SERVICE MANUAL

Crawler Excavators

CX290

9-53581

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

TYPE 1-4

SERVICE MANUAL

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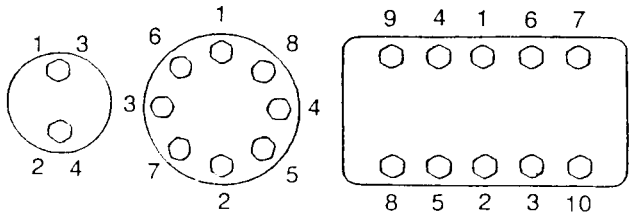
TYPE 1-4

STANDARD TORQUE DATA FOR CAP SCREWS AND NUTS

Tightening of Cap Screws and Nuts

Tighten alternately so that tightening torque can be applied evenly. The numbers in the figure below indicate the order of tightening.



JS00481B

Cap screws which have had Loctite used (white residue remains after removal) should be cleaned with light oil or suitable cleaning solvent and dried. Apply 2-3 drops of Loctite to the thread portion of the cap screw and then tighten.

Hydraulic system

Main hydraulic pump

Variable flow double pump, with axial pistons.
Maximum flow..... 2 x 58.4 gpm
Displacement..... 2 x 5.93 cu in

Hydraulic pilot pump

Fixed flow pump
Max flow .....5.8 gpm
Displacement..... 0.61 cu in

Pressure setting

Pilot circuit relief ..... 566 ± 14 psi
Main circuit relief (standard) ..... 4975 ± 43 psi
Main circuit relief (power-up) ..... 5410 ± 72 psi
Secondary relief (boom, dipper and bucket)..... 5685 ± 72 psi
Secondary relief (swing) ..... 4264 ± 58 psi
Secondary relief (travel) ..... 5511 ± 72 psi
Safety valve (boom and dipper)..... 5685 ± 72 psi

Cylinder

Boom cylinder

Cylinder bore .....5.31 in
Rod diameter .....3.74 in
Stroke .....53.89 in

Dipper cylinder

Cylinder bore .....5.9 in
Rod diameter .....4.13 in
Stroke .....56.6 in

Bucket cylinder

Cylinder bore ..... 5.11 in
Rod diameter .....3.54 in
Stroke .....42.2 in

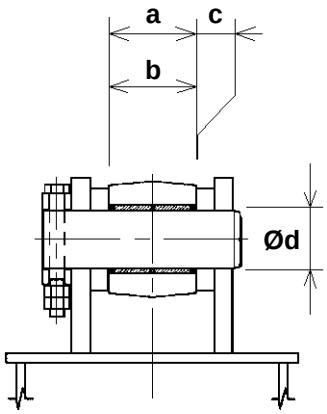
Cylinder leakage - attachment lowering (without load)

Boom cylinders (rods retraction).....0.11 in/5 min
Dipper cylinder (rod extension)..... 0.19 in/5 min
Dipper cylinder (rod extension)..... 0.27 in/5 min
Total (at the end of the attachment)..... 7.87 in/5 min

Cylinder speed (in S mode)

Boom raised (bucket open and on the ground) ..... 4.6 ± 0,6 seconds
Boom lowered (bucket open)..... 3.7 ± 0.6 seconds
Dipper extended ..... 2.9 ± 0.5 seconds
Dipper retracted..... 4.0 ± 0.5 seconds
Bucket open..... 2.5 ± 0.5 seconds
Bucket closed ..... 4.9 ± 0.5 seconds

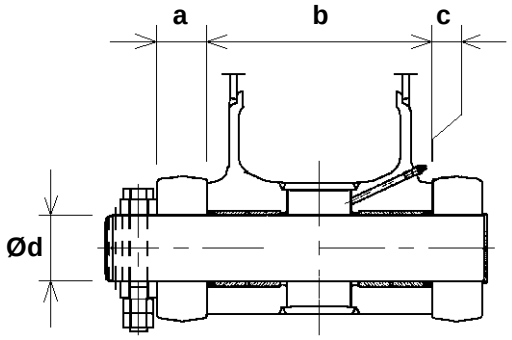
4. Dipper cylinder foot/Boom



CS01B525

Mark		Dimension (in)
a	Standard	4.88
	Limit	5.11
b	Standard	4.84
	Limit	4.76
c (a - b)	Standard	0.019 to 0.11
	Limit	Shims
Ø d (shaft)	Standard	3.74
	Limit	3.70
Ø d (bushing)	Standard	3.74
	Limit	3.79

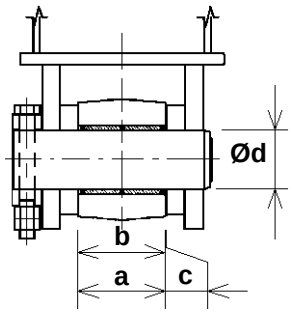
5. Boom/Dipper



CS01B526

Mark		Dimension (in)
a	Standard	3.22
	Limit	3.14
b (boom)	Standard	12.9
	Limit	13.1
b (dipper)	Standard	12.9
	Limit	12.8
c (play)	Standard	0.019 to 0.04
	Limit	Shims
Ø d (shaft)	Standard	3.9
	Limit	3.8
Ø d (dipper)	Standard	3.9
	Limit	3.99
Ø d (boom)	Standard	3.9
	Limit	3.99

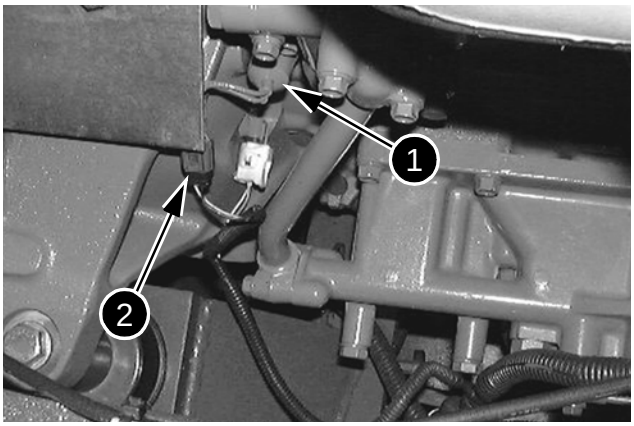
6. Dipper cylinder head/Dipper



CS01B527

Mark		Dimension (in)
a	Standard	5.47
	Limit	5.66
b	Standard	5.43
	Limit	5.35
c (a - b)	Standard	0.019 to 0.11
	Limit	Shims
Ø d (shaft)	Standard	3.74
	Limit	3.70
Ø d (bushing)	Standard	3.74
	Limit	3.79

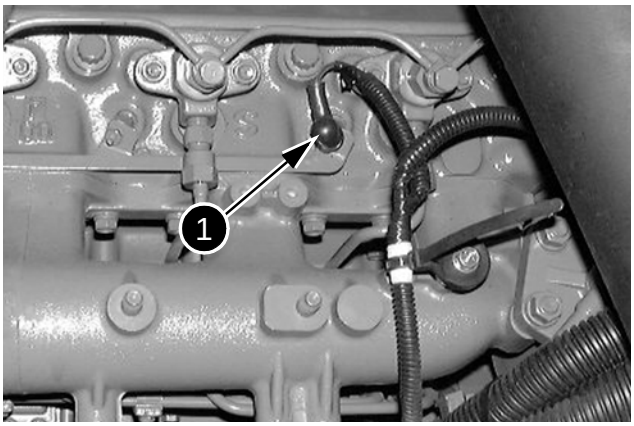
STEP 9



CD00J046

Label and disconnect the electrical connection for the oil pressure sender (1) and the engine speed sender (2).

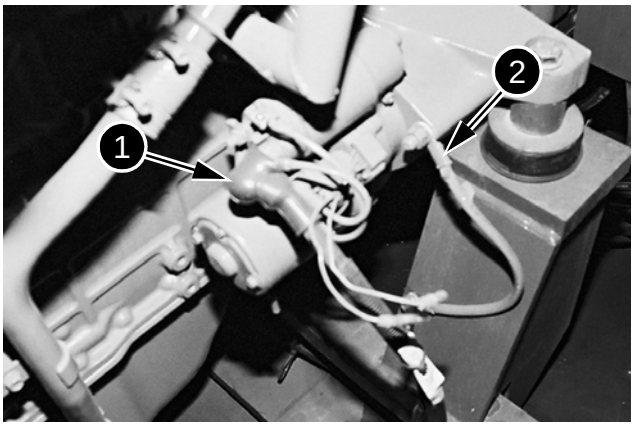
STEP 10



CD00J047

Label and disconnect the electrical supply (1) to the pre-heating plugs.

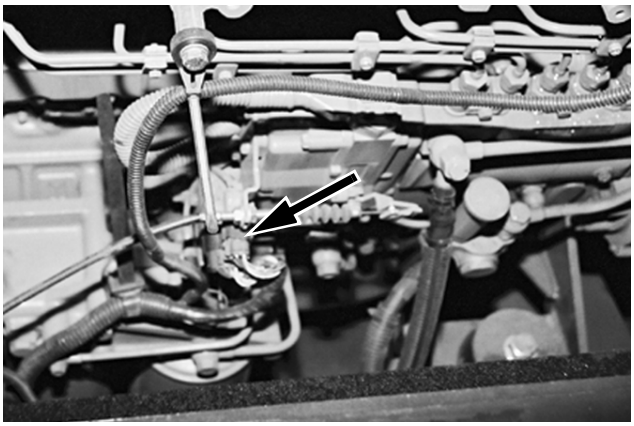
STEP 11



CD02C170

Label and disconnect the electrical connections to the starter motor (1). Remove the earth cable (2) at the engine end.

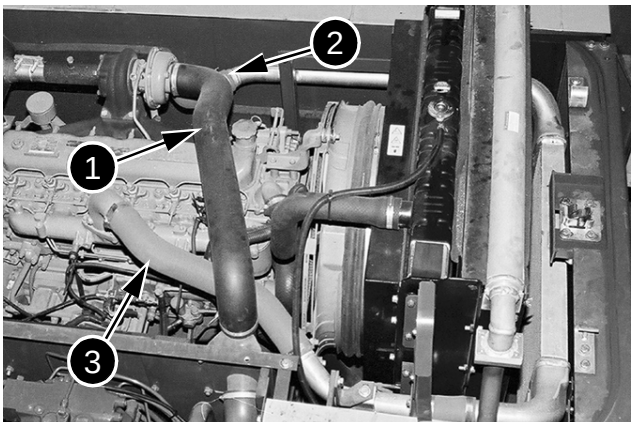
STEP 12



CD02C168

Identify and disconnect the connectors for the electronic regulator and disconnect the fuel flow regulator resistor.

STEP 13



CD02C171

Remove the hose (1) which connects the turbo-charger to the air filter, disassemble the hose (2) which connects the turbo-charger to the heat exchanger and also the hose (3) which connects the heat exchanger to the inlet pipe.

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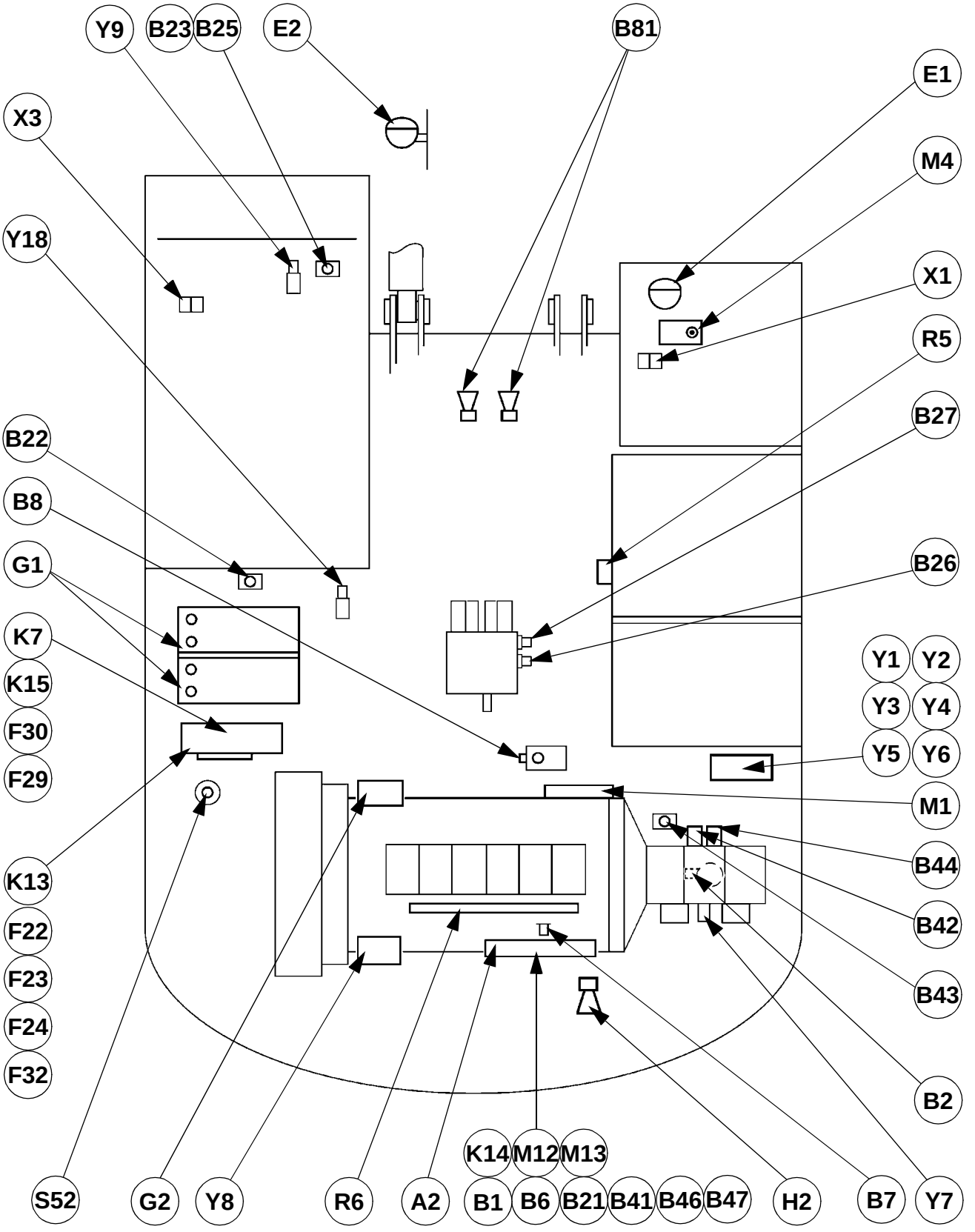
SPECIFICATIONS

See Section 1002

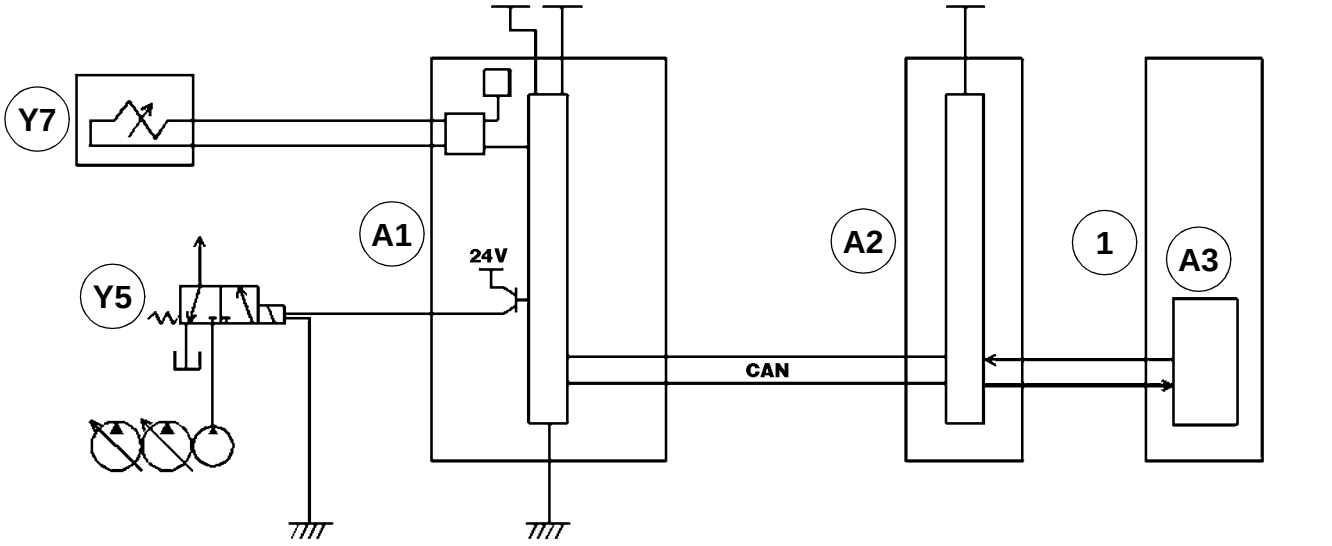
General location of the components (outside the cab)



CS02M503

H/S/L Mode Control

1) Circuit configuration



CS00F509

1. Engine
A1. Computer
A2. Engine controller
A3. Electronic acceleration
Y5. Power-up solenoid valve (yellow band)
Y7. Main pump proportional solenoid

2) Values set for each mode

					Hydraulic power-up
Mode H	Number of engine revolutions (Maxi)		rpm	2250	Automatic control
	Current (variable amperage)	(Max)	mA	415	
		(Min)	mA	305	
Mode S	Number of engine revolutions (Max -200)		rpm	2050	Automatic control
	Fixed current amperage (90% of torque)		mA	305	
Mode L	Number of engine revolutions (Max -300)		rpm	1950	Constant
	Fixed current amperage (70% of torque)		mA	<50	
Idle	Number of engine revolutions		rpm	900	-----
Number of engine revolutions at maximum torque			rpm	1400	-----

NOTE: *The shown above are for normal conditions; the following are exceptions:*

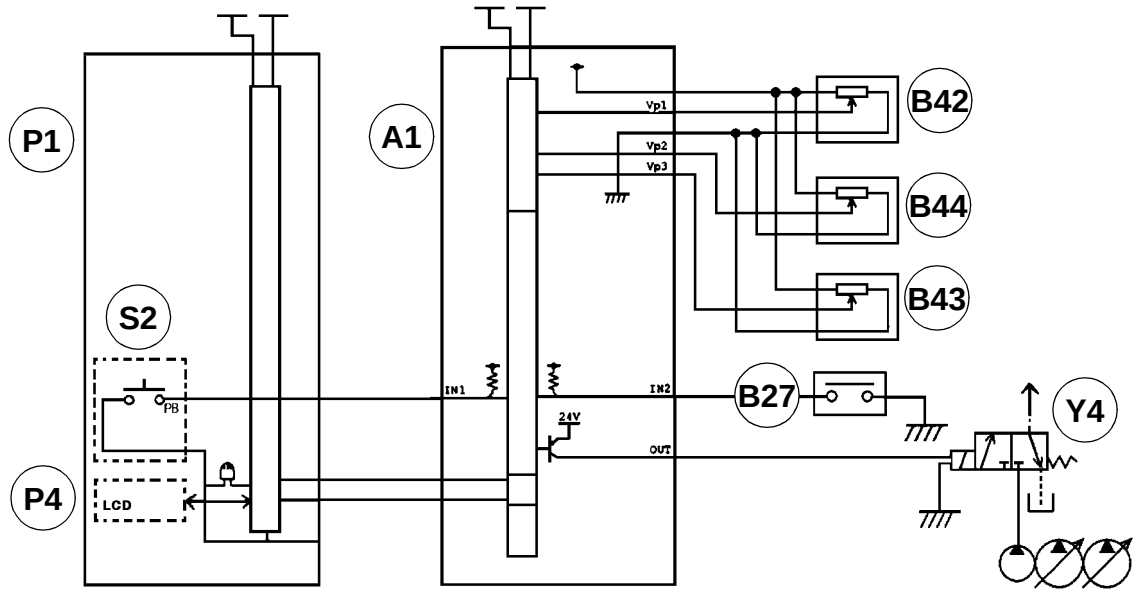
1. If the target number of engine revolutions is less than the maximum torque number of revolutions, the pump is controlled by the value of "L" mode current (even in H/S modes).

2. In "L" mode, if travel operation only is actuated, the pump is controlled by the value of "S" mode current.

3. In "L" mode, if a hydraulic hammer is used, the pump is controlled by the value of "S" mode current.

Travel Speed

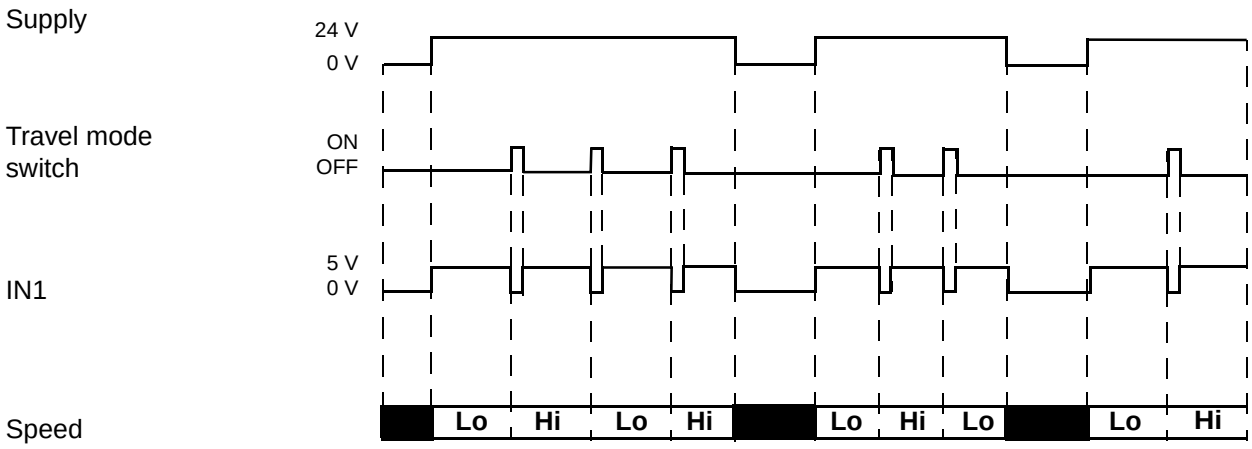
1) Circuit configuration



CS00F504

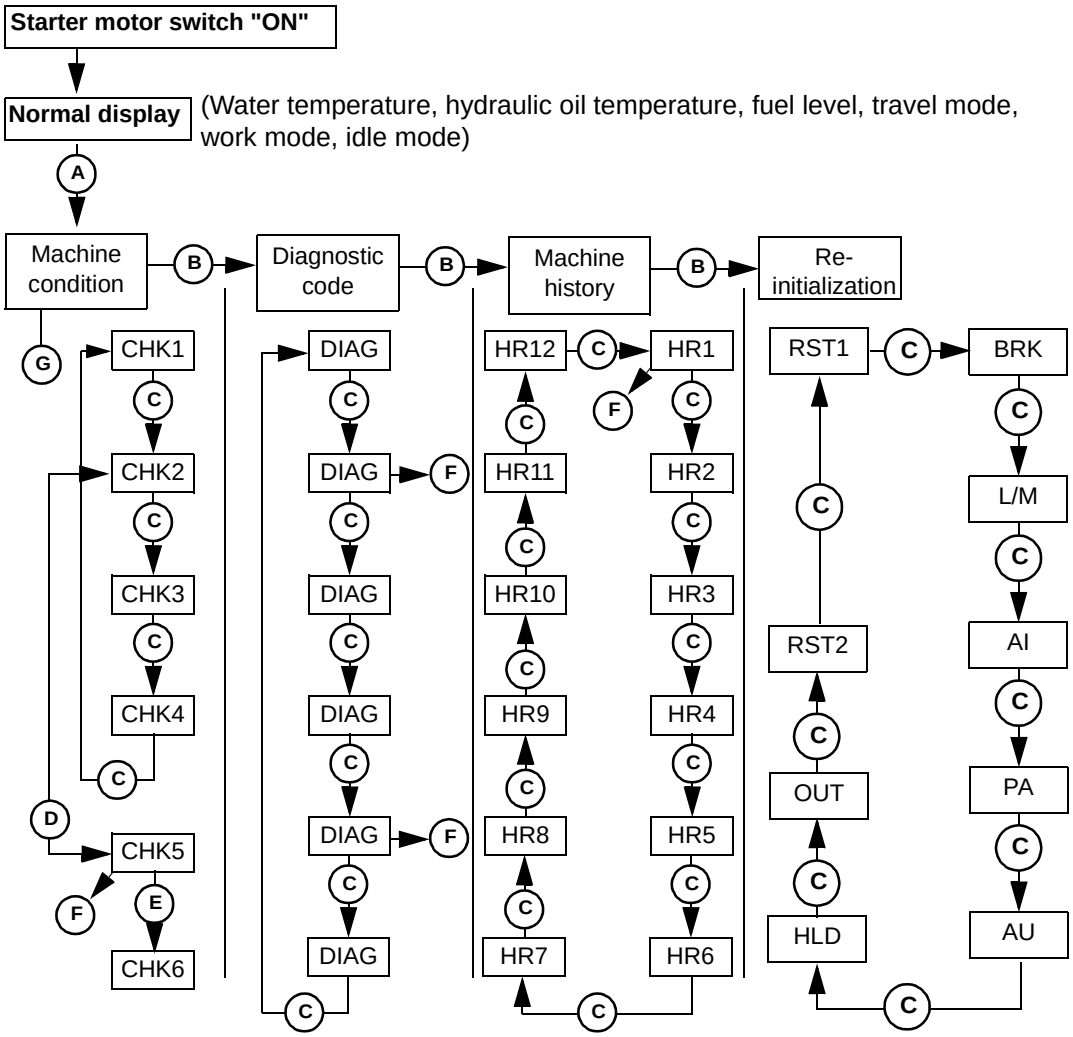
A1. Computer
B27. Pilot pressure switch
B42. Pump pressure sensor (P1)
B43. Pressure sensor (nega-cont)
B44. Pump pressure sensor (P2) (yellow band)
P1. Instrument panel
P4. Monitor display
S2. Travel mode switch
Y4.2nd stage travel solenoid valve (red band)

2) Timing diagram



ACCESS AND CONTENTS OF MONITOR DISPLAYS (Diagnostic mode)

Access to monitor displays



A. To scroll between the Normal display and Diagnostic display screens press the Travel and Work mode switch simultaneously for 3 seconds

B. To scroll between the CHK, DIAG, HR and RST1 press the Auto mode switch

C. To scroll through the CHK, DIAG, HR and RST1 screens press the Buzzer stop switch

D. While in the CHK2 screen push and hold the Travel mode switch you will scroll to the CHK5 screen. Past TR1, TR2 and TR3 faults will be displayed. When fault codes in the diagnostic mode (DIAG) is cleared this information will also be cleared. Do not hold the Travel switch longer than 10 seconds.

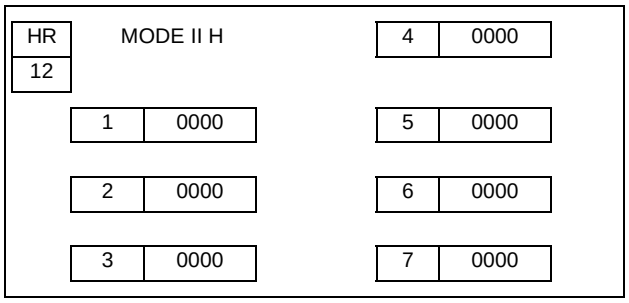
E. Self-Check of the protected transistor circuits can be checking automatically. While holding the One-Touch idle button turn the key switch on then release the idle button. The controller will energize each of the TR circuits automatically. If a over-current is detected the display will indicate a "ELECTRICAL PROBLEM" and sound the alarm. If no over-current is detected only the alarm will sound. Return to CHK2 to see which circuits have been recorded. CHK6 will not appear on the display

F. To erase data in CHK5 & DIAG2 scroll to DIAG2. To erase data in DIAG5 scroll to DIAG5. To erase data in HR1-HR12 scroll to HR1. At each of these fields, press the Work mode switch for 10 seconds (buzzer will sound) turn OFF the key

G. To change between the International and English units for the diagnostic check screens use the working light switch on the display monitor. By pressing this once, the computer will change from English to International units or vice versa.

Example: Mpa (megapascals) to psi (pounds/inch^2)

12. Screen HR12, operating time of the various engine load rates in mode "S" (maximum rpm)

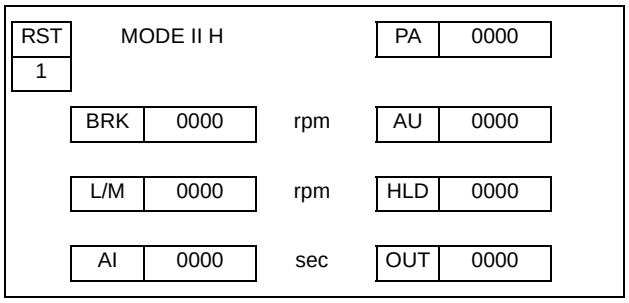


1: 30% or lower
2: 30% to 40%
3: 40% to 50%
4: 50% to 60%
5: 60% à 70%
6: 70% to 80%
7: 80% or higher

To erase all data from the machine history mode (screens HR1 to HR12), press the work mode switch for 10 seconds.

Resetting

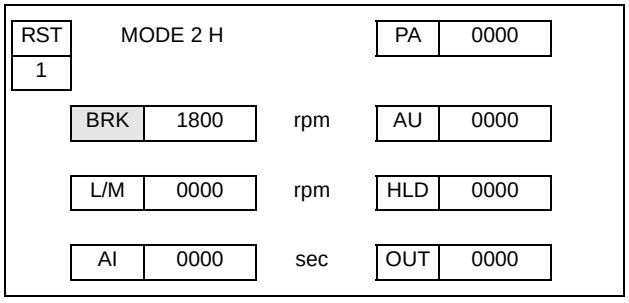
1. Resetting RST1



MODE: Travel mode - work mode
BRK: Setting engine speed for hammer option
L/M: Not used
AI: Adjusting timing of automatic return to idle (from 1 to 30 seconds)
PA: Altitude compensation (0=off, 1=on)
AU: Automatic power boost
HLD: Hold previous (default) data (0=with; 1=without)
OUT: Not used

NOTE: *To select the various adjustment windows, press as many times as necessary on the audible warning device stop switch (a window is selected when the item concerned changes from negative appearance to positive appearance).*

2. Setting engine speed for hammer option



A. Select window BRK (see NOTE on this page).
B. Start engine and adjust engine speed to desired RPM using the Free swing switch to increase RPM and Cushion switch to decrease RPM. The switches must be held for a minimum of 5 seconds in order for a RPM change to occur.
C. To save the engine speed, press the work mode switch for 10 seconds. The audible warning device sounds when saving is completed.
D. Do not the throttle down. Turn the starter key switch to the OFF position.
E. Start engine, increase engine RPM to high idle and operate the auxiliary pedal. Engine RPM should lower to preset value.
F. Check the engine RPM on screen CHK1.

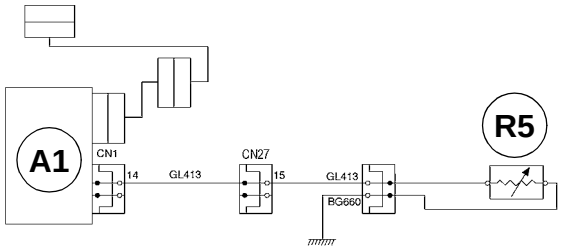
Example:

In the above screen, the engine speed for the hammer option is set at 1800 rpm.

Fuel

Description of the problem No. 1

- The message is still displayed even after refilling the fuel tank.



CM00N002

A1. Computer

R5. Fuel sensor

Troubleshooting	Cause	Action
Starter key switch ON Measure the resistance of the fuel sensor using maintenance support CHK4. (Refer to the table below for the resistance). YES →	Defective computer	Change the computer
Starter key switch OFF NO → Disconnect the coupler from the fuel sensor to measure the resistance of the coupler at the fuel sensor end. (Refer to the table below for the resistance). NO →	Defective fuel sensor	Change or check the fuel sensor
YES → Disconnect the CN27 connector to measure the resistance between GL female and the GND earth. (Refer to the table below for the resistance). NO →	Bad connection on fuel sensor	Clean the connection terminal
YES → Disconnect connector CN1 to measure the resistance between female GL and the GND earth. (Refer to the table below for the resistance). NO →	Bad connection on CN27	Clean CN27 connection terminal
YES →	Defective computer or incorrect CN1 connection	Change the computer or clean the CN1 connection terminal

Note: All the bar graph indicators have disappeared when the circuit is open

Resistance between GL and BG

Monitor	1. Refill the tank	2	3	4	5	6	7	8
Resistance (OHM)	80-75	75-61	61-47	47-37	37-30	30-24	24-19	19-10

Translation

Description of problem No. 8

- Not possible to change travel speed

No.	Check	Result	Repair
1	Changing to second speed is not shown on the checking screen when pressing the speed selection switch	Check the signal at connector CN4 terminal 64 on the computer	0 Volt continuous, change the computer
		Check the signal at connector CN12 terminal 3 on the instrument panel	0 Volt continuous, check the connecting cable between terminals 3 and 64
			5 Volts continuous when pressing the switch, change the speed change switch
2	The travel mode changes when the speed control switch is held pressed down for over two seconds	The electrical harness between the computer and the 2 stage travel solenoid valve (red) is defective	
		The voltage is equal to 24 V at the output from the computer (CN6 terminal 28)	Check the solenoid valve and the hydraulic system (see hydraulic system troubleshooting)
		The voltage is below 24 V at the output from the computer (CN6 borne 28)	Change the harness
3	Using diagnostic mode CHK3, the travel pressure switch does not change to ON when the travel function is operated	The electrical harness between the computer and the pressure switch is cut	Repair the harness
		The pressure switch is defective	Change the pressure switch
4	Using diagnostic mode CHK3, the pilot pressure switch stays ON	The electrical harness between the computer and the pressure switch is short circuited	Repair the harness
		The pressure switch is defective	Change the pressure switch
5	Check the pressure detectors P1, P2 and the negative pressure detector (N) using mode CHK1	One of the harnesses is defective	Repair the harness
		Voltage under 5 V, at input to one of the detectors	Change the computer
		Voltage under 5 V, at input to one of the detectors	Change the computer
		Voltage equal to 5 V, at input to one of the detectors	Change the faulty detector
6	The hydraulic oil temperature is not displayed or is below 77°F on the CHK1 check screen	The electrical harness between the hydraulic oil temperature sensor and the computer (CN1 terminal 6 and 13) is defective	Repair the electrical harness
		Voltage below 5 V, at sender input	Change the computer
		Voltage equal to 5 V, at sender input	Change the hydraulic oil temperature sensor

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

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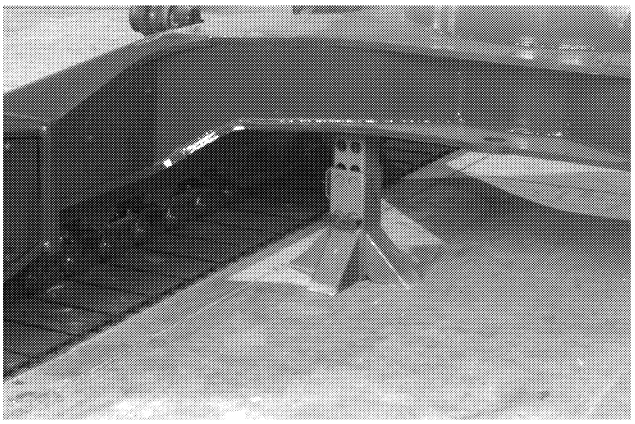
Installation

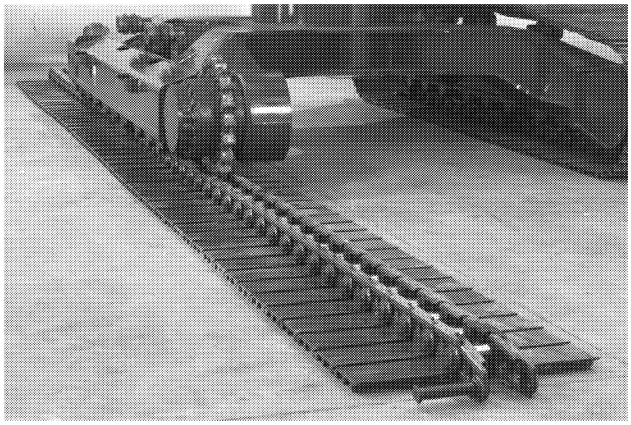
STEP 1



JD00279A

Lift the undercarriage. Install supports under the machine to hold the machine in place.

STEP 2



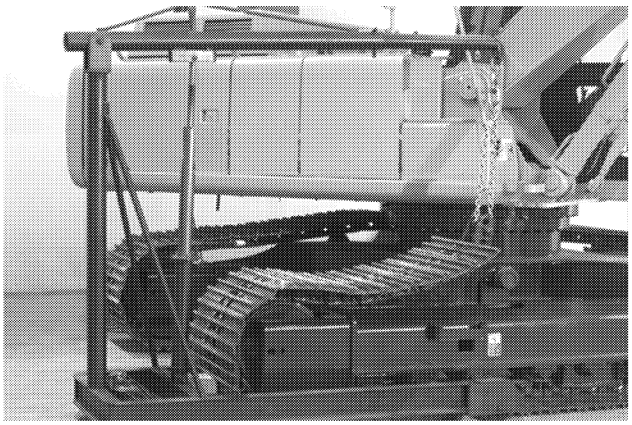
JD00281A

Place and align the new track under the lower roller.

STEP 3

Lower the machine onto the track chain.

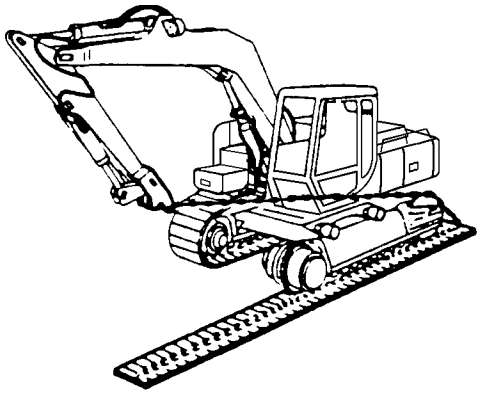
STEP 4



CD00F057A

Connect lifting equipment to the track. Lift the track on the idler wheel.

STEP 5



JS00283A

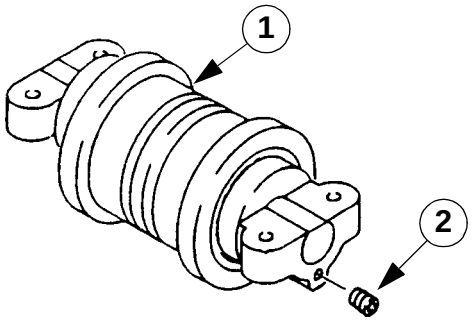
Sling the track to the attachment. Start the engine, operate the machine forward and move the arm out at the same time to pull the track on the sprocket. Keep the track engaged on the sprocket teeth.

Reconditioning

When the roller is worn out or is leaking, it must be reconditioned or replaced by a new one. See Section 1002 for wear limits.

Disassembly

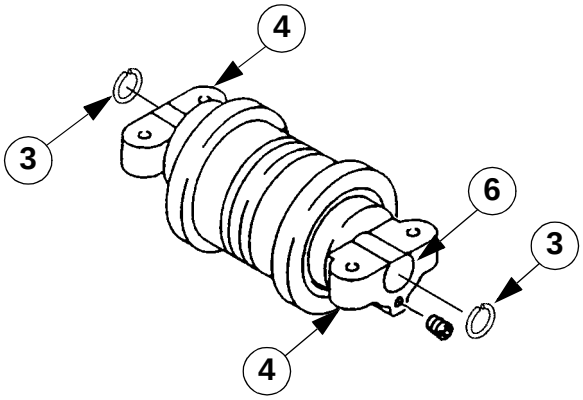
STEP 1



JS00301A

Clean the lower roller (1) using a suitable solvent. Remove the two drain plugs (2) and drain the oil.

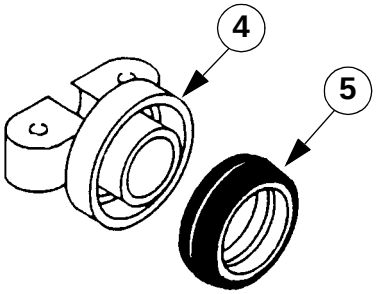
STEP 2



JS00302A

Remove the retainer rings (3) and the end caps (4) from the shaft (6). Discard the retainer rings.

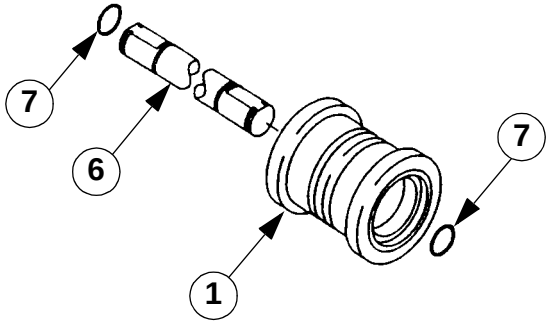
STEP 3



JS00303A

Remove the face seals (5) from the end bearings (4) with a screwdriver or similar tool. Be careful not to damage the seal bore in the end bearing. Discard the face seals.

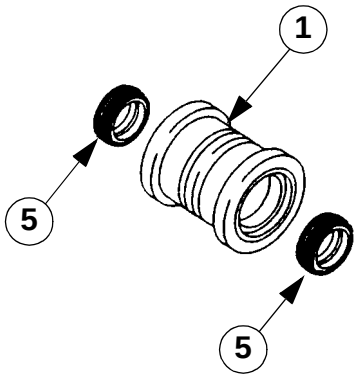
STEP 4



JS00304A

Remove and discard the O-rings (7) from the shaft (6). Take the shaft (6) out of the lower roller (1).

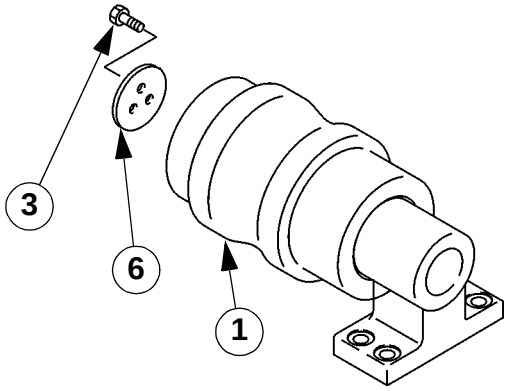
STEP 5



JS00305A

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

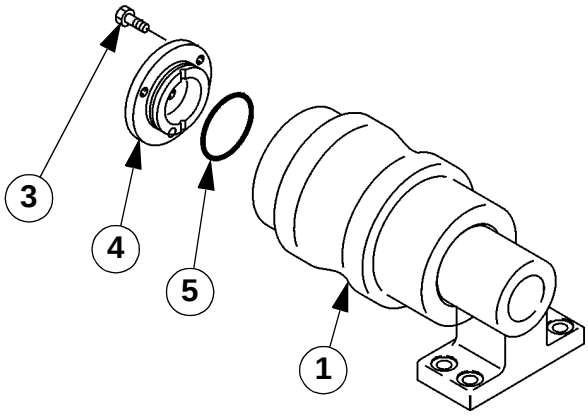
STEP 6



CS02B515

Apply grease on the inside of the thrust plate (6). Position the thrust plate on the shaft (7) and install the three screws (3). Apply brake thread fluid to the screws and tighten to a torque of 46.3 to 53.5 lb-ft.

STEP 7



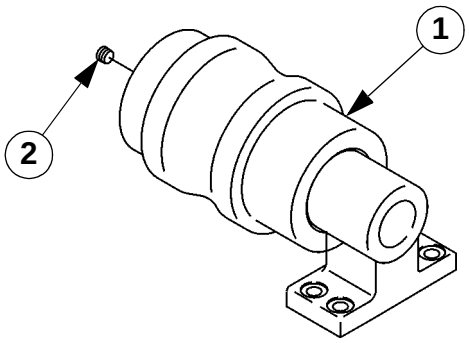
CS02B506

Apply grease on the seal (5) and install in the groove of the cover (4). Install the cover on the upper roller (1) using screws (3). Apply brake thread fluid to the screws and tighten to a torque of 46.3 to 53.5 lb-ft.

STEP 8

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

STEP 9



CS02B505

Fill the upper roller (1) with synthetic oil (see the specifications for quantity). Install the drain plug (2) in the cover (4). Tighten the plug to a torque of 18 lb-ft.

REMOVING AND INSTALLING THE IDLER WHEEL AND THE TENSION SHOCK ABSORBER

Removal

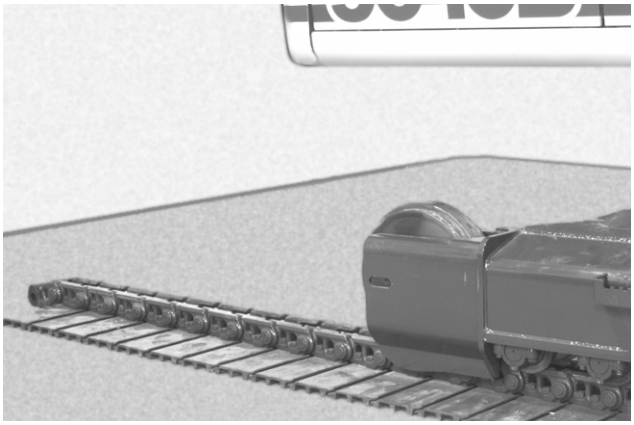
NOTE: *The photos below do not correspond to the machine model, but the procedure is the same.*

STEP 1

Disconnect the chain.

See "Removing and installing a set of tracks", Section 5001.

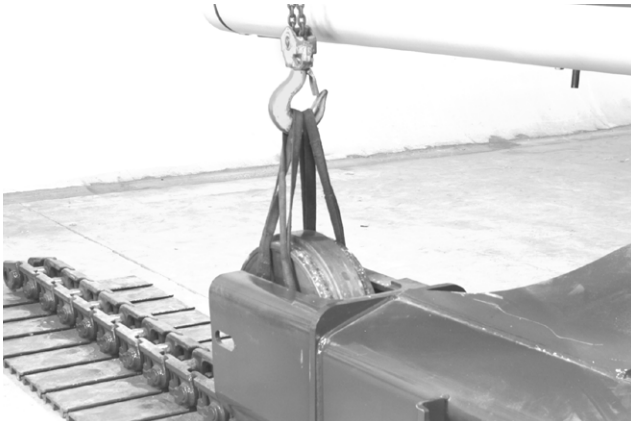
STEP 2



JD00339A

Start the engine. Move the machine until the track chain is disengaged from the idler wheel. Shut down the engine.

STEP 3



JD00340A

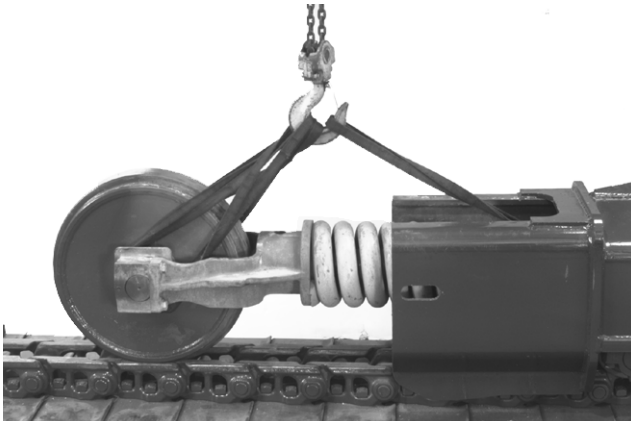
Attach the nylon sling from the lifting equipment to the idler wheel.

STEP 4

JD00341A

Using a crowbar, move the idler wheel and the shock absorber spring assembly out of the housing in the undercarriage.

STEP 5

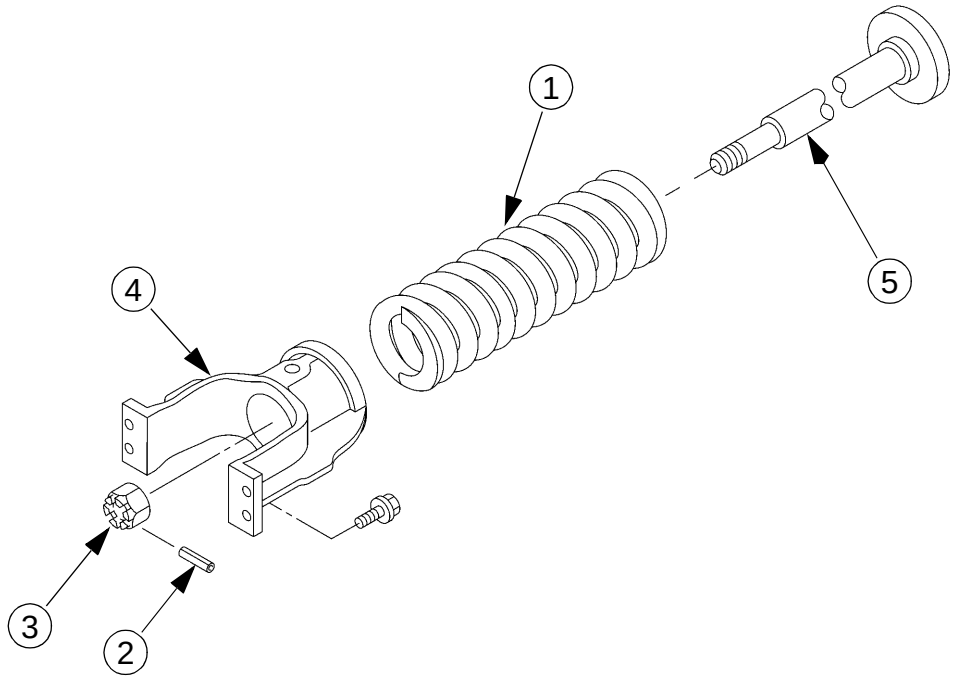


JD00342A

Move the idler wheel and the shock absorber spring assembly out of the housing in the undercarriage, using a crowbar, until the nylon sling can be attached to the shock absorber spring assembly.

DISASSEMBLING AND ASSEMBLING THE TENSION SHOCK ABSORBER

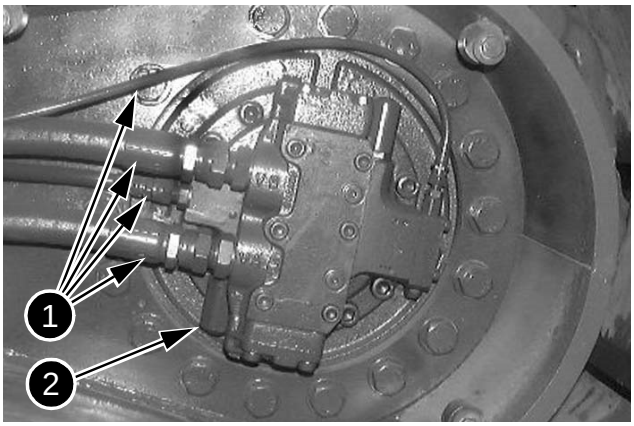
Description



CI02B500

1 SHOCK ABSORBER SPRING
2 RETAINER PIN
3 SLOTTED NUT
4 COMPENSATOR
5 SPRING GUIDE

STEP 9



CD02B005

Disconnect the hoses (1) from the travel motor (2). Plug the hoses and the unions.

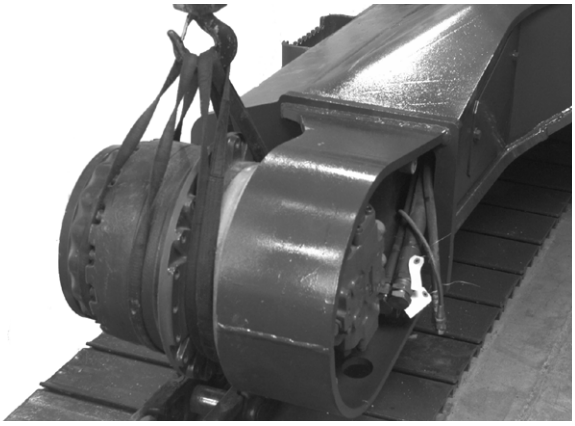
STEP 10

Stop the vacuum pump.

STEP 11

Refer to Section 5004 and carry out the steps for the removal of the sprocket wheel.

STEP 12

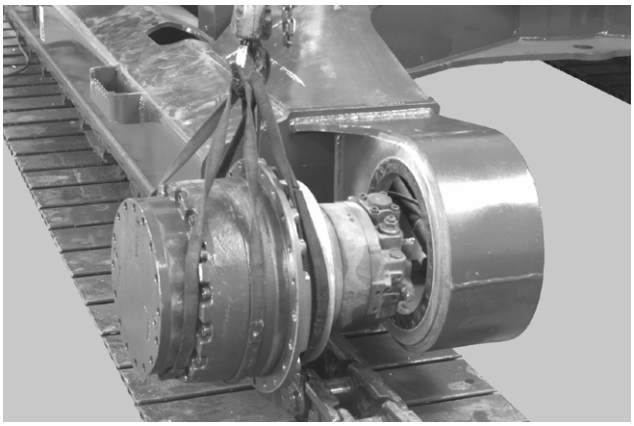


JD00836A

Connect a suitable lifting device to the travel motor/ reduction gear assembly.

NOTE: *See Section 1002 for the weight of the travel motor/reduction gear assembly.*

STEP 13



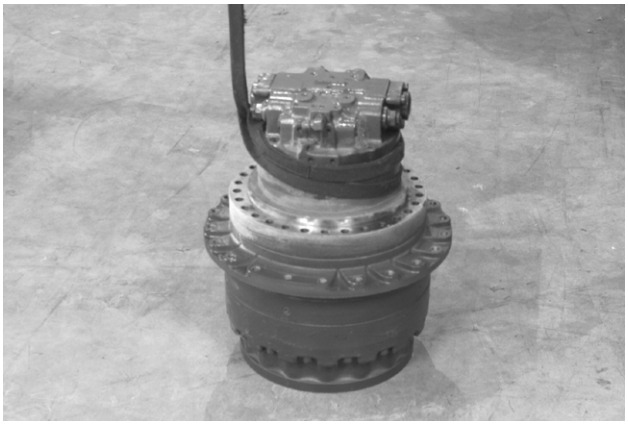
JD00838A

Remove the retaining screws from the travel motor/ reduction gear assembly of the undercarriage.

Remove the travel motor/reduction gear assembly from the machine.

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

STEP 14



6002-11

Place the travel motor/reduction gear assembly on a flat surface with the drive motor turned upwards. Remove the lifting equipment.

NOTE: *When installing, follow the same procedure in the reverse order. Replace all O-rings with new O-rings. Fill the housing with hydraulic oil using the leak return port. Before operating the machine, check the circuit for leaks. Check the hydraulic oil level in the reservoir and the oil level in the housing of the travel reduction gear, top up if necessary.*

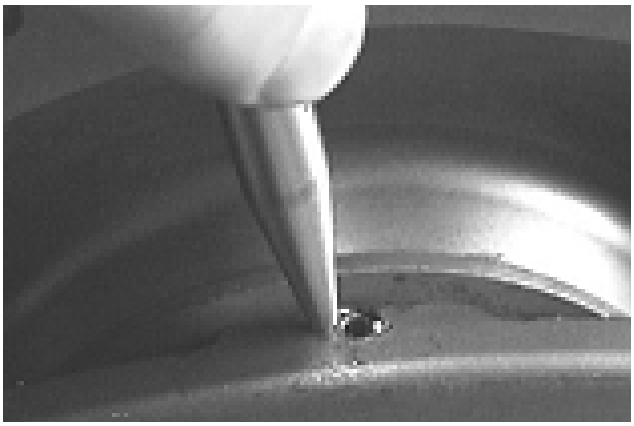
TABLE OF CONTENTS

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.*

SPECIAL TORQUE SETTINGS

Cover retaining screws ..... 419 to 479 lb-ft

STEP 6



CD02B024

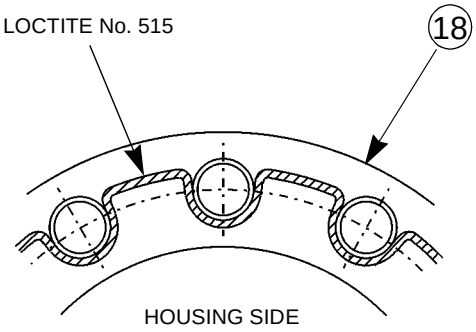
Crimp them on two 180° symmetrical locations.

STEP 7

CD02B025

Install the floating seal (23) for the motor side.

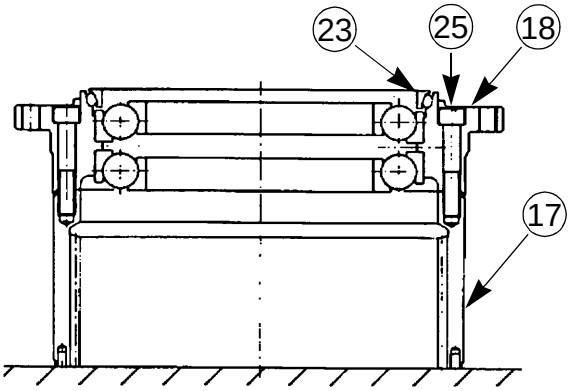
STEP 8



CS02B544

Apply Loctite No. 515 to the mating surfaces of housing (18) and ring gear (17).

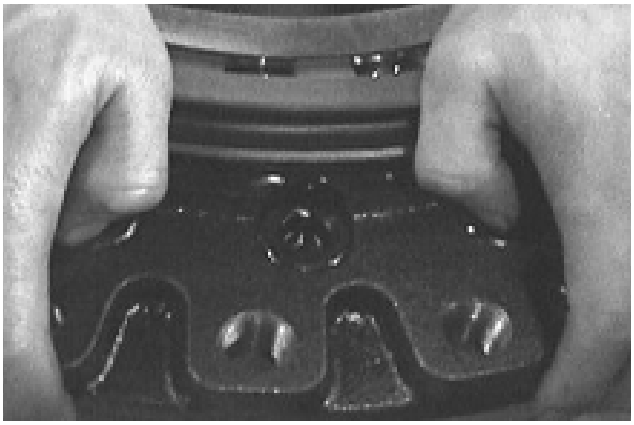
STEP 9



CS02B542

Attach three eyebolts on the housing (18) and lift it with a wire to install onto the ring gear (17) with the counter marks aligned.
Apply Loctite No. 242 to hexagonal socket head cap screws (25) and fasten them with tightening torque of 279 lb-ft.

STEP 10



CD02B026

Install the floating seal (23) for the housing side.

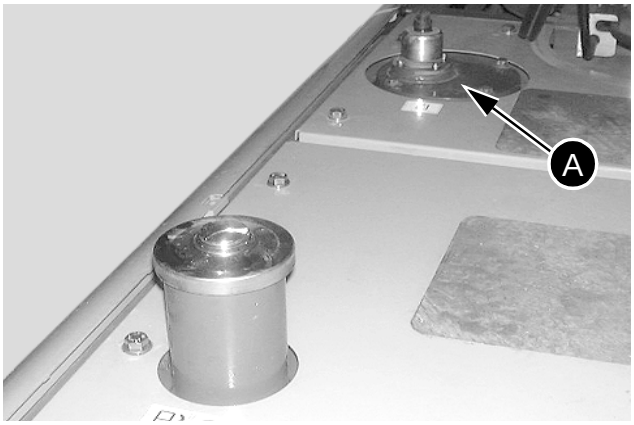
VACUUM PUMP

Installation

STEP 1

Release pressure in the hydraulic system, see page 4.

STEP 2



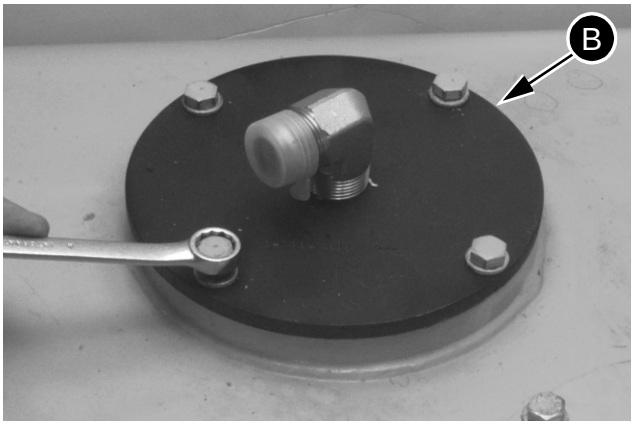
CD01K024

Remove the plate (A) from the top of the hydraulic reservoir.

NOTE: *Do not remove the O-ring from the reservoir.*

NOTE: *The photos for steps 3 and 4 are not for the same model, but the procedure remains the same.*

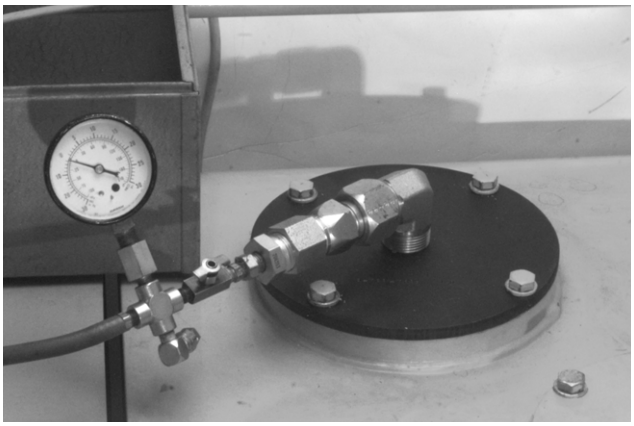
STEP 3



JD00019A

Install the adaptor plate (B) from the kit CAS 40035 on the hydraulic reservoir.

STEP 4



JD00020A

Connect the vacuum pump CAS 10193 to the elbow union of the adaptor plate. Connect the vacuum pump harness to the batteries.

Removal

STEP 1

Disconnect the vacuum pump harness from the batteries.

STEP 2

Disconnect the vacuum pump from the elbow union of the adaptor plate (B).

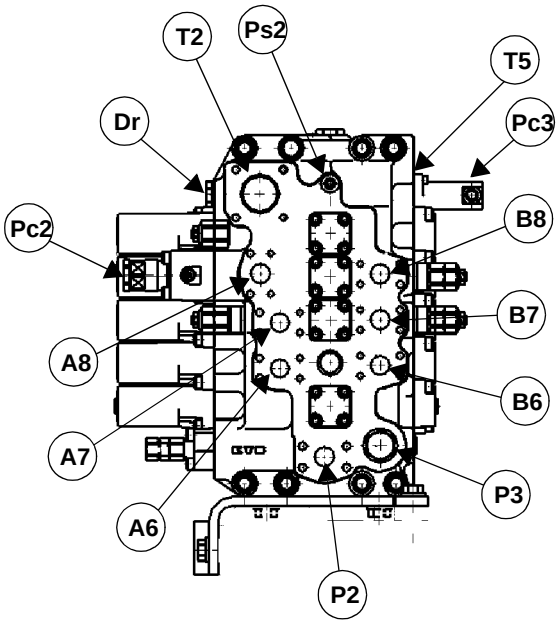
STEP 3

Remove the adaptor plate (B) from the hydraulic reservoir and discard the O-ring.

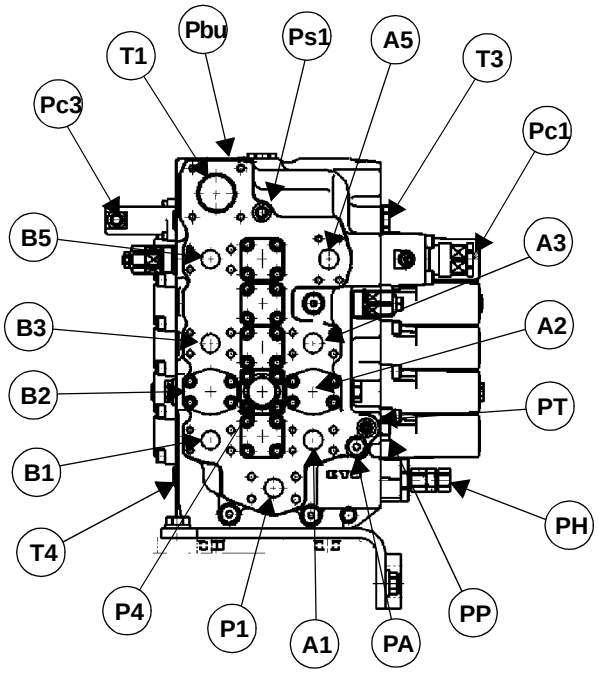
STEP 4

Install a new O-ring on the hydraulic reservoir and install the plate (A).

Control valve

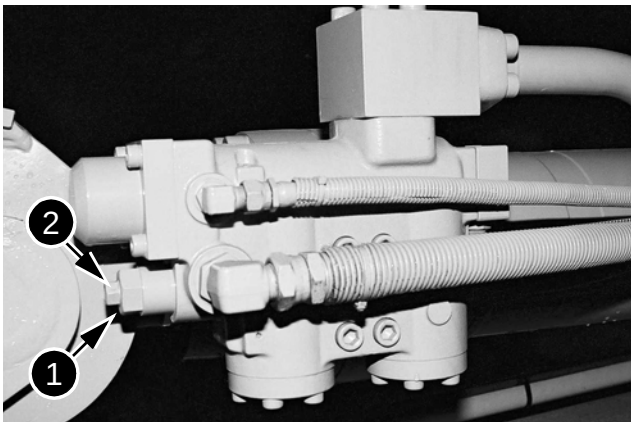


CS01M603



CS01M602

Port	Description	Port	Description
B7	Bucket opening	P3 P4	Option circuit
A7	Bucket closing	T1 T2	Return
B8	Boom lowering	Ps1 Ps2	Negative signal check
A8	Boom raising		
A6	LH forward travel	PT	Travel pilot pressure switch
B6	LH reverse travel	PH	Main relief power boost control
A5	Dipper out	PA	Attachment and swing pressure switch
B5	Dipper in	Dr	Leak return
B3	RH swing	Pc1	Dipper load holding
A3	LH swing	Pc2	Boom load holding
A2	Option circuit	T4	By-pass return
B2	Option circuit	T5	To shock absorber (pre-heat)
A1	LH forward travel	T3	Swing return
B1	LH reverse travel	Pc3-Pc3'	Priority to swing
P1 P2	Pump pressure	Pbu	Swing priority cancellation
		PP	Pilot pressure

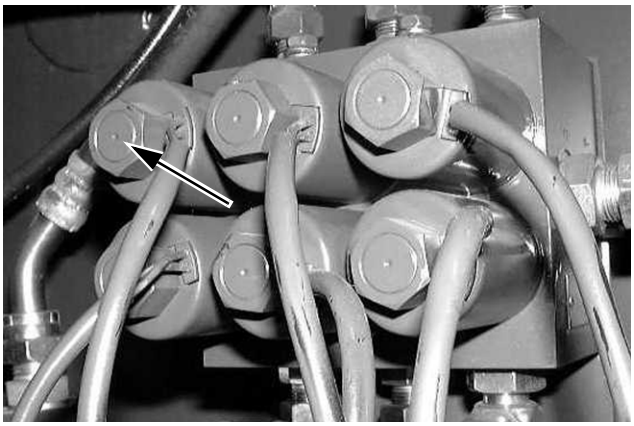


CD01M021

9. If the value is not correct, loosen the lock nut (1) and turn the pressure setting screw (2) to adjust the pressure. Tighten to increase the pressure, untighten to decrease. When the pressure is correct, hold the screw (2) and tighten the lock nut (1). Reset the control valve main relief (A).

Swing port secondary relief (I, J)

Test



CD00E143

1. Disconnect the connector (green) from the swing cancellation solenoid valve.

2. Display the "CHK1" monitor display.

3. Start the engine and select mode "S".

4. Switch on the swing brake control on the instrument panel (indicator lamp ON).

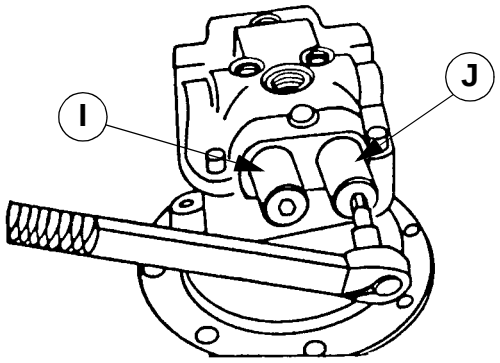
5. Slowly operate the swing control lever to the right and gradually increase the engine speed to full speed to make sure that the swing is locked.

6. Repeat Step 5, for the LH swing, the pressures must be:

Function		
RH swing	**P1**	**4264±58 psi**
LH swing	**P1**	**4264±58 psi**

Note the pressures if they are not correct to determine the number of shims needed for adjustment. **One 0.0039 in shim corresponds to 72 psi pressure**.

Adjustment



CS99B596

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

1. Remove the swing motor secondary relief concerned. If the two secondary reliefs have to be removed, mark them to ensure they are replaced in their original positions.

Not possible to select cushion control

No.	Tests	Results	Repairs
1	Check on monitor display "CHK3" if information displayed changes to "ON" when cushion control is selected/deselected	Information stays on "OFF"	Check the signal at the electronic input box: Below 5 volts: replace the electronic box 5 volts: replace the electronic box
2	Check the pilot pressure at the cushion control solenoid valve output (C4)	Pressure too low	Check the electrical supply and the solenoid valve coil (No. 3 and 4)
		Pressure correct 566 psi	Repair or replace the cushion control valve
3	Check the voltage at the electrical plug on the cushion control solenoid valve	Voltage < 24 V	Check the electrical harness
4	Check the cushion control solenoid valve coil	Infinite or 0 Ohm	Replace the solenoid valve
		About 40 Ohm	Replace the solenoid valve coil

The boom or the dipper does not lower

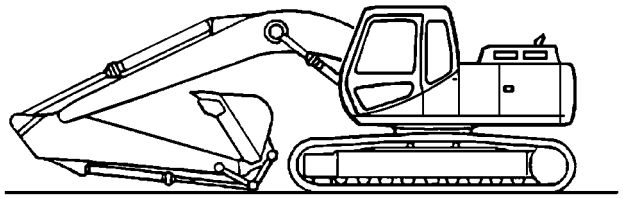
(No problems with other movements)

No.	Tests	Results	Repairs
1	Manually check the movement of the pilot spool	Difficult to move	Spool stuck or spring broken
2	Check the anti drift operation	Sticking	Repair or replace the anti drift valve
3	Check the pilot pressure at the control valve spool	Pressure below 30 bar	Check the operation of the control lever spool, replace or repair

MAIN HYDRAULIC PUMP

Removal and installation

STEP 1



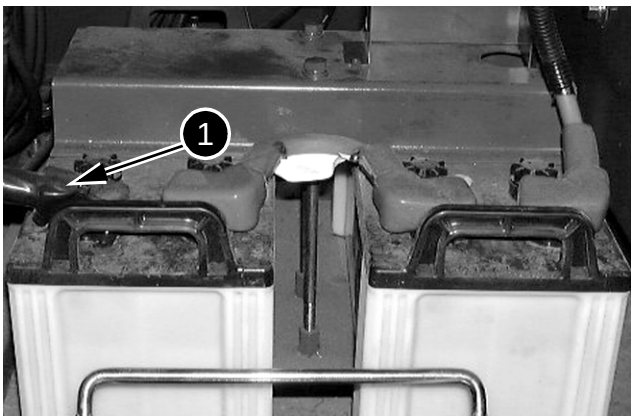
JS00163A1

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

STEP 2

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

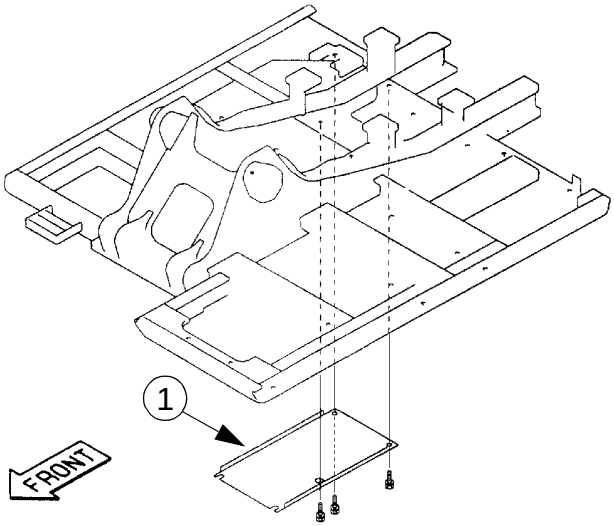
STEP 3



CD00F091

Disconnect the earth cable (1) from the battery.

STEP 4



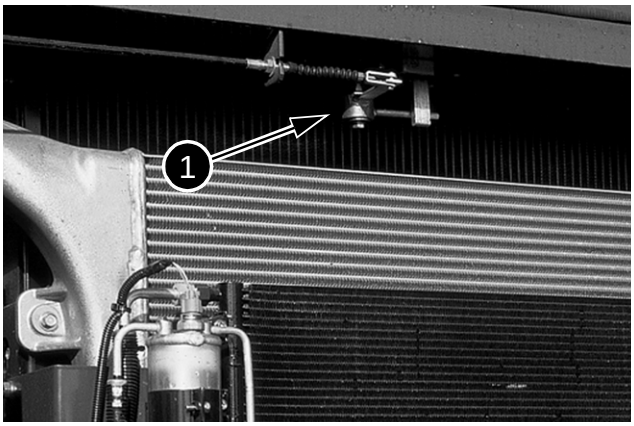
6003-011

Remove the access panel (1) retaining screws from underneath the hydraulic reservoir, then remove the panel.

STEP 5

Place a container of 44 gallons capacity under the oil change valve of the hydraulic reservoir. Empty the hydraulic fluid and close the valve.

STEP 6



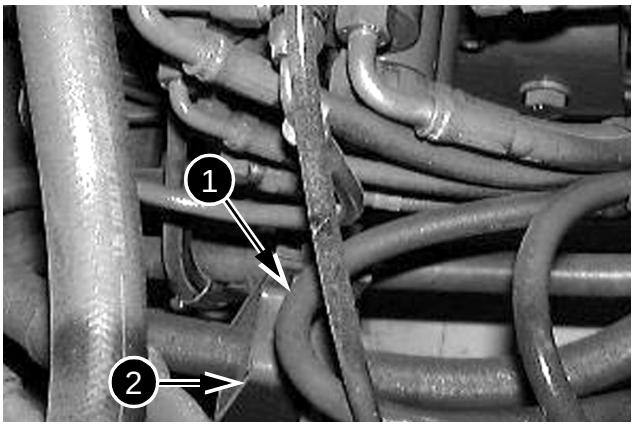
CD02D004

Release the locking lever (1) of the engine hood by pulling on the cab opening handle and raise the hood to the high latched position.

STEP 7

Attach suitable lifting slings to the hood.

STEP 7



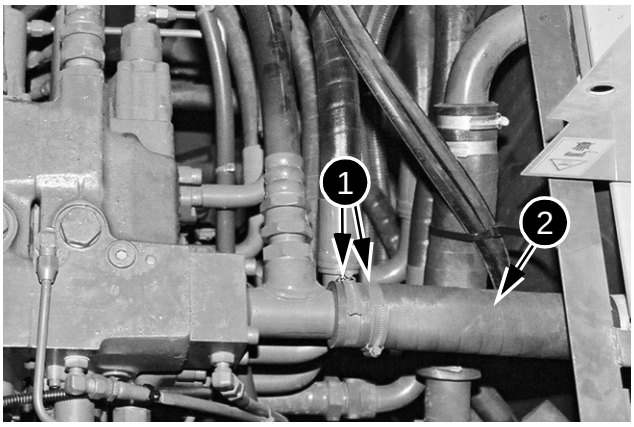
CD00F116

Remove the screws (1) then remove the clamp (2).

STEP 8

Start the vacuum pump.

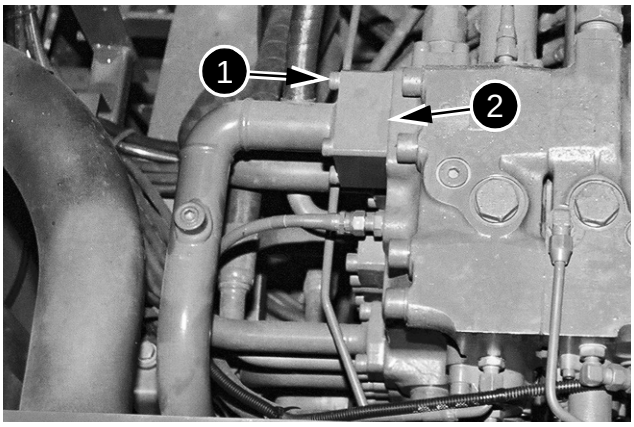
STEP 9



CD02D006

Remove the two retaining clips (1) from the hose (2) then remove the hose from the manifold.

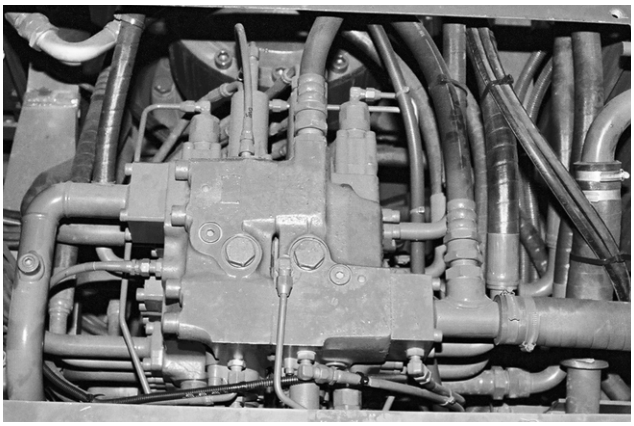
STEP 10



CD02D007

Remove the retaining screws (1) from the clamp (2).

STEP 11



CD02D005

Attach identification tags to all hoses, pipes and electrical wires of the control valve. Disconnect and seal the hoses and pipes. Seal the control valve ports. Disconnect the electrical connections.

STEP 12

Stop the vacuum pump.

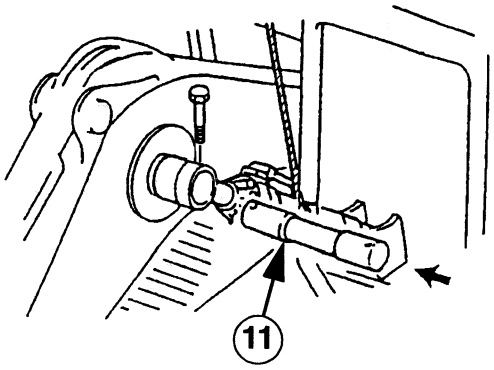
STEP 13

Install lifting rings in the threaded orifices on the top of the control valve.

STEP 14

Connect a suitable lifting device to the control valve. See Section 1002 for the weight of the control valve.

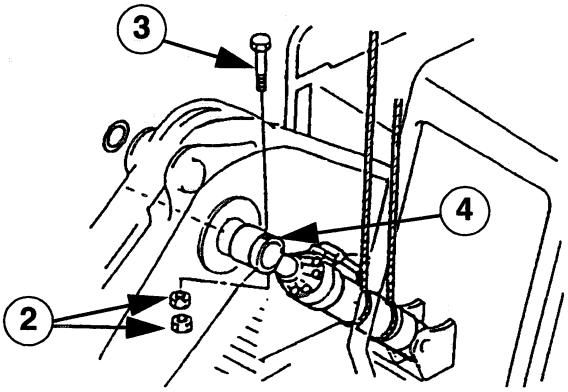
STEP 9



JS00591A

Install the pin (11) and the shims (5).

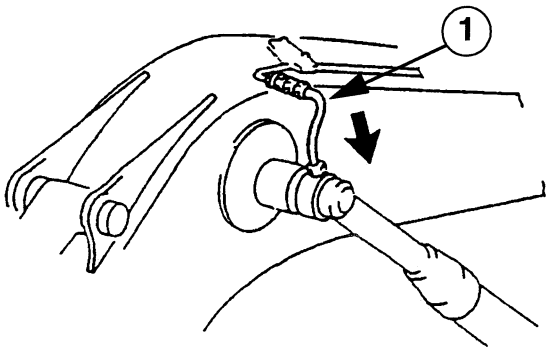
STEP 10



JS00592A

Install the locking bushings (4). Install the screws (3) through the locking bushings and the pin. Using a set of feeler gauges, check that there is a clearance of 1 to 2.5 mm between the mounting bracket and the cylinder rod mounting eye. If necessary, remove the screws and the pin and add or remove one or more shim(s) as required to obtain the correct clearance. Install the pin and the screws. Install the first nut (2) on the screw and tighten until the nut touches the locking bushing. Loosen the nut a quarter of a turn and, using two wrenches, install the second nut (2) to lock the first nut in position. Remove the sling from the boom cylinder.

STEP 11



JS00656A

Connect the lubricating hoses (1) to the boom cylinders.

STEP 12

Remove the vacuum pump and bleed air from the boom cylinders (see Section 8000).

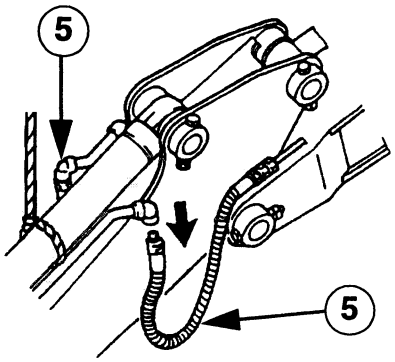
STEP 13

Check the level of hydraulic fluid in the reservoir. Top up as necessary.

STEP 14

Lubricate the linkages.

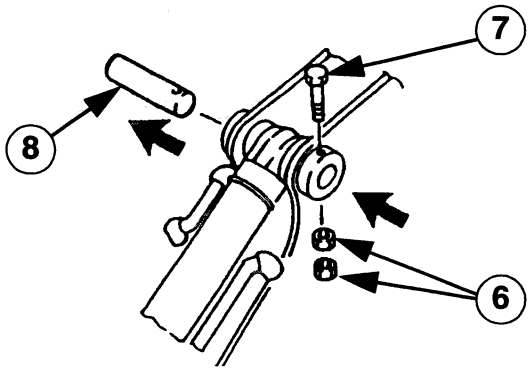
STEP 6



JS00612A

Start the vacuum pump. Disconnect the two hydraulic hoses (5) from the bucket cylinder. Plug the hydraulic hoses with plugs and the unions with caps. Stop the vacuum pump.

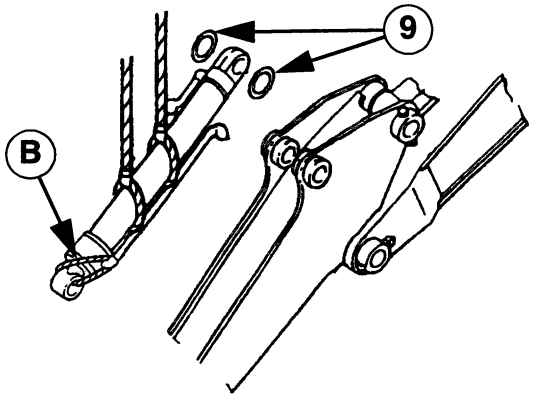
STEP 7



JS00613A

Remove the nuts (6) and the screw (7). Remove the dipper pin (8).

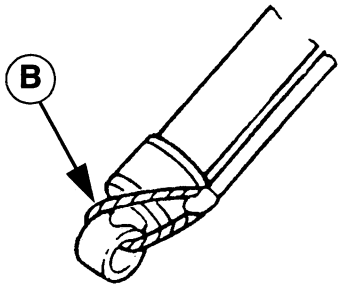
STEP 8



JS00614A

Carefully raise the bucket cylinder and move it away from the dipper. Remove the shims (9). Place the bucket cylinder on suitable stands.

STEP 9

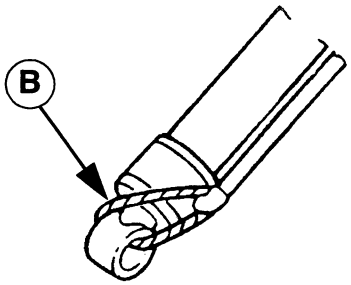


JS00586A

Remove the sling (B) which was holding the cylinder rod onto the cylinder barrel.

Installation

STEP 1

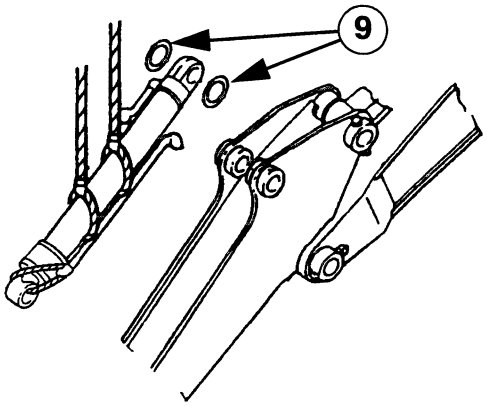


JS00586A

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

NOTE: *Carefully raise the cylinder. The cylinder is heavy and its weight must be distributed over the slings when lifting.*

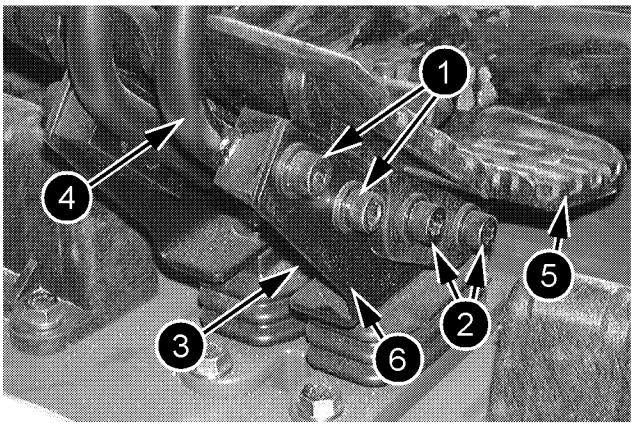
STEP 2



JS00614A

Install the bucket cylinder on the dipper and install the shims (9).

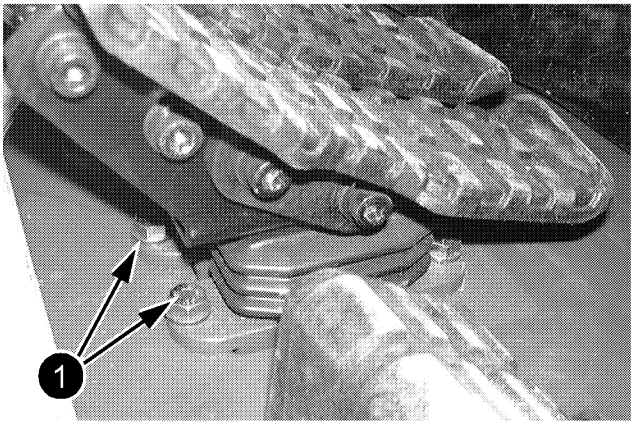
STEP 10



CD00G047

Remove the retainers (1), then remove the lever (4). Remove the retainers (2), then remove the pedal (5). Remove the retainers (3), then remove the bracket (6). Proceed in the same manner for the second pedal.

STEP 11



CD00E046

Put the floor carpet away from the pedals. Remove the four screws (1) that fasten the control pedal block to the cab floor, then remove the control pedal block.

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, add oil if necessary.*

LH control lever

Removal and installation

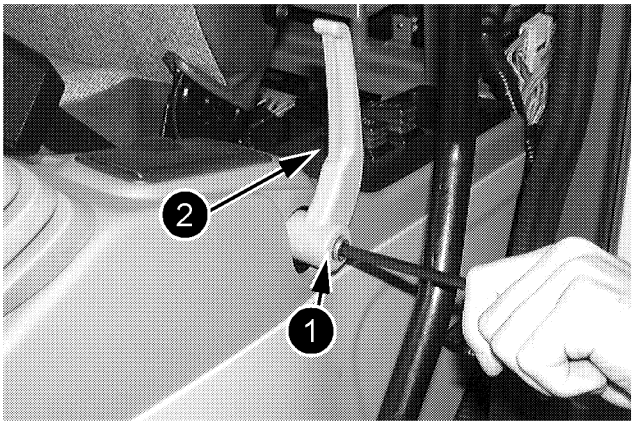
NOTE: *Refer to page 3 and carry out steps 1 to 4.*

STEP 1

CD00G048

Lift the grommet. Loosen and remove the four retaining screws from the front upper portion of the control arm.

STEP 2



CD00G049

Loosen and remove the retaining screw (1) from the function cancellation lever (2), then remove the lever.

6 solenoid valve block

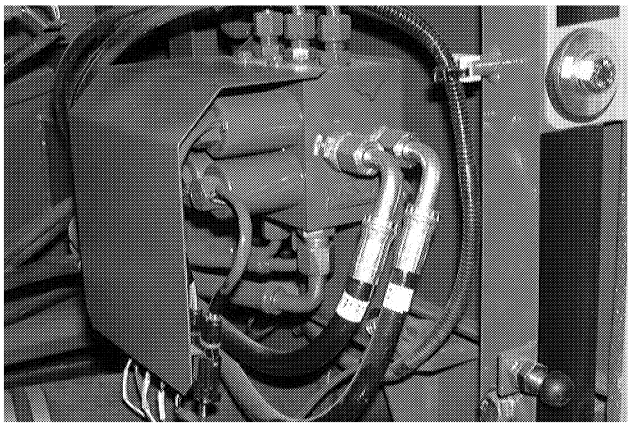
Removal and installation

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

STEP 1

Open the right-hand side door of the machine.

STEP 2



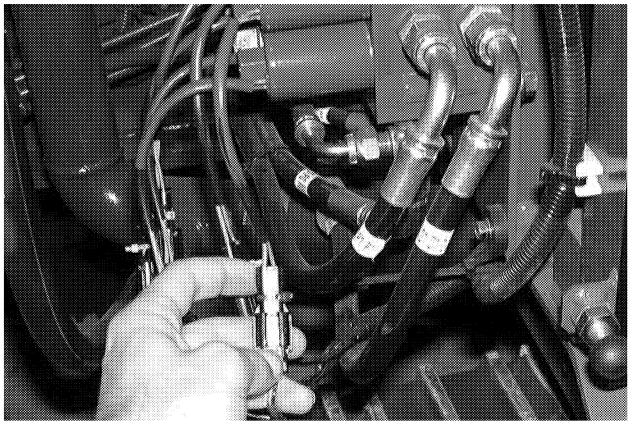
CD00F049

Remove the two screws and the washers from the protective housing.

STEP 3

Put the protective housing away to make it easier to disconnect the connectors from the protective housing.

STEP 4



CD00F050

Disconnect the connectors by pressing on the tongue fastener then by pulling to separate them (the connectors are identified by rings of different colours).

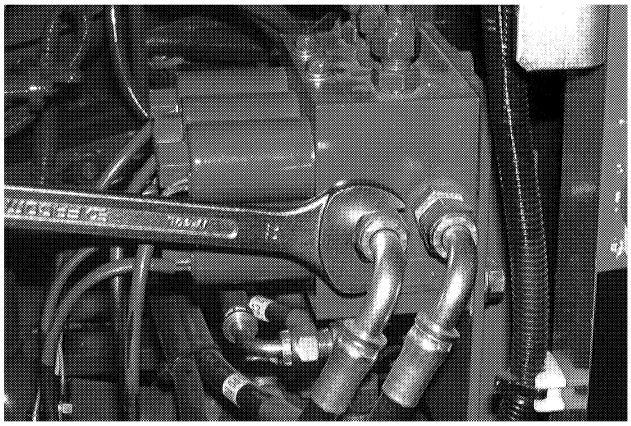
STEP 5

To aid installation, put identification tags on the hydraulic hoses.

STEP 6

Start the vacuum pump.

STEP 7



CD00F051

Disconnect the hydraulic hoses connected to the solenoid valve block. Seal the ports with caps and the hoses with plugs.

STEP 8

Shut off the vacuum pump.

STEP 9

Loosen the retaining screws from the solenoid valve block. While supporting the solenoid valve block, remove the screws and the washers. Remove the solenoid valve block from its bracket.

STEP 10

For proper installation of the connections, mark the locations of the elbow unions. Hold the solenoid valve in a vice. Remove the elbow unions and the straight unions from the ports of the solenoid valve. Seal the ports of the solenoid valve with plugs to avoid any penetration of foreign bodies into the block.

NOTE: *When installing, proceed in the reverse order to that of removal. Start the engine. Activate several times the solenoid valves (selection of the second speed, swing brake control, power boost, cushion pilot cancellation, swing pilot cancellation, pilot pressure cancellation control). Stop the engine, check the circuit for leaks and the hydraulic oil level in the reservoir, add oil if necessary.*

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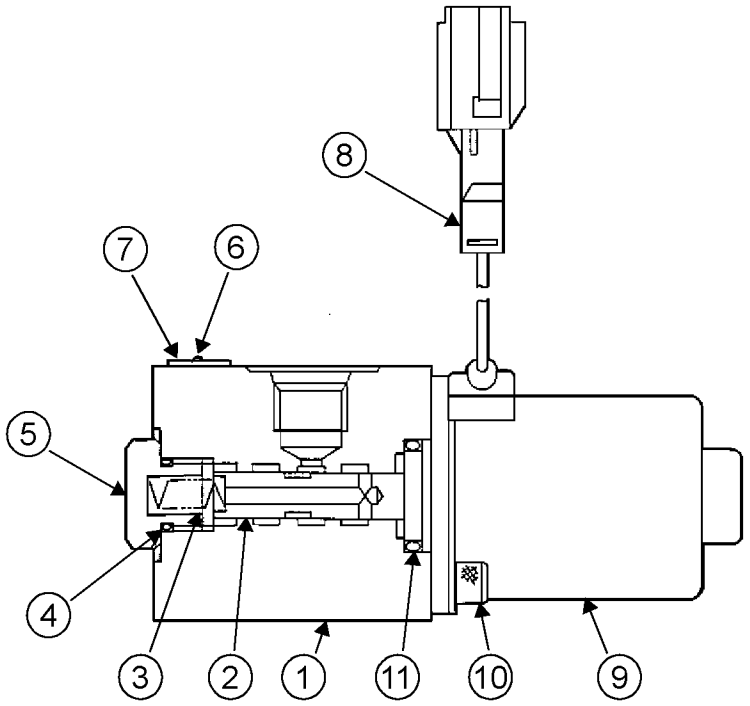
FREE SWING SOLENOIDE VALVE

Section



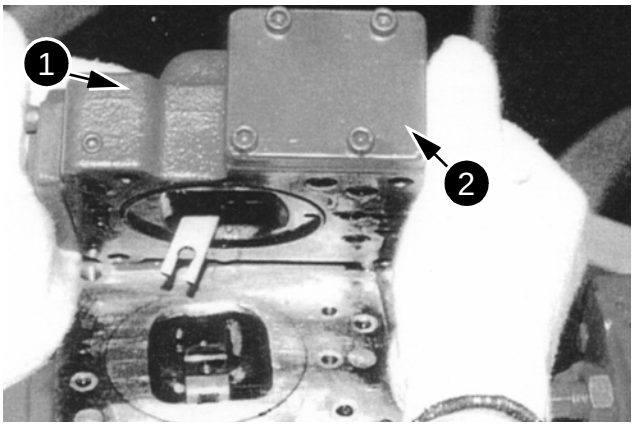
JS00739A

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

DISASSEMBLY

STEP 1

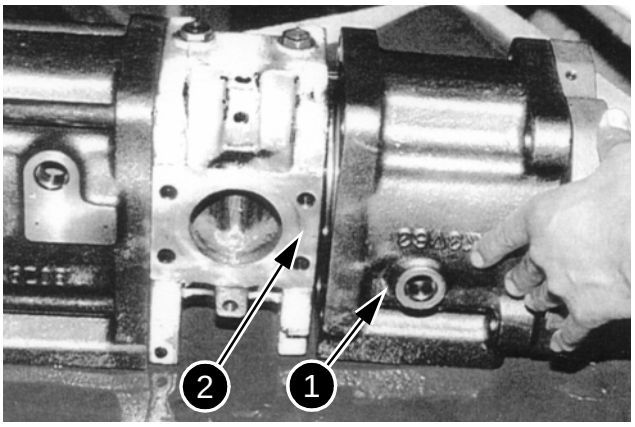
NOTE: *Always keep the components from different pumps separate from one another. During disassembly of the pump, place the components on a rubber mat. Handle the components carefully, always mark the position of the parts.*



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).

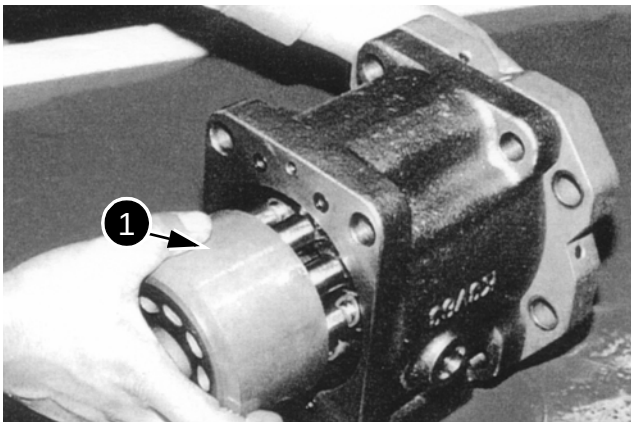
STEP 2



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

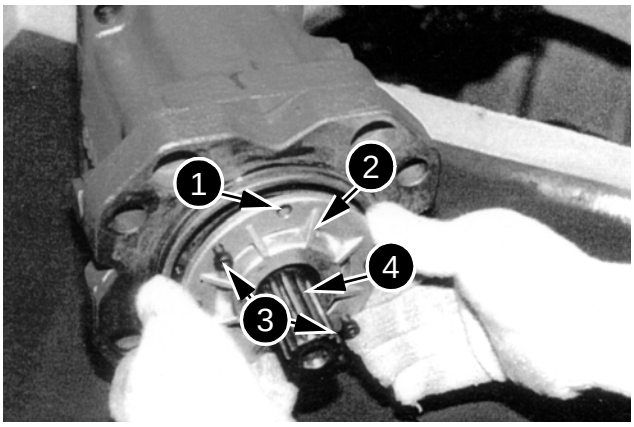


CD01G105

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.

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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.*

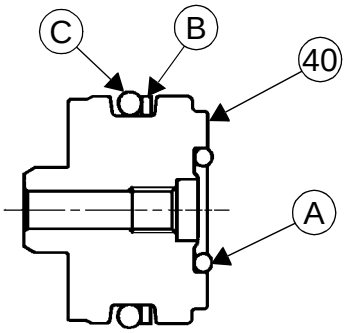
STEP 1

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

STEP 3

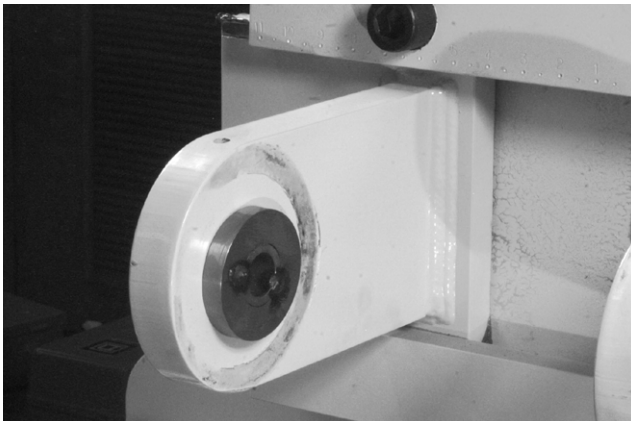
Bucket cylinder

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.*

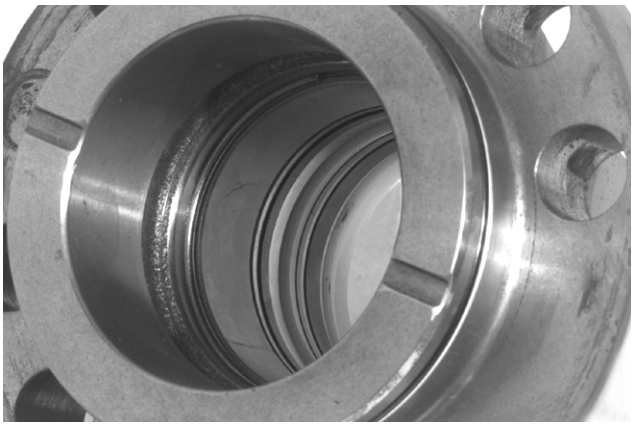
STEP 4



JD00620A

Install suitable bushings on the cylinder head stock chuck wings.

STEP 5

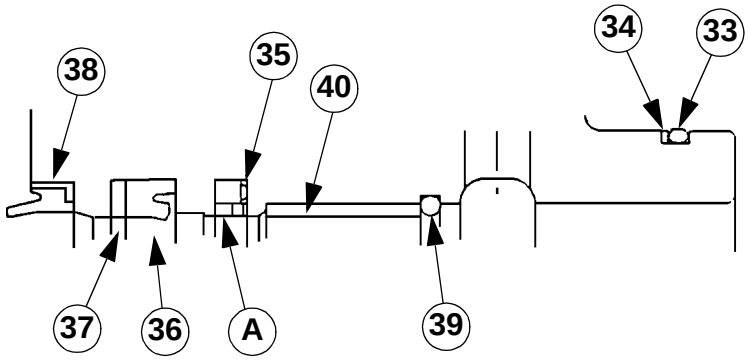


JD00652A

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).



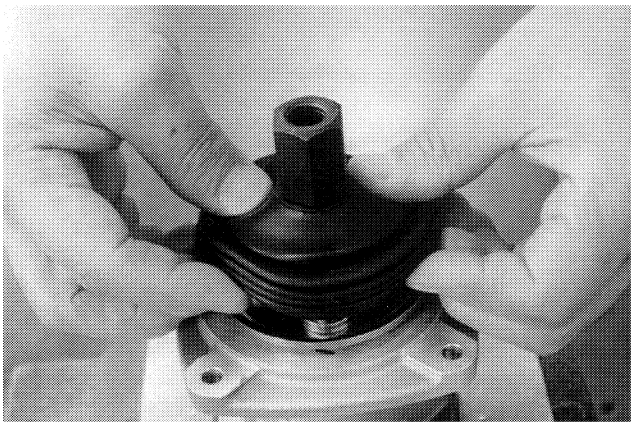
JS00649A

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.

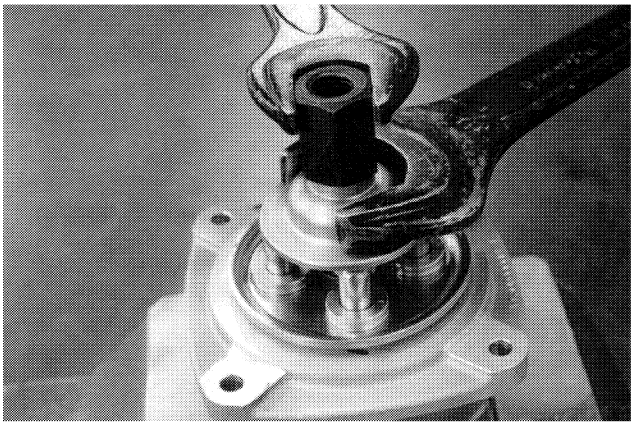
STEP 1



CD00G087

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

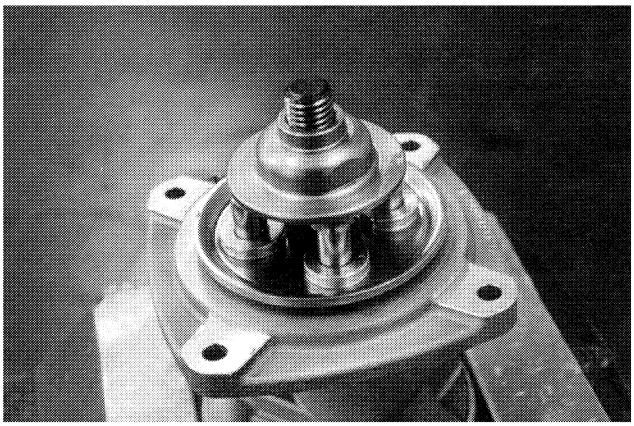
STEP 2



CD00G088

Remove the lock-nut from the control lever.

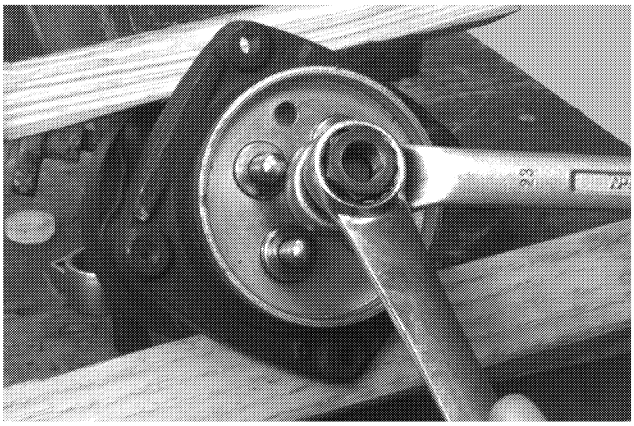
STEP 3



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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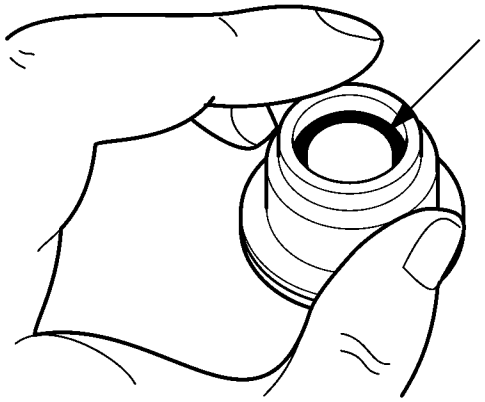
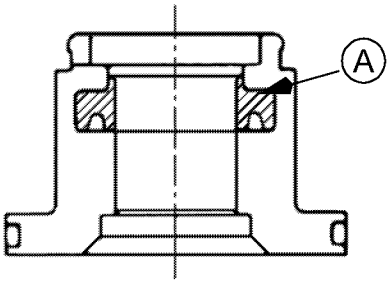
STEP 14



CI01B538

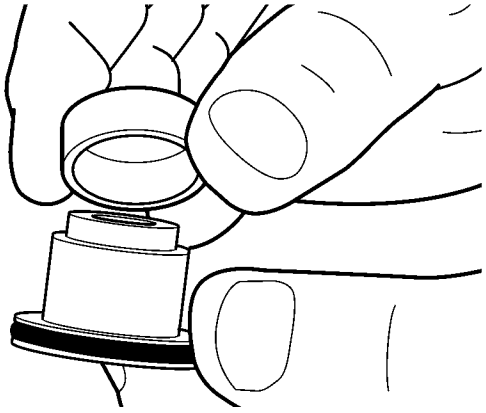
Apply a thin coat of grease on the wiper seal and install it in the tappet guide.

NOTE: *Respect the position of the wiper seal (A) according to the illustration below.*



CS01C527

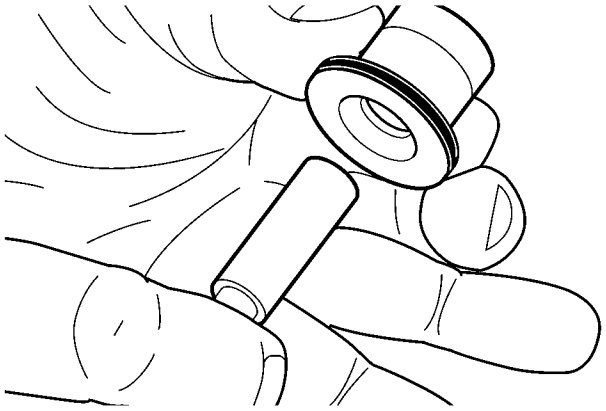
STEP 15



CI01B537

Assemble the bushing on the tappet guide.

STEP 16

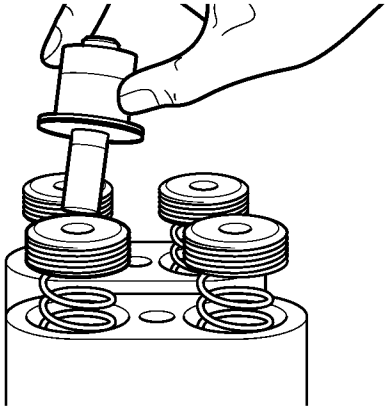


CI01B545

Oil and install the push-rod in the guide.

NOTE: *Make sure that the wiper seal does not get damaged.*

STEP 17



CI01B546

Assemble the tappet guide assembly.

NOTE: *Repeat the steps 1 to 17 for the three other ports of the control pedal.*

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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TORQUE SETTINGS

Boom anti-hose burst valve

Spool cap (3) ..... 202 ± 2 lb-ft

Spool stop cap (1) ..... 58 ± 0.5 lb-ft

Plug (11) ..... 159 ± 1.4 lb-ft

Plug (15) ..... 58 ± 0.5 lb-ft

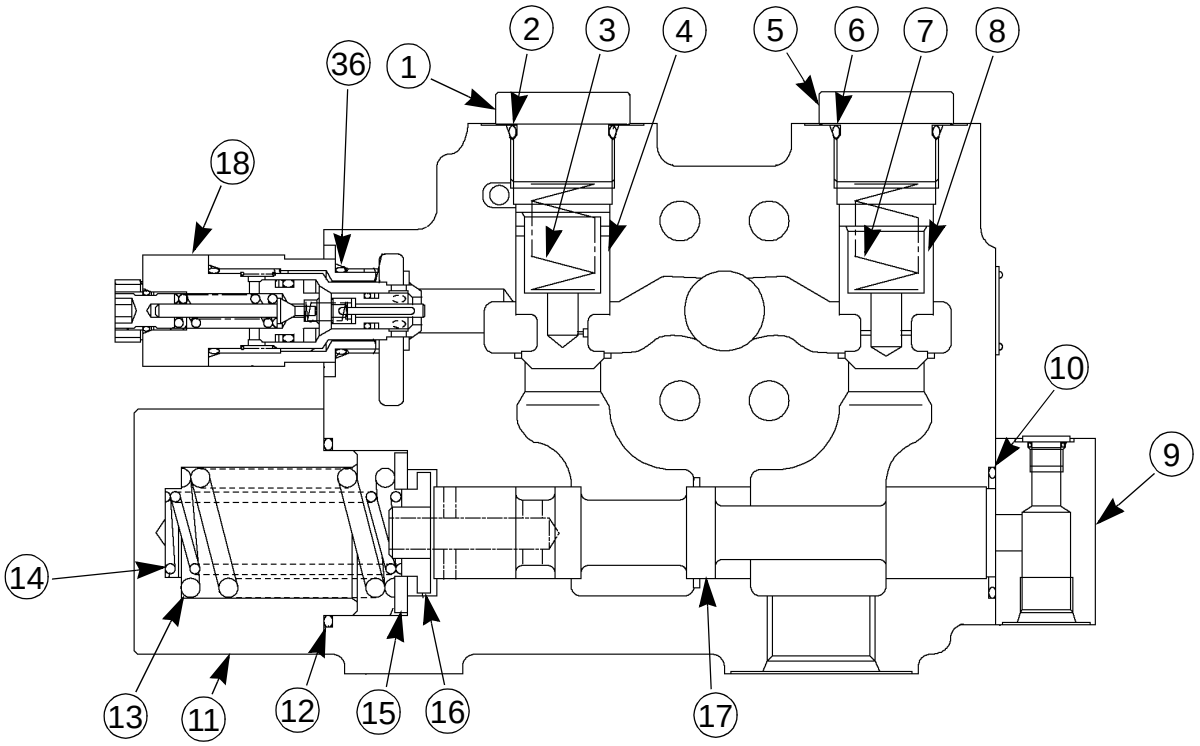
Anti-hose burst valve (10) ..... 43 ± 0.4 lb-ft

Dipper anti-hose burst valve

Plug (1) and (5) ..... 159 ± 1.4 lb-ft

Spool cap (9) and (11) retaining screws ..... 29 ± 0.2 lb-ft

Anti-hose burst valve (18) ..... 43 ± 0.4 lb-ft



CI00K503

13. Install a O-ring (36) on the valve (18).
14. Install the valve (18).
15. Oil and install the check valve (4) and the spring (3) according to the markings made during disassembly, install the plug (1) equipped with a O-ring (2).
16. Oil and install the check valve (8) and the spring (7) according to the markings made during disassembly, install the plug (5) equipped with a O-ring (6).
17. Install a O-ring (10) and install the spool stop cap (9) using four retaining screws.
18. Oil and install the spool (17).
19. Install the spring seats (16) and (15).
20. Install the springs (13) and (14).
21. Install a O-ring (12) on the spool cap (11).
22. Install and fasten the spool cap (11) using the four screws.

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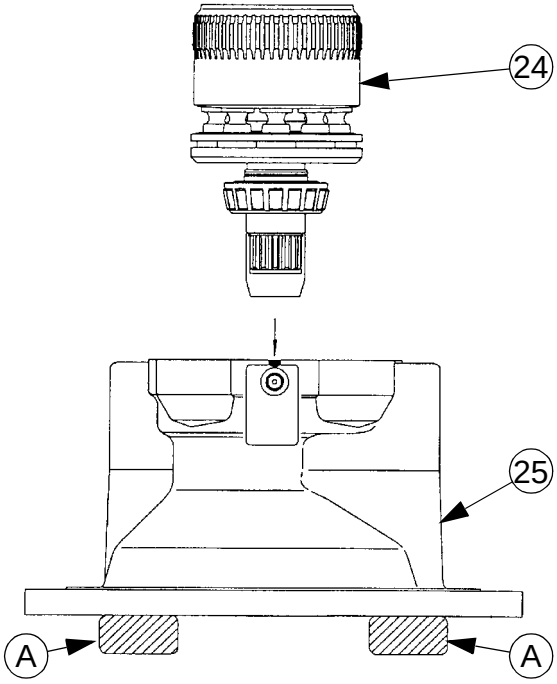
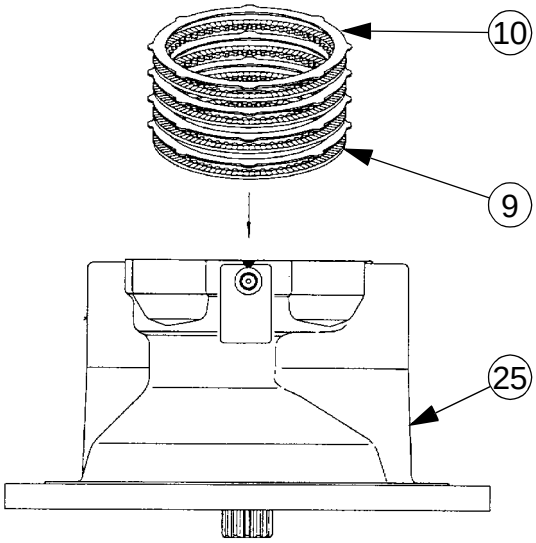
STEP 9



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.

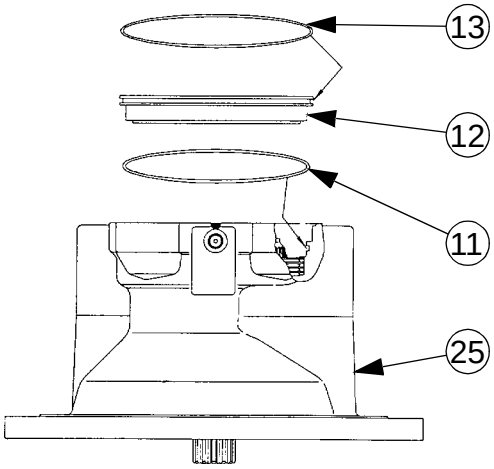
STEP 10



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.

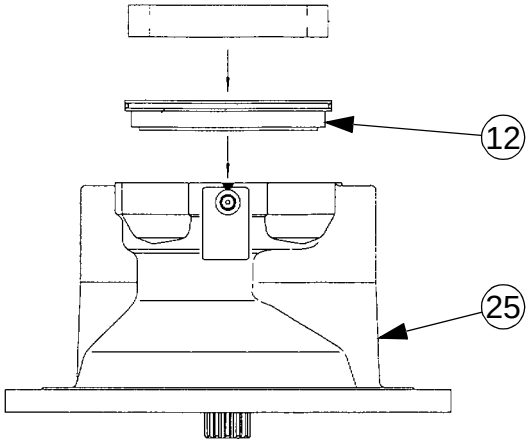
STEP 11



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).

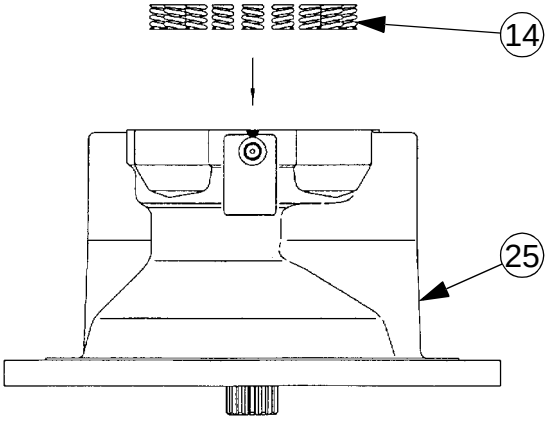
STEP 12



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 370 psi at 13.2 gpm and two restrictors (4) and (5). These two pressures are sent to the HP pumps via ports Pi1 and Pi2, 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 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.

When upperstructure swing and dipper retraction or boom raising take place simultaneously, the parallel connection is reduced and the swing pressure 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 two dipper spools (1) (3), which reduces pressure drops.

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). Therefore the oil from the dipper cylinder small chamber is re-injected into the large chamber of the dipper cylinder (27) passing via the small restriction in the recycling valve (4) and the non-return check valve (5).

When the pressure in the large chamber of the dipper cylinder (27) increases, the recycling 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 anti drift valve
P1. Outlet flow A1
P2. Outlet flow A2
Pa5/A5. Extending the dipper
Pb5/B5. Retracting the dipper
Pa9/Pb9. Dipper 2 spool

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 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

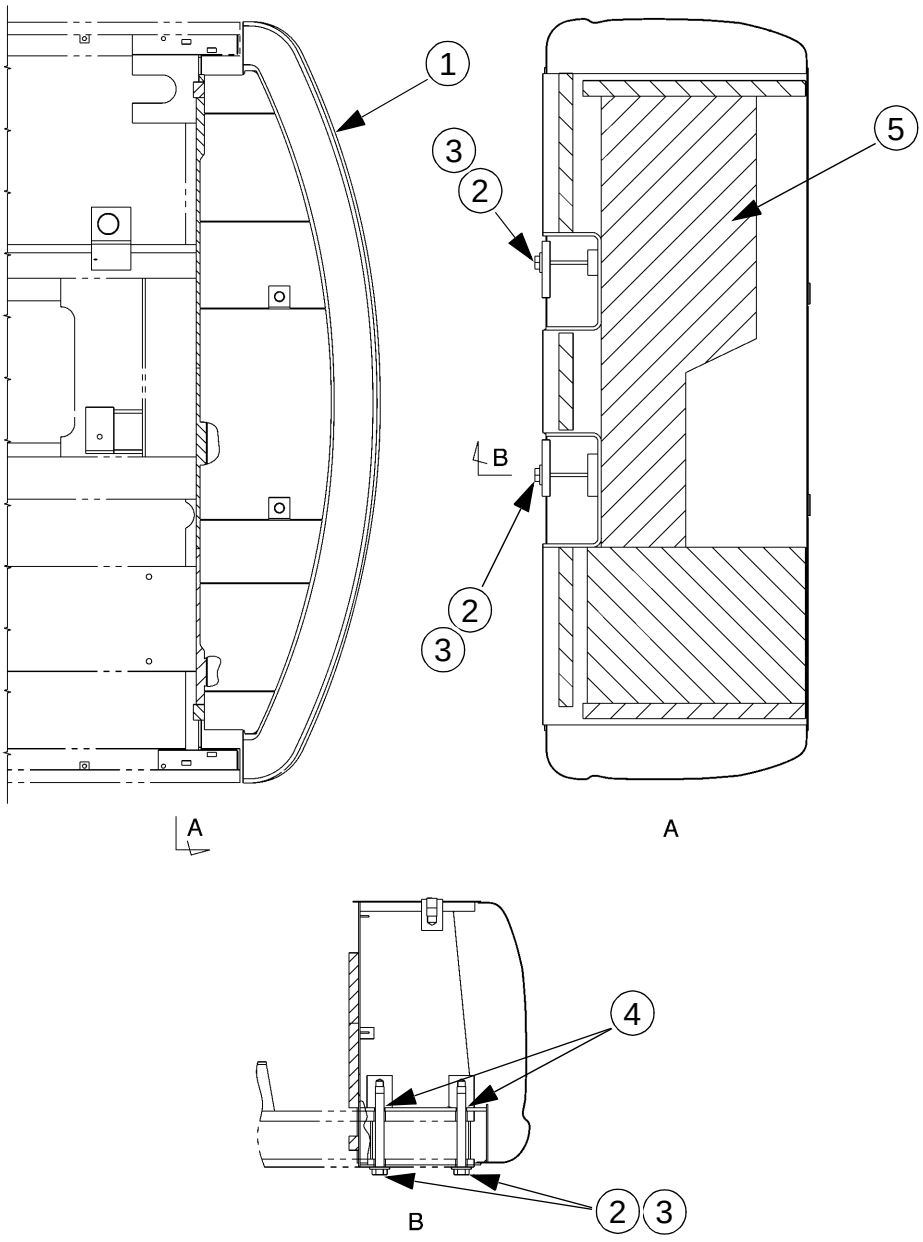
Install the cover (7) on the main body (1) with the screws (12).

STEP 6

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

COUNTERWEIGHT

Description



CS02C567

1 COUNTERWEIGHT
2 SCREW
3 WASHER
4 SHIM
5 INSULATING MATERIAL

Removal

STEP 1

Remove the bucket, the guide link and the bucket link, see page 4.

STEP 2

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

STEP 3

Remove the bucket cylinder and disconnect the arm cylinder rod from the arm, see Section 8005. Attach the arm cylinder rod to the boom.

NOTE: *The numbers in the following steps refer to the arm drawing on page 7.*

STEP 4

Attach a suitable lifting device to the arm. Take up any slack on the lifting slings, since the arm has to be supported before lifting.

STEP 5

Remove the nuts (1), the screw (2) and remove the pin (3).

STEP 6

Start the engine, move the machine backwards to separate the arm from the boom. Lower the boom to the ground and shut down the engine.

STEP 7

Lower the arm to the ground and remove the lifting equipment from the arm.

STEP 8

Remove and discard the dust seals (6).

NOTE: *Perform step 9 only if the bushings (8), (9), (10) or (11) have to be changed, see Specifications.*

STEP 9

Remove the bushings (8), (9), (10) or (11) from the arm or from the boom, using a hammer and a suitable drift on the outer diameter of the bushing.

Installation

NOTE: *Perform step 1 only if the bushings (8), (9), (10) or (11) have been removed.*

STEP 1

Using a suitable sleeve, install the bushings (8), (9), (10) or (11).

STEP 2

Install new dust seals (6) on the arm.

STEP 3

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

STEP 4

Start the engine and move the machine forwards so that the boom is aligned with the arm. Check the alignment of the pin bores on the boom and the arm. Shut down the engine.

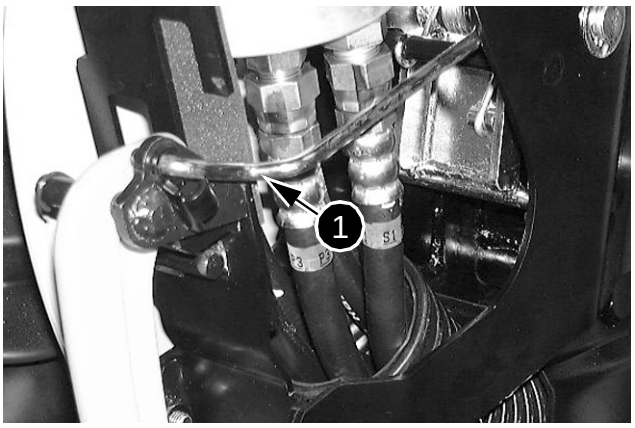
STEP 5

Install the pin (3).

STEP 6

Using a set of feeler gauges, check that the play between the boom and the arm is 0.019 to 0.043 inch (0.5 to 1.1 mm) . If necessary, remove the pin (3) and add one or more shims as required to arrive at the correct clearance. Install the pin (3).

STEP 14

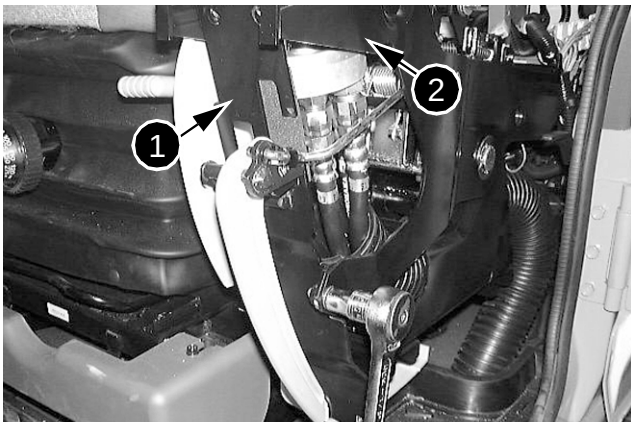


CD00G058

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

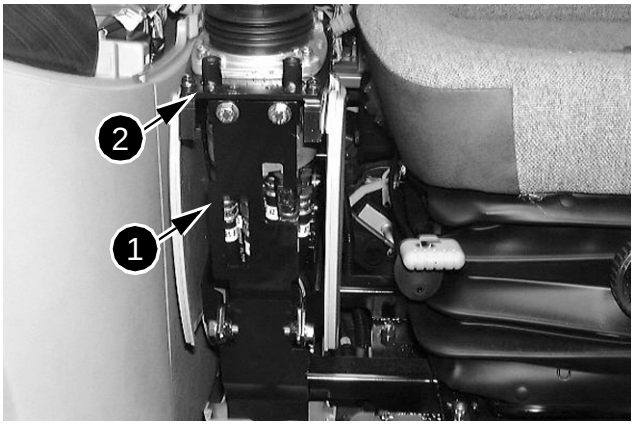
STEP 15

LH side



CD00G059

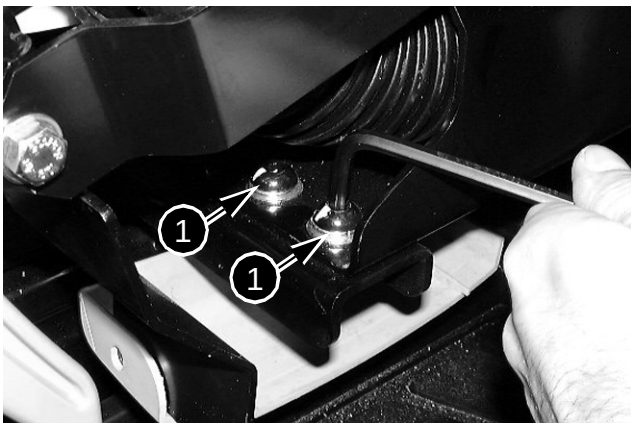
RH side



CD00G119

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

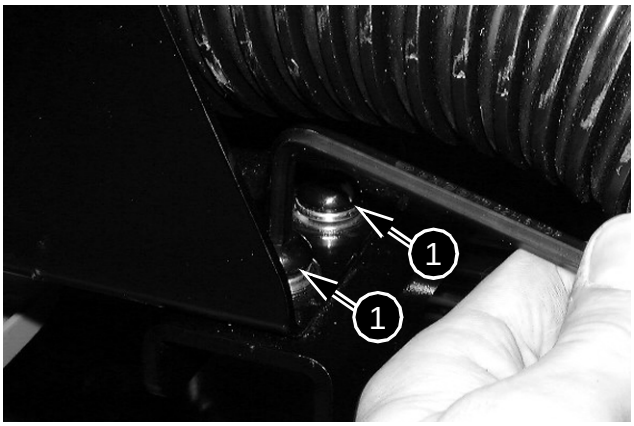
STEP 16



CD00G120

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

STEP 17

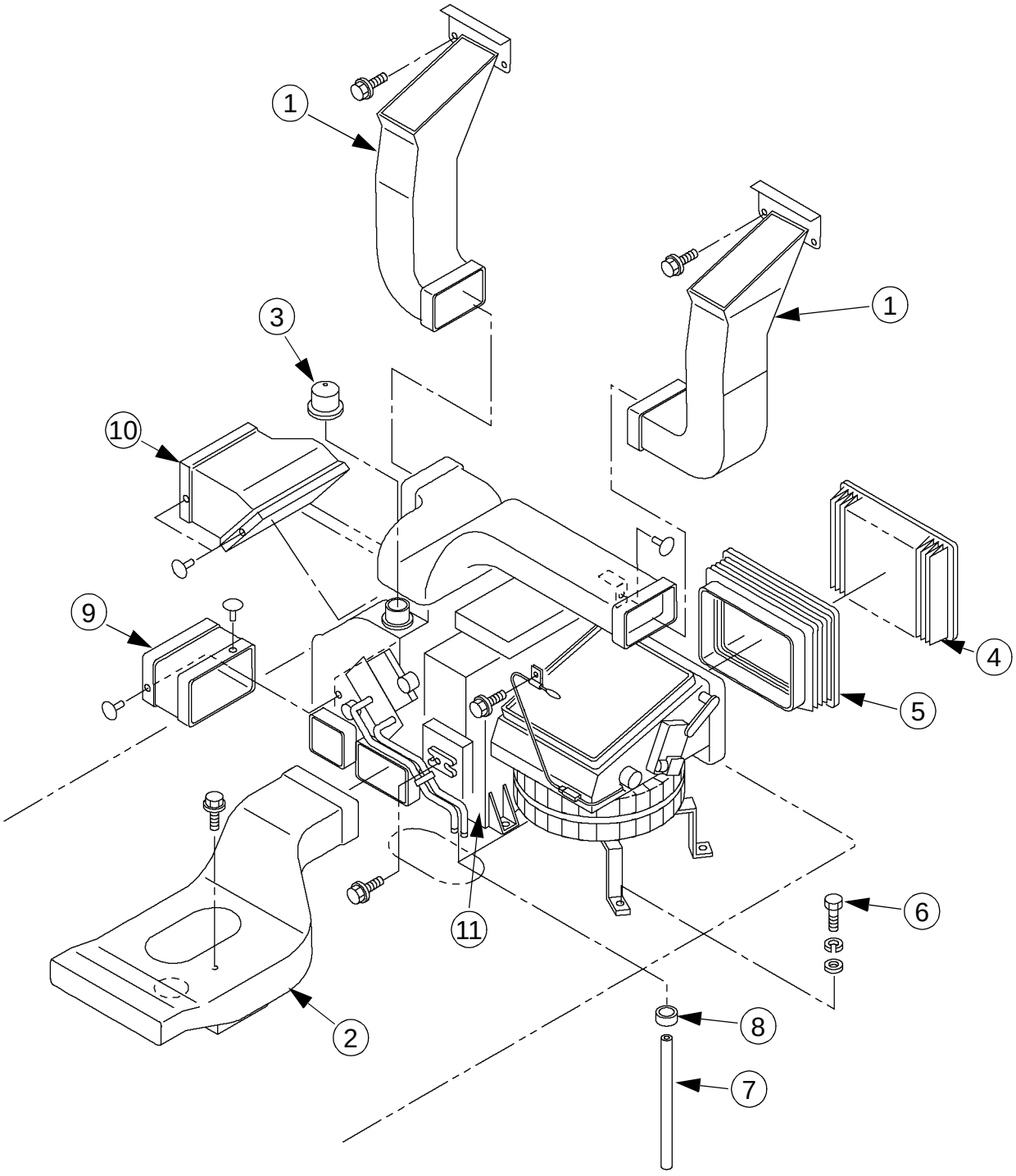


CD00G121

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

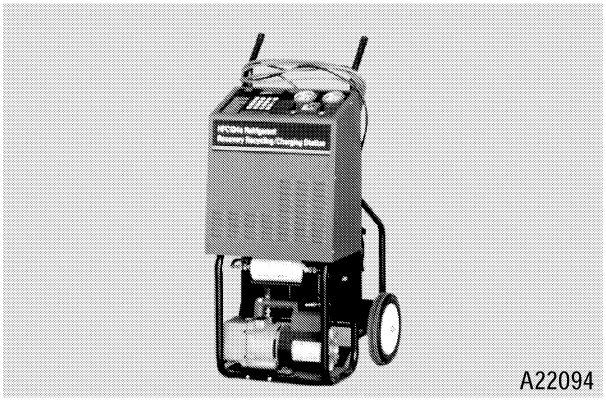
HEATER

Description

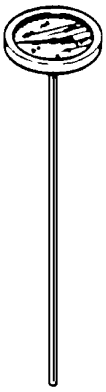


1 CAB REAR VENTILATION CONDUIT
2 CAB LOWER VENTILATION CONDUIT
3 PLUG
4 POLLEN FILTER
5 CONDUIT
6 SCREW
7 HEATER HOSE
8 RETAINING CLIP
9 UNION
10 UNION
11 HEATER ASSEMBLY

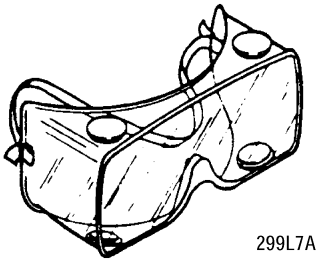
SPECIAL TOOLS



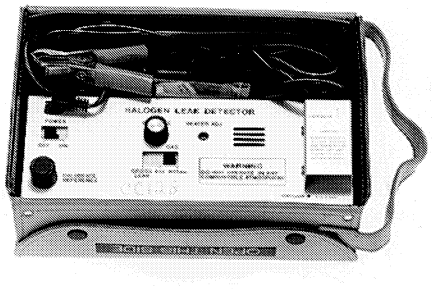
Refrigerant Recovery, Recycling and Charging Station OEM-1418



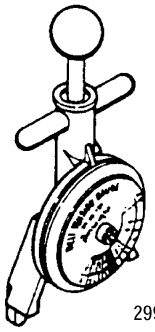
9 Inch Stem Type Thermometer 0°-250 CAS-10248



Safety Goggles CAS10073-3



Electronic Leak Detector OEM-1437



Belt Tension Tool CAS-10808

TROUBLESHOOTING