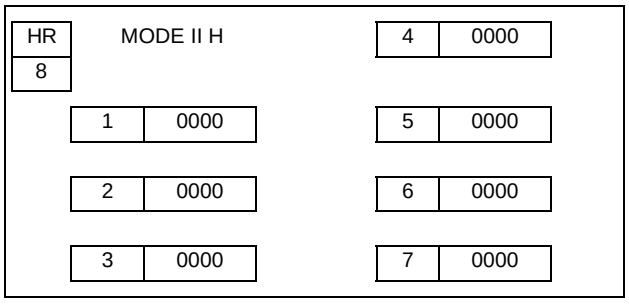
1: 1175 rpm or lower
2: Between 1175 rpm and 1375 rpm
3: Between 1375 rpm and 1575 rpm
4: Between 1575 rpm and 1775 rpm
5: Between 1775 rpm and 1975 rpm
6: Between 1975 rpm and 2175 rpm
7: 2175 rpm or above

7. Screen HR7, operating time of the various coolant temperatures



1: 171°F or lower (1st and 2nd bar)
2: 171°F to 180°F (3rd bar)
3: 180°F to 207°F (4th bar)
4: 207°F to 212°F (5th bar)
5: 212°F to 217°F (6th bar)
6: 217°F to 221°F (7th bar)
7: 221°F or higher (8th bar)

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



1: 113°F or lower (1st and 2nd bar)
2: 113°F to 140°F (3rd bar)
3: 140°F to176°F (4th bar)
4: 176°F to 190°F (5th bar)
5: 190°F to 203°F (6th bar)
6: 203°F to 208°F (7th bar)
7: 208°F or higher (8th bar)

Reading the Organization Charts

Error code and description of problem

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

Error code	Description of 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 Step 1, 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 Step 1. 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 Step 1. 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 color

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

Table showing wire colors

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		

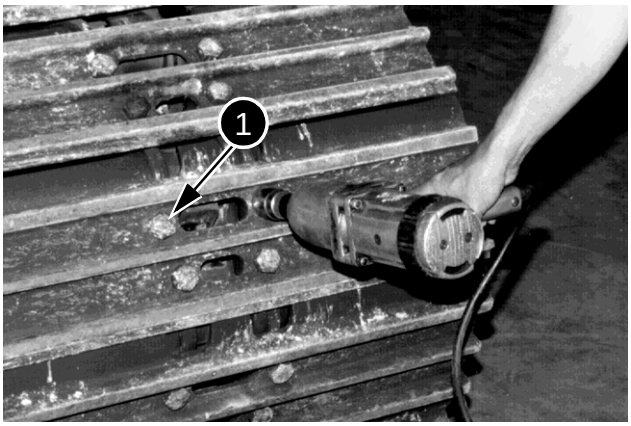
BR indicates color B striped with R.
Example: BR indicates a black wire with red stripes

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

Troubleshooting	Cause	Action
Troubleshooting using the diagnostic system Starting motor switch ON Failure code displayed in DIAG 4 YES M0010 — Check that the transistor output is not short circuited YES To CHK6		
Self-detection finds the short circuit YES The failure code disappears after disconnecting the solenoid valve connector — YES	Defective solenoid valve	Change the solenoid valve
NO The failure code disappears after disconnecting connector CN26 — YES	Short circuit on wire between CN26 and the solenoid valve	Repair the wiring
NO The failure code disappears after disconnecting connector CN25 — YES	Short circuit on wire between CN25 and the solenoid valve	Repair the wiring
NO The failure code disappears after disconnecting connector CN6 — YES	Short circuit on wire between CN25 and CN6 or CN26 and CN6	Repair the wiring
NO The failure code disappears after disconnecting connector CN5 — YES	Short circuit on wire between CN25 and CN5	Repair the wiring
NO	Computer defective	Change the Computer

6. If the connections are made from another machine, start the machine and run it at half the maximum engine speed.
7. Start the engine of the machine that has broken down and ask your assistant to disconnect first the negative (-) booster cable and last the positive (+) booster cable.
8. Put back the battery cover and close the LH access doors.
9. Do not stop the engine for at least 20 minutes. This is to allow the batteries to recharge correctly.

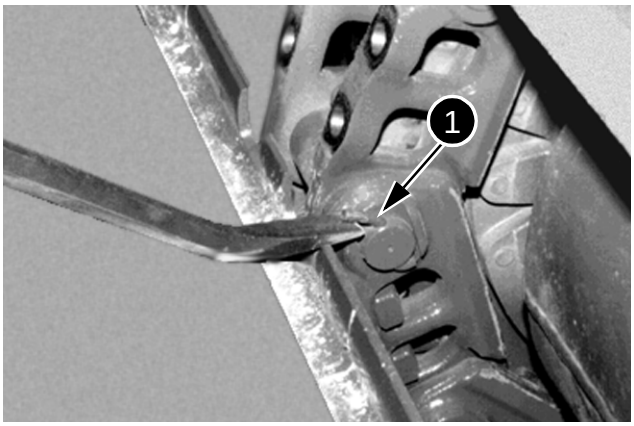
STEP 5



JD00274A

Remove the four screws (1) and the track pad nuts on top of the end of chain axle. Remove the track pad.

STEP 6

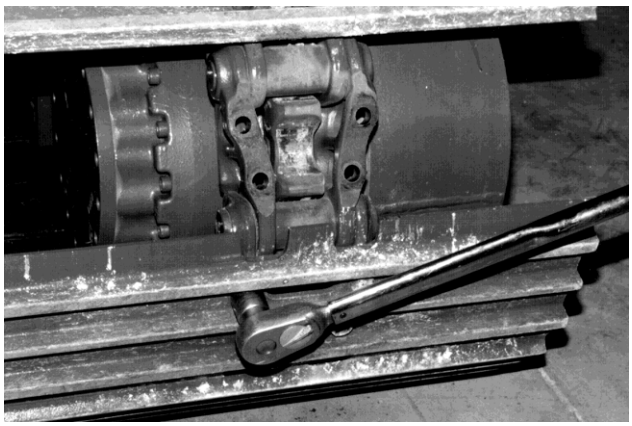


JD00275A

JD00276A

Straighten up one end of the pin (1) and remove the pin from the end of chain axle.

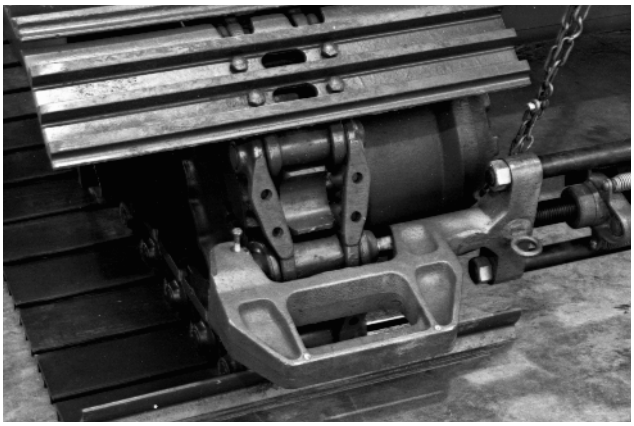
STEP 7



JD00277A

Remove the four screws and the nuts from the track pad under the end of chain axle. Remove the track pad.

STEP 8



B504423M

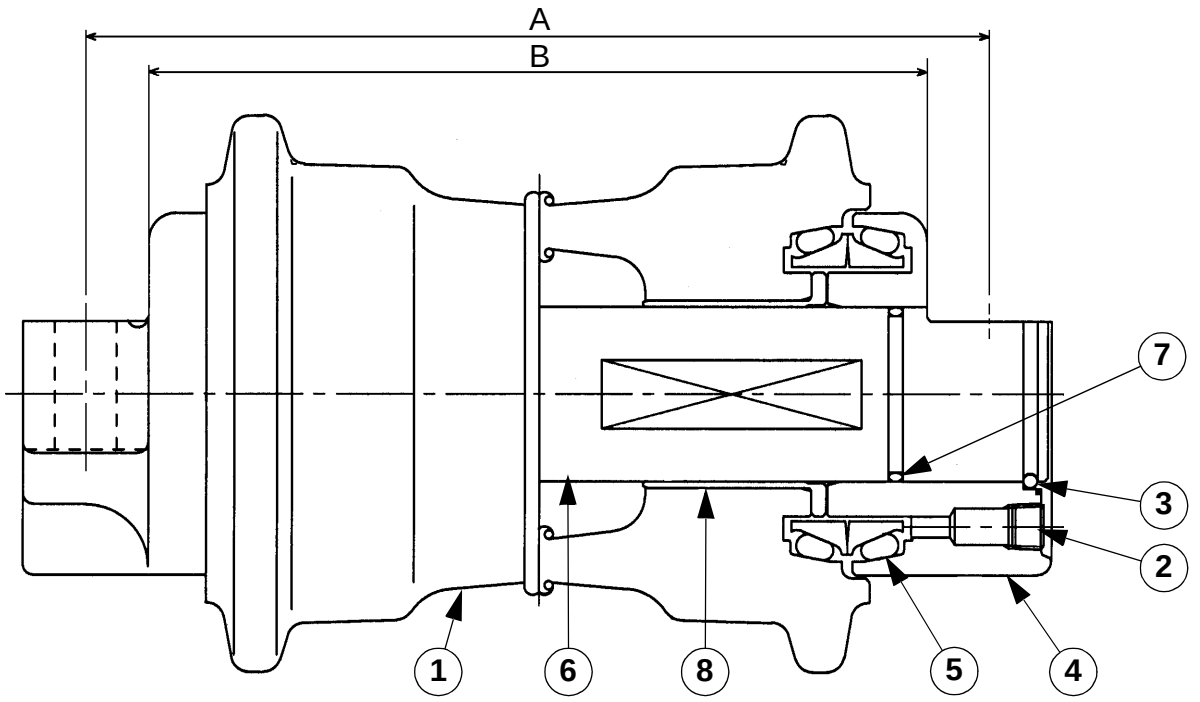
Install a portable hydraulic press CAS 10044 on the end of chain axle. Using the portable hydraulic press, force the end of chain axle out.

STEP 9

Remove the portable hydraulic press.

LOWER ROLLER

Description



CS01B539

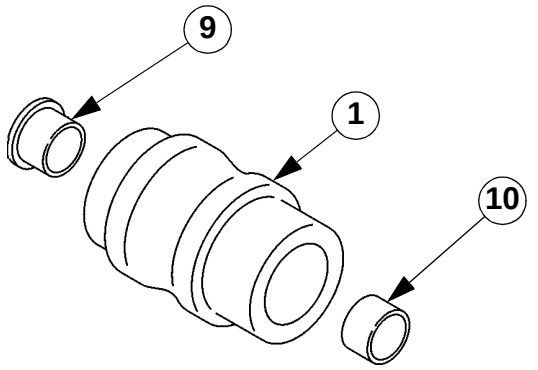
1 LOWER ROLLER
2 DRAIN PLUG
3 SNAP RING
4 END CAP
5 FACE SEAL
6 SHAFT
7 O-RING
8 BUSHING

A (assembly dimensions) ..... 15.9 to 16 in

B (assembly dimensions) ..... 12.5 in

NOTE: *Carry out step 8 only if inspection reveals that the bushings (9 and 10) need to be replaced.*

STEP 8



CS02B511

Using a hammer and a brass punch, drive the bushings (9) and (10) from the upper roller (1). Be careful not to damage the seal bore in the upper roller.

Inspection

STEP 1

Clean all the components with cleaning solvent.

STEP 2

Inspect the bushing surfaces on the shaft (7) for scoring, pitting, and other damage. Measure the diameter of the shaft at four opposing points. Compare the values with the specifications, replace 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, replace if necessary.

STEP 4

Inspect the thrust plate for wear and damage. Measure the thickness of the thrust plate. Compare the values with the specifications, replace if necessary.

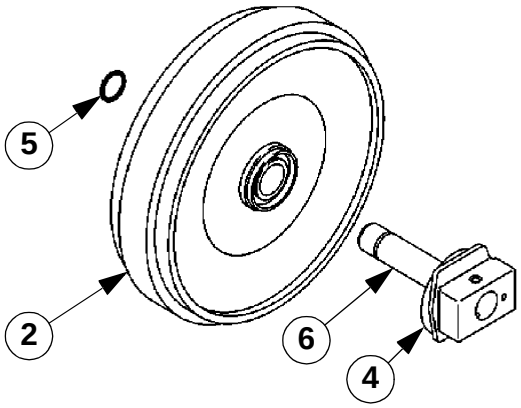
STEP 5

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

TABLE OF CONTENTS

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.*

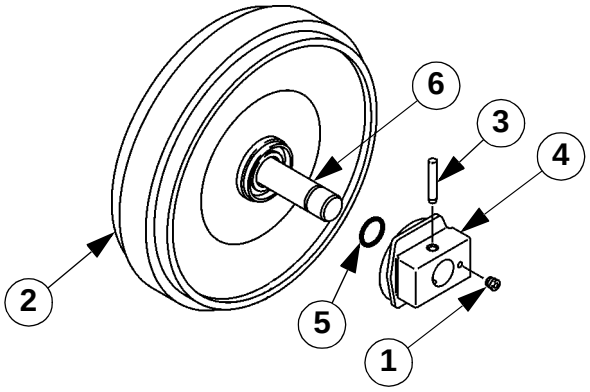
STEP 5



CS02B519

Apply clean grease around the shaft (6). Install the shaft and slide (4) assembly in the idler wheel (2).

STEP 6



CS02B572

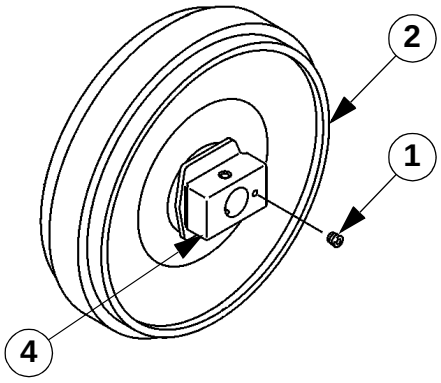
Apply clean grease on the O-ring (5) if this has not already been done and install the O-ring on the shaft (6). Install the slide (4) on the shaft and install a retainer pin (3) to fasten the slide and the shaft. Install a drain plug (1).

NOTE: *Check the pitch of the retaining ports of the tension shock absorber yoke, see page 8.*

STEP 7

Check for leaks to ensure that the idler wheel has been correctly reassembled and check for any damage which could give rise to leaks at seals and other components.

STEP 8



CS02B517

Fill the idler wheel (2) with clean oil (see specifications). Install the drain plug (1) in the slide (4).

TABLE OF CONTENTS

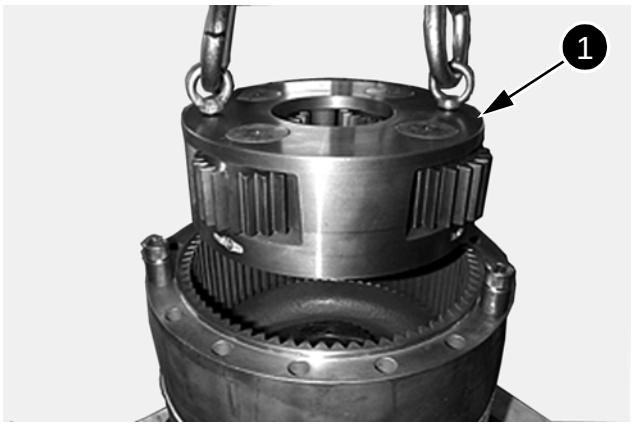
SPECIFICATIONS

Hydraulic fluid ..... See Section 1002
Lubricant for reducing gear pinion
Type ..... See Section 1002
Quantity ..... See Section 1002
Weight of the travel motor/reduction gear assembly ..... See Section 1002

SPECIAL TORQUE SETTINGS

Travel motor/reduction gear assembly to track frame retaining screw ..... See Section 1002
(apply Loctite 262 to the screw threads)
Drain plug, oil filling and oil level plug ..... 355 to 426 psi
(put Teflon tape around the threads)

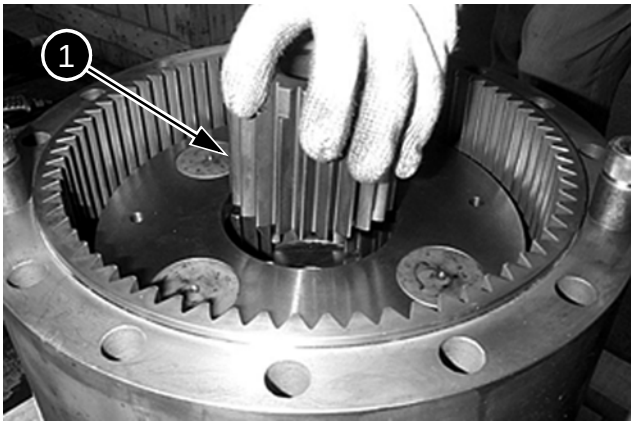
STEP 12



CD02B038

Install the second stage planet wheel carrier (1) so that it meshes correctly with the internal teeth of the ring gear. Turn the planetary assembly slightly to engage the splines of the pinion shaft.

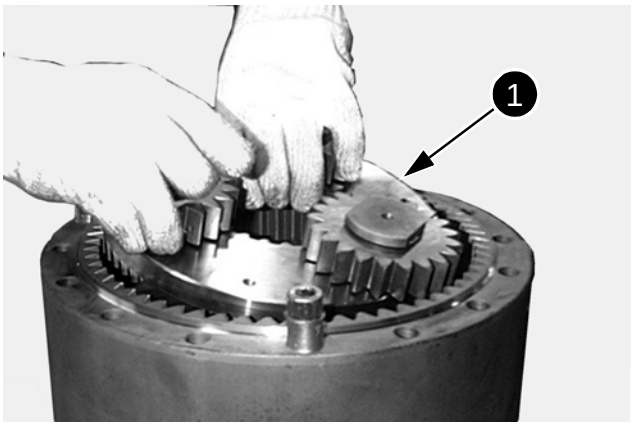
STEP 13



CD02B037

Install the second stage sun gear (1) so that it meshes with the planetary gear assembly.

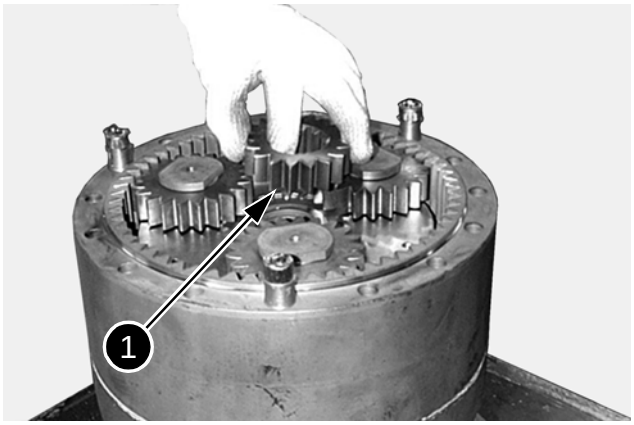
STEP 14



CD02B036

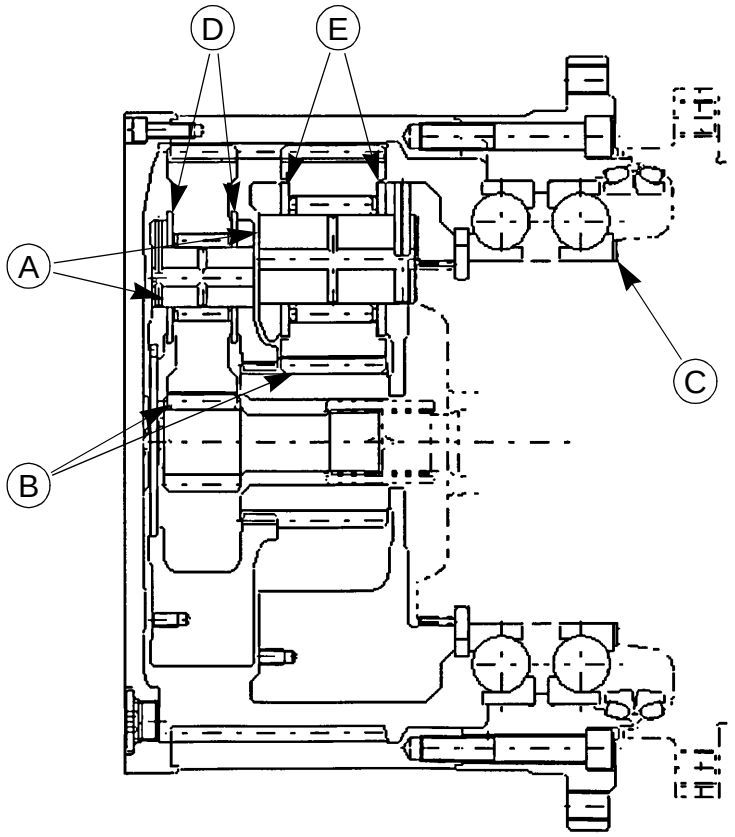
Install the first stage planetary assembly (1) so that it meshes with the internal teeth of the ring gear. Turn the planetary assembly slightly to mesh the teeth of the planetary gears with the teeth of the second stage sun gear.

STEP 15



CD02B035

Install the thrust shim on the second stage sun gear. Install the first stage sun gear (1) so that it meshes correctly with the teeth of the planetary gears. Turn the first stage planetary assembly by hand and check that the output shaft rotates smoothly.



CS02B543

Mark	Item	Reference value	Allowable value	Remedy
A	Wear on the planetary shaft	Smooth, no abnormal wear and seizure	Smooth, no abnormal wear and seizure	Replace all three together
B	Conditions on face of tooth and root of tooth	Smooth, no abnormal wear and seizure	No pitching of dia. 1.6 or more, no cracks on the root of tooth	Replace all three planetary gears together
C	Thrust spaces in the inner race of angular bearings	- 0.0031 to 0.0007in (Interference) (Space)	- 0.0031 to 0.0007in (Interference) (Space)	Changing shims (See *2-3*. 6)
D	Thickness of thrust washer 1	0.10 ± 0.007 in	Wear 0.0039 in	Replace
E	Thickness of thrust washer 2	0.12 ± 0.007 in	Wear 0.0039 in	Replace

RELEASING PRESSURE IN THE HYDRAULIC SYSTEM

IMPORTANT: *Before carrying out any operation on the hydraulic system, the pressure in all the systems must be zero.*

STEP 1

Place the machine on flat, level ground, with the attachment lowered to the ground, then shut down the engine.

STEP 2

CD00E060

Turn the ignition key to the "ON" position (ignition).

STEP 3

CD00E006

Lower the function cancellation control arm (exit safety bar).

STEP 4

CD00E111

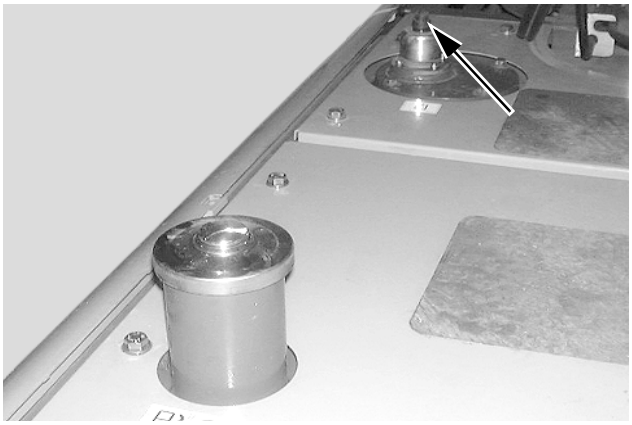
Operate the control levers ten times to the right and left and backwards and forwards.

STEP 5

CD00E080

Turn the ignition key to the "OFF" position (shut down).

STEP 6



CD01K024

Press the button located above the breather to release any possible pressure.

SPECIFICATIONS

See section 1002.

SPECIAL TOOLS

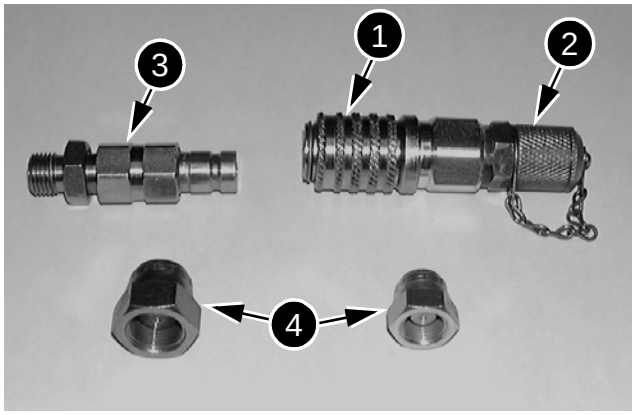
Tester

CS02K573

1. *OEM 1652 DIGITAL PRESSURE GAUGE*

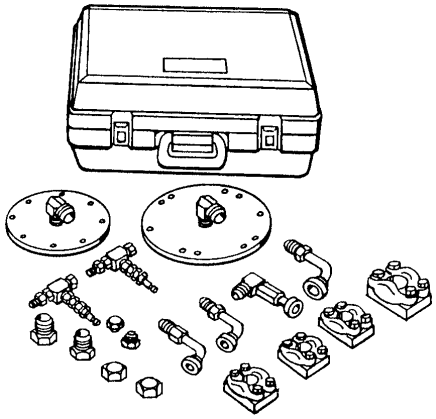
CS02K574

2. *OEM 1653 DIGITAL PRESSURE TEMPERATURE ANALYSER*



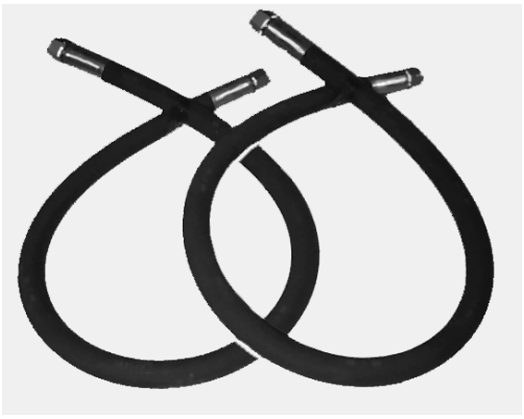
CD01B005

3. *FEMALE COUPLING JOINT E47894 (1) PRESSURE TEST POINT 14X1.5 A3237549 (2) MALE COUPLING JOINT WITH UNION (3) AND PLUGS (4) CONTAINED IN THE SUITCASE CAS 40023A.*



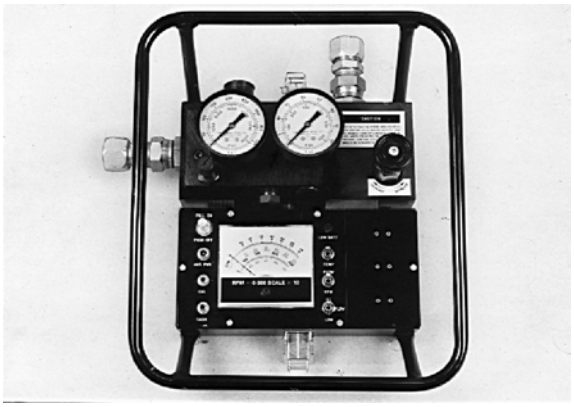
CS99B532

4. *SET OF UNIONS FOR PRESSURE TEST AND HYDRAULIC FLOW CAS 40023A AND CAS 40035.*



CD99C002

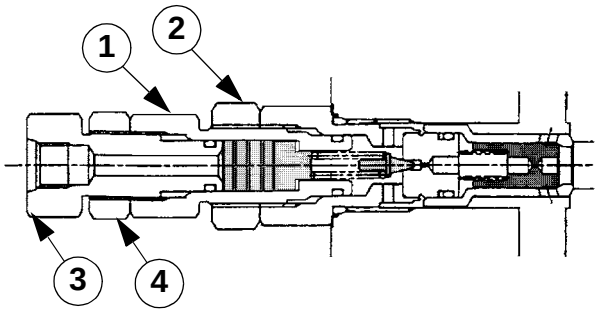
5. *SET OF HIGH PRESSURE HYDRAULIC HOSES CAS 30036 (INCLUDING TWO HIGH PRESSURE HOSES).*



B785789R

6. *CAS 10280 FLOW METER*

Setting the power boost pressure



CS00E550

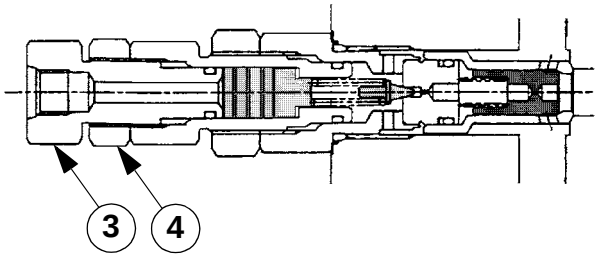
1. Disconnect and plug the power boost pilot hose on the main relief.
2. Using a wrench, hold the adjusting screw (3) in position and loosen the lock nut (4).
3. Tight the adjusting screw (3) up to the stop.
4. Tighten the lock nut (4).
5. Start the engine and run it at maximum speed, select mode "S".
6. Operate and hold in position the dipper retracting control (against cylinder stops).
7. Loosen the lock nut (2) and turn the adjusting screw (1) until the power boost pressure is reached.

NOTE: *Tighten the screw (1) to increase the pressure. Loosen the screw (1) to reduce the pressure.*

8. Using a wrench, hold the adjusting screw (1) and tighten the lock nut (2).
9. Check the pressure again. If the desired value is not obtained, repeat steps 6 to 9.
10. Cary out the standard pressure setting.

Adjusting the standard pressure

NOTE: *Carry out the procedure below only if the power boost pressure is correct, otherwise carry out the power boost pressure setting procedure.*



CS00E550

1. Disconnect and plug the power boost pilot hose on the main relief.
2. Using a wrench, hold the adjusting screw (3) in position and loosen the lock nut (4).
3. Start the engine and run it at maximum speed, select mode "S".
4. Operate and hold in position the dipper retracting control (against cylinder stops).
5. Turn the adjusting screw (3) until the standard pressure is reached.

NOTE: *Tighten the screw (3) to increase the pressure. Loosen the screw (3) to reduce the pressure.*

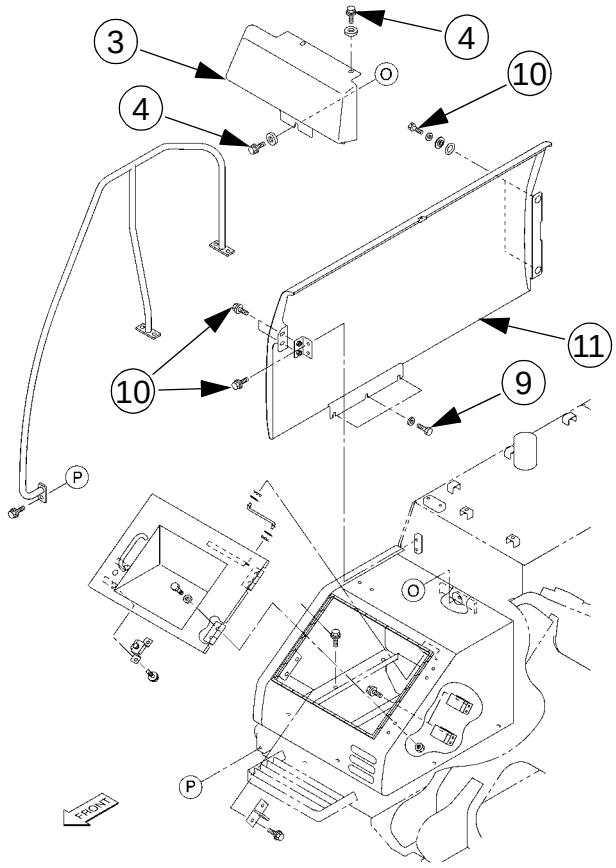
6. Using a wrench, hold the adjusting screw (3) in position and tighten the lock nut (4).
7. Check the pressure again. If the desired value is not obtained, repeat steps 2 to 6.
8. Stop the engine.
9. Reconnect the power boost pilot hose to the main relief.

Not possible to select 2nd travel speed

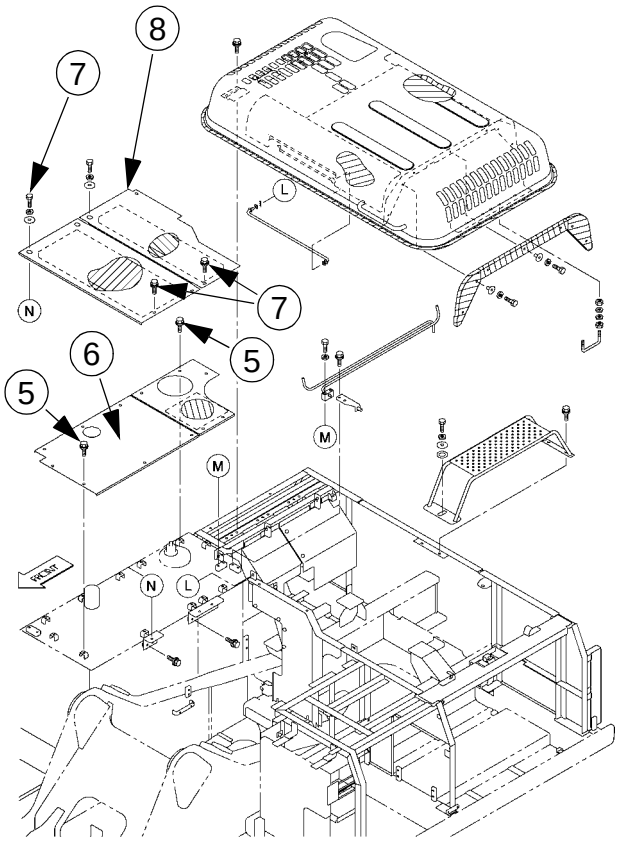
No.	Tests	Results	Repairs
1	Press the travel speed control and check that the speed changes from I to II on the monitor display	Speed II not displayed	Refer to troubleshooting electrical failures
2	Check on the monitor display "CHK2" if the information changes to "ON" when the machine is travelling	Information stays on "OFF"	Check pressures P1 and P2 on the monitor display "CHK1" when the machine is travelling 1) Both pressures are less than 580 psi: refer to troubleshooting electrical failures 2) Both pressures are higher than 580 psi, refer to point No. 3
3	Check the negative pressure (N) of the pump	Too high	Adjust the pressure
4	Check the pilot pressure at the output from the solenoid valve (C1)	Pressure too low	Check electrical supply and the solenoid valve coil (No. 5 and 6)
		Pressure correct 566 psi	Check the pilot pressure at the travel motor displacement change spool (No. 7)
5	Check the voltage at the electrical plug on the displacement change solenoid valve	Voltage < 24 V	Check the electrical harness
6	Check the displacement change solenoid valve coil	Infinite or 0 Ohm	Replace the solenoid valve
		About 40 Ohm	Replace the solenoid valve coil
7	Check the pilot pressure at the travel motor displacement change spool	Pressure too low	Internal leak at hydraulic swivel, repair or replace the hydraulic swivel
		Pressure correct 566 psi	Check the travel motor displacement change spool. Repair or replace the travel motor

Description

Location



CS02B557



CS02B556

3 PROTECTIVE HOUSING
4 SCREW
5 SCREW
6 PROTECTIVE PLATE OF THE HYDRAULIC RESERVOIR
7 SCREW
8 PROTECTIVE PLATE OF THE CONTROL VALVE
9 SCREW
10 SCREW
11 PROTECTIVE PLATE OF THE RESERVOIR

Removal and installation

NOTE: *The numbers within brackets refer to the schematic on page 9.*

STEP 1

Rotate the engine so that the screws (1) can be positioned facing the port (A). Remove the screws (1) from the coupling flange (2).

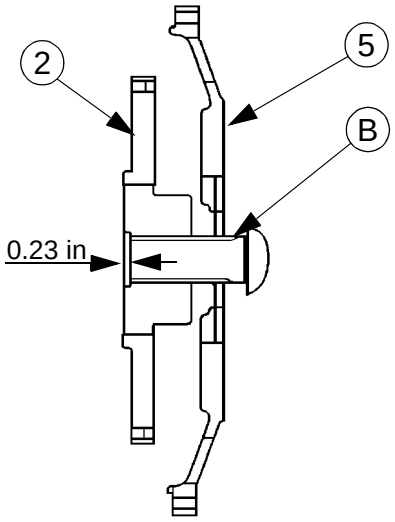
STEP 2

Remove the screws (3) and the washers (4) from the coupling flange (5). Remove the assembly from the hydraulic pump.

STEP 3

Remove the retaining screw (6) from the coupling (9), then remove the coupling flange (2).

NOTE: *When installing, the depth between the end of the pump shaft (B) and the shoulder of the flange (2) should be 0.23 inch (see illustration below).*



CS02K571

STEP 4

Remove the coupling (9) from the coupling flange (2), make a visual inspection of the wear and the condition of the coupling, replace it if necessary.

STEP 5

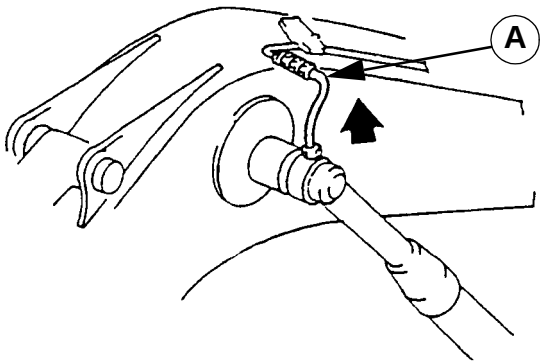
Remove the screws (7) and the coupling flange (5) from the hydraulic pump (8).

NOTE: *When installing the hydraulic pump coupling, proceed in the reverse order to that of removal.*

Removal

NOTE: *The numbers within brackets in the following steps refer to the boom cylinder schematic on page 3.*

STEP 1

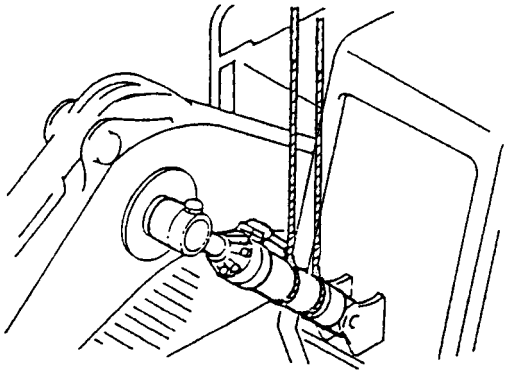


JS00577A

Disconnect the lubrication hose (A) from the boom cylinder.

NOTE: *Lift the cylinder carefully, the cylinder is heavy, its weight has to be balanced with slings during lifting.*

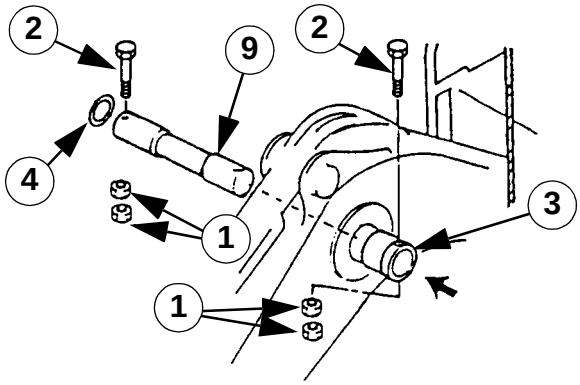
STEP 2



JS00578A

Attach a suitable lifting device to the boom cylinder. Use the total movement to get sufficient support during removal of the boom cylinder.

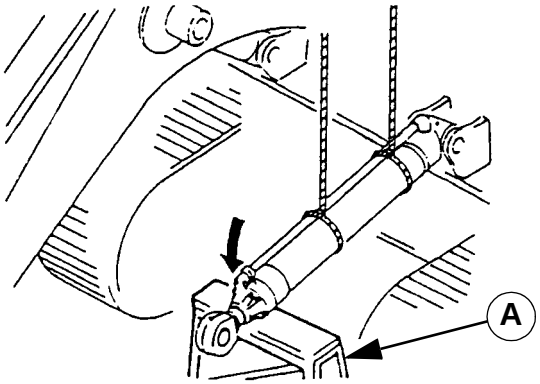
STEP 3



JS00579A

Remove the nuts (1) and the screws (2). Remove the screws from the shaft (9) and the locking rings (3). Push the shaft far enough so that it does not intefere with the removal of the boom cylinder. Remove the shims (4) and the locking rings.

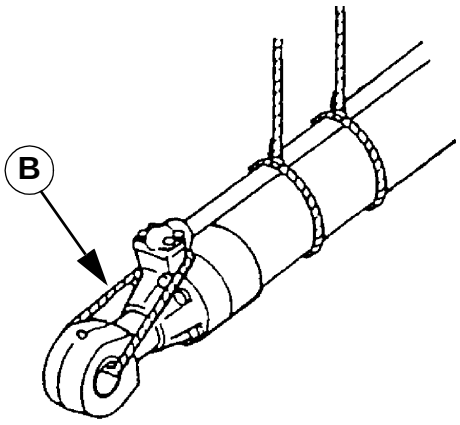
STEP 4



JS00580A

Install a support (A) in front of the boom cylinder. Lower the front of the boom cylinder on the support.

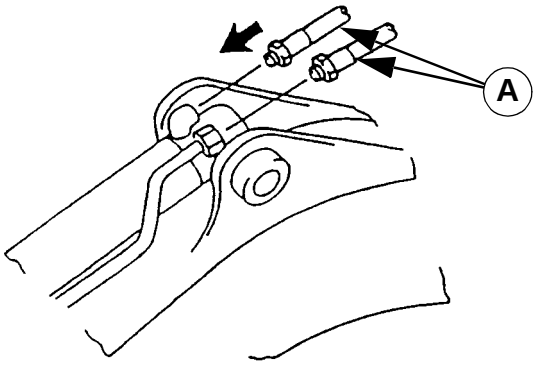
STEP 5



JS00581A

Attach a sling (B) to hold the cylinder rod to the cylinder barrel.

STEP 6

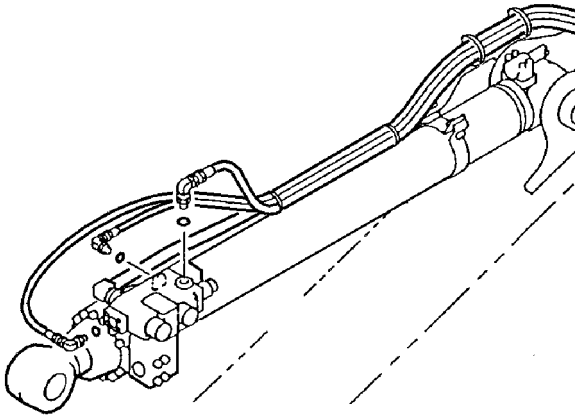


JS00605A

Start the vacuum pump. Remove the plugs from the hydraulic hoses (A) and the caps from the unions. Connect the hydraulic supply hoses on the dipper cylinder.

STEP 7

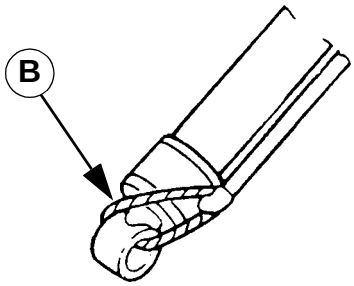
(Only if the machine is equipped with a anti-hose burst valve)



CS00G503

Connect the hydraulic pilot hoses to the anti-hose burst valve. Stop the vacuum pump.

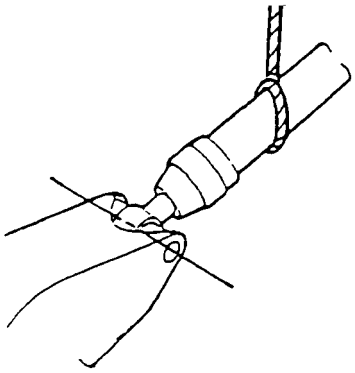
STEP 8



JS00586A

Remove the sling (B) that holds the cylinder rod to the cylinder barrel.

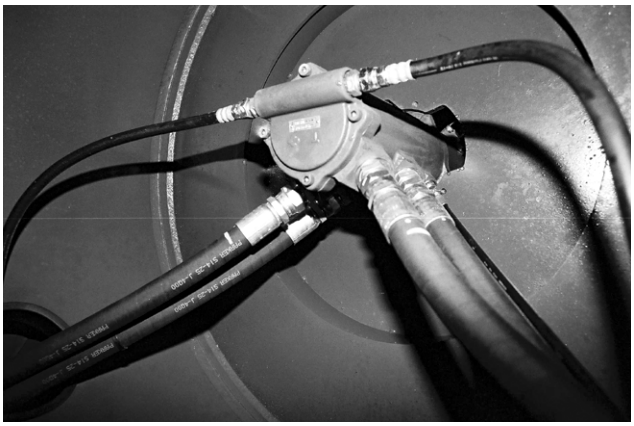
STEP 9



JS00606A

Align the dipper cylinder mounting ports with the dipper ports.

STEP 6



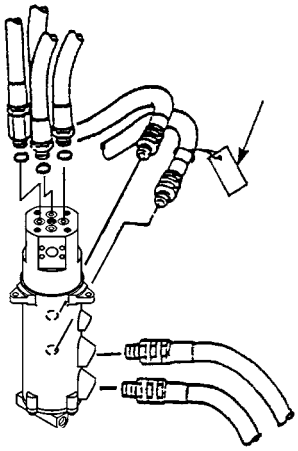
CD02C137

To facilitate installation, attach identification labels to all the hydraulic swivel hoses (outer and inner).

STEP 7

Start the vacuum pump.

STEP 8



CS02C503

Disconnect the hoses from the hydraulic swivel. Plug the hydraulic swivel hoses and orifices.

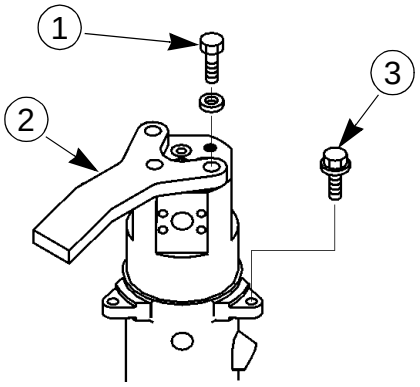
STEP 9

Stop the vacuum pump.

STEP 10

Connect suitable lifting equipment to the hydraulic swivel. Do not leave any slack since the hydraulic swivel has to be supported once the retaining screws are removed.

STEP 11



CS02C504

Remove the retaining screws (1), the locking bar (2) and the retaining screws (3) from the hydraulic swivel outer component.

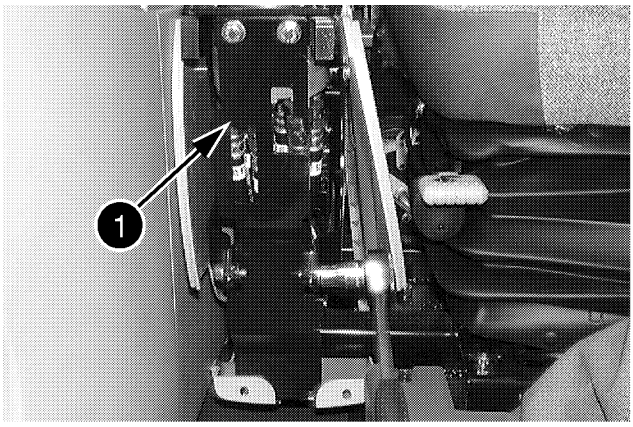
NOTE: *When installing, tighten to the torque specified in Section 1002.*

STEP 12

Raise the hydraulic swivel sufficiently to free it from its bracket, so that it can be pivoted 90°. Place the hydraulic swivel on the ground.

NOTE: *When installing, use the same procedure in the reverse order. Replace all O-rings with new O-rings. Before operating the machine, operate the travel, stop the engine and check that there are no leaks. If there is a leak, tighten the hose connections, check the level of hydraulic oil in the reservoir and top up if necessary.*

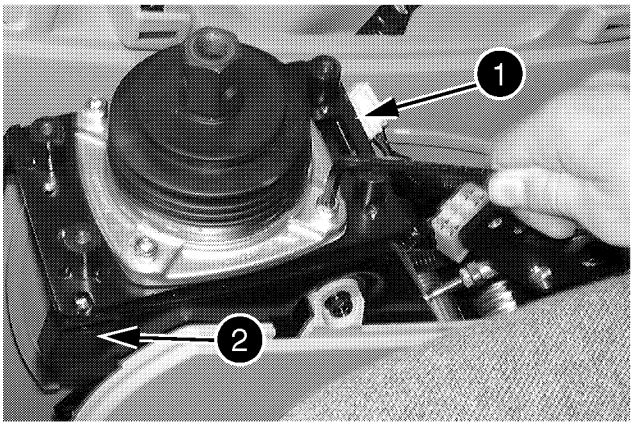
STEP 10



CD00G074

Loosen and remove the four retaining screws from the plate (1).

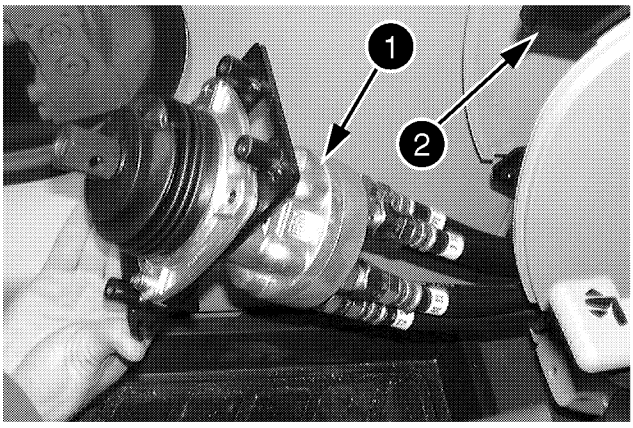
STEP 11



CD00G075

Loosen and remove the four screws that fasten the retaining plate of the control valve (1) to the bracket (2).

STEP 12



CD00G076

Take the control lever block (1) out from the bracket (2).

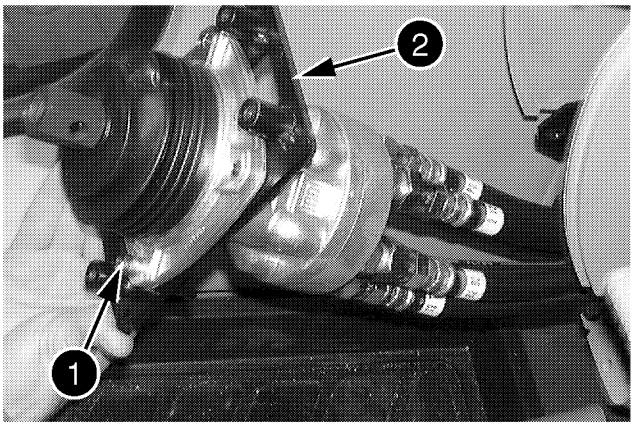
STEP 13

Start the vacuum pump.

STEP 14

Provide for a container to recover any possible hydraulic fluid leaks.

STEP 15



CD00G07

Attach identification tags to all hoses of the control lever block. Remove and seal the hydraulic hoses. Remove the junction unions, put plugs on the ports of the control lever block, then discard the O-rings. Loosen and remove the two retaining screws (1) from the plate (2).

NOTE: *When installing, replace all O-rings with new O-rings.*

STEP 16

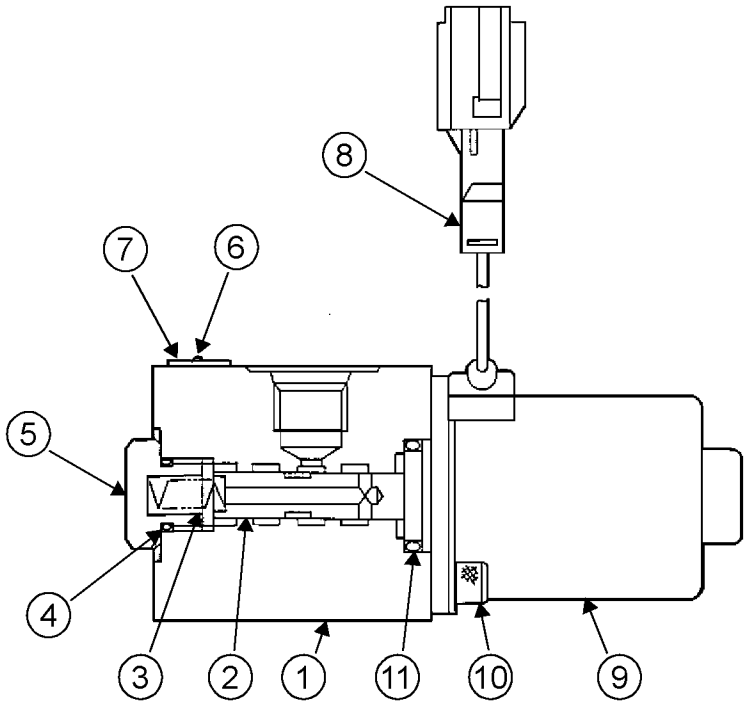
Stop the vacuum pump.

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

TABLE OF CONTENTS

FREE SWING SOLENOIDE VALVE

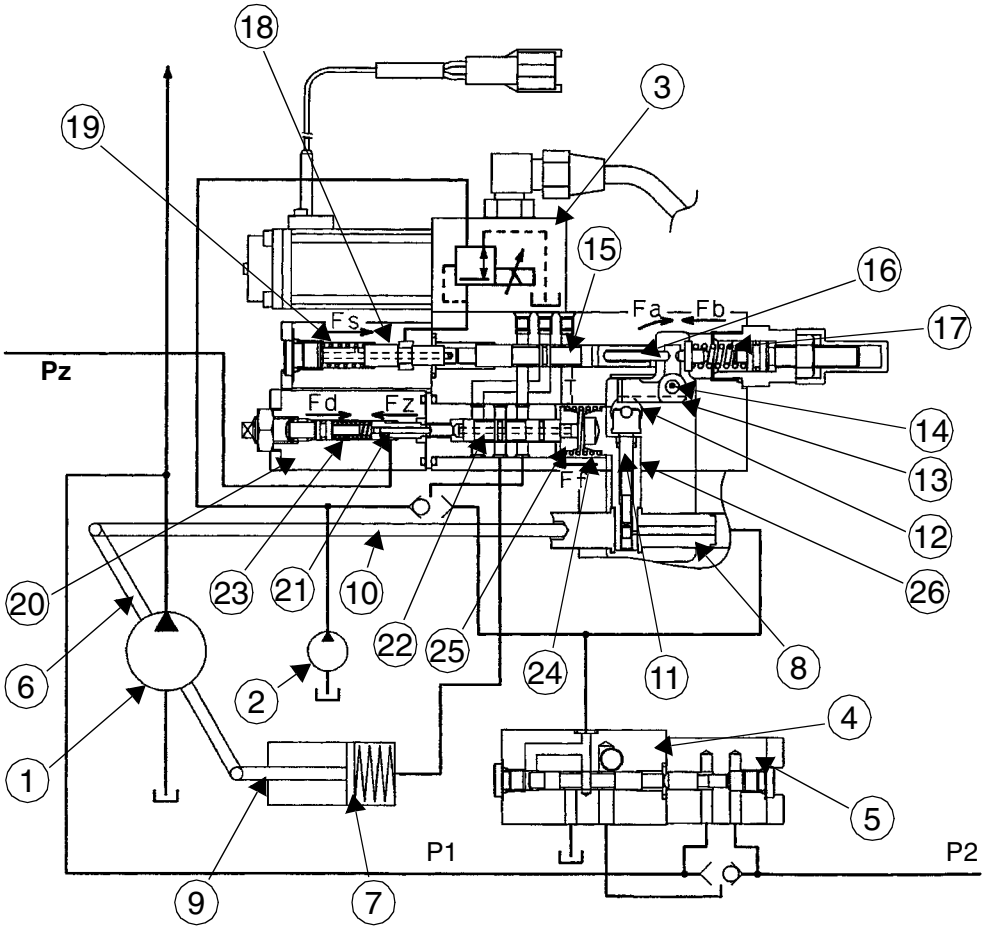
Section



JS00739A

1. Housing
2. Spool
3. Spring
4. O-ring
5. Plug
6. Rivet
7. Name plate
8. Electrical connector
9. Solenoid
10. Socket head cap screw
11. O-ring

REGULATION CONTROL

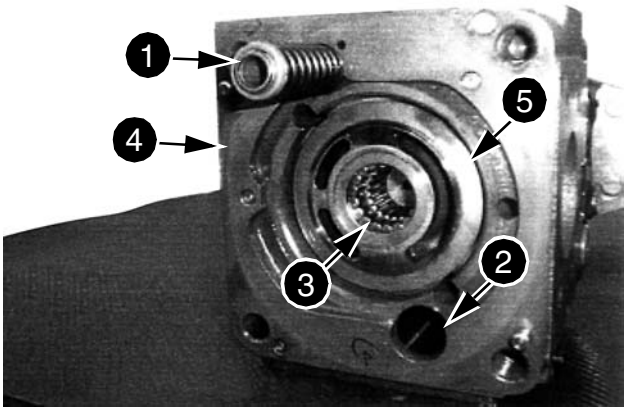


CI01E518

1 VARIABLE FLOW HYDRAULIC PUMP
2 GEAR PUMP
3 PROPORTIONAL VALVE
4 COUNTERBALANCE VALVE
5 PILOT CIRCUIT VALVE
6 SWASH PLATE
7 LARGE Ø CONTROL PISTON
8 SMALL Ø CONTROL PISTON
9 LARGE Ø PISTON ROD
10 SMALL Ø PISTON ROD
11 PISTON
12 CASTOR
13 PENDULUM DRIVE
14 PIN
15 CONTROL SPOOL
16 LINK ROD
17 OUTPUT ADJUSTMENT SPRING
18 PISTON
19 SPRING
20 NEGATIVE PRESSURE SETTING BLOCK
21 PRESSURE SETTING BLOCK PISTON
22 CONTROL SPOOL
23 CONTROL ADJUSTMENT NEGATIVE SPRING
24 DISCHARGING SPRING
25 SPRING SEAT
26 GUIDE

P1-P2: P1-P2 pump flow
Pz: Negative control pressure

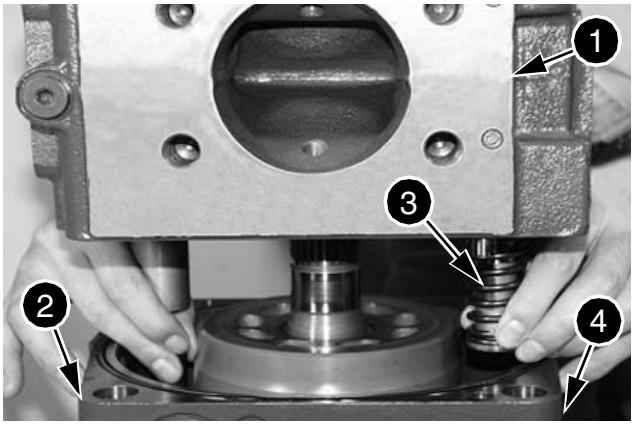
STEP 13



CD01F016

Install the small diameter piston (1) and the large diameter piston (2). Install the bearing (3) in the intermediate plate (4). Coat the cylinder block plate (5) with grease. Install the plate (5) on the intermediate plate. Install two lifting rings on the intermediate plate.

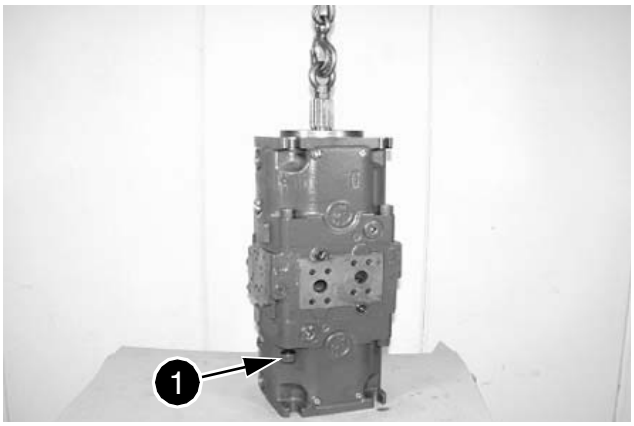
STEP 14



CD02B093

Lift and install the intermediate plate (1) on the pump body (2). Take care to position the push rods in the pistons (3). Make sure that you don't drop the cylinder block plate during installation. Install and tighten the four retaining screws (M18x75) (4) to a torque of 228.6 to 287.6 lb-ft.

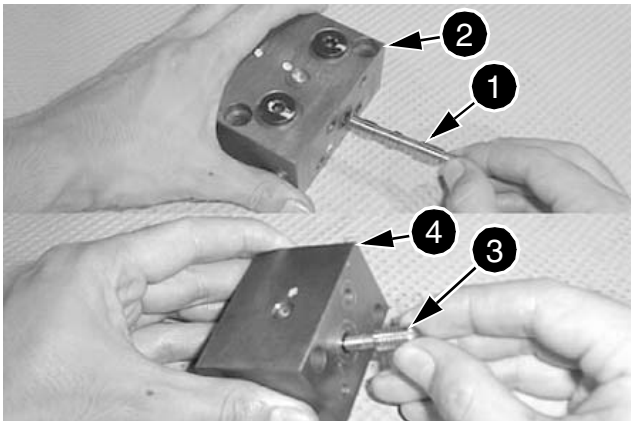
STEP 15



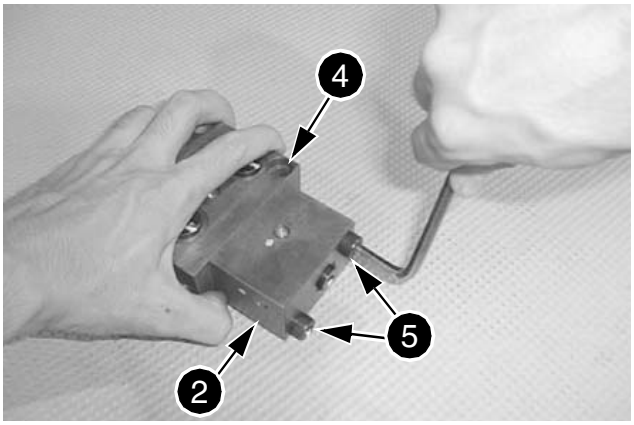
CD02B074

Follow steps 1 to 13 to assemble the other pump body. Attach lifting rings. Install the pump shaft coupling. Install new seals. Install the assembly according to the reference marks made during removal. Position and guide the push rods in the small and large diameter pistons. Install and tighten the screws (1) to a torque of 228.6 to 287.6 lb-ft.

STEP 16



CD02B086



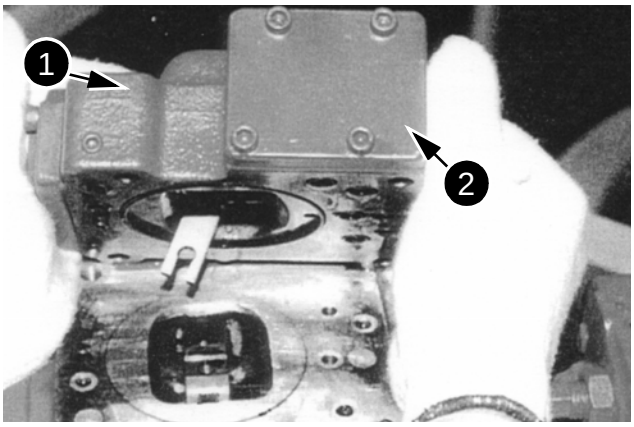
CD02B085

Assemble the balance relief valve. Install the spool (1) in the body (2), the piston (3) in the cover (4), assemble the body (2) and the cover (4) by tightening the screws (5) to a torque of 20.6 to 25.8 lb-ft.

DISASSEMBLY

STEP 1

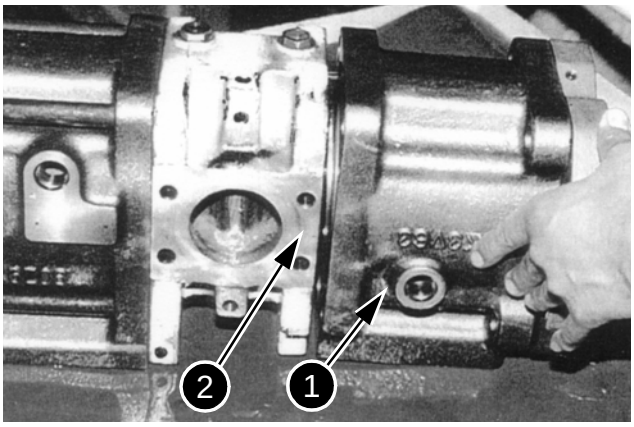
NOTE: *Always keep the components from different pumps separate from one another. During disassembly of the pump, place the components on a rubber mat. Handle the components carefully, always mark the position of the parts.*



CD01G103

Remove the oil drain plug located in the low pressure pump gear housing and drain the pump. Remove the retaining screws (1) and remove the regulator block (2).

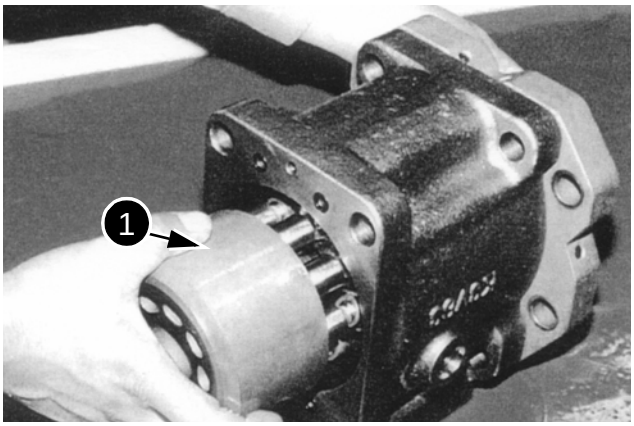
STEP 2



CD01G104

Place the pump on a table, with the regulators facing downwards. Remove the retaining screws and remove the front pump housing (1). Retain the cylinder plate. Remove the main pinion. Extract the needle bearing from the intermediate housing (2).

STEP 3

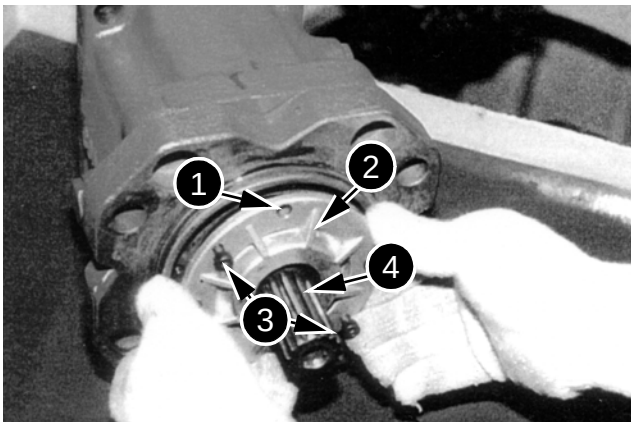


CD01G105

Remove the cylinder assembly (1), the spherical bushing, the thrust springs, the piston plate.

NOTE: *Do not loosen the stop screws of the control piston, the front and rear flanges and the intermediate housing, as doing so will alter the flow.*

STEP 4



CD01G106

Remove the retaining screws (1) from the cover (2). Install two screws in the extraction holes (3). Protect the shaft splines (4) with adhesive tape. Remove the cover (2), remove and discard the O-ring and the lip seal.

TABLE OF CONTENTS

SPECIFICATIONS

Weight of control valve ..... See Section 1002
Safety valve settings..... See Section 8001

TOOLS REQUIRED

1. Loctite 262
2. Torque wrench OEM 6472, OEM 6474 and OEM 6476

STEP 4

Remove the spacer (53) from the control valve body, then remove the O-ring (54), the back-up ring (55) from the spacer (53).

STEP 5

Remove the spring (35) and the check valve (34) from the control valve body.

STEP 6

Loosen and remove the plug (72) from Arm 1 parallel tandem section (see section C-C).

STEP 7

Remove the spring (33) and the check valve (32) from the control valve body.

STEP 8

Loosen and remove the plug (72) from Arm 2 parallel tandem section (see section L-L).

STEP 9

Remove the spacer (57), the spring (33) and the check valve (32) from the control valve body.

STEP 10

Loosen and remove the plug (92) from the backup section (see section G-G).

STEP 11

Loosen and remove the screws (96) and remove the cap (43).

STEP 12

Remove the spring (45), the check valve (44) and the O-ring (36) from the control valve body.

STEP 13

Loosen and remove the plug (46) and the O-ring (47) from the travel section (see section G-G).

STEP 14

Remove the spring (48) and the check valve (49) from the control valve body.

Spacer assembly (40)

NOTE: *Be careful when removing components, some parts are subject to spring pressure.*

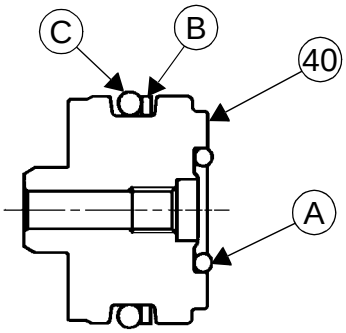
STEP 1

Loosen and remove the screws (76) from the anti-drift valve (67) then remove the anti-drift valve.

STEP 2

Remove the O-rings (41) and (42) from the control valve body.

STEP 3



CS01K598

Remove the O-ring (A).

STEP 4

Use the screw (78) M6 x 1 as an extracting screw to remove the spacer (40).

STEP 5

Remove the O-ring (C) and the back-up ring (B).

STEP 6

Remove the spring (39) and the check valve (38) from the control valve body.

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SPECIFICATIONS

See Section 1002.

Disassembly

NOTE: *The boom, dipper and bucket cylinders are basically identical in construction. What changes is the hydraulic tube connections. Before installing the cylinder in the repair stand, remove the hydraulic tubes.*

STEP 1

Boom cylinder

NOTE: *The numbers within brackets in the following steps refer to the boom cylinder schematic on page 6.*

1. Remove the grease gun (1) from the cylinder.
2. Remove the two plugs (2). Remove and discard the two O-rings (3).
3. Remove the screws (4) and disconnect the hydraulic tubes (8) and (10) from the cylinder.
4. Remove the screw (5), the washer (6) and the pipe clamp (7). Remove the hydraulic tubes (8) and (10) from the cylinder. Remove and discard the two O-rings (9) and (11).
5. Remove the screws (15), the washers (16) and the circlip (17).

STEP 2

Dipper cylinder

NOTE: *The numbers within brackets in the following steps refer to the dipper cylinder schematic on page 8.*

1. Remove the plug (2) from the hydraulic pipe (8). Remove and discard the O-ring (3).
2. Remove the screws (4) and disconnect the hydraulic tubes (8) and (10).
3. Remove the screws (5), the washers (6) and the pipe clamps (7) Remove the pipes (8) and (10) from the cylinder. Remove and discard the two O-rings (9) and (11).
4. Remove the screws (12). Disconnect the hydraulic clamp (13) from the pipe (10). Remove and discard the O-ring (14).
5. Remove the screws (15), the washers (16) and the circlips (17)

STEP 3

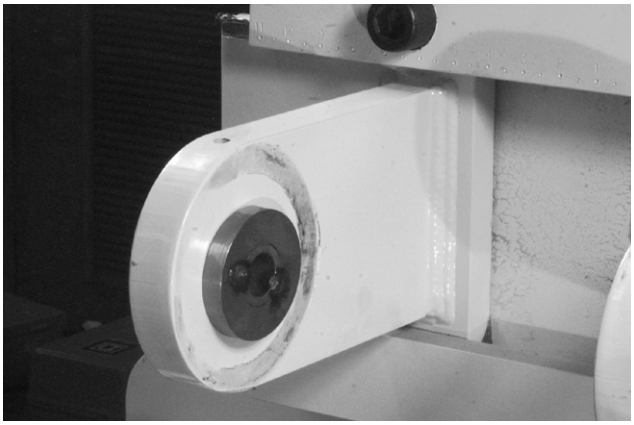
Bucket cylinder

NOTE: *The numbers within brackets in the following steps refer to the bucket cylinder diagram on page 10.*

1. Remove the grease fittings (1) from the cylinder.
2. Remove the screws (4). Disconnect the hydraulic pipes (8) and (10) from the cylinder.
3. Remove the screws (5), the washers (6) and the pipe clamps (7) Remove the hydraulic tubes (8) and (10) from the cylinder. Remove and discard the two O-rings (9) and (11).
4. Remove the screws (15), the washers (16) and the circlip (17).

NOTE: *As an example, the repairing bench CAS 10918 is used.*

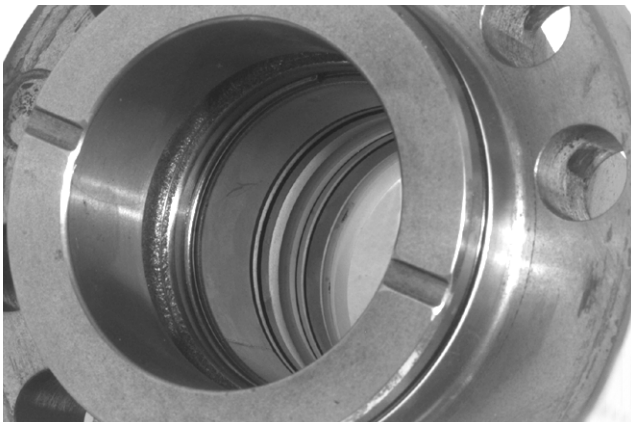
STEP 4



JD00620A

Install suitable bushings on the cylinder head stock chuck wings.

STEP 5

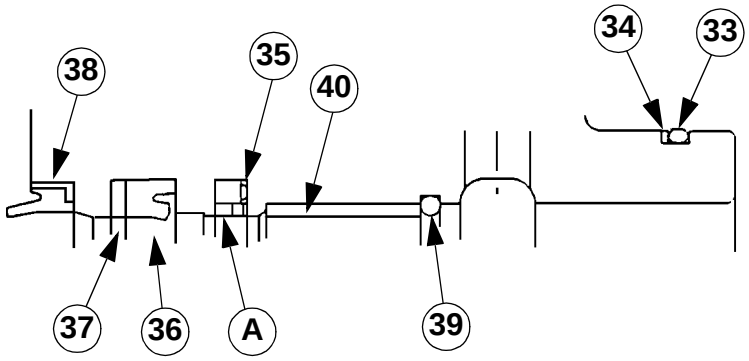


JD00652A

JD00651A

JD00650A

Install a new O-ring (33) and back up ring (34). Install a new wiper ring (38). Install a new U-ring (36) and back up ring (37). Install a new buffer ring (A), consisting of a ring (35).



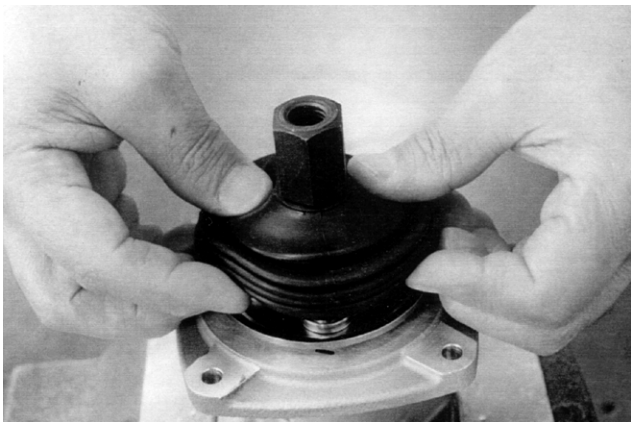
JS00649A

Disassembly

NOTE: *The numbers in brackets in the following steps refer to the schematic on page 3.*

Always handle high precision parts with the greatest care to prevent them being damaged by being knocked or dropped. The components of the control lever may rust due to contamination and humidity if they are left without protection after disassembly. If work has to be stopped, the components must be protected against contamination or corrosion.

STEP 1



CD00G087

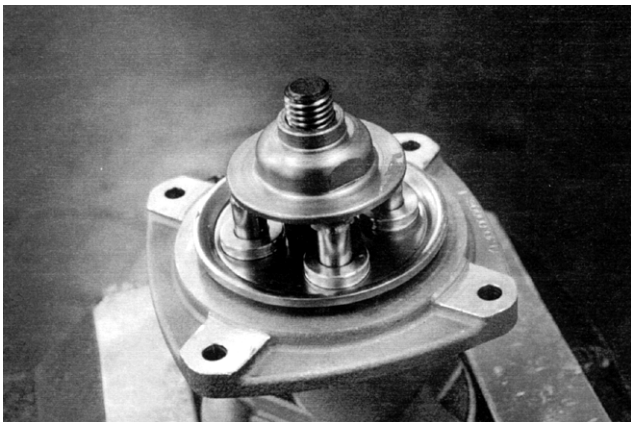
Install the control lever in a soft-jawed vice. Remove the protective boot.

STEP 2

CD00G088

Remove the lock-nut from the control lever.

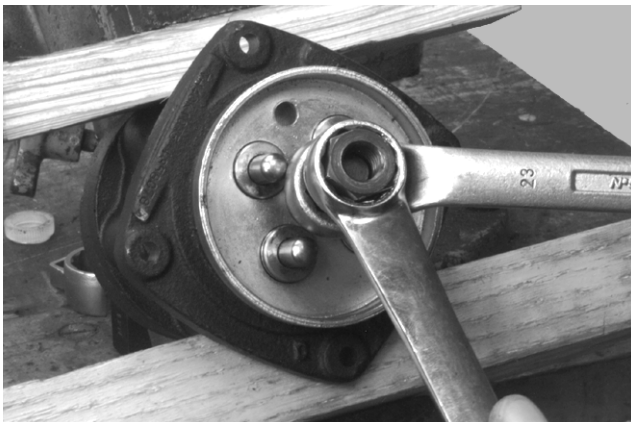
STEP 3



CD00G089

Remove the disc from the control lever.

STEP 4



JD00767A

Install two nuts on the universal joint and tighten them fully. While holding the upper nut, turn the lower nut anti-clockwise to unscrew the universal joint. Remove the universal joint from the control lever.

NOTE: *Carefully remove the universal joint to prevent the plate and the push-rods, which are under pressure from the springs, from flying out too quickly.*

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TORQUE SETTINGS

Cover retaining screws	39.7 to 47 lb-ft
Cam articulation pin locking screw (Apply Loctite 241)	9.8 to 11.8 lb-ft
Cap screw	2.8 to 4.2 lb-ft

Inspection

1. Clean all parts using suitable cleaning solvent. Immerse the solenoid valve housing in a cleaning solvent for several minutes to dissolve dirt or other foreign matter inside the solenoid valve housing. Use low pressure compressed air to blow out any foreign matter from interior of valve housing. Dry parts using clean cloths.
2. Inspect springs for cracks, distortion, or evidence of permanent set. Replace a spring if any of these defects are observed.
3. Check for cracks, holes, deformities and other signs of wear on the spools. Check that the spools slide easily into the grooves of the solenoid valve block spools. If any of these conditions are seen, replace the solenoid valve block.
4. Check that the internal threading is not worn out and that the solenoid valve block is not damaged inside. If any of these conditions are seen, replace the solenoid valve block.
5. Measure the play between the spool groove and the spool. The play must be approximately 0.00039 in. If this is not the case, replace the solenoid valve block.

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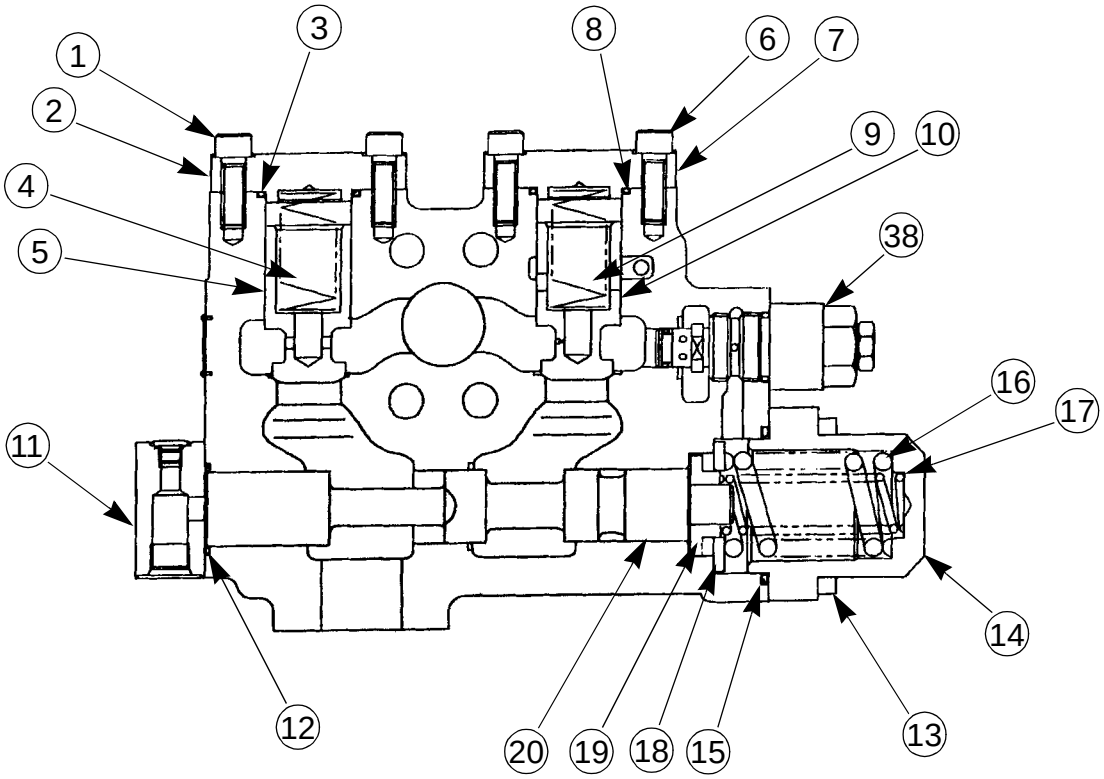

CS02C502

14. Install the valve (38).
15. Oil and install the check valve (5) and the spring (4) according to the markings made during disassembly, install the cover (2) equipped with a seal (3) using screws (1).
16. Oil and install the check valve (10) and the spring (9) according to the markings made during disassembly, install the cover (7) equipped with a seal (8) using screws (6).
17. Install a seal (12) and install the spool stop cap (11) using retaining screws.
18. Oil and install the spool (20).
19. Install the spring seats (18) and (19).
20. Install the springs (16) and (17).
21. Install a seal (15) on the cover (14).
22. Install and fasten the cover (14) using screws (13).

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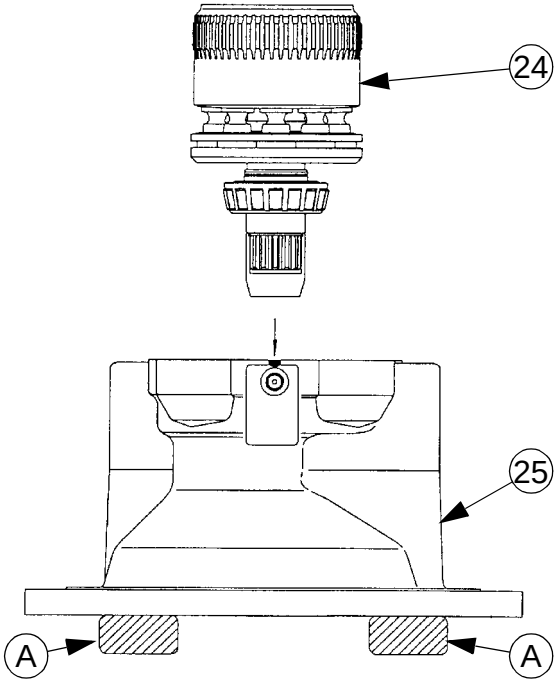
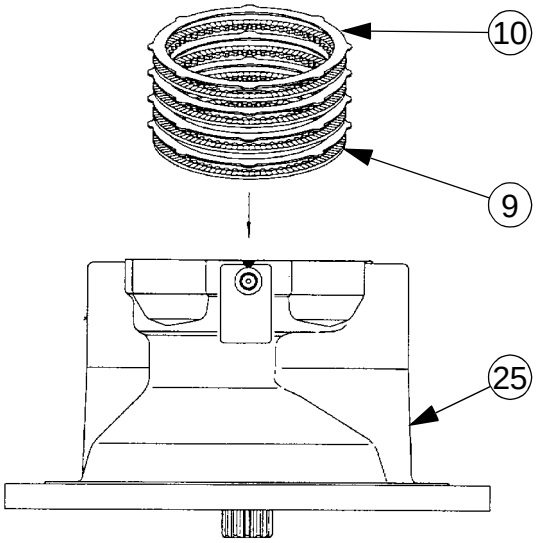
STEP 9



CS02C540

Install the housing (25) on shims (A).
Carefully install the cylinder assembly (24) in the housing (25). Be careful when installing the cylinder assembly not to damage the splines on the shaft.

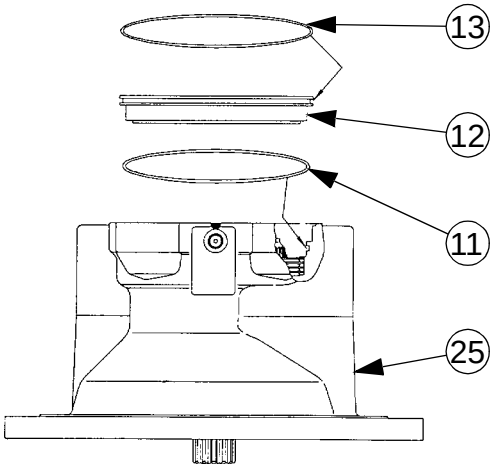
STEP 10



CS02C541

Apply clean hydraulic fluid to both faces of the friction plates (9) and the disc plates (10). First, install a steel disk then a friction disk, then a steel disk, a friction disk, then a steel disk, a friction disk, finally the last steel disk and the last friction disk.

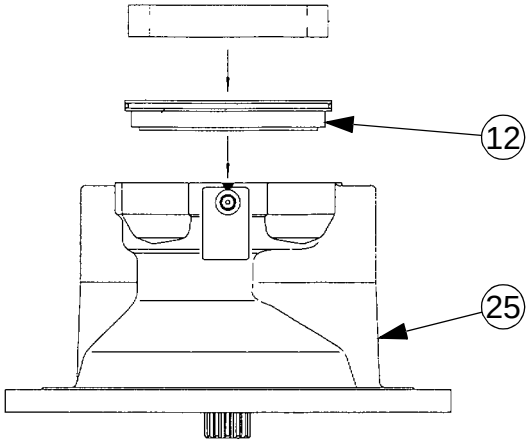
STEP 11



CS02C542

Apply grease on the new O-rings (11) and (13); install the O-ring (11) in the housing (25) and the O-ring (13) on the brake piston (12).

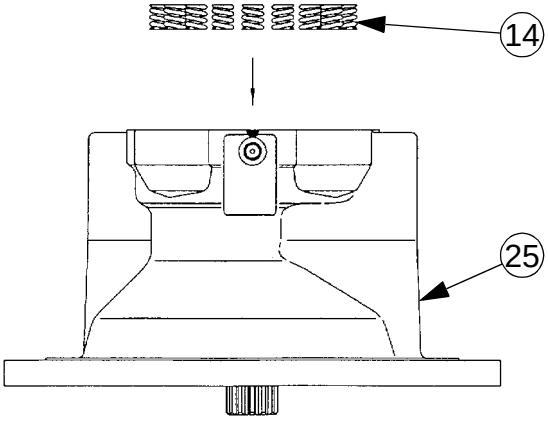
STEP 12



CS02C543

Apply clean hydraulic fluid on the periphery of the brake piston (12). Drive the brake piston (12) into the housing (25).

STEP 13



CS02C544

Install the springs (14) in the brake piston (12) in their original locations.

Controls in neutral position

In neutral position, with the engine running, part of the flow coming from the low pressure pump (1) arrives at PP, and is divided by a restrictor bridge. One part goes through the two travel spools, the other part goes via all the other spools and then into the general return circuit. When the spools are moved, these circuits will be locked, which will close the upper pilot (B26) and travel pilot (B27) pressure switches so as to inform the main computer (A1).

The A1 pump outlet port enters the control valve at P1 while the pump A2 enters P2, flows through the control valve via the free passages. They are controlled by two pressure limiters (2) and (3) which are set to 419 psi at 14 gpm and two restrictors (4) and (5). These two pressures are sent to the HP pumps via ports Pz1 and Pz2, to set them at minimum flow.

1. Low pressure pump
2. Pressure limiter
3. Pressure limiter
4. Restriction
5. Restriction
A1. Computer
B26. Upper pilot pressure switch
B27. Travel pilot pressure switch

Swing variable priority circuit

The swing pilot pressure arrives in the main control valve (15) via port Pc3 after passing through the swing shuttle block (81), and then pilots the swing priority valve (1). Which provides the maximum possible torque on the swing motor (22) at a high swing pressure, even if the dipper is used at the same time.

When digging, the boom raising pilot pressure pilots the swing priority valve (1) via port Pbu. The swing flow is therefore in parallel with the dipper via the swing priority valve (1). Which has the effect of increasing the speed of the dipper.

The trench is dug more uniformly even if the free passage is closed by the spool on boom 2.

When upperstructure swing and dipper retraction or boom raising take place simultaneously, the parallel connection is reduced and the swing flow is maintained.

1.	Swing priority valve
15.	Main control valve
22.	Swing motor
81.	Swing shuttle block
Pa5/A5.	Extending the dipper
Pb5/B5.	Retracting the dipper
Pa9/Pb9.	Dipper 2 spool
Pa3/A3.	LH swing
Pb3/B3.	RH swing
Pc3.	Swing priority
Pb4.	Boom 2 spool
Pbu.	Swing priority valve piloting

Dipper retracting circuit

Dipper retracting (cylinder large chamber) (27) is supplied by flows from P1 and P2 pumps.

When the dipper retracting control is operated, the spools for dipper 1 (1) and dipper 2 (3) are piloted by ports Pb5 and Pb9.

The flow coming from pump P1 arrives at dipper 1 (1) spool via the free passage or through the parallel passage after passing through the straight-line travel valve (2).

The flow coming from pump P2 arrives at the dipper 2 (3) spool via the free passage or through the parallel passage after passing through the straight-line travel valve (2). It joins the flow from pump P1 before the dipper spool 1 (1). The flows from P1 and P2 pumps supply the large chamber of the dipper cylinder (27). The return from the large chamber passes through the dipper spool (1).

Dipper retracting additional supply circuit

When the dipper retracting control is operated, the pilot pressure arrives at Pc1 and unlocks the dipper anti drift-valve (31). Return flow is restricted by an orifice in the spool (1) and the restriction in the regeneration valve (4).The check valve in spool (1) opens allowing oil to flow to the small chamber.

When the pressure in the large chamber of the dipper cylinder (27) increases, the regeneration valve (4) is piloted and changes to the large restriction position. This has the effect of stopping the small chamber re-injecting into the dipper cylinder large chamber (27).

1. Dipper 1 spool
2. Straight-line travel valve
3. Dipper 2 spool
4. Recycling valve
5. Non-return check valve
27. Dipper cylinder
31. Dipper load holding valve
P1. Outlet flow A1
P2. Outlet flow A2
Pa5/A5. Extending the dipper
Pb5/B5. Retracting the dipper
Pa9/Pb9. Dipper 2 spool

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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 that follows, as there is a risk of serious injury.*

SPECIFICATIONS

See Section 1002.

SPECIAL TORQUES

Screw (32)	239 lb-ft
Overload valve (40)	72.3 to 86.7 lb-ft
Screw (12) (brake valve)	72.3 lb-ft
Screw (14) (brake valve)	52.1 to 63.6 lb-ft
Plug (10) (brake valve)	18 to 21.6 lb-ft
Plug (15) (brake valve)	18 to 21.7 lb-ft

Assembly

General precautions

1. Work should be conducted in a clean area.
2. Make sure that each part is assembled into the original location.
3. Scratches made during disassembly can be removed with oil stones.
4. Applying a light amount of hydraulic oil to parts will facilitate the installation.
5. O-rings should be systematically replaced.

STEP 1

Install the throttle valve (8) and the spring (9) onto the cover (7) and secure them with the plug (10), to which the O-ring (11) is installed.

STEP 2

Install the O-ring (18) onto plug (15) and fasten the plug onto the main body (1).

STEP 3

Install the O-rings (5) and (6) onto the main body (1).

STEP 4

Install the spool (2), spring bearing (3) and spring (4) in this particular order onto the main body (1). The orientation of the spool must be correct when it is installed.

STEP 5

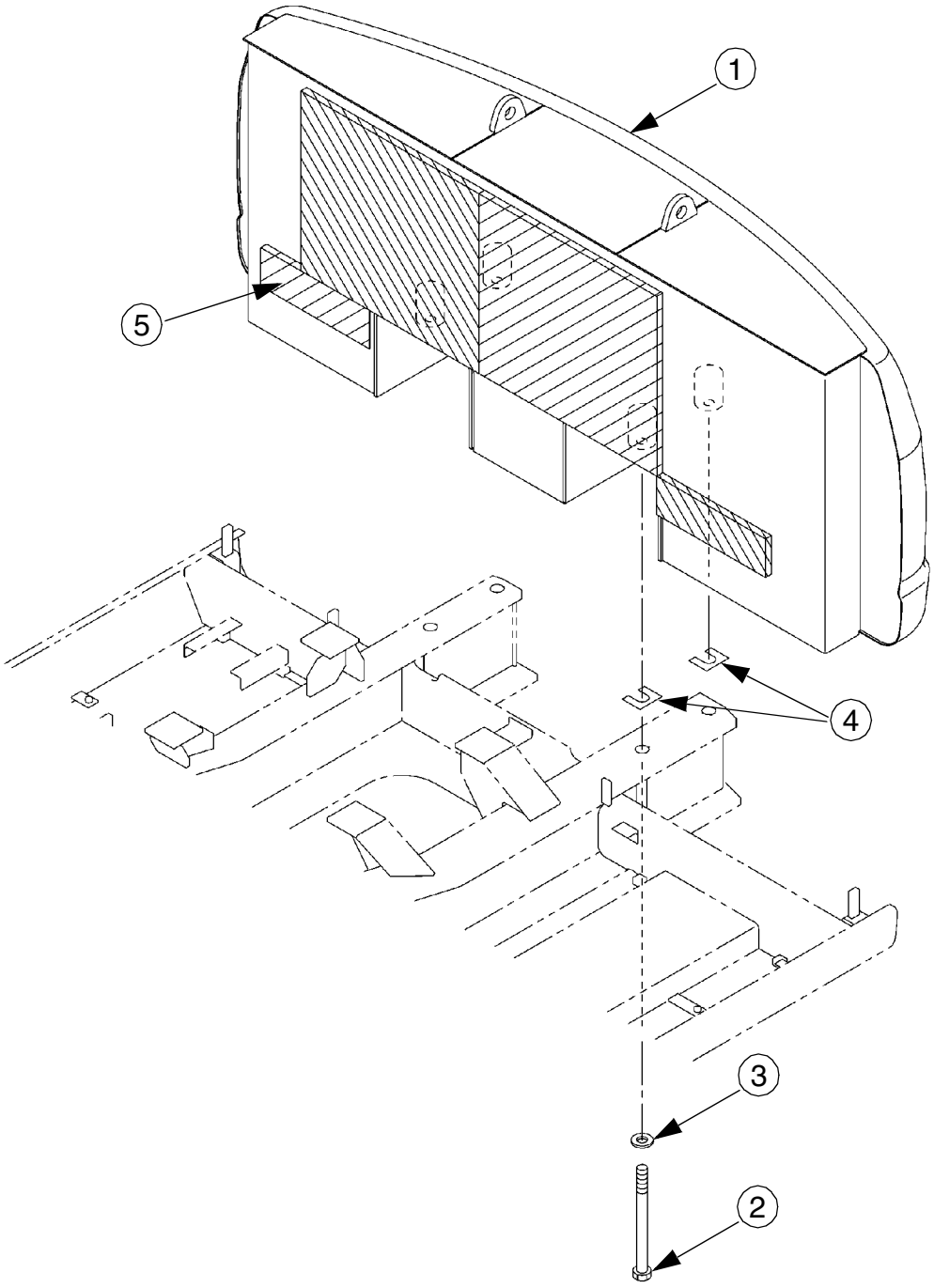
Install the cover (7) on the main body (1) with the screws (12).

STEP 6

Install O-rings (13), (16) and (17) on the mating face with the motor.

COUNTERWEIGHT

Description



CS02C507

1 COUNTERWEIGHT
2 SCREW
3 WASHER
4 SHIM
5 INSULATING MATERIAL

Removal

STEP 1

Remove the bucket, the connecting rods and the compensator, see page 4.

STEP 2

Start the engine, retract the dipper cylinder rod and lower the attachment to the ground. Shut down the engine.

STEP 3

Remove the bucket cylinder and disconnect the dipper cylinder rod from the dipper, see Section 8005. Attach the dipper cylinder rod on the boom.

NOTE: *The numbers in the following steps refer to the diagram of the dipper on page 7.*

STEP 4

Attach a suitable lifting device to the dipper. Use the total movement of the lifting device.

STEP 5

Remove the screw (1), the washer (2) and the shaft (3).

STEP 6

Start the engine, reverse the machine to separate the dipper from the boom. Lower the boom to the ground and shut down the engine.

STEP 7

Lower the attachment to the ground and unhook the lifting device from the dipper.

STEP 8

Remove and scrap the dust seals (6), (11) and (12).

NOTE: *Carry out step 9 only if the bushings (8), (9) or (10) have to be changed, see Specifications.*

STEP 9

Remove the bushings (8), (9) or (10) from the dipper or the boom by using a hammer and a suitable drift on the outer diameter of the bushing.

Installation

NOTE: *Carry out step 1 only if the bushings (8), (9) or (10) have been removed.*

STEP 1

Using a suitable sleeve, install the bushings (8), (9), or (10).

STEP 2

Install new dust seals (6), (11) and (12) on the dipper.

STEP 3

Attach a suitable lifting device to the dipper. Move the dipper into position near the machine.

STEP 4

Start the engine and advance the machine so that the boom is aligned with the dipper. Check the alignment of the mounting ports of the boom and the dipper. Shut down the engine.

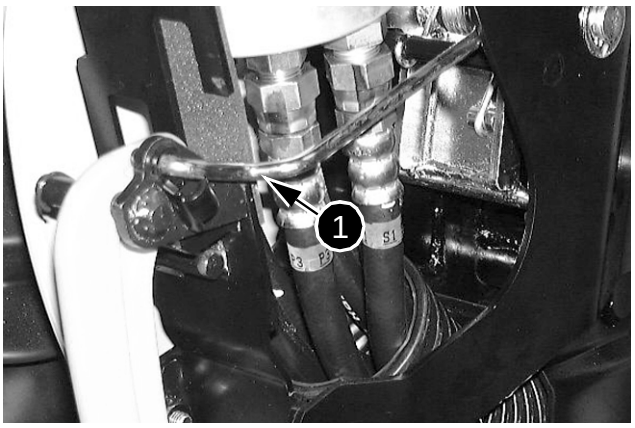
STEP 5

Install the pin (3).

STEP 6

Using a set of spacer rings, check that the play between the boom and the dipper is 0.019 to 0.043 in. If required, remove the pin (3) and add one or more shims according to the requirement in order to get the correct play. Install the pin (3).

STEP 14

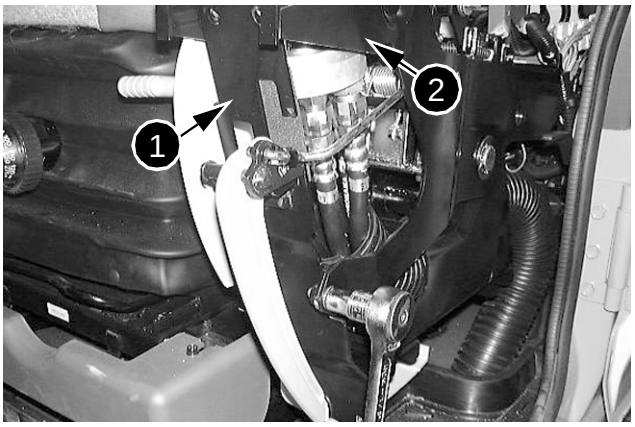


CD00G058

Loosen from the LH side, the rod (1) that links the function cancellation lever to the safety bar (2).

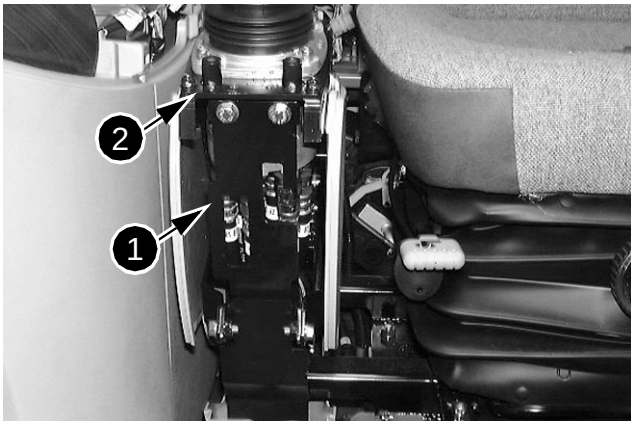
STEP 15

LH side



CD00G059

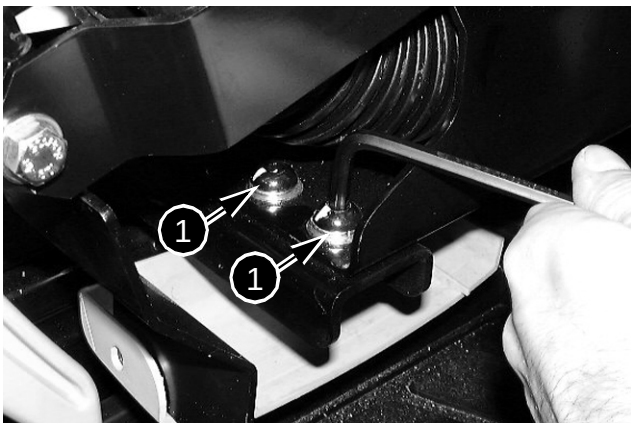
RH side



CD00G119

Loosen and remove the four screws that fasten the plate (1) to the bracket (2).

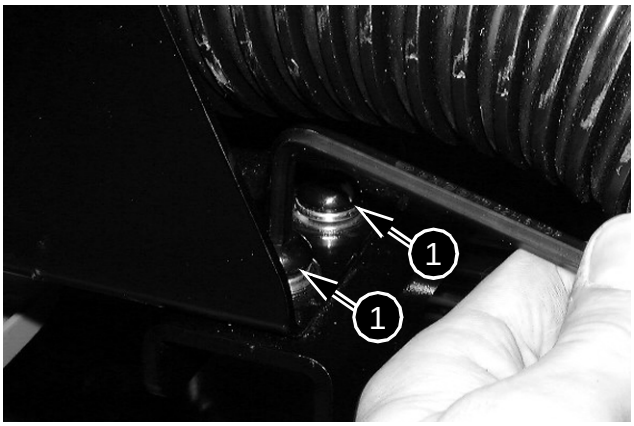
STEP 16



CD00G120

Loosen and remove the two front retaining screws (1) of the control arm to the front seat bracket.

STEP 17

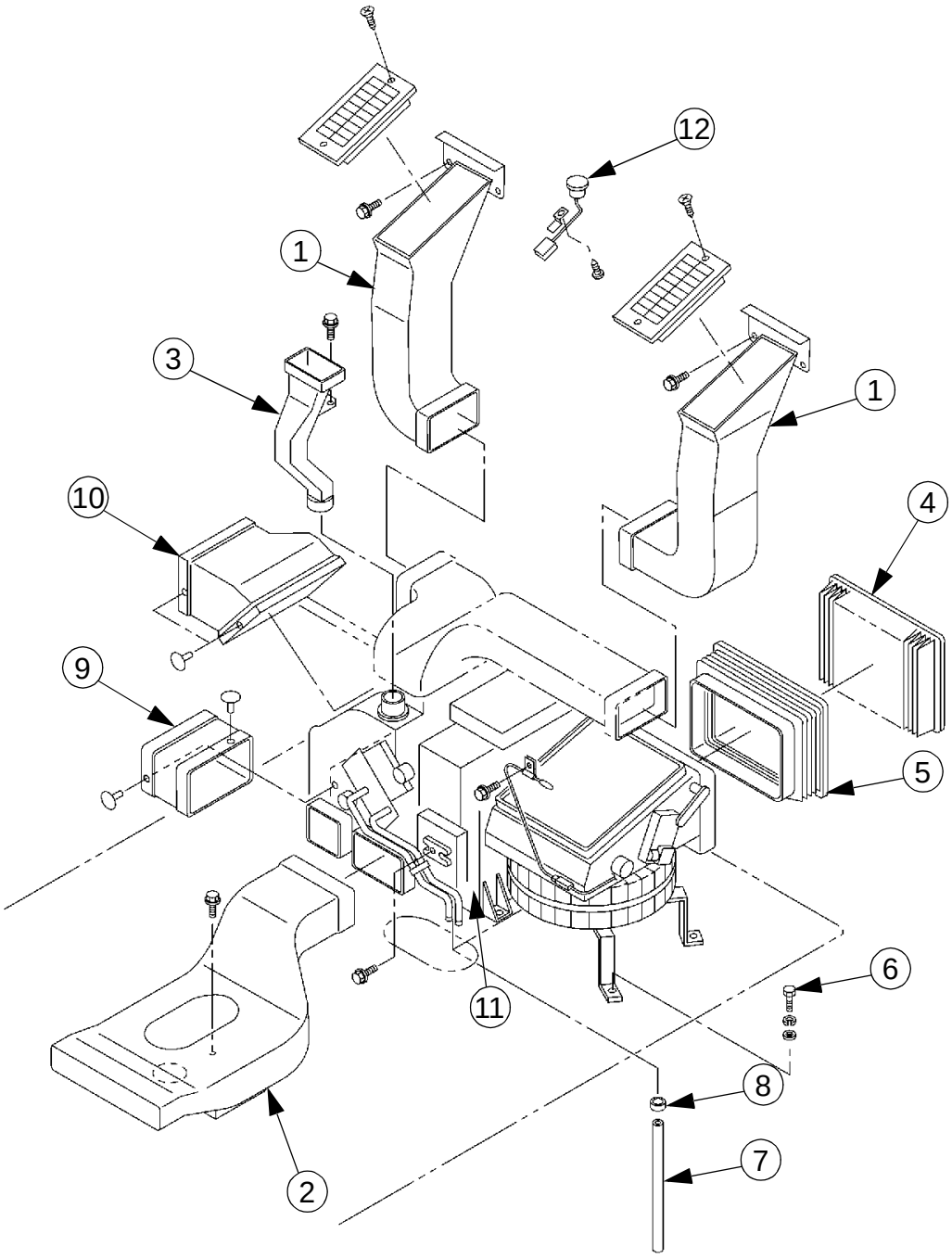


CD00G121

Loosen and remove the two rear retaining screws (1) of the control arm to the rear seat bracket.

HEATER

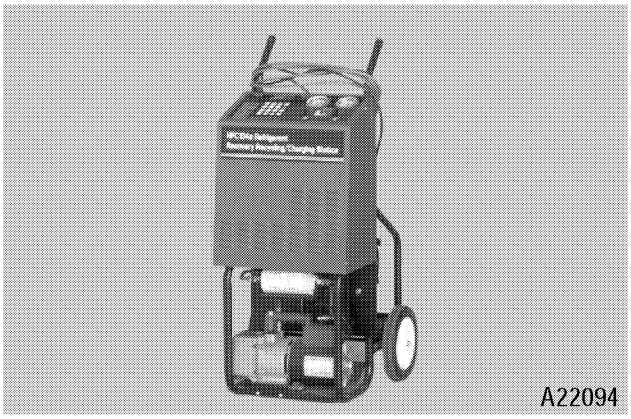
Description



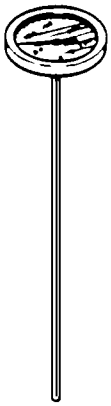
CS02C514

1 CAB REAR VENTILATION CONDUIT
2 CAB LOWER VENTILATION CONDUIT
3 CAB REAR VENTILATION CONDUIT
4 POLLEN FILTER
5 CONDUIT
6 SCREW
7 HEATER HOSE
8 RETAINING CLIP
9 UNION
10 UNION
11 HEATER ASSEMBLY
12 CONTROL BLOCK

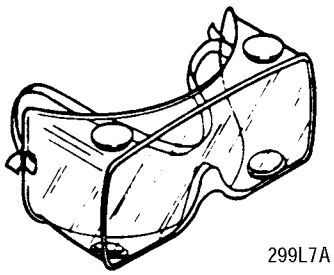
SPECIAL TOOLS



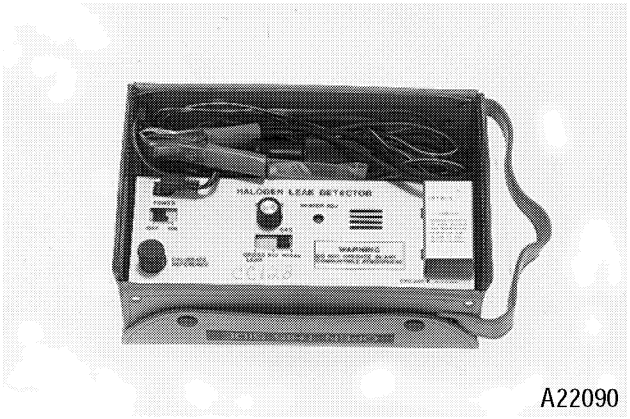
Refrigerant Recovery, Recycling and Charging Station OEM-1418



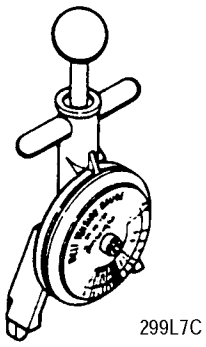
9 Inch Stem Type Thermometer 0°-250 CAS-10248



Safety Goggles CAS10073-3



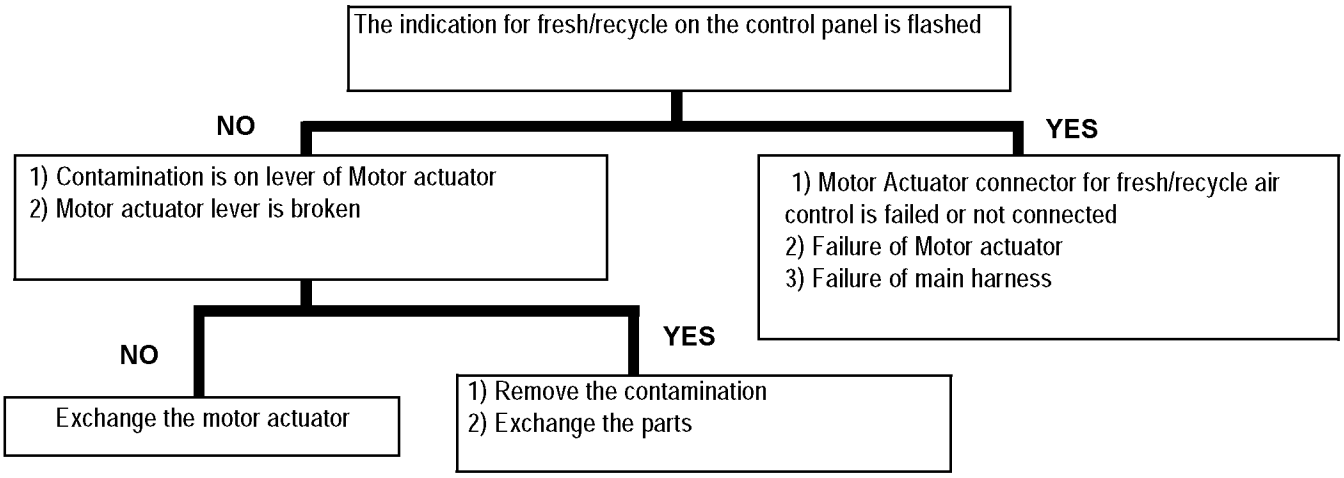
Electronic Leak Detector OEM-1437



Belt Tension Tool CAS-10808

TROUBLESHOOTING

Blow air is not changeable in fresh or recycle



A/C mode is not changeable