CASE

PROFESSIONAL PARTNER

SERVICE MANUAL

CRAWLER EXCAVATOR

CX800
TIER III

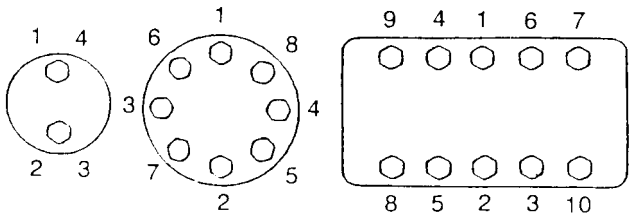
87571787 NA

Issued 07-2006

STANDARD TORQUE DATA FOR CAP SCREWS AND NUTS

Tightening of cap screws, nuts

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



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

Torque table

Tighten cap screws and nuts according to the table below if there are no other special instructions.

Cap Screw Name Size (Size)			**M6**	**M8**	**M10**	**M12**	**M14**	**M16**	**M18**	**M20**
Hexagon Screw	Spanner	[mm]	10	13	17	19	22	24	27	30
		[in.]	0.39	0.51	0.67	0.75	0.87	0.95	1.06	1.18
	Tightening torque	[Nm]	6.9	19.6	39.2	58.8	98.1	156.9	196.1	294.2
		[lb-ft]	5.1	14.5	28.9	43.4	72.3	115.7	144.6	217
Hexagon Socket Head Cap Screw	Spanner	[mm]	5	6	8	10	12	14	14	17
		[in.]	0.20	0.24	0.32	0.39	0.47	0.55	0.55	0.67
	Tightening torque	[Nm]	8.8	21.6	42.1	78.5	117.7	176.5	245.2	343.2
		[lb-ft]	6.5	15.9	31.1	57.9	86.9	130.2	181	253.2

Operating devices

Operator's seat

Location; left side

Structure; low frequency air suspension with helical springs and double acting hydraulic damper.

Cab

Smooth and round shape design cab, fabricated by press work Safety glass for all windows, high impact plastic for all other windows.

Levers and pedals

For travel use; levers and pedals (hydraulic pilot type) (2)

For operating machine use; levers (hydraulic pilot type) (2)

Instruments and switches

Work mode switchover; 4 modes (heavy digging, standard, finishing and auto)

Travel speed switchover; Low Speed / High Speed panel switch

One-touch idle; Knob switch type

Monitor device

Machine status display (full-dot liquid crystal)

Travel speed selection status; Low Speed / High Speed

Work mode selection status; H/S/L/A

Auto idle selection status; ON/OFF

Instruments (full-dot liquid crystal, except for hour meter)

Fuel gauge; bar graph indicator

Engine coolant temperature gauge; bar graph indicator

Hydraulic oil temperature gauge; bar graph indicator

Hour meter; digital type

Machine Status and Warning Alarms (full-dot liquid crystal and warning tone) *Items have a warning alarm

Over heat*	Battery charge*	Faulty electrical system*
Refill fuel*	Engine oil pressure*	Refill coolant*
Engine preheat	Auto warm-up	Air cleaner*
Idling	Service interval	Digging power up

Lighting

Working light	House:	24V, 70W (1)
	Boom:	24V, 70W (1)
	Cab:	24V, 70W (2)
Interior light		24V, 10W (1)

Horn; electric horn (2)

Other

Wiper with intermittent function (1)

Window washer fluid (1)

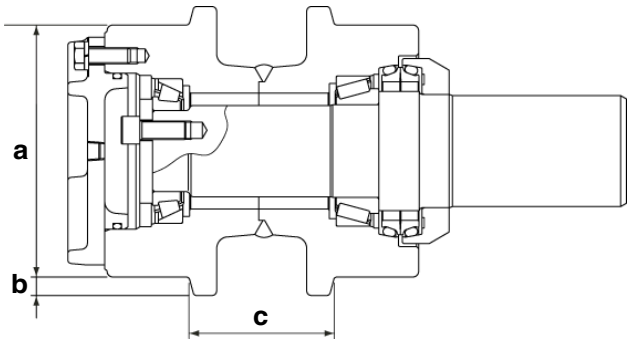
Air conditioner (1)

Rear view mirror (right-hand side) (1)

High dump

Upper roller

Dimensions



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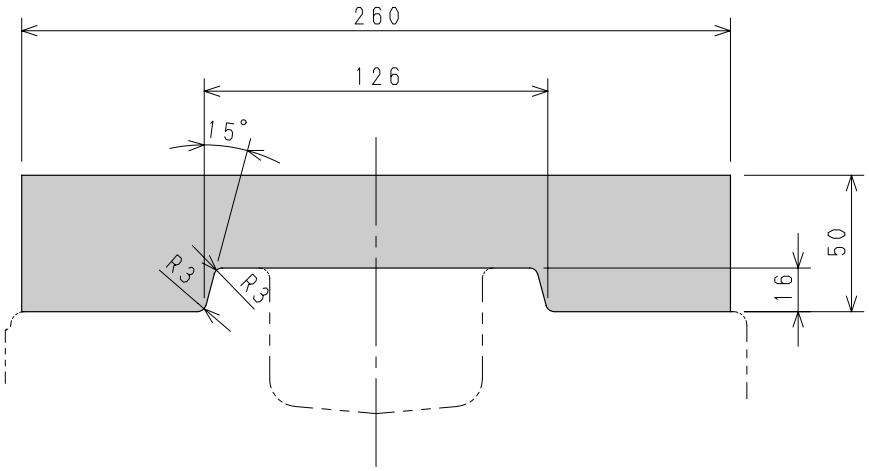
Mark		Dimension	
		mm	in
Ø a	Standard	218	8.58
	Limit	206	8.11
b	Standard	16	0.62
	Limit	22	0.86
c	Standard	126	4.96
	Limit	118	4.64

Gauge

Unit in mm

[Unit: mm]



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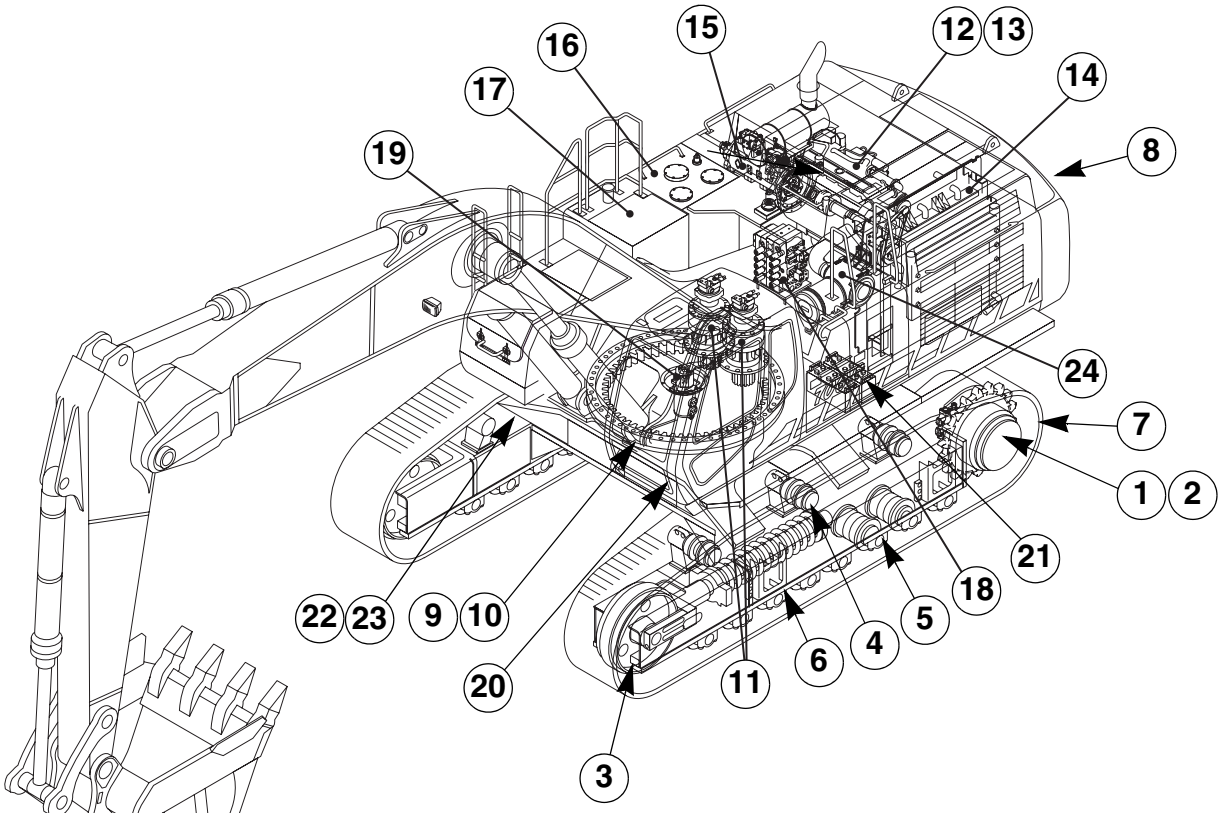

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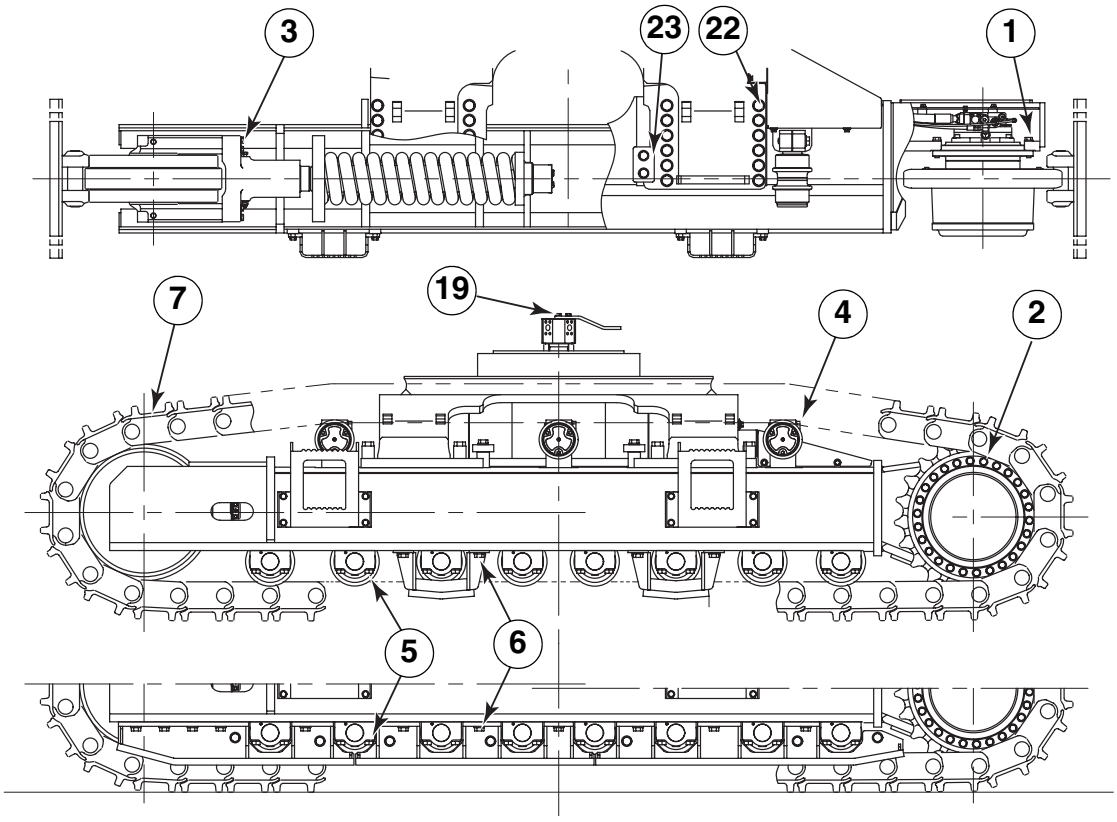

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Kilometers to miles

km	0	1	2	3	4	5	6	7	8	9	km
	miles	miles	miles	miles	miles	miles	miles	miles	miles	miles	
----		0.621	1.243	1.864	2.485	3.107	3.728	4.350	4.971	5.592	----
10	6.214	6.835	7.456	8.078	8.699	9.321	9.942	10.563	11.185	11.806	10
20	12.427	13.049	13.670	14.292	14.913	15.534	16.156	16.777	17.398	18.020	20
30	18.641	19.263	19.884	20.505	21.127	21.748	22.369	22.991	23.612	24.233	30
40	24.855	25.476	26.098	26.719	27.340	27.962	28.583	29.204	29.826	30.447	40
50	31.069	31.690	32.311	32.933	33.554	34.175	34.797	35.418	36.040	36.661	50
60	37.282	37.904	38.525	39.146	39.768	40.389	41.010	41.632	42.253	42.875	60
70	43.496	44.117	44.739	45.360	45.981	46.603	47.224	47.846	48.467	49.088	70
80	49.710	50.331	50.952	51.574	52.195	52.817	53.438	54.059	54.681	55.302	80
90	55.923	56.545	57.166	57.788	58.409	59.030	59.652	60.273	60.894	61.516	90
100	62.137	62.758	63.380	64.001	64.623	65.244	65.865	66.487	67.108	67.729	100

Area

Square inches to Square centimeters

in^2	0	1	2	3	4	5	6	7	8	9	in^2
	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	cm^2	
----		6.452	12.903	19.355	25.806	32.258	38.710	45.161	51.613	58.064	----
10	64.516	70.968	77.419	83.871	90.322	96.774	103.226	109.677	116.129	122.580	10
20	129.032	135.484	141.935	148.387	154.838	161.290	167.742	174.193	180.645	187.096	20
30	193.548	200.000	206.451	212.903	219.354	225.806	232.258	238.709	245.161	251.612	30
40	258.064	264.516	270.967	277.419	283.870	290.322	296.774	303.225	309.677	316.128	40
50	322.580	329.032	335.483	341.935	348.386	354.838	361.290	367.741	374.193	380.644	50
60	387.096	393.548	399.999	406.451	412.902	419.354	425.806	432.257	438.709	445.160	60
70	451.612	458.064	464.515	470.967	477.418	483.870	490.322	496.773	503.225	509.676	70
80	516.128	522.580	529.031	535.483	541.934	548.386	554.838	561.289	567.741	574.192	80
90	580.644	587.096	593.547	599.999	606.450	612.902	619.354	625.805	632.257	638.708	90
100	645.160	651.612	658.063	664.515	670.966	677.418	683.870	690.321	696.773	703.224	100

Square centimeters to square inches

cm^2	0	1	2	3	4	5	6	7	8	9	cm^2
	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	in^2	
----		0.155	0.310	0.465	0.620	0.775	0.930	1.085	1.240	1.395	----
10	1.550	1.705	1.860	2.015	2.170	2.325	2.480	2.635	2.790	2.945	10
20	3.100	3.255	3.410	3.565	3.720	3.875	4.030	4.185	4.340	4.495	20
30	4.650	4.805	4.960	5.115	5.270	5.425	5.580	5.735	5.890	6.045	30
40	6.200	6.355	6.510	6.665	6.820	6.975	7.130	7.285	7.440	7.595	40
50	7.750	7.905	8.060	8.215	8.370	8.525	8.680	8.835	8.990	9.145	50
60	9.300	9.455	9.610	9.765	9.920	10.075	10.230	10.385	10.540	10.695	60
70	10.850	11.005	11.160	11.315	11.470	11.625	11.780	11.935	12.090	12.245	70
80	12.400	12.555	12.710	12.865	13.020	13.175	13.330	13.485	13.640	13.795	80
90	13.950	14.105	14.260	14.415	14.570	14.725	14.880	15.035	15.190	15.345	90
100	15.500	15.655	15.810	15.965	16.120	16.275	16.430	16.585	16.740	16.895	100

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.*

SPECIFICATIONS

See Section 1002

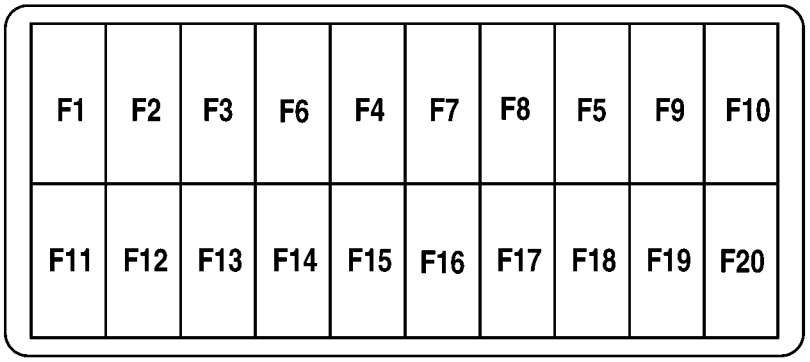
NOTES

ELECTRIC CIRCUITS OPERATION EXPLANATION

System Chart of Function

	ITEM	FUNCTION	METHOD
1	Engine control		Electronic control (common-rail)
2	Work mode selection	a) H/S/L mode Machine setting can be selected according to conditions such as of workload or fuel efficiency preference, and lifting operation.	Maximum engine speed, pump current, and pressurizing solenoid valve are controlled according to the selected work mode.
		b) Auto-mode Suitable work mode is automatically selected.	Selection of auto-mode allows the load to be calculated with pressure of negative control P1 and P2 which in turn work mode is switched.
		c) Load prefectch control Pump current is kept at 0 mA while machine is not being operated.	Pump current and engine controller are controlled by signal from pressure switch.
3	Throttle control	Engine can be controlled continuously from idling to high idling speed by operator's instruction.	Engine speed is adjusted by control of throttle valve.
4	Idling control	Engine speed can be switched to/form idling by control of onetouch switch.	Pushing knob of switch on the right allows the engine to run idle and pushing it again to return it as it was.
		It makes engine to run idle while machine is not being operated.	Selection of auto-idle allows the engine to run at idling speed automatically in 5 minutes after he lever is shifted to its neutral. Shifting lever makes the engine to return to its normal speed automatically.
5	Breaker mode	Pressing the breaker pedal allows the engine to run at the set speed automatically and boosting pressure will be cut.	Turning ON the pressure switch in breaker pilot line allows the engine to run at previously set speed. Also, pump current will be set as that in S-mode and boosting pressure is to be cut.
6	Auto preheat	It helps the engine to start easily at a low temperature. Also, it stabilizes engine speed immediately after start of the engine to reduce exhausting smoke.	Depending on cooling water temperature at the time when the key switch is turned ON, the glow plug is energized for a period of time being set. It is to be energized for a certain period of set time after the engine has been started to reduce exhausting smoke.
7	Auto warm-up	When coolant temperature is low, it allows the engine to start warming up automatically after it has been started.	In case where no operation of the machine after the engine has been started is carried out when coolant temperature is low, it automatically increases engine speed gradually to warm it up.
8	Overheat protection	When engine coolant temperature has been increased, reduce injection quantity to protect engine.	When coolant temperature goes over 108°C, reduce fuel injection quantity. Coolant temperature sensor to ECM.

FUSE BOX



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F1 Fuse 20 A: Engine controller
F2 Fuse 20 A: Computer control, instrument panel and diagnostic test socket
F3 Fuse 20 A: Computer power
F4 Fuse 10 A: Hydraulic function cancellation lever switch
F5 Fuse 15 A: Lubricator (not used); counterweight removal
F6 Fuse 10 A: Rotary light
F7 Fuse 20 A: Fuel filler pump
F8 Fuse 30 A: Engine emergency stop motor
F9 Fuse 30 A: Glow plug
F10 Fuse 10 A: Option line and lubricator connector
F11 Fuse 10 A: Back-up
F12 Fuse 10 A: Key switch
F13 Fuse 20 A: Heater /air conditioner
F14 Fuse 5 A: Air conditioner compressor
F15 Fuse 15 A: Working lights
F16 Fuse 15 A: Working light (cab) and option connector
F17 Fuse 10 A: DC converter (24V - 12V)
F18 Fuse 15 A: Wiper and washer
F19 Fuse 10 A: Horn
F20 Fuse 15 A: Cigarette lighter and cab seat compressor adjustment

1 Engine
A1 Computer
A2 Engine controller
B1 Coolant temperature sensor
B3 Fuel temperature sensor
B6 Air intake temperature sensor
B21 Engine oil pressure switch
B47 Boost pressure sensor
B48 Ambient air (barometric) pressure sensor
B49 Crankshaft position sensor
B50 Camshaft position sensor
B51 Boost temperature sensor
B52 Common rail pressure sensor
B53 Exhaust gas recirculation valve position sensor
K2 Relay-glow plug
K7 Relay battery
K8 Relay safety
K33 Main relay
M15 Exhaust gas recirculation motor
R1 Glow plug
R3 Throttle volume
S1 Key switch
S9 Engine emergency stop switch
Y33 Supply pump valve (pcv1)
Y34 Supply pump valve (pcv2)

CONTROL WHEN STARTING ENGINE

1) Starting control (by monitoring water temperature

1. Purpose

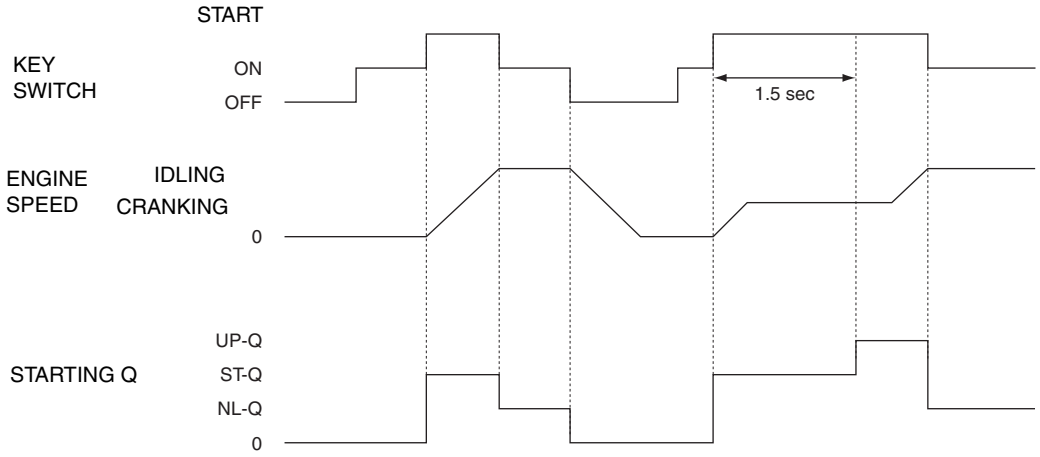
When water temperature is below 0°C (32°F), Purpose is to ensure starting performance of the engine in cold temperature by making fuel injection according to water temperature.

2) Long cranking control

1. Purpose

While aiming at reduction of black smoke when starting engine, the purpose is to improve starting performance by increasing starting Q (fuel injection) by fixed quantity, as a backup when sufficient starting Q (fuel injection) will not be injected in such case where an injector is worn out, after the specified time has passed from the time when cranking was started.

2. Time chart



ST-Q: Standard starting Q, UP-Q: Starting Q after increase of quantity, NL-Q: Q in no lord

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3) Starting control when number of effective cylinders is reduced

1. Purpose

Purpose is to correct fuel injection quantity to assure starting performance of the engine with a view to escaping in an emergency when a certain number of stopped injectors are detected by trouble diagnosis.

2. Operation

1. Fuel quantity to be injected by faulty injectors is allotted to other normal injectors (total quantity is to be the same).
2. In case where number of faulty cylinders is over half of the total numbers, increase of fuel injection.

3. Number of cylinders-Correction factor

Number of effective cylinders	6	5	4	3	2	1	0
Correction factor	1.0	1.2	1.5	2.0	1.0	1.0	1.0

3) Operation

When the starter motor switch is positioned in the «ON» position, the 1st speed is selected by default.

Every time the travel mode switch is pressed (S2), the computer (A1) registers a signal (IN1: 0 volts).

The computer (A1) changes the travel speed in the following way I-> II, II -> I and transmits the modifications to the monitor display (P4).

Travel speed I selected

The output from the computer (OUT)(A1) of the 2 stage travel solenoid valve (Y4) is deactivated (1st speed).

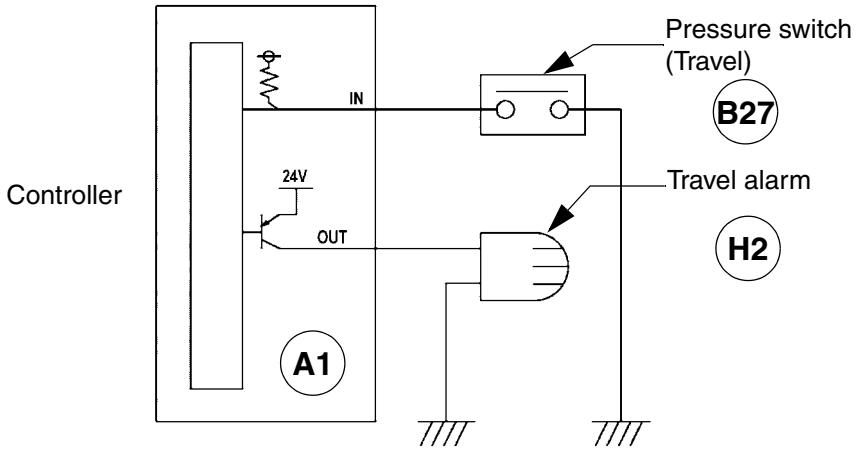
Travel speed II selected

1. When the pressure of the pumps P1 or P2 is less than 580 psi, the output from the computer (OUT)(A1) of the 2 stage travel solenoid valve (Y4) is deactivated (1st speed).
2. When the pressure of the pumps P1 or P2 is greater than 580 psi, the output from the computer (OUT)(A1) of the 2 stage travel solenoid valve (Y4) is activated (2nd speed).

   When the attachment controls are operated, the output from the computer (OUT)(A1) of the 2 stage travel solenoid valve (Y4) cannot be activated or deactivated.
3. When the travel pressure is greater than 3582 psi, the travel motor displacement change spool is pushed back and the swash plate angle is in high displacement (1st speed).
4. Travel speed II may still be selected if necessary, for example for cleaning tracks.

TRAVEL ALARM

1) Circuit configuration



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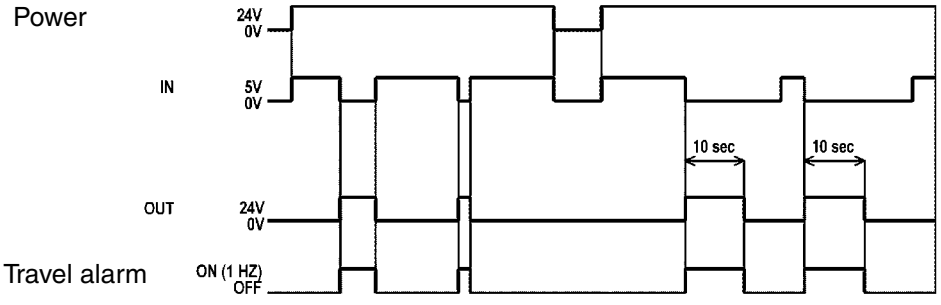
A1 Computer
B27 Travel pilot pressure switch
H2 Travel alarm

2) Timing diagram

The pressure switch (travel) will be turned ON through the travel lever operation. The travel alarm will sound for 10 seconds, then stop.



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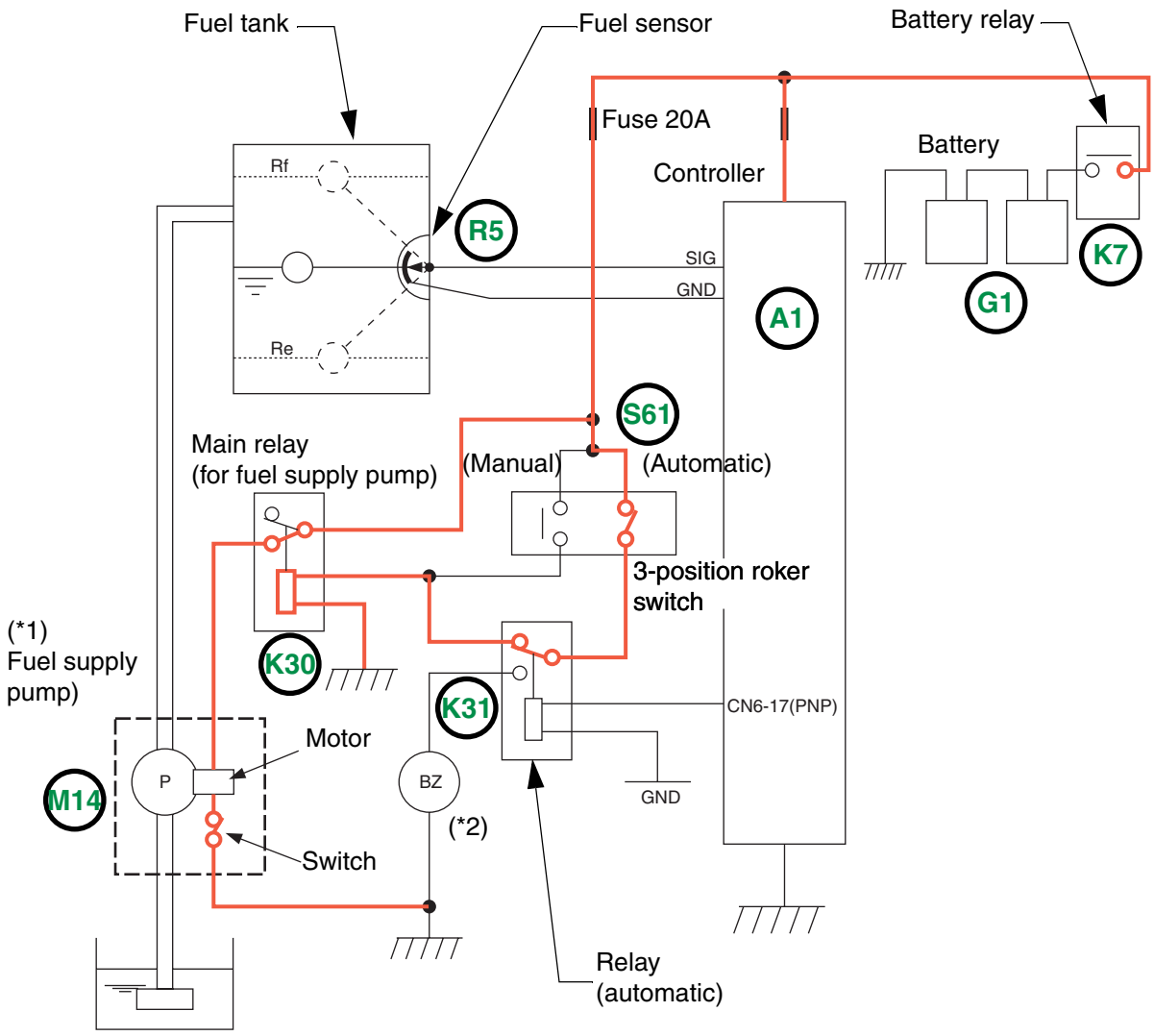
FUEL SUPPLY PUMP CONTROL (AUTOMATIC STOP) OPTION

1) Control outline

The controller detects fuel quantity by fuel sensor allowing the fuel supply pump to make an automatic stop when the fuel tank is filled up.

2) Circuit configuration



(*1) Fuel supply pump: Made by JABSCO (manufacturer in UK).
(*2) Buzzer: Same buzzer used as travelling alarm to MSR.

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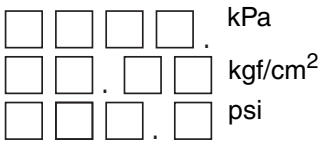
*All components other than controller, battery, and fuel level sensor are stored in the tool box (in house in front-right).

A1 Computer/controller
G1 Battery
K7 Relay battery
K30 Refuel pump relay
K31 Refuel pump stop relay
M14 Fuel feed pump motor
R5 Fuel sensor
S61 Refuel pump switch

Setting of unit fir each shipping territory

	TR5, SP1, SP2	
	Default	When switched
Japan	kPa	kgf/cm^2
Export	kgf/cm^2	kPa
North America	psi	kPa
Europe	kPa	-

Below a decimal point is not displayed but it is as fallows.



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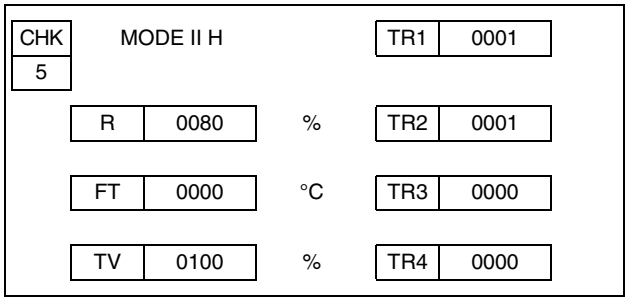
5. Machine condition CHK5



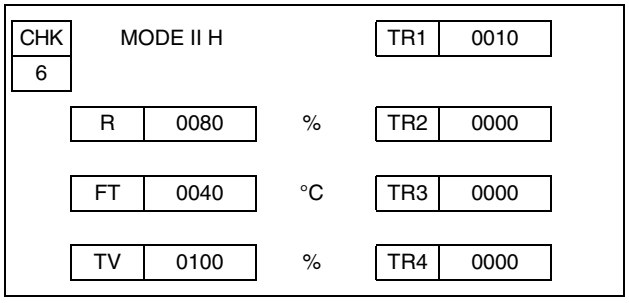
1. While the travel mode switch is ON on the «CHK2» screen, the output status when over-current has been detected in the past is displayed.

2. Data is cleared by resetting the trouble code on the trouble diagnosis screen.

3. The example in the figure above shows that a travel alarm, swing braking, and battery relay output were being carried out when over-current was detected.

R Engine load ratio
FT Fuel temperature
TV Throttle volume degree of opening
TR1 Transistor output status when over-current detected
TR2 Transistor output status when over-current detected
TR3 Transistor output status when over-current detected
TR4 Transistor output status when over-current detected

6. Machine condition CHK6



1. Shorts are automatically detected if the key switch is switched ON while the one-touch idle switch is ON.(* The engine must not be running.)

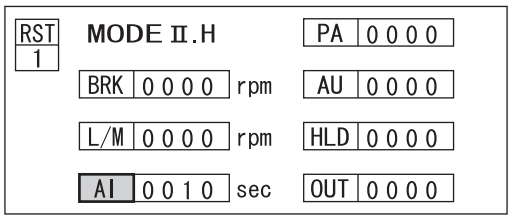
2. If you switch to the «CHK2» screen and switch the travel mode switch ON for 10 seconds, the automatic detection results are displayed.

3. The example in the figure above shows that the 2-speed travel line is currently shorted.

R Engine load ratio
FT Fuel temperature
TV Throttle volume degree of opening
TR1 Results of automatic short detection
TR2 Results of automatic short detection
TR3 Results of automatic short detection
TR4 Results of automatic short detection

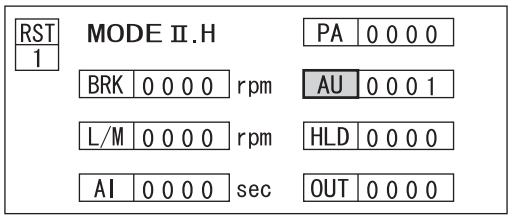
4. This data is cleared when the key switch is switched OFF.
* For CHK1 to 6, the units can be switched with the work lamp switch. Status held as is when key OFF

3) Auto idle time change



1. Select the auto idle time change (AI) with the buzzer stop switch. (The selected item switches from light-on-dark display to dark-on-light display.)
2. Now, set the auto idle time to 10 seconds. Turn ON the travel mode switch untl the number reaches 10. The number increases each time the switch is switched ON and can be set from 1 to 30. When the setting is complete, turn ON the work mode switch for 10 seconds. Buzzer sound to indicate that the settings have been memorized.
3. Turn OFF the key switch.

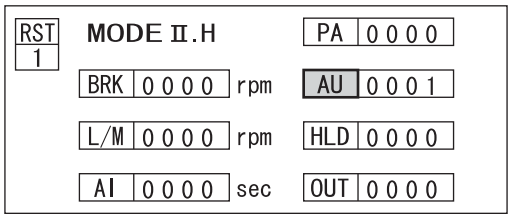
4) Pump output change

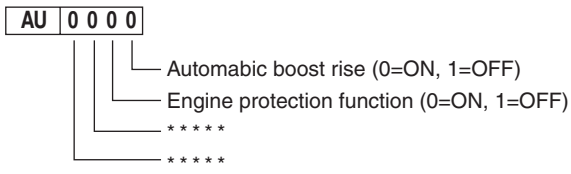


PA=0 : Normal output mode
PA=1 : Low output mode 1 (-100 mA)
PA=2 : Low output mode 2 (-150 mA)
PA=3 : Low output mode 3 (-200 mA)

1. Select the pump output adjustment (PA) with the buzzer stop switch. (The selected item switches from light-on-dark display to dark-on-light display.)
2. Now, set the pump output to low-output mode. Turn ON the travel mode switch so that the number reaches 1, 2, or 3. Each time the switch is switched ON, the number displayed moves to the next step in the sequence 0, 1, 2, 3, …… When the setting is complete, turn ON the work mode switch for 10 seconds. Buzzer sounds to indicate that the settings have been memorized.
3. Switch OFF the Key switch.

5) Automatic pressure rise release setting





1. Select the automatic boost rise release and engine protection function release (AU) with the buzzer stop switch. (The selected item switches from light-on-dark display to dark-on-light display.)
2. Now, set the automatic boost rise engine protection fanction to none. Turn ON the travel mode switch so that the number reaches 1. Each time the switch is switched ON, the number displayed moves to the next step in the sequence: 0000 → 0001 → 0010 → 0011 → 0000. When the setting is complete, turn ON the work mode switch for 10 seconds. Buzzuer sounds to indicate that the setteings have been memorized.
3. Turn OFF the key switch.

Reading the organisation charts

Error code and description of problem

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

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

Prior checks

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

How to proceed

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

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

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

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

Wire colour

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

Table showing wire colours

Symbol	Colour	Symbol	Colour
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		

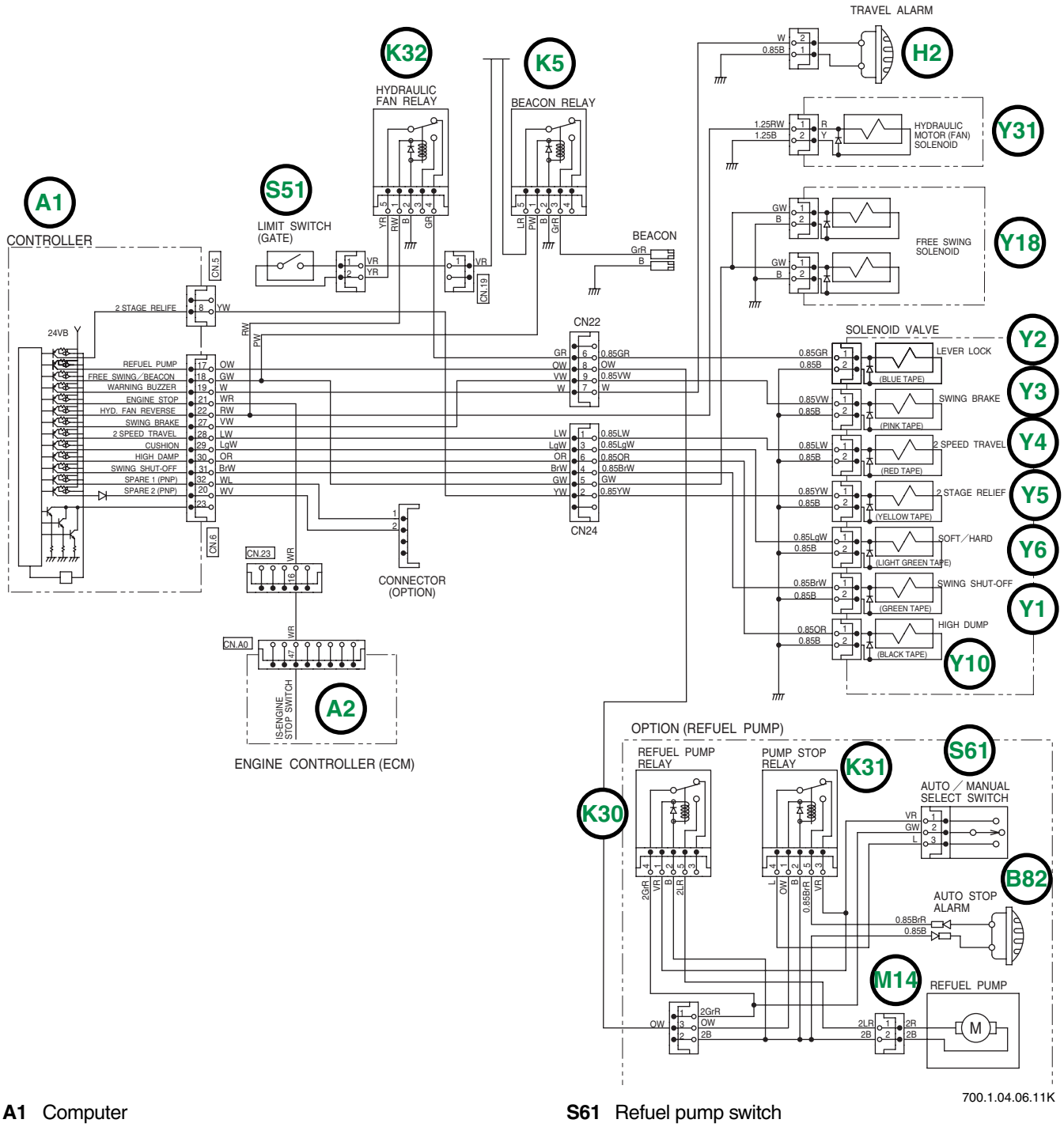
BR indicates a wire of colour B striped with R.
Example: BR indicates a black wire with red stripes

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

Electrical system troubleshooting

Description of problem No. 6

- The message is still displayed



A1 Computer
A2 Engine controller
B82 Refuel pump stop alarm
H2 Travel alarm (North America)
K5 Relay-rotary light
K30 Refuel pump relay
K31 Refuel pump stop relay
K32 Relay, hydraulic fan
M14 Fuel feed pump motor
S51 Hydraulic function cancellation lever switch
S61 Refuel pump switch
Y1 Swing pilot shut-off solenoid valve (green band)
Y2 Pilot pressure solenoid valve (blue band)
Y3 Swing brake solenoid valve (pink band)
Y4 2 stage travel solenoid valve (red band)
Y5 Power-up solenoid valve
Y6 Cushion control solenoid valve (light green band)
Y10 Boom raising priority solenoid (black band)
Y18 Free swing solenoid valve (North America)
Y31 Cooling hydraulic motor solenoid valve

MAINTENANCE

Electrolyte level

If the battery is a maintenance-free battery, check the electrolyte level every 1000 hours of use or every six months, whichever comes first. For all other batteries, check the electrolyte level every 250 hours of use.

Inspecting and cleaning the battery

If the battery is damaged and leaks, it must be replaced. Check the battery regularly for contamination, corrosion and damage. If the top covering of the battery is contaminated by impurities or the electrolyte, the battery can get discharged since the current can pass.

> ⚠ **WARNING:** *When disconnecting the battery cables, always disconnect the earth cable first. When reconnecting the battery cables, always reconnect the earth cable last.*

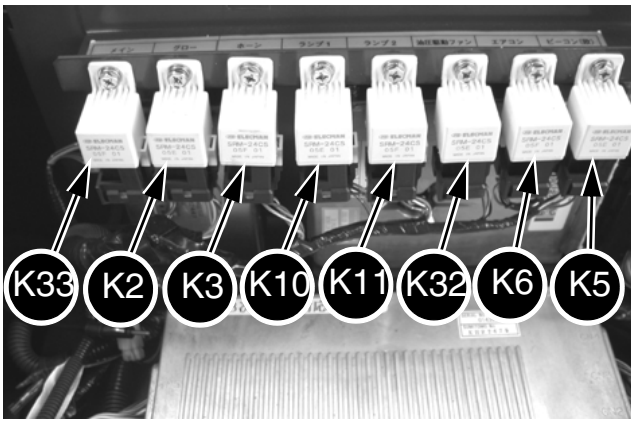
If the battery needs to be cleaned, remove the battery from its bracket and clean the battery, the cable terminals as well as the battery bracket. If possible, use CASE Battery Saver and Cleaner, following the instructions on the cartridge. CASE Battery Saver and Cleaner also fights corrosion. If CASE Battery Saver and Cleaner is not available, use bicarbonate of soda and water. MAKE SURE that the cleaning agent does not enter the battery components.

> ⚠ **WARNING:** *When disconnecting the battery cables, always disconnect the earth cable first. When reconnecting the battery cables, always reconnect the earth cable last.*

Assemble the battery on the machine and check that the straps are tightened properly. Apply CASE Battery Saver and Cleaner or a urethane based sealant on the battery terminals to prevent corrosion. Refer to the Parts Catalogue. Do not use grease.

Engine controller

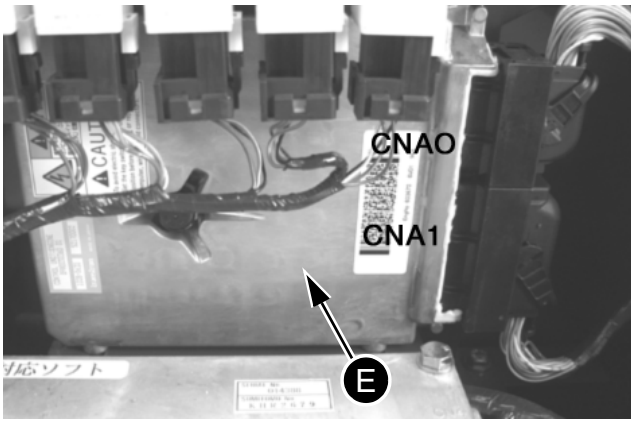
STEP 5



CRPH06A026A

Label and remove the relay-glow plug (K2), the relay-horn (K3), the relay-rotary light (K5), the relay-air conditioner condenser fan (K6), the relay-working light (upperstructure/attachment) (K10), the relay-working light (cab) (K11), the relay-hydraulic fan (K32) and the main relay (K33).

STEP 6



CRPH06A027A

Disconnect the connectors CNA0 and CNA1 from the engine controller (E).

STEP 7

Remove the 4 retaining screws from the engine controller (E).

STEP 8

Remove the engine controller (E).

Installation

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

NOTE: *To reprogram the computer and engine controller, see Section 4001.*

Track tension adjustment

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

STEP 1

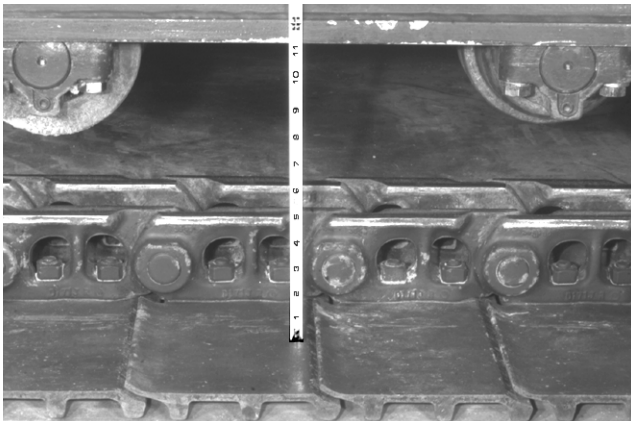
Park the machine on hard, flat ground. Rotate the upper structure of the machine so that the cab is over the track to be checked.

STEP 2

CD01M018

Lower the attachment to lift the machine until the track to be checked is lifted off the ground by a few centimetres.

STEP 3



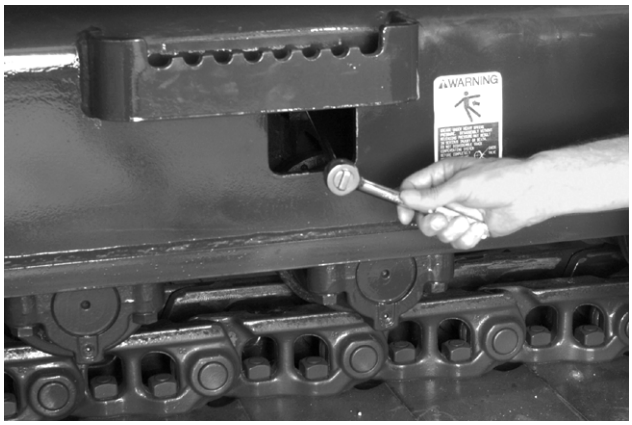
JD01074A

Measure the distance between the bottom surface of the track frame and the top surface of the track shoe. Compare the values with the specifications.

STEP 4

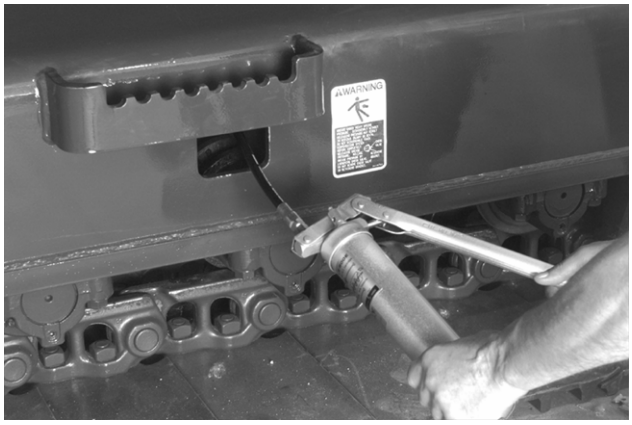
Do the following procedure to increase the track tension:

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



JD00273A

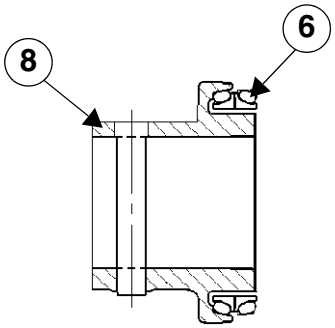
2. Check that the check valve is tight.



JD00287A

3. Inject grease into the track tension cylinder until the required tension is obtained.

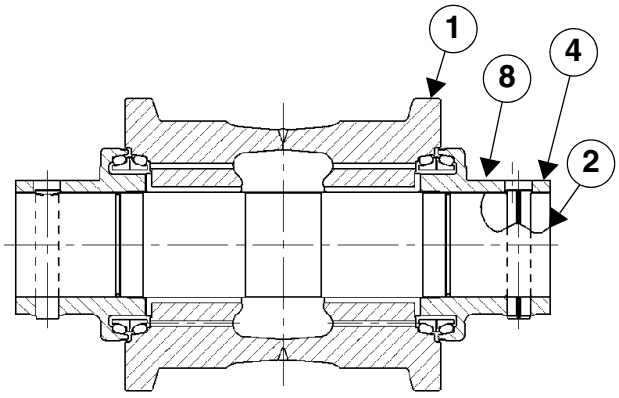
STEP 3



CI01M529

Install the face seals (6) on the end bearings (8). Apply clean oil copiously to the face seals (6).

STEP 4



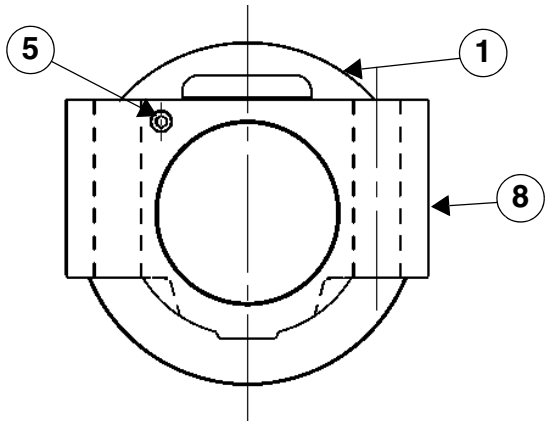
CI01M528

Install the end bearings (8) on the shaft (2) and install new retainer pins (4).

STEP 5

See the chapter on “Leak checks”, carry out an inspection to ensure that the lower roller has been correctly installed.

STEP 6



CI01M527

Fill the lower roller (1) with clean oil, see specifications. Install the drain plug (5) in the end bearing (8).

TABLE OF CONTENTS

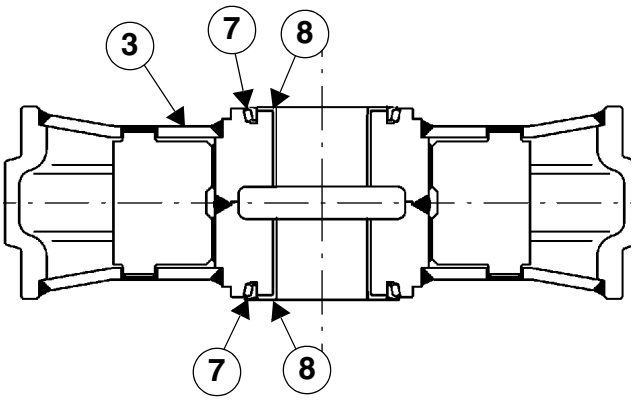
SPECIFICATIONS

See Section 1002.

SPECIAL TORQUE SETTINGS

See Section 1002.

STEP 4



CI01M552

Remove and discard the face seals (7) from the idler wheel (3) using a screwdriver or similar tool. Make sure you do not damage the idler wheel seal bore (3).

STEP 5

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

Using a hammer and a brass drift, drive the bushings (8) out of the idler wheel (3). Make sure you do not damage the idler wheel seal bore.

Inspection

STEP 1

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

STEP 2

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

STEP 3

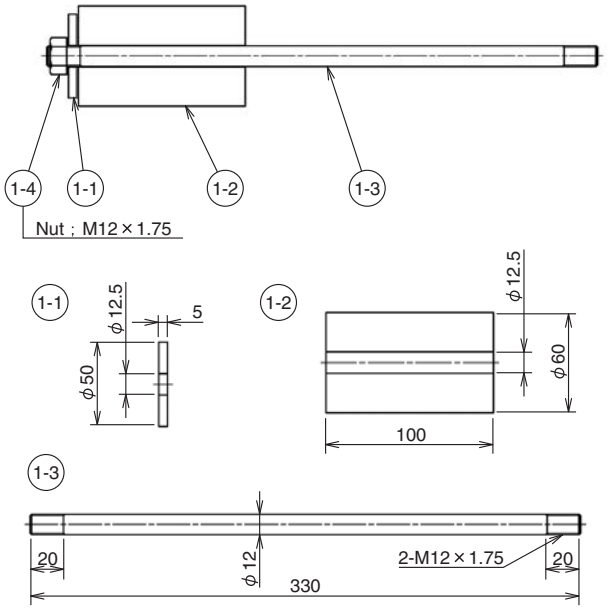
Check for wear and damage to the bushings. Measure the inner diameter and width of the bushing. Compare the values with the specifications. Change them if necessary.

STEP 4

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

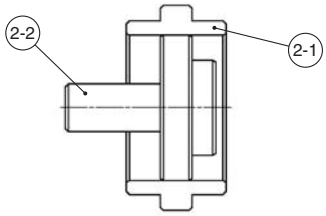
NOTES

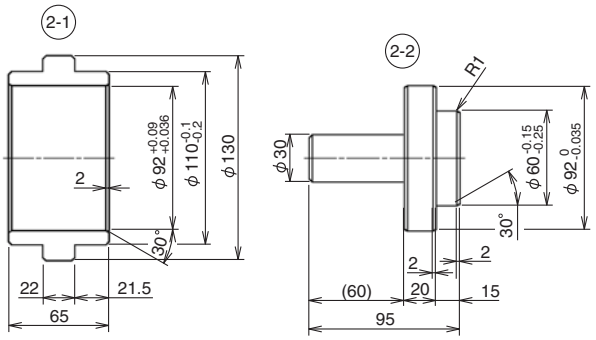
SPECIAL TOOLS



800-7-02-02-40A

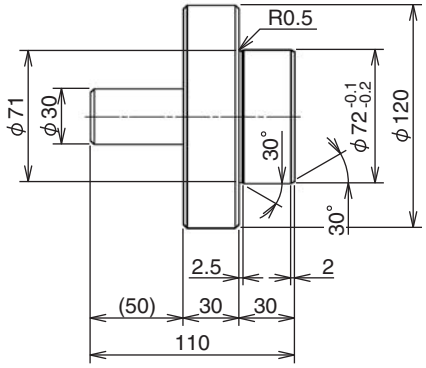
Brake piston disassembling jig (applicable part n°21)





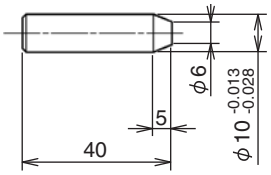
800-7-02-02-40B

Oil seal assembling jig (applicable part n°28)



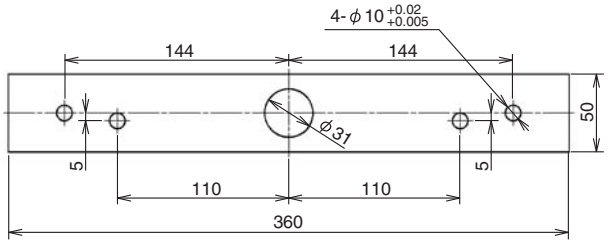
800-7-02-02-40C

Bearing assembling jig (applicable part n°13)



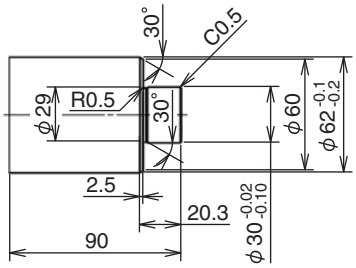
800-7-02-02-40D

Guide pin (applicable part n°21)



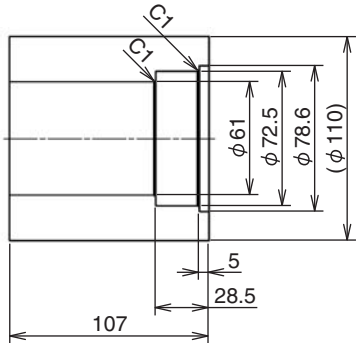
800-7-02-02-40E

Brake piston positioning jig (applicable part N° 21)



800-7-02-02-40F

Bearing assembling jig (applicable part N° 14)

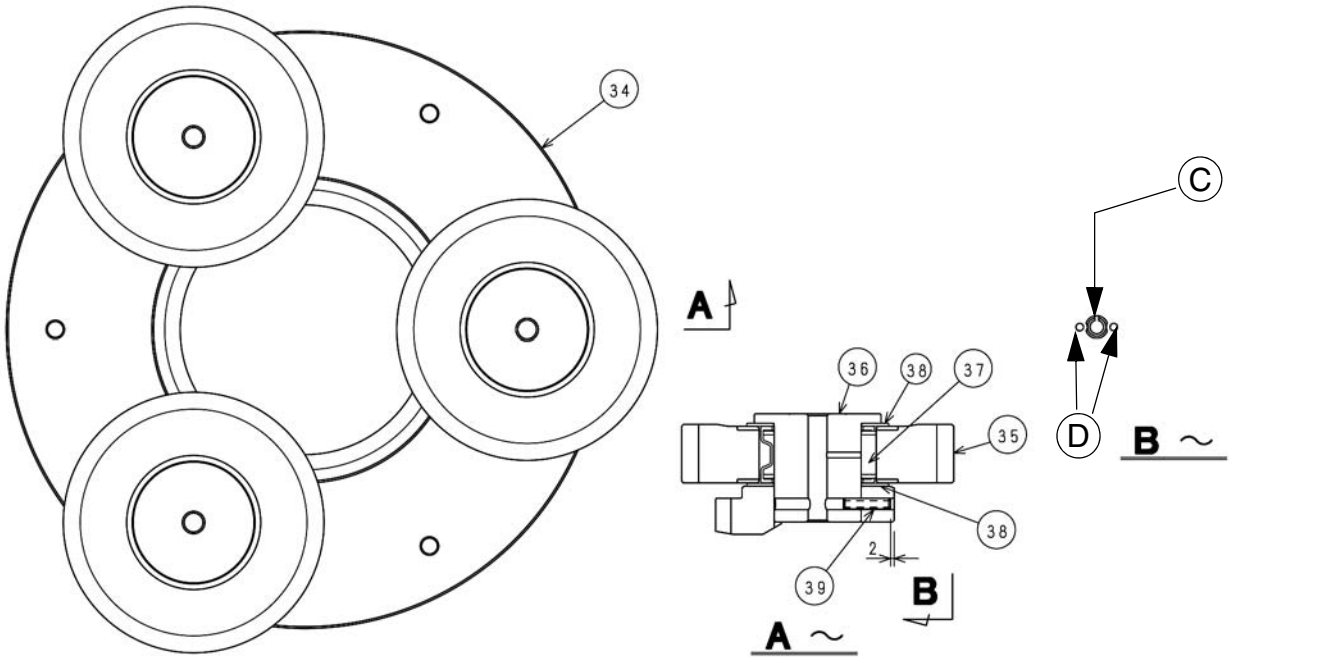


800-7-02-02-40G

Inner race assembling jig (applicable parts N° 3, 14)

Parts Name	Appearance	Allowance	Replacement Parts
Base plate (2-1)	when remarkable flaws or high surface roughness are found on each sliding surface with spool assembly.	Roughness; 0.8 a There should be no seizure and remarkable flaws (over 0.02 mm in thickness).	Base plate subassembly
	When clearance between spool assembly and base plate bore is great.	Clearance; 0.050mm	
	When remarkable flaws or high surface roughness are found on each sliding surface with valve assembly.	Roughness; 0.8 a There should be no seizure and remarkable flaws (over 0.02 mm in thickness).	
	When clearance between valve assembly and base plate bore is great.	Clearance; 0.040mm	
	When remarkable flaws or high surface roughness are found on each sliding surface with spool assembly.	There should be no seizure and remarkable flaws (over 0.02 mm in thickness).	
Valve Assembly (2-9)	When remarkable flaws or high surface roughness are found on each sliding surface with spool assembly.	Roughness; 0.8 a There should be no seizure and remarkable flaws (over 0.02 mm in thickness).	Base plate subassembly
	When clearance between valve assembly and base plate bore is great.	Clearance; 0.040mm	
Free piston (2-7-10)	When remarkable flaws or high surface roughness are found on each sliding surface with base plate.	There should be no seizure and remarkable flaws (over 0.02 mm in thickness).	Relief valve assembly
Housing (2-7-2)	When remarkable flaws or high surface roughness are found on each sliding surface with free piston.	There should be no seizure and remarkable flaws (over 0.02 mm in thickness).	

Planetary Carrier N°.3 Assembly Drawing



800-7-02-03-08BH

34. Planetary carrier N° 1
35. Planetary gear N° 1
36. Planetary pin N° 1
27. Needle bearing
38. Side plate N° 1
39. Spring pin 6X25
40. Planetary carrier N° 2
41. Planetary gear N° 2
42. Planetary pin N° 2
43. Side plate N° 2
44. Spring pin 8X45
45. Planetary carrier N° 3
46. Planetary gear N° 3
47. Planetary pin N° 3
48. Side plate N° 3
49. Spring pin 13X63

(C) The slit must be positioned at the indicate direction.
(D) Punch two point.

STEP 6

800-7-02-03-08D3

The lock is made by deforming the spring pin hole by punching a place 2 mm apart from the hole using a punch.

STEP 7

Confirm no catching and no uneven rotation is observed by rotating the planetary gear N°.1 (35) by hand. If any catching or uneven rotation is observed, disassemble it according to the Chapter Disassembly for carrier N°.1 subassembly and reassemble according to this chapter.

Replace the spring pin 6 × 25 (39) with a new one. If the old spring pin is used for the reassembly work, the pin holding force would be decreased, which could cause breakage.

NOTE: *Carry out procedures (1) through (7) for the 3 locations, and the work is finished.*

Carrier N°2 subassembly

STEP 1

800-7-02-03-08E1

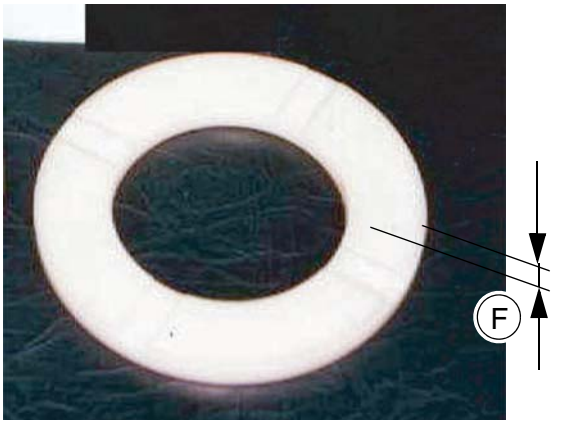
Insert the thrust plate N°.2 (18) to the groove (Diameter 170) on the spline of the planetary carrier N°.2 (40).

STEP 2

800-7-02-03-08E2

Slide the planetary gear N°.2 (41) and the side plate N°.2 (43) (2 sheets) in from the side of the planetary carrier N°.2 (40) and set them in the specified location.

STEP 12



800-7-02-03-08W3

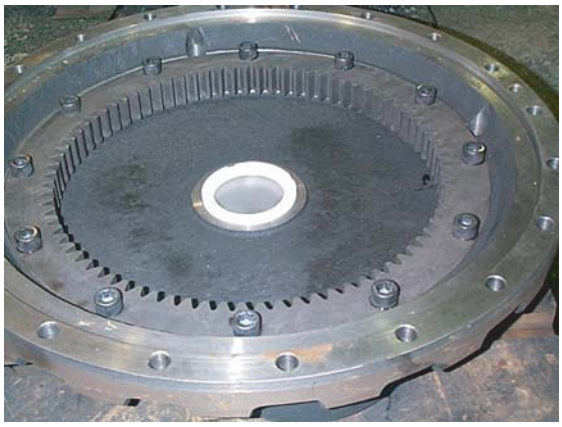
Measure the thickness (F) of the trust plate N°.1(23) and record.

STEP 13

800-7-02-03-08X1

Select enough plate shim (25) so that the figure in the (A)–(E)–(F) comes to 1.5 to 2.0, and insert the side cover (15). The plates shim (25) come in the thickness of 0.5 to 1.0 mm.

STEP 14



800-7-02-03-08X2

Use a plastic hammer to drive the trust plate N°.1 (23) into the side cover (15) to prevent warpage.

STEP 15

800-7-02-03-08Y1

Deoil the joining faces of the ring gear (11) and the side cover (15), and apply liquid packing evenly. Turn the side cover (15) upside down and lift it by a crane and assemble into the case subassembly.

Deoil the screw portion of the hexagon socket head bolts M12 × 35 (13) and apply liquid packing. Tighten at 20 positions to the torque specified on page 3.

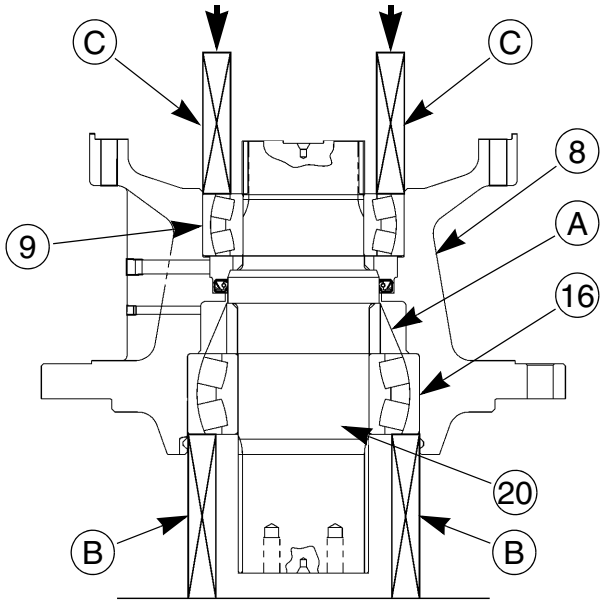
STEP 16

800-7-02-03-08Y2

Check the seal. This check is to be made by adding compressed air of 3 kg/mm^2 and hold it for 3 minutes with no air leakage observed.

NOTES

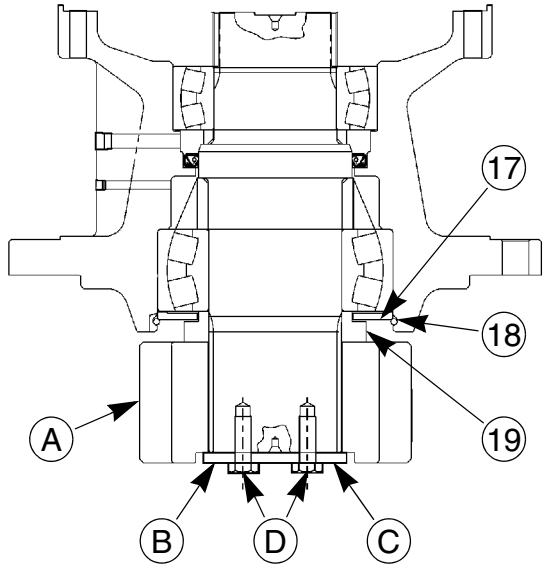
STEP 8



CI02B505

Coat the roller bearings (16) with 800 grams of No. 2 EP lithium grease (A). Place the shaft assembled (20) on the shims (B) under a press. Position the housing (8) equipped with the bearing and the lip seal on the shaft (20). Position the shims (C) on the bearing (9). Assemble the housing using the press (booms).

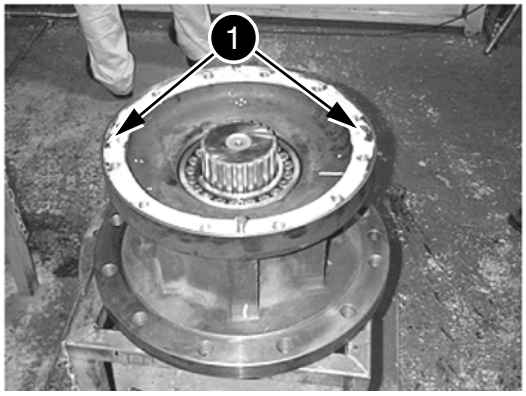
STEP 9



CI02B506

Assemble the plate (17). Assemble the snap ring (18) with a gap of about 30 mm with respect to the notch on the housing. Install the spacer (19). Lubricate and assemble the pinion (A). Assemble the stop plate (B). Install the brake plate (C), assemble and tighten the screws (D). Bend the corners of the brake plate (C) on the screw heads (D).

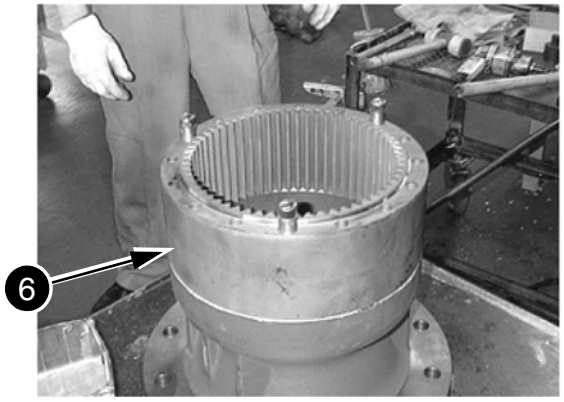
STEP 10



CRPH06F013A

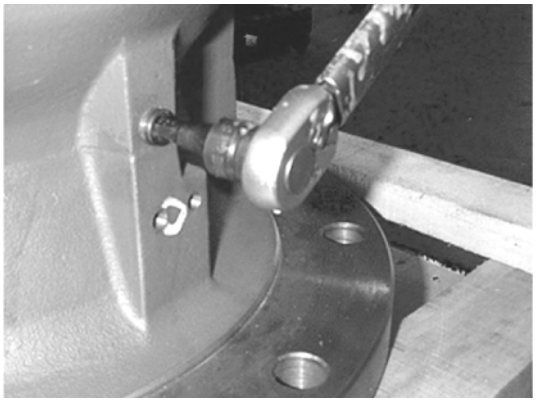
Degrease the mating surfaces of the gear housing, ring gear and the four dowel pins. Install the four dowel pins (1) into the gear housing. Apply Loctite 504 liquid packing to the mating surfaces.

STEP 11



CRPH06F014A

Install the ring gear (6) ensuring the alignment marks are aligned. Assemble four screws in opposition to hold the ring gear (6).



CRPH06F015A

Screw the plug with nylon seals (11), (14) onto the drain port on the gear case (8).

Decontaminating the hydraulic circuit

STEP 1

Prepare the portable filter CAS 10162A as follows:

1. Eliminate all hydraulic fluid from the inlet and outlet hoses of the portable filter.
2. Remove the cartridge of the portable filter.
3. Eliminate all the hydraulic fluid from the portable filter.
4. Clean the interior of the cartridge housing.
5. Install a new filter cartridge.

STEP 2

Release pressure in the hydraulic system, see page 4.

STEP 3

Drain the hydraulic fluid from the reservoir, see the operator's manual.

NOTE: *Do not assemble the access door under the hydraulic reservoir.*

STEP 4

Change the breather cartridge, the return filter and clean the inlet filter, see the operator's manual.

NOTE: *Do not install the plate complete with the breather.*

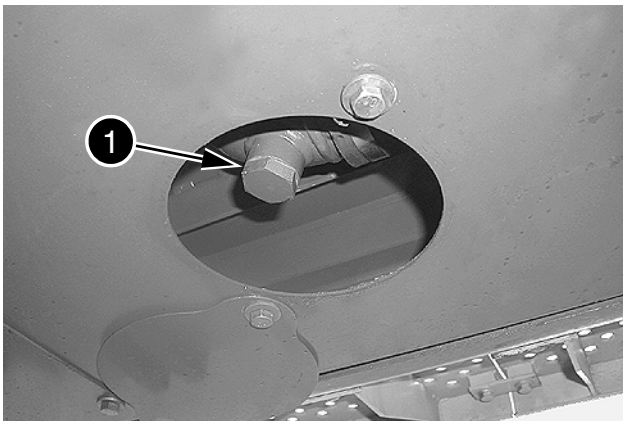
STEP 5

Change the pilot circuit filter, see the operator's manual.

STEP 6

Change the Ultra Clean filter, see the operator's manual.

STEP 7



CT05L041

Remove the bleed screw (1) from under the hydraulic reservoir and install the shut-off valve from the union kit CAS 10508.

NOTE: *Make sure that the valve is closed.*

STEP 8

Fill the hydraulic reservoir with clean hydraulic fluid, see the operator's manual.

STEP 9

Install the inlet hose from the portable filter on the valve under the hydraulic reservoir.

STEP 10

Install the long pipe from the union kit CAS 10508 on the portable filter return hose.

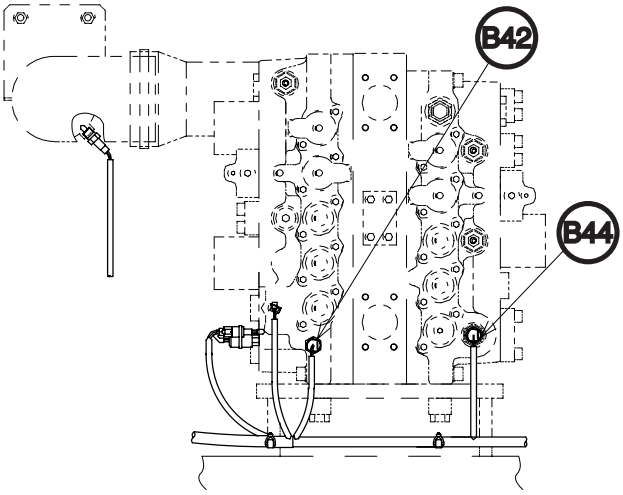
STEP 11

Insert the long pipe in the hydraulic reservoir. Move the inlet filter long pipe as far away as possible.

STEP 12

Open the valve under the hydraulic reservoir.

Main pressure measuring port



700-1-05-00-24AA

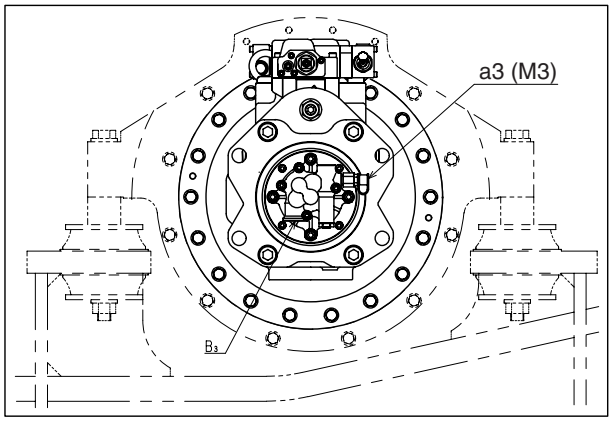
A pressure sensor is mounted on the control valve and the circuit pressure can be displayed on the monitor (except for pilot pressure).

B42, Pump pressure sensor P1.

B44, Pump pressure sensor P2.

Pressure on each relief valve (except for pilot pressure) can be confirmed on the monitor display.

Installing the pilot pressure test point



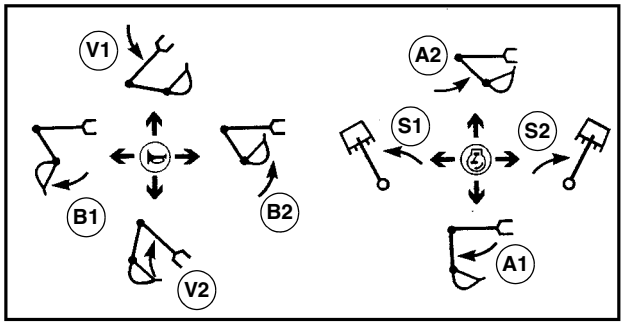
CD02C144

Install a pressure test point (M3) on the port (a3) of the pilot pump.

Old Mitsubishi type

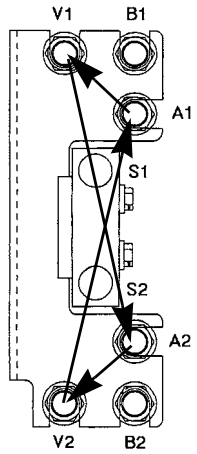
Adopted manufacturers: MITSUBISHI, NIKO.

Operation Levers

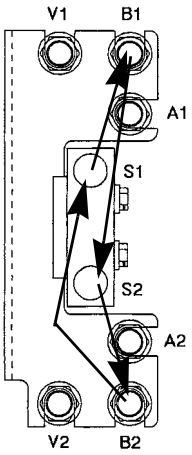


CS00F530M

Illustration of changing hoses



A1: Arm out (move to V1)
A2: Arm in (move to V2)
V1: Boom down (move to A2)
V2: Boom up (move to A1)



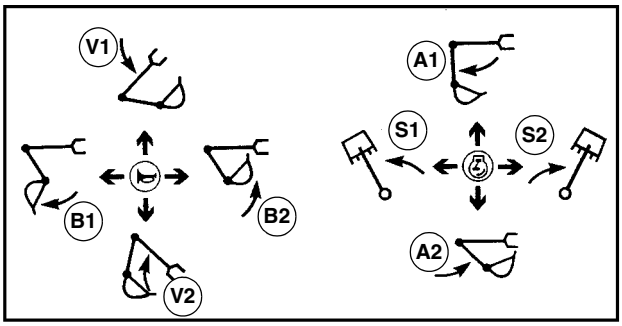
B1: Bucket open (move to S2)
B2: Bucket closed (move to S1)
S1: Swing left (move to B1)
S2: Swing right (move to B2)

000-8-02-01-07B

Old Kobelco type

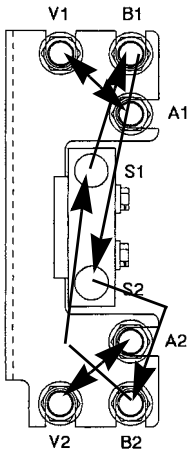
Adopted manufacturers: KOBELCO, FURUKAWA.

Operation Levers



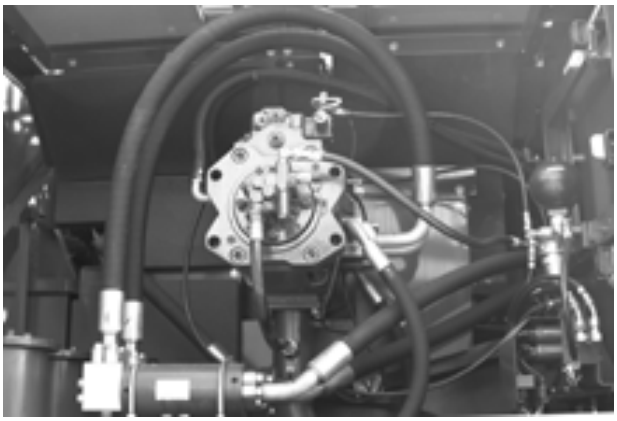
CS00F530K

Illustration of changing hoses



A1: Arm out (move to V1)
A2: Arm in (move to V2)
B1: Bucket open (move to S2)
B2: Bucket closed (move to S1)
V1: Boom down (move to A1)
V2: Boom up (move to A2)
S1: Swing left (move to B1)
S2: Swing right (move to B2)

STEP 7



CRPH06F011A

To facilitate correct installation, attach identification tags on all the hoses of the main hydraulic pump and the pilot pump.

STEP 8

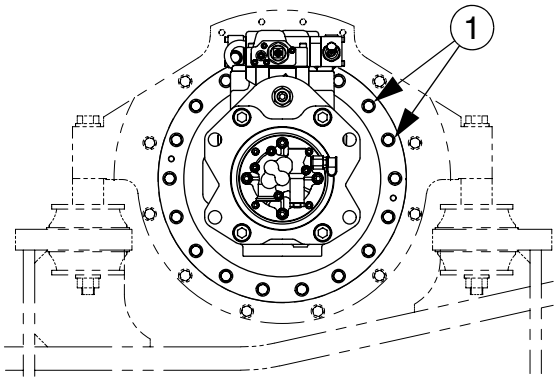
Remove and seal all hoses and union of the main pump as well as those of the pilot pump.

STEP 9

Install an appropriate lifting apparatus on the hydraulic pump.

Do not leave any slack so that the pump can be supported once the fastening screws of the pump are removed.

STEP 10



700-1-05-00-24AL1

Remove the retaining screws (1) and remove the hydraulic pump.

NOTE: *When installing, tighten the retaining screws (1) to the specified torque (see Section 1002).*

STEP 11

Remove the hydraulic pump from the motor and put it away from the machine. Place the hydraulic pump on a clean workbench using suitable brackets.

NOTE: *Carry out steps 12 and 13 only if a new hydraulic pump needs to be installed.*

STEP 12

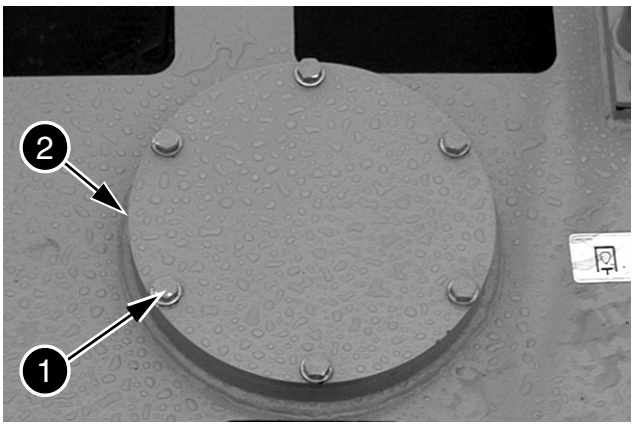
Remove screws fixing the grooved spacer on the shaft and screws fixing the hydraulic pump on the coupling flange.

STEP 13

Remove the connections of the hydraulic pump that has just been removed and install them on the new hydraulic pump. Remove and install the connections one after another to avoid improper installation of the connections on the new hydraulic pump.

NOTE: *For installing the hydraulic pump, proceed in the reverse order to that of removal. Replace all rings with new rings.*

STEP 14



CD01N005

Remove the six screws and washers (1). Remove the cover (2) and the O-ring from on top of the hydraulic reservoir. Scrap the O-ring. Fill the hydraulic reservoir with hydraulic fluid (see Section 1002) up to a level in between the "high" and "low" marks on the visual gauge. Install the cover with a new O-ring, fasten it using the six screws and washers (1), tighten the screws.

TABLE OF CONTENTS

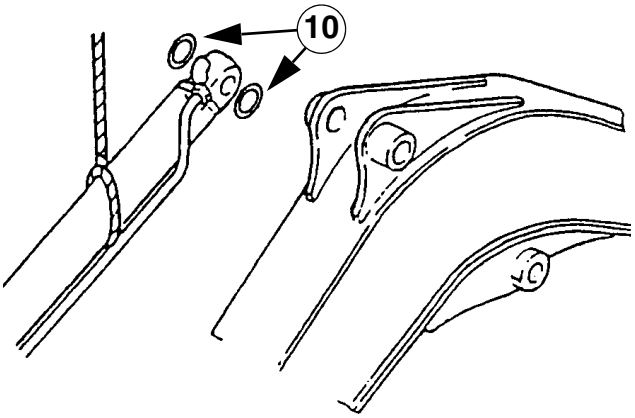
SPECIFICATIONS

See Section 1002

PREPARATION BEFORE REMOVAL/INSTALLATION

- Park the machine on hard, flat ground.
- Completely retract the bucket and dipper cylinder rods and lower the attachment to the ground.
- Release pressure in the hydraulic system and install a vacuum pump on the hydraulic reservoir (see Section 8000).

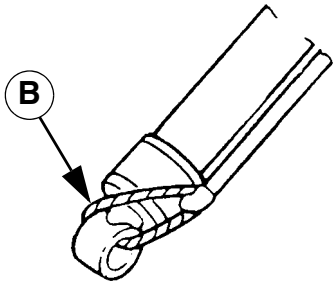
STEP 12



JS00602A

Carefully raise the dipper cylinder and move it away from the dipper. Remove the shims (10). Place the dipper cylinder on suitable stands.

STEP 13

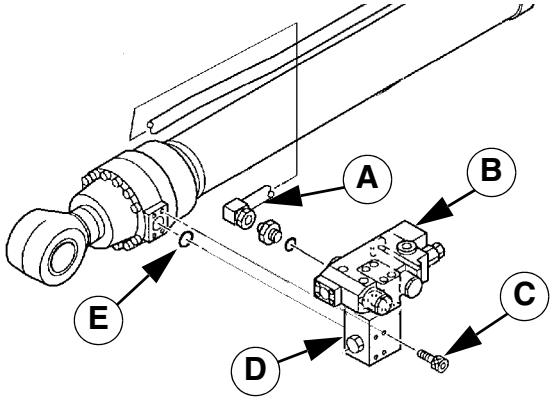


JS00586A

Remove the strap (B) which holds the cylinder rod to the cylinder barrel.

STEP 14

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

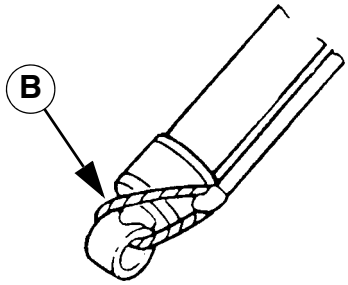


CS00G504

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

Installation

STEP 1



JS00586A

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

TABLE OF CONTENTS

SPECIFICATIONS

Weight ..... See Section 1002

SPECIAL TORQUE SETTINGS

Cap screw for retaining locking bar ..... See Section 1002

Cap screw for retaining the outer component on the upperstructure ..... See Section 1002

FUNCTION

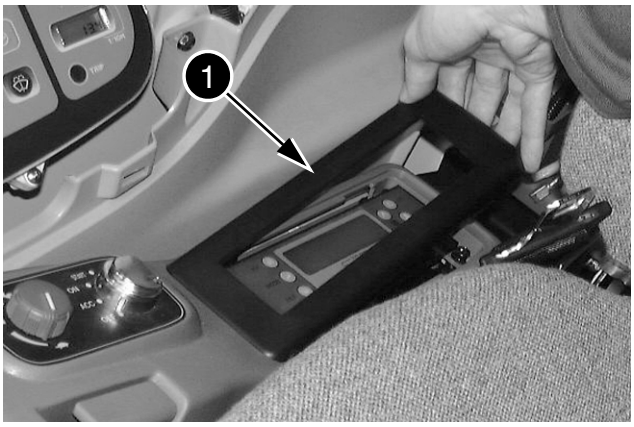
The rotating joint is located in the machine center portion between the lower section and the upper section, and rotates around the swing center shaft. It receives the supply oil and the return oil coming and going from the control valve to the travel motor and is free from the hydraulic torsion. It makes possible continuous swing in all directions of the lower and the upper sections.

RH control lever

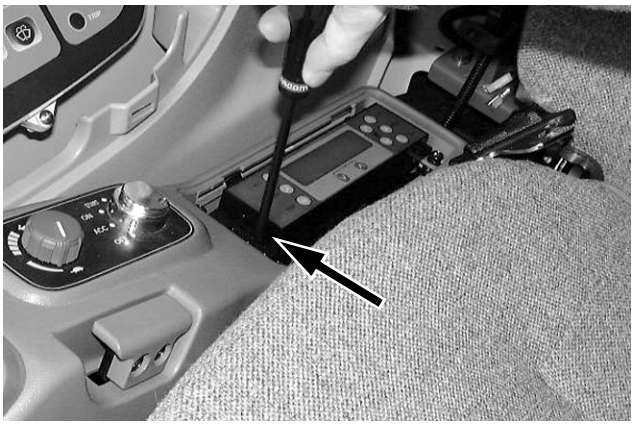
Removal and installation

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

STEP 1



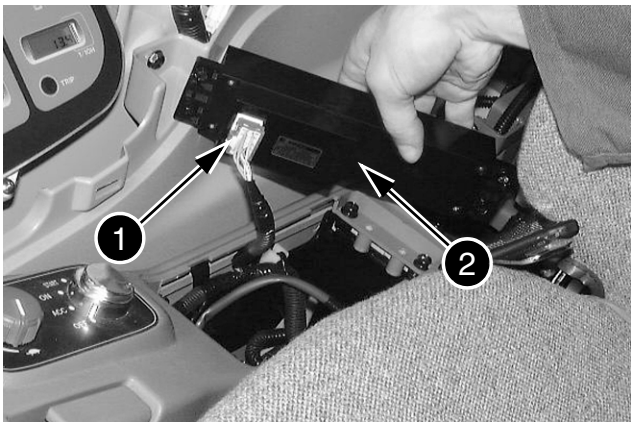
CD00G065



CD00G066

Remove the trim panel (1) then remove the retaining screws from the air-conditioning control box.

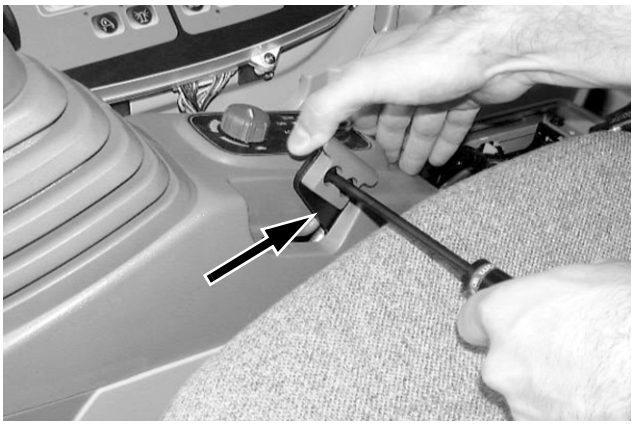
STEP 2



CD00G067

Label and disconnect the electrical connection (1) then remove the air-conditioning control box (2).

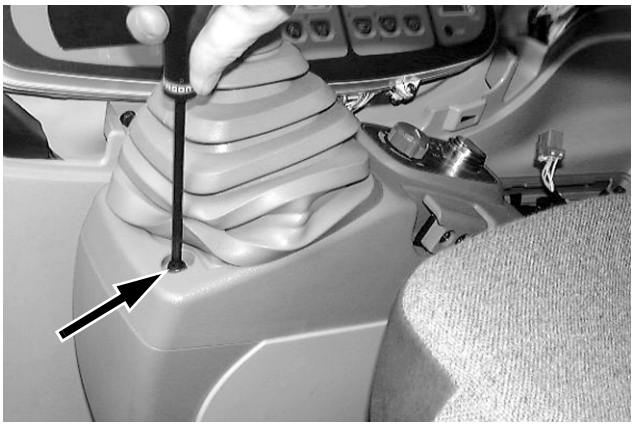
STEP 3



CD00G068

Loosen and remove the two retaining screws from the arm angle adjustment lever.

STEP 4



CD00G069

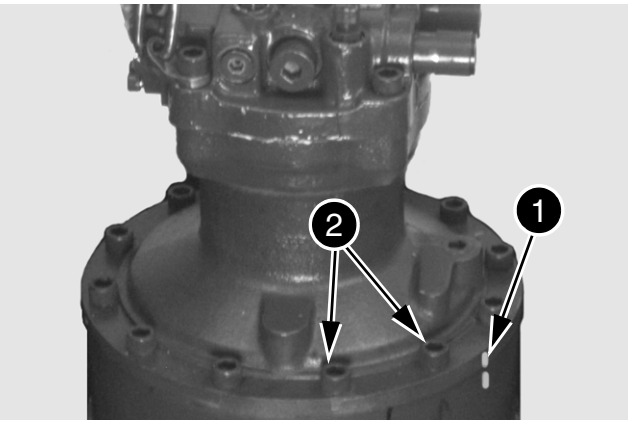
Lift the grommet. Loosen and remove the four retaining screws from the front upper portion of the control arm.

STEP 5

CD00G070

Loosen and remove the four retaining screws from the rear upper portion of the control arm.

STEP 10



JD00386A

To facilitate reassembly, make an alignment mark (1) on the swing motor and on the reduction gear. Remove the twelve retaining screws (2) from the hydraulic swing motor.

NOTE: *When installing, tighten the screws to the torque specified on page 2.*

STEP 11

Carefully lift the swing motor and move it away from the swing reduction gear. Move the swing motor away from the machine and place it on a clean workbench.

NOTE: *When installing, apply Loctite 504 to the mating surfaces between the reduction gear and the swing motor.*

STEP 12

To prevent any contamination of the gear oil, cover the reduction gear with a cloth or a suitable protection.

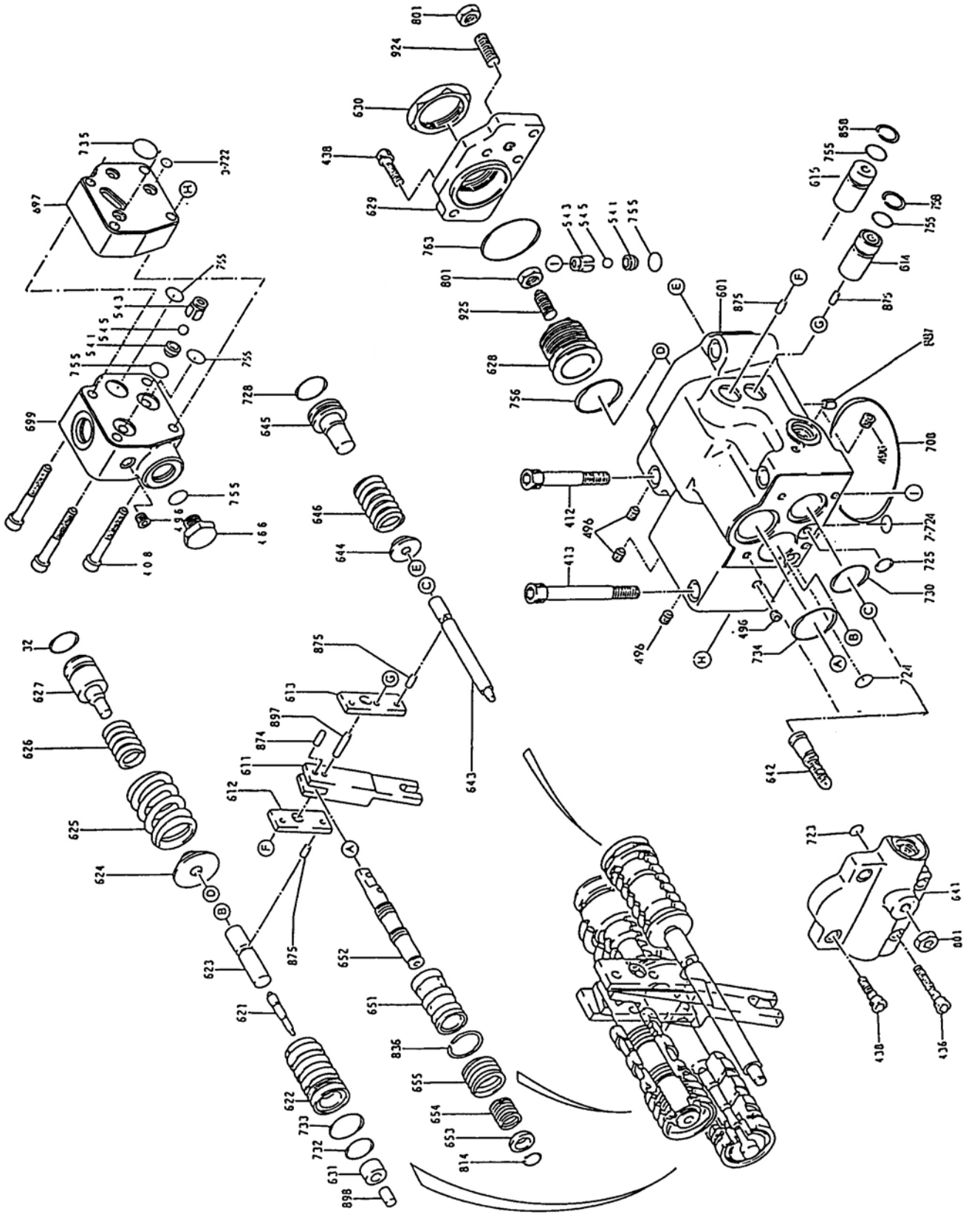
NOTE: *When installing, follow the same procedure in the reverse order.*

STEP 13

See Section 8001 and adjust the swing motor secondary relief valves.

NOTE: *Before operating the machine, start the engine, check the system for leaks and check the hydraulic oil level in the reservoir, top up if necessary.*

EXPLODED VIEW OF REGULATOR

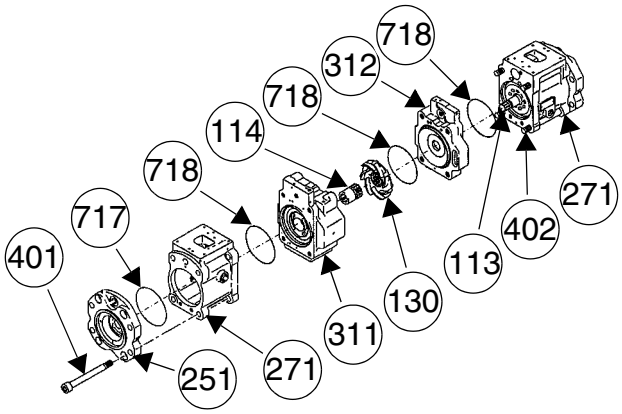


700.7.01.02.25W

REMOVING THE PUMP

NOTE: *The numbers in brackets refer to the drawing on page 14.*

STEP 1



CS02A528

Remove the screws (401) from the pump body (271). Remove the screws (402) from the pump body assembly (271). Remove the flange (251) and discard the O-ring (717).

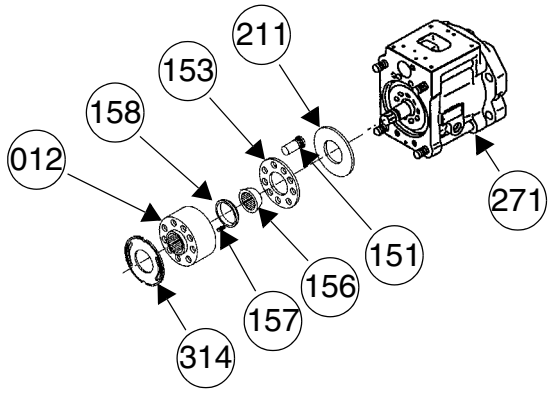
STEP 2

Place the pump horizontally on a table with the controller attachments upwards. Separate the pump body (271) from the intermediate housing (311). Remove and scrap the O-rings (718).

STEP 3

Separate the intermediate housing (312) from the intermediate cover (311). Remove and discard the O-ring (718). Remove the booster turbine (130) and remove the grooved coupling (114) from the rear shaft (113).

STEP 4



CS02A529

Remove the cylinder plate (314) from the pump body (271), then remove the rear cylinder block (012), along with the piston retaining plate (153), the pistons (151), the bearing (158), the plate (211), the springs (157) and the spherical bushing (156).

STEP 5

Remove the screws (406) from the flange (251) and remove the cover (261). Remove and discard the O-ring (710).

STEP 6

Remove the screws (407) from the pump body (271) and remove the cover (263). Remove and discard the O-ring.

STEP 7

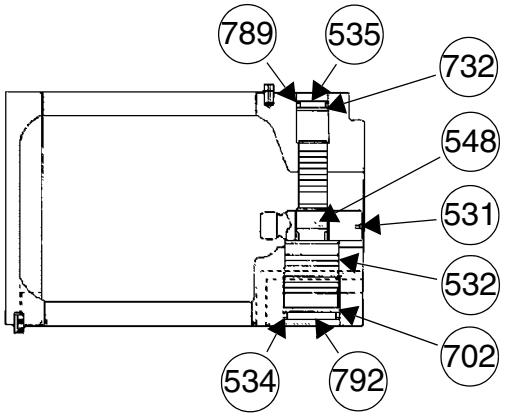
Remove the swash plate (212) from the pump body (271).

STEP 8

Remove the shafts (111) from the pump body (271) using a plastic mallet.

STEP 9

NOTE: *Operation to be carried out only in case of wear of the piston or the control pivot.*



CI01G502

Remove the snap rings (789) and (534) and remove the seal plates (535) and (792), discard the O-rings (732) and (702). Force the control pivot (531) blocking pin (548) out. Remove the control pivot (531).

NOTE: *The control pivot is installed using Loctite. Extract the control piston (532).*

NOTES

Disassembling the control valve

Separating the sections

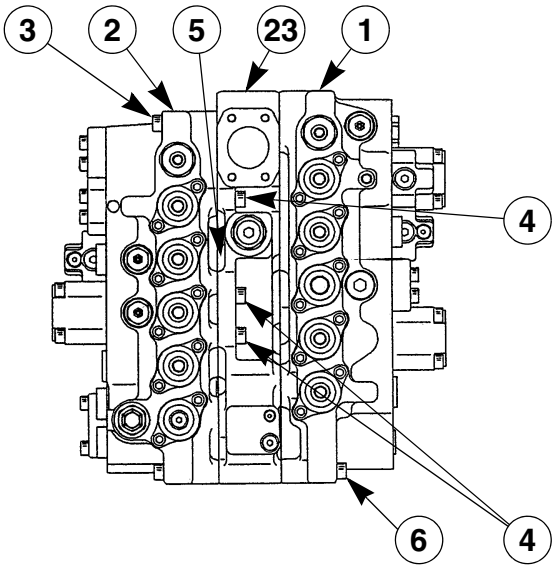
STEP 1

Remove the control valve from the machine, see Section 8004.

STEP 2

Clean the outside of the control valve with a suitable cleaning solvent to eliminate all impurities, grease or other foreign bodies. Dry, using low pressure compressed air.

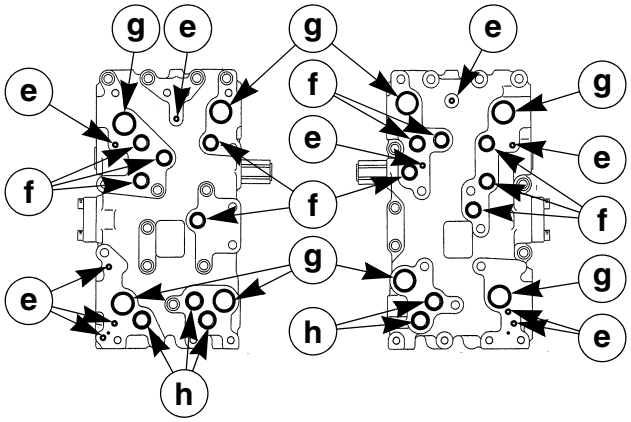
STEP 3



CS02A567

Separate the section (2) from the control valve block by removing the screws (3) and (4). Separate the section (1) from the block by removing the screws (5) and (6).

STEP 4



CS02A566

Discard the O-rings (e, f, g, and h).

Re-assembling the control valve

Assembling the sections

STEP 1

Install new O-rings (e, f, g and h).

STEP 2

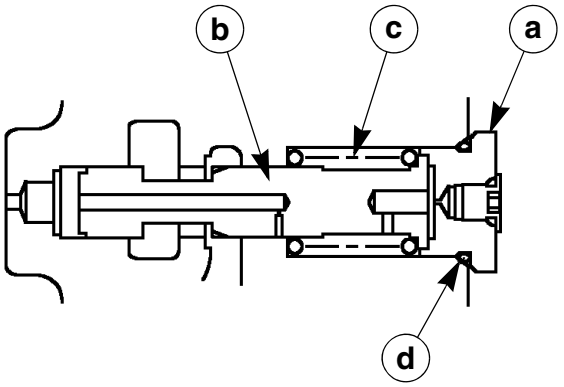
Assemble the section (1) with the connection section (23), then the section (2) using screws (3), (4), (5), (6). Tighten to a torque of 245 Nm (180.7 lb-ft).

STEP 3

For installation of the control valve on the machine, see Section 8004.

Installing the by-pass valve (3)

STEP 1



CI02A507

Install the spring (c) then the spool (b) in the control valve.

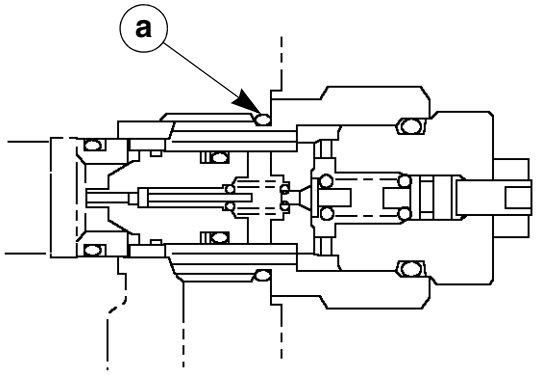
STEP 2

Install a new O-ring (d) on the nut (a), then install the assembly on the control valve, tighten to a torque of 245 Nm (180.7 lb-ft).

Installing the dipper out (D) and dipper in (E) port secondary reliefs

NOTE: *Do not touch the secondary relief adjustments during installation, otherwise see Section 8001 for the settings.*

STEP 1



CI02A511

Install a new O-ring (a) on the valve.

STEP 2

Install the boom raising secondary relief on the control valve, tighten to a torque of 98 Nm (72 lb-ft).

Carry out steps 1 and 2 for the other secondary relief.

Installing the plug (4)

Install and tighten the plug equipped with a new O-ring on the control valve.

Installing the non-return check valves (5), (6), (7)

STEP 1

Install the LH travel non-return check valve (7) on the control valve, tighten to a torque of 343 Nm (253 lb-ft).

STEP 2

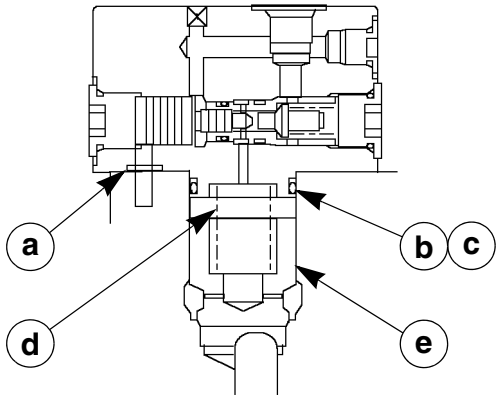
Install the boom 2 non-return check valve (5) on the control valve, tighten to a torque of 343 Nm (253 lb-ft).

STEP 3

Install the boom (6) non-return check valve on the control valve, tighten to a torque of 343 Nm (253 lb-ft).

Installing the dipper (13) and boom (14) load holding valve

STEP 1



CI02A505

Install the check valve (e) on the control valve, and then the spring (d).

STEP 2

Install new O-rings (a) and (b) and the back-up ring (c) on the boom load holding block.

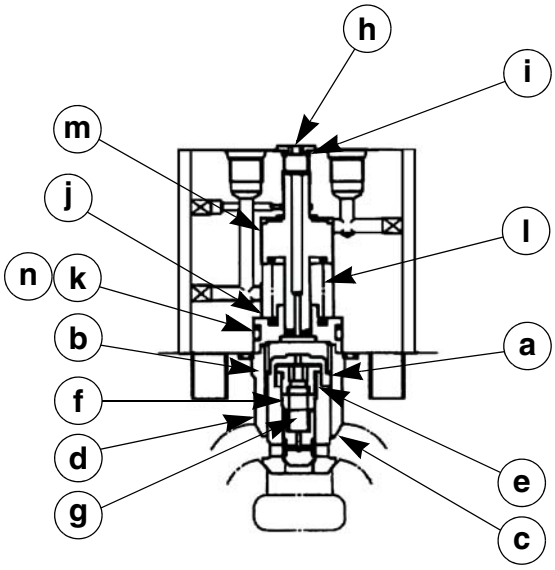
STEP 3

Install the boom load holding block boom on the control valve, tighten to a torque of 176.5 Nm (130 lb-ft).

ARM PRIORITY BLOCK (12), SWING PRIORITY BLOCK (29) AND BUCKET PRIORITY BLOC (15)

Disassembly

STEP 1



800-7-04-01-13I

a. Spring
b. Spring seat
c. Guide
d. Check valve assembly
e. Plug
f. Spring
g. Poppet
h. Plug
i. O-ring
j. Piston guide
k. O-ring
l. Spring
m. Piston
n. Back up ring

Remove the spring (a), the spring seat (b), the guide (c) and the check valve assembly (d).

STEP 2

Remove the plug (e), the spring (f) and the check valve (g) from the check valve assembly, using the tool **2**.

STEP 3

Remove the plug (h) and discard the O-ring (i).

STEP 4

Remove the piston guide (j) and discard the O-ring (k) and the back-up ring (n).

STEP 5

Remove the spring (l), then the piston (m) from the priority block.

Inspection

See "Inspection" chapter page 35.

Assembly

STEP 1

Install the piston (m) in the priority block.

STEP 2

Install a new O-ring (k) and a new back-up ring (n) on the piston guide (j), then install the assembly in the priority block.

STEP 3

Install a new O-ring (i) on the plug (h). Install the assembly on the priority block, tighten to a torque of 19.6 Nm (14.5 lb-ft).

STEP 4

Install a check valve (g), a spring (f) and a plug (e) in the check valve assembly (d). Position the check valve assembly (d) in a vice with protective jaws, using the tool **2** and tighten the plug (e) to a torque of 34.3 Nm (25 lb-ft).

STEP 5

Install the check valve assembly (d), the spring seat (b) and the spring (a) in the guide (c).

STEP 6

Install the guide assembly (c) on the control valve.

STEP 7

See "Installing the boom priority block, swing priority block or bucket priority block" chapter for installing the block on the control valve.

SPECIAL TOOLS

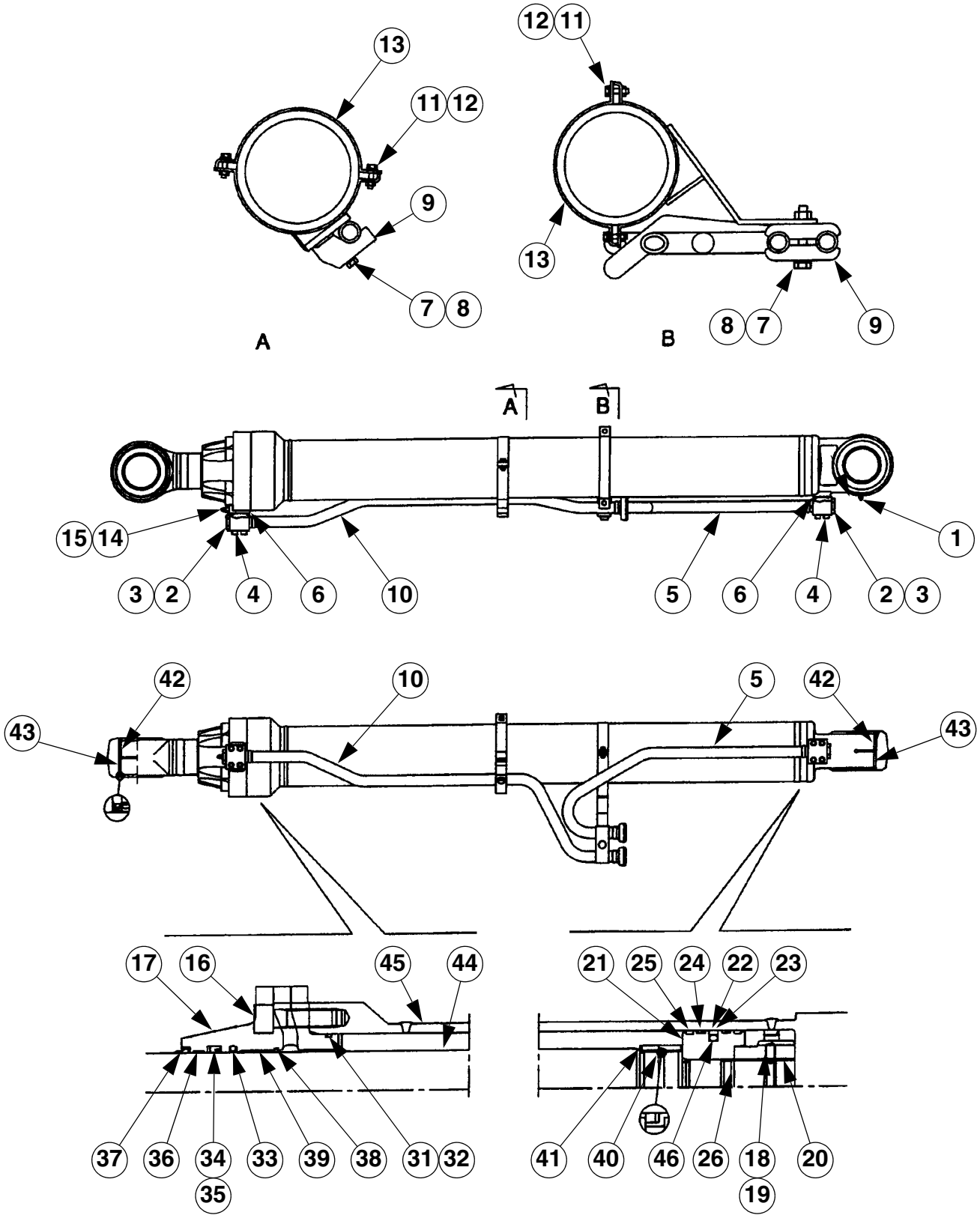
OEM 9797 Hydraulic cylinder repair bench
OEM 9798 Piston nut screw
PE.174E-220 Hydraulic/electric pump

or

CAS 10918 Hydraulic cylinder repairing bench

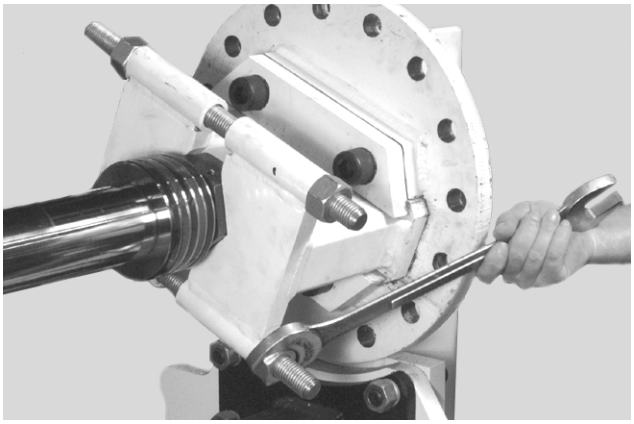
CYLINDERS

Boom cylinder description



CS02A507

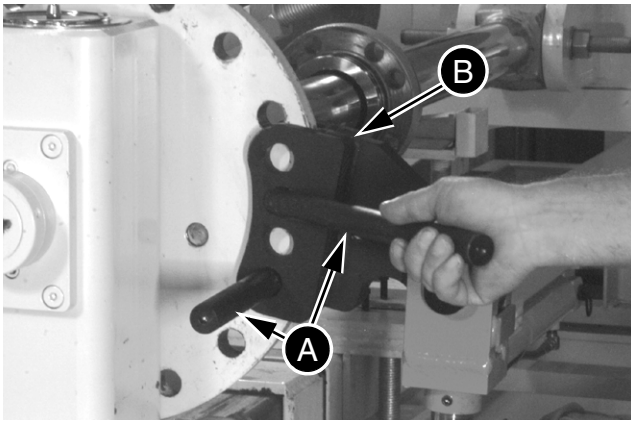
STEP 20



JD00637A

Loosen the tail stock chuck screws. Tighten the wrench nuts on the piston nut (20). Check that the wrench is centred by using the scale on the chuck.

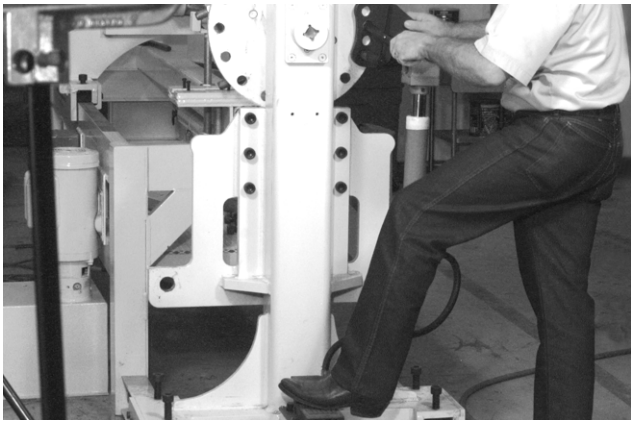
STEP 21



JD00638A

Lower the toggle assembly (B) as far as possible on the circular plate and install the stop bars (A).

STEP 22



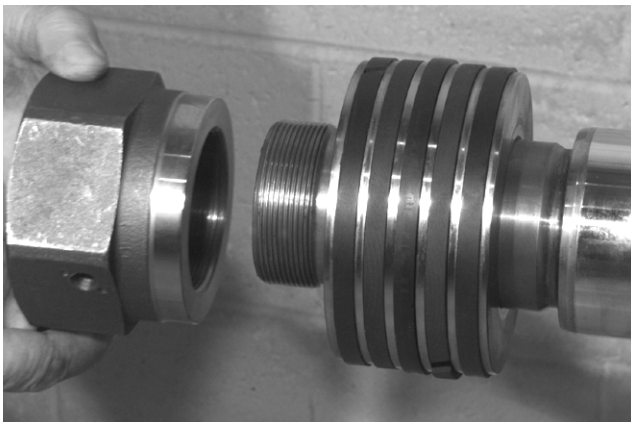
JD00639A

Start the hydraulic pump by pressing on the pedal to loosen the piston nut. At the end of the stroke, remove the two stop bars; if necessary, depress the rear of the pedal to retract the cylinder rod just enough to enable removal of the stop bars. Depress the rear of the pedal to retract the cylinder rod to lower the toggle assembly as far as possible on the circular plate then install the stop bars.

STEP 23

Repeat step 22, if necessary, until the piston nut has been loosened.

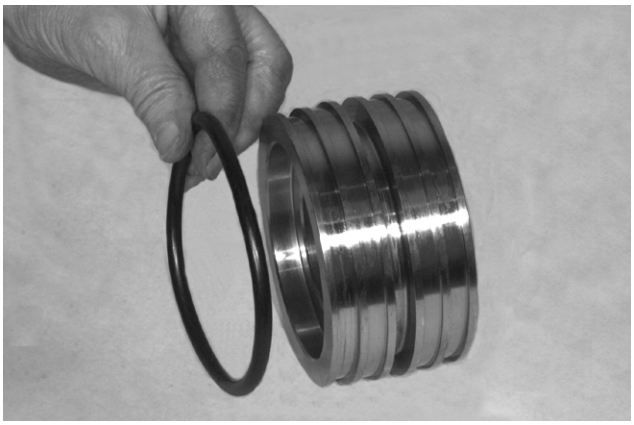
STEP 24



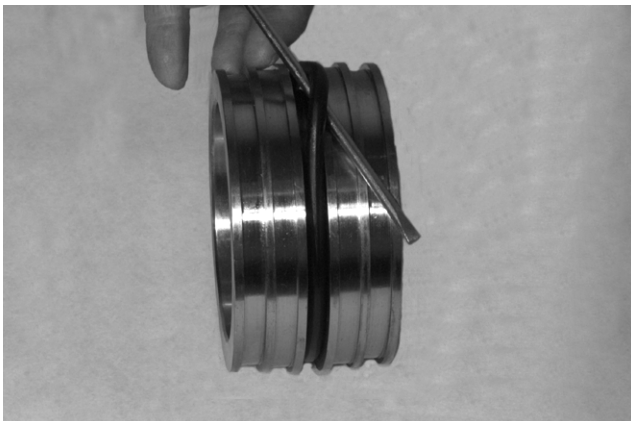
JD00640A

Remove the piston nut (20) from the rod.

STEP 7



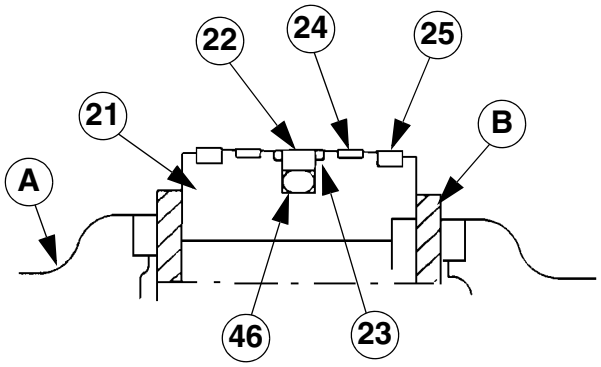
JD00647A



JD00646A

Coat a new O-ring (46) with clean hydraulic oil. Install the O-ring in the centre groove of the piston.

STEP 8

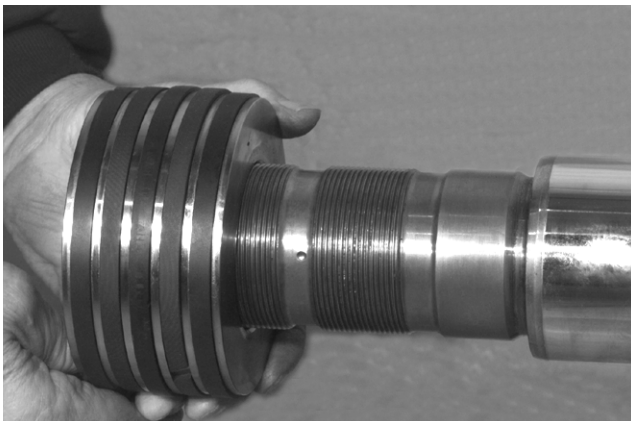


JS00645A

(A) VICE
(B) HARD WOOD

Place a tapered tool over the piston (21). Coat a new seal ring (22) with clean hydraulic fluid. Slide the seal onto the tool and install it in the groove of the piston on top of the O-ring (46). Install two new back up rings (23). Install four new sealing rings (24) and (25) in the grooves of the piston.

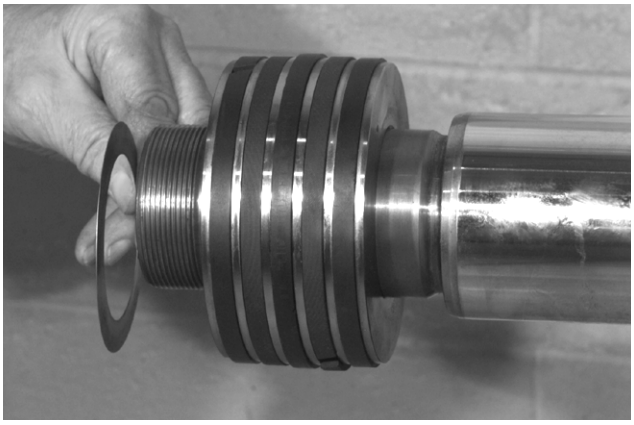
STEP 9



JD00642A

Install the bearing (17) then the piston (21) on the cylinder rod.

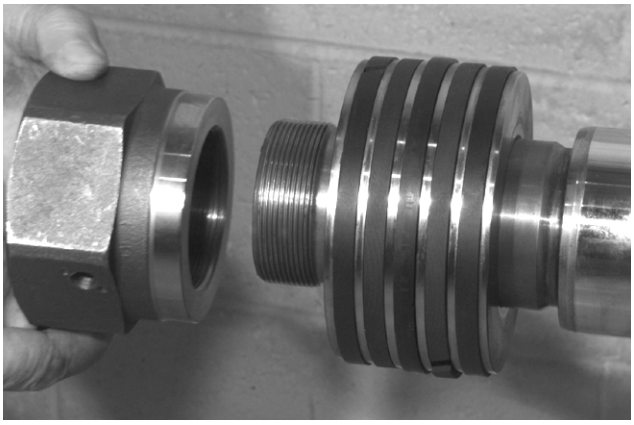
STEP 10



JD00641A

Install the shim (26) on the piston rod behind the piston.

STEP 11

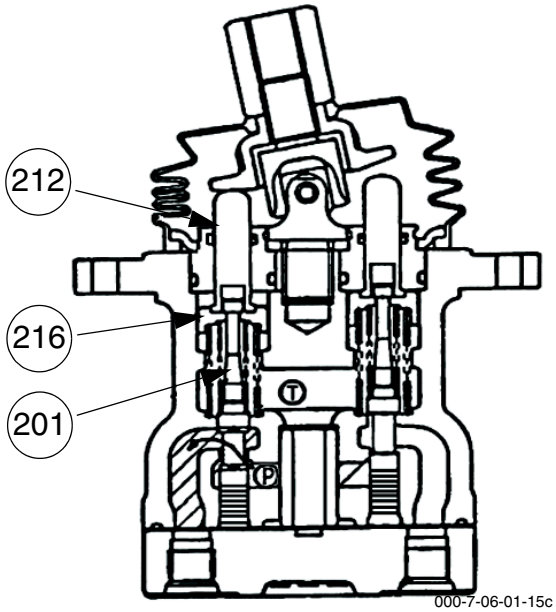


JD00640A

Install the piston nut (20) on the cylinder rod and hand tighten.

2) When the handle is inclined (Figure 3)

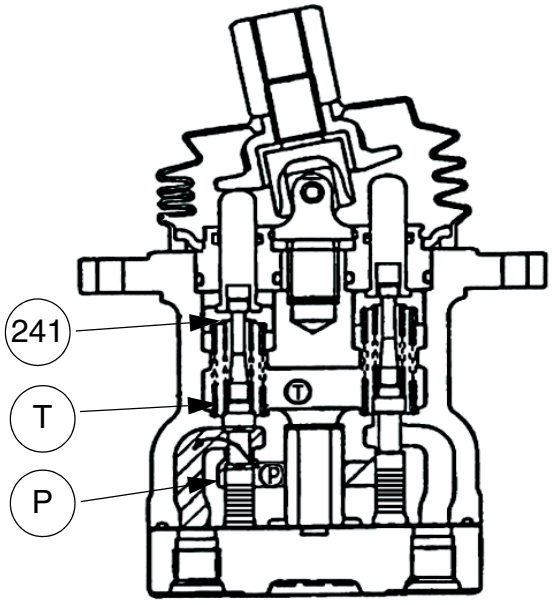
As the push rod (212) is pushed in by inclining the handle, the spool (201) (spring seat 1 (216)) moves downward and the port P and ports (2, 4) are connected. As a result, the oil supplied from the pilot pump flows into ports (2, 4), thus generating pressure.



000-7-06-01-15c

3) When the handle is held (Figure 4)

When the pressures at ports (2, 4) rise up to a pressure equivalent to the force of the spring (241), which was set by inclining the handle, the hydraulic force and the force of the spring are in balance. When the pressures at ports (2, 4) are more than the set pressure, ports (2, 4) and port P close and ports (2, 4) and port T open. When the pressures at ports (2, 4) are less than the set pressure, ports (2, 4) and port P open and ports (2, 4) and port T close. As a result, secondary pressures are maintained constantly.
(T) Port T
(P) Port P



000-7-06-01-15d

4) Operation in ranges where the handle is greatly inclined (depends on models)

In some models, when the handle is inclined more than a given degree, the upper end of the spool touches the bottom part of the push rod bore and the output pressure remains equal to the port P pressure as connected.
What's more, if a structure where the spring seat and spring are integrated in the inside of push rod is used, when the handle is inclined more than a given degree, the bottom part of the push rod bore contacts the spring, and the force of the spring causes the secondary pressure gradient to change. Afterwards, the bottom part of the push rod bore contacts the upper end of the spring seat; thus the output pressure remains equal to the port P pressure as connected.

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OPERATIONAL DESCRIPTION

Neutral position

In neutral position of the remote control, the control valve spool ends are connected to the tank through the spool F, the central and cross drilled orifices of the spools E and the remote control valve.
The control valve spool stays in neutral position.
When the lever is neutral, the heat oil separated from the oil cooler line enters the port "R" and flows to the reverse notch spool interior.
Then, after flowing through outer periphery of the respective cushion spools, the oil returns to the hydraulic oil tank through port "T" in the cushion valve

Inspection

STEP 1

Clean all parts using suitable cleaning solvent. Immerse valve housing in cleaning solvent for several minutes to dissolve dirt or other foreign matter inside valve housing. Use low pressure compressed air to blow out any foreign matter from interior of valve housing. Dry parts using clean cloths.

STEP 2

Inspect springs for cracks, distortion, or evidence of permanent set. Replace a spring if any of these defects are observed.

STEP 3

Check the spools for cracks, holes, distortion or other damage. Check that the spools slide easily in the groove of the control valve housing. If any defects are observed replace the cushion valve.

STEP 4

Check the plugs, flow restriction adapters, and spring guides for damaged threads. Check the ports in flow restriction adapters for foreign matter, chipping, or other damage. Check spring guides for bent condition. Replace a defective part.

STEP 5

Check the spacer for chipping, wear and signs of damage. If any of these conditions are seen replace the spacer.

STEP 6

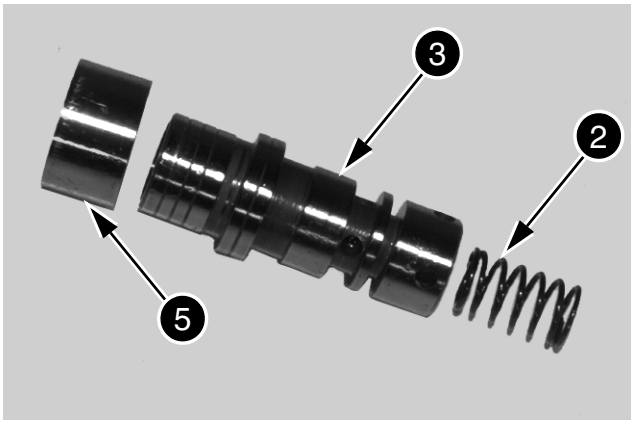
Check for damaged threads and signs of internal wear on the control valve housing. If any defects are seen, replace the cushion valve.

Assembly

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

NOTE: *Lubricate all parts with clean hydraulic oil. Ensure that parts are assembled in the same groove as they were removed from.*

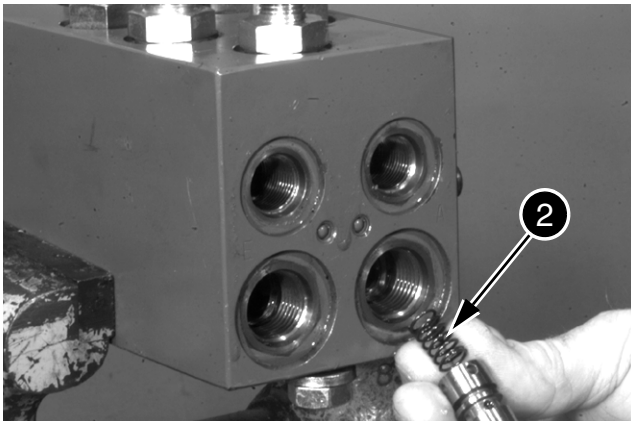
STEP 1



JD00559A

Install the spacer (5) on the spool (3).

STEP 2



JD00560A

Install the spring (2), the spool (3) and the spacer (5) in the control valve housing.

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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.*

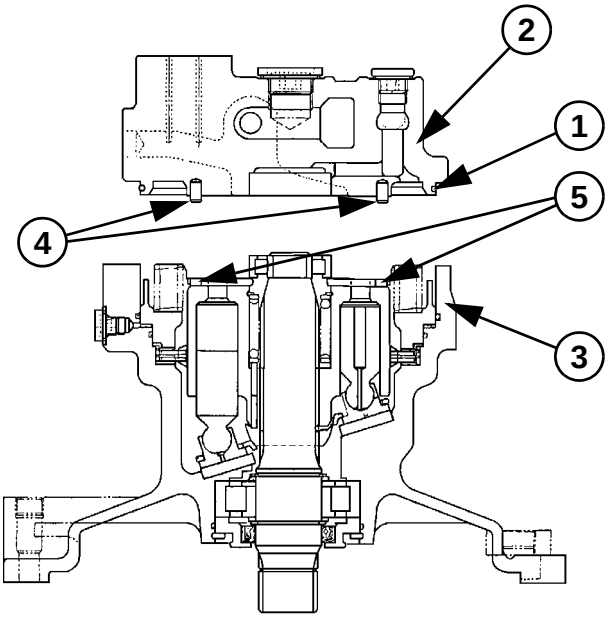
SPECIFICATION

See Section 1002.

SPECIAL TORQUE SETTINGS

Secondary relief assembly ..... 180 Nm (133 lb-ft)
Engine housing cover capscrew ..... 627 Nm (462 lb-ft)
Non-return check valve plug ..... 539 Nm (397 lb-ft)
Anti-rebound block retaining screw ..... 29 Nm (21 lb-ft)
Anti-rebound valve ..... 69 Nm (51 lb-ft)

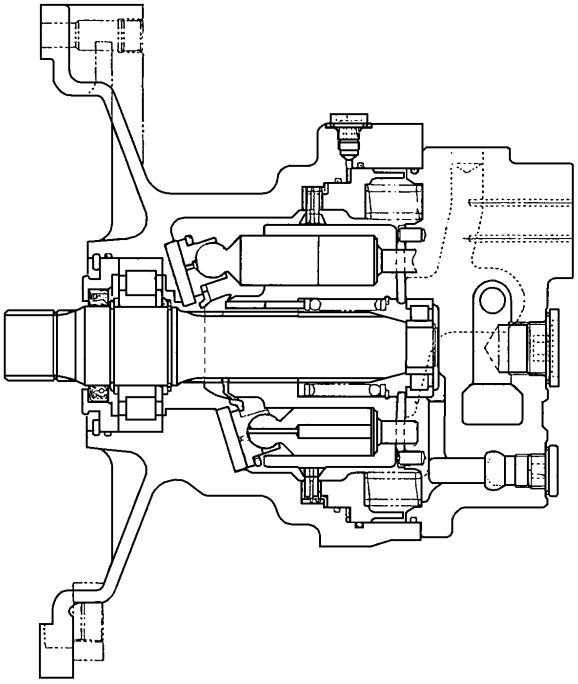
STEP 8



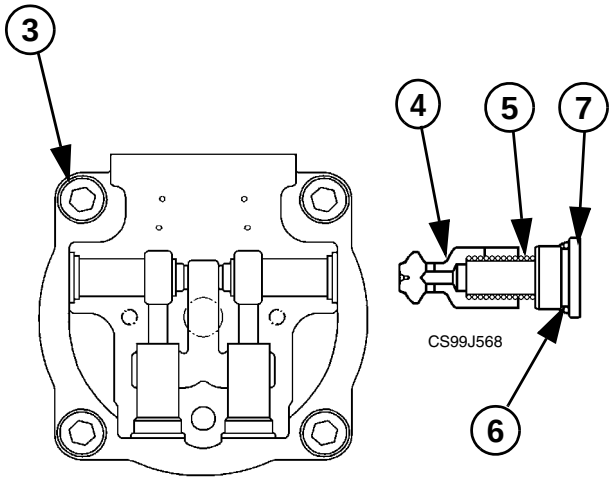
CS99J566

Install a new O-ring (1) on the control valve housing (2). Install the control valve housing (2) by aligning the mark made during disassembly and taking care to engage the pins (4) in the bores (5) of the distribution plate. Install and tighten to torque the four retaining screws (see special torque settings chapter).

STEP 9

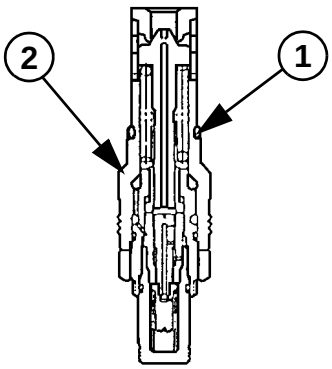


CS99J567



CS99J568

CS99J569



CS99J570

Install a new seal and back-up ring (1) on the main relief (2). Install and tighten to torque the main relief (2) on the control valve housing. Proceed in the same manner for the second main relief. Lubricate and install the feeding check valve (4). Install the spring (5). Equip the plug (7) with a new seal (6). Assemble the plug and tighten to torque (7). Proceed in the same manner for the second feeding check valve.

High Speed Travel Circuit

With High Speed Travel, high speeds can be achieved by setting the two-level inclinatory angle of the travel motor to the smaller angle side. The circuit has a travel motor that automatically switches over to lower speed by utilizing load pressure on the travel motor when travelling at high speed.

Discharged oil from the hydraulic pump A1 enters the Port P1 of control valve while discharged oil from the hydraulic pump A2 enters the Port P2 of control valve. Each flow goes into the travel motor by switching between the right and left travel spools. By these flows, the machine travels forward and backward.

By operating the travel mode switch, electric signals are sent to the controller, and from the controller, electric signals are sent to the solenoid valve for 2-speed (high speed) travel in the 8-way solenoid valve. By the switchover of the solenoid valve, the original pilot pressure (4.4 MPa / 44 bar / 638 psi) from Port C1 on the 8-way solenoid valve enters Port P of right and left travel motors via the rotating joint to set the inclinatory angle of the travel motor to the smaller angle side, which enables high speeds.

4pb1/4B1. RH forward travel
4pa1/4A1. RH reverse travel
5pa1/5A1. LH forward travel
5pb1/5B1. LH reverse travel
10. Main hydraulic pump
15. Main control valve
21. Travel motors
25/26. Boom cylinders
61. 8 solenoid valve bank
A1. Computer / Controller
C1. Travel 2nd speed pilot
S2. Travel mode switch
Y2. Pilot pressure solenoid valve (blue band)
Y4. 2 stage travel solenoid valve (red band)

Swing Push Digging

Pilot pressure for swing is fed in the port 5pc4 via shuttle valve and restricts stroke of large puppet in the swing priority valve allowing discharged oil to the arm to flow via the constriction.

In simultaneous operation of arm and swing, constriction of parallel circuit allows swing pressure to increase and secure power of swing during press digging operation.

5pb2/B2.	LH swing
5pa2/A2.	RH swing
10.	Main hydraulic pump
15.	Main control valve
22.	Swing motor
54.	Swing control valve
61.	8 Solenoid valve bank
A1.	Computer / Controller
B22.	Swing pilot pressure switch
B26.	Upper pilot pressure switch
B42.	Pump pressure sensor P1
B44.	Pump pressure sensor P2
C2.	Swing brake pilot
S8.	Swing brake switch
Y2.	Pilot pressure solenoid valve (blue band)
Y3.	Swing brake solenoid valve (pink band)

Boom-Up Circuit (Single)

Oil discharged from hydraulic pump A1 is supplied to the boom (2) spool from the parallel oil passage via the control valve and merges at the downstream of the boom (1) spool. Oil discharged from hydraulic pump A2 merges with the discharged oil from the boom (2) via the boom (1) spool through the parallel oil passage and flows into the bottom side of the boom cylinder via the holding valve.

5pa4/5A4.	Lowering the boom (Boom 2)
5pb4/5B4.	Raising the boom (Boom 2)
4pb3/4B3.	Lowering the boom (Boom 1)
4pa34A3.	Raising the boom (Boom 1)
10.	Main hydraulic pump
15.	Main control valve
25/26.	Boom cylinders
27.	Arm (Dipper) cylinder
28.	Bucket cylinder
53.	Boom control lever
57.	Boom and arm (dipper) control shock absorber

Combined Circuit (High Speed Confluence Circuit)

Through remote control operation, the pilot pressure that is supplied to Port 5A3 (or 5B3) of the control valve switches the backup spool. This allows the discharged oil from the hydraulic pump A1 to flow into the end attachment.

Turning the change-over switch in the cab to crusher (2) energizes the solenoid valve so that the valve is switched over.

Pilot pressure divided via remote control valve is fed in the port 4pc2 by way of solenoid valve.

This changes over the spool to block the center-bypass circuit.

The blocked discharge oil of hydraulic pump A2 flows by way of merging passage to be combined together with the dischaged oil out of hydraulic pump A1 at upper flow course of the spare spool.

5pa3/5A3. Breaker/Crusher circuit
5pb3/5B3. Crusher Circuit
10. Main hydraulic pump
15. Main control valve
72. Control pedal
76. 3-way selector
78. Return filter
83. Shut-off valve
A1. Computer / Controller
A2. Engine Controller
B25. Breaker pilot pressure switch
S14. Breaker/Crusher Switch
W4. Breaker safety valve
Y9. Breaker/Crusher two flow solenoid valve

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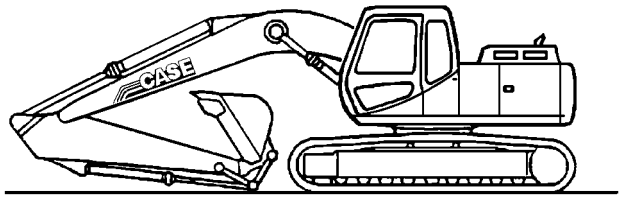
FAN PUMP

Removal

STEP 1



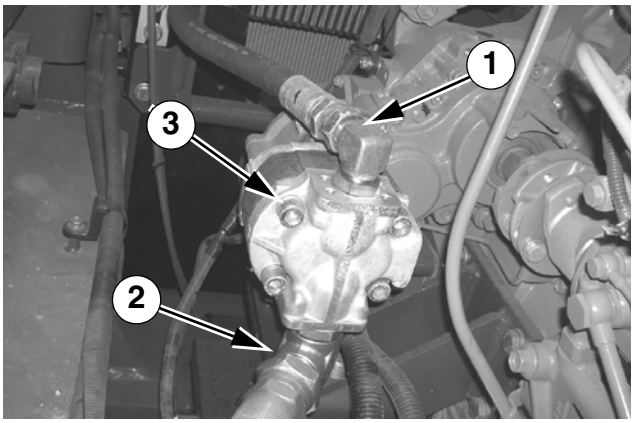
JS0016A

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



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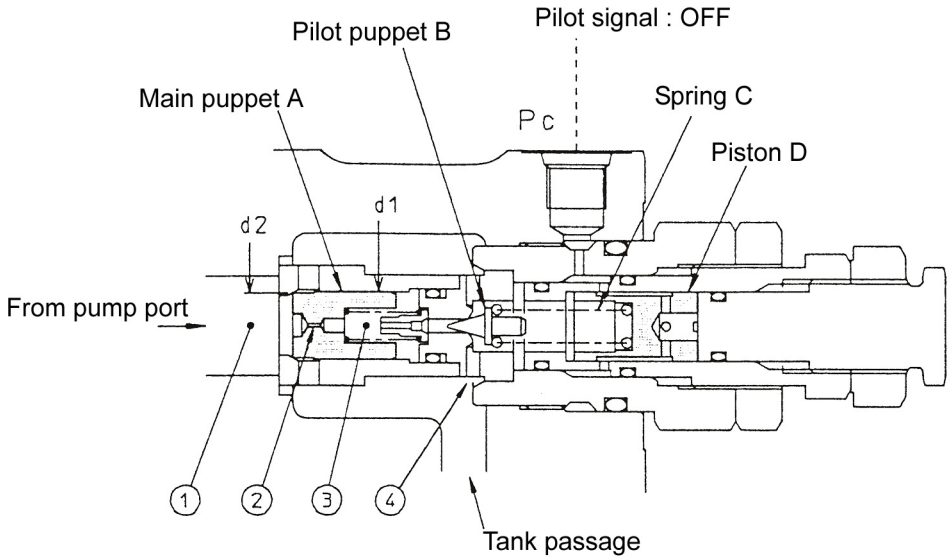
Label and disconnect the hoses (1) and (2).
Remove the screws (3) fixing the fan pump and remove the fan pump.

1. Main Relief Valve

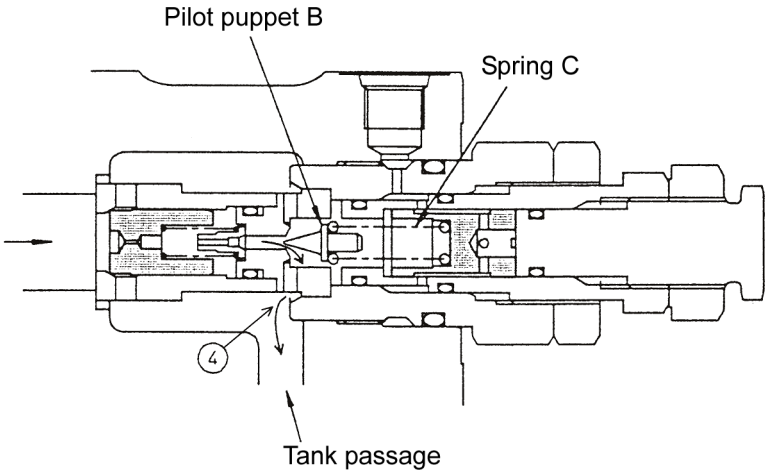
[1] Usual pressure set time (Pc pilot signal: OFF)

Piston D is located at the right side of the spring C.

1) Pressured oil from the pump runs into the room [3] through the orifice [2] of the main puppet A. Being d1>d2, the main puppet A is entirely seated.

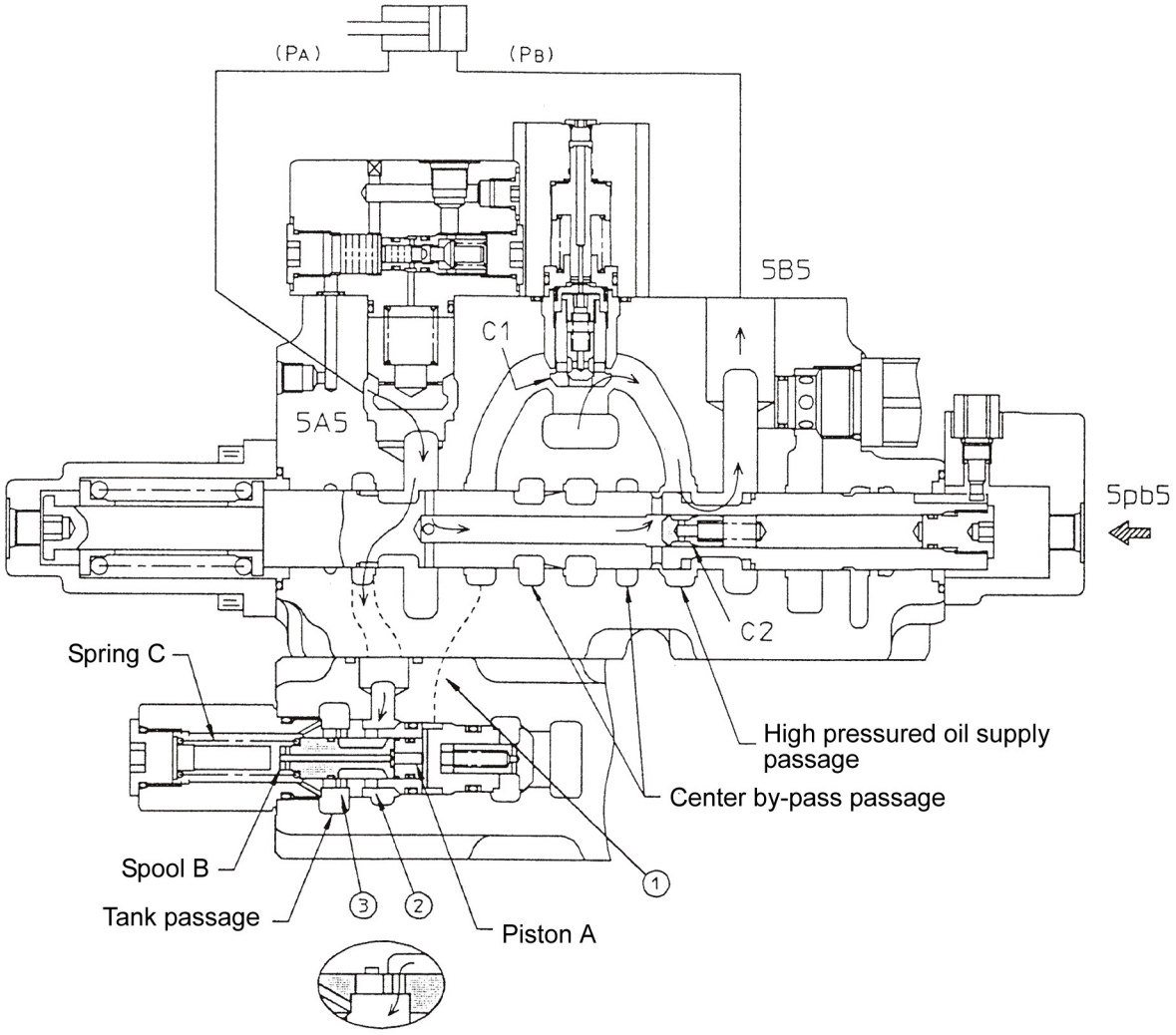


2) When the pressured oil reaches to the pressure that was set by the spring C, the pilot puppet B opens and the oil runs to the tank passage through the horizontal hole [4].



[2] When the pressure in the rod side is higher [PA>PB].

As the head side pressure is lower, the recharge switching spool is located as shown above and, being the rod side returning oil throttled by the small hole [1], the check C2 in the plunger is let open and the oil is again supplied to the head side through the high pressured oil supply passage.



5. Brake Section

The cylinder (111) is connecting with the tooth gear of the drive shaft (101), the separator plate (743) is tapped to the casing and the circle rotation around the cave is banned.

The friction plate (742) connecting with the tooth gear around outer circle of the cylinder, is pushed into the casing (301) by the brake spring (712) with acting of the separator plate (743) and the brake piston (702), which produce the frictional force between the friction plate and the casing, the separator plate and the brake piston. This frictional force bans the drive shaft and makes the brake action.

To change the releasing pressure in the oil chamber formed between the brake piston and the casing, the oil pressure overcomes the spring force, makes the brake piston move, the friction plate is not pushed by the casing, the brake is released

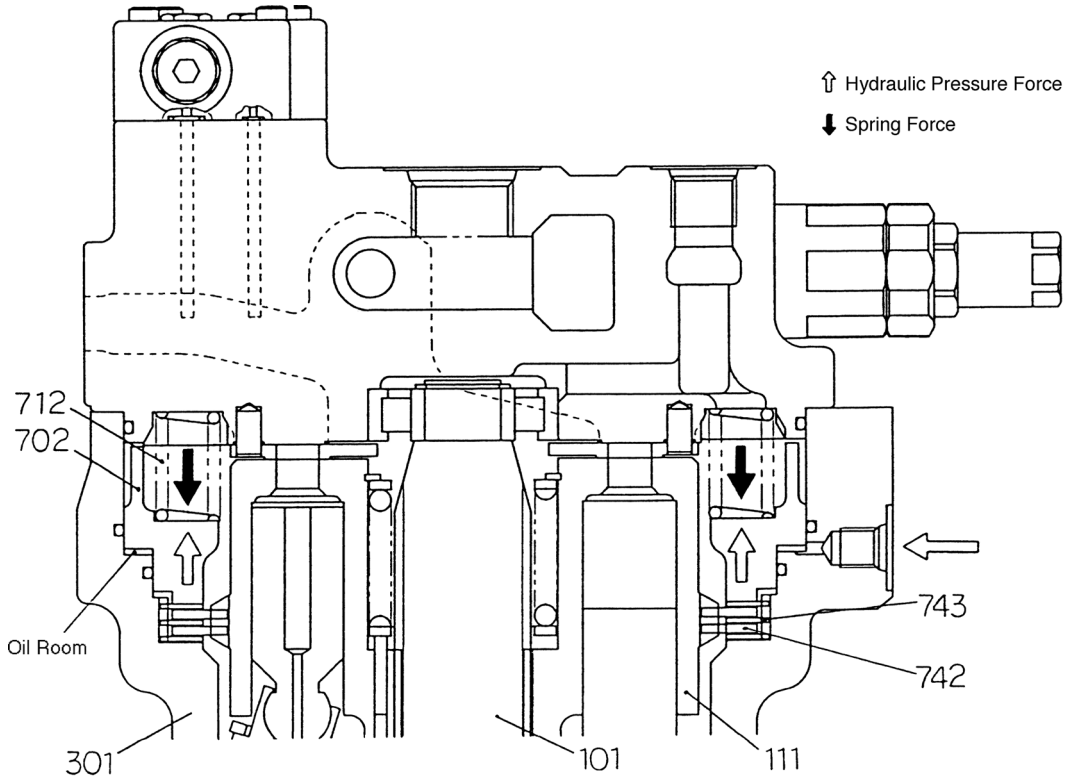


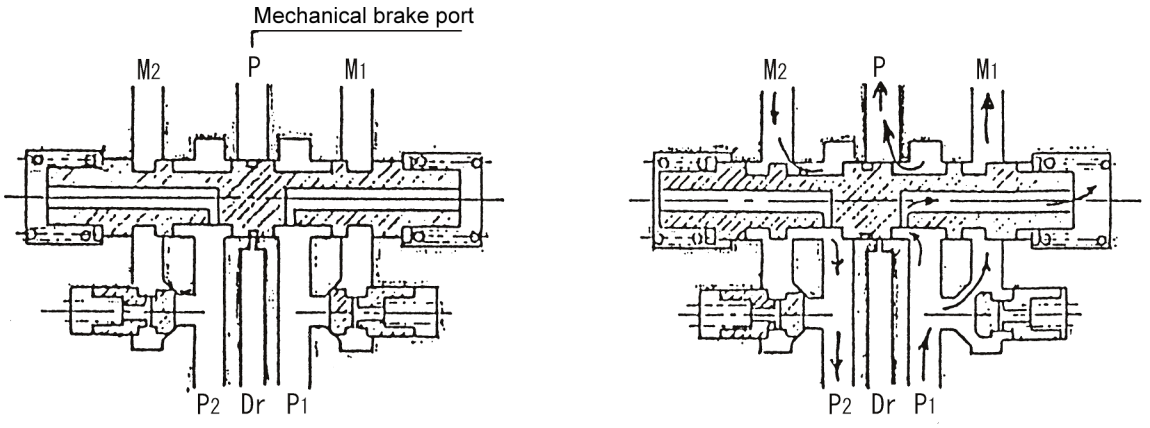
Fig. 3 Brake Operation Diagram

[1] Counter balance valve

Counter balance valve is the valve to prevent the piston motor from stopping and overrunning.

When controlling counter load speed during pumping operation of the piston motor, it controls oil quantity on the return side to keep the primary pressure (P1 or P2) of valve constant and maintains traveling speed reflecting oil quantity supplied by the motor and as a result, preventing the vehicle from deviation of traveling speed.

In addition, since pressure will not be generated in both ports of P1 and P2 when the control valve is at its neutral, the plunger of counter balance valve is at neutral position so that vehicle will not move as the motor port is blocked.



When braking

When Operating

(P_1) When high pressure

Shuttle function

When plunger in counter balance valve is in actuation:

Pressurized oil (P1 or P2) is introduced into the cylinder chamber for releasing parking brake in the piston motor from the port P to release the parking brake.

When plunger in counter balance valve is at neutral:

Pressurized oil is directed to the tank passing through the cylinder chamber for releasing parking brake and the port Dr to actuate the parking brake.

[2] Check valve

Check valve is the valve for preventing cavitation generated by overrunning of the piston motor.

When the piston motor is rotated from the vehicle body and the speed on pumping operation surpasses the speed matching the oil quantity supplied to the motor, insufficient oil is sucked up from the control valve into the hydraulic circuit via check valve and avoids vacuum generating in the circuit to prevent the vehicle from deviation of vehicle speed.

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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.*

SPECIAL TORQUE SETTINGS

See Section 1002.

SPECIFICATIONS

Weight ..... See Section 1002
Quantity of grease to be applied to the turntable ..... See Section 1002

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SPECIFICATIONS

See Section 1002.

Installation

NOTE: *Carry out Steps 1 and 2 only if the bushings (6) were removed.*

STEP 1

Install new seals (8) on the boom.

STEP 2

Using a suitable sleeve, install the bushings (6) on the boom.

STEP 3

Attach a suitable lifting device to the boom. Lift the boom and bring it in position, check the alignment of the ports of the boom and the undercarriage.

STEP 4

Install the pin (3).

STEP 5

Using a set of spacer rings, check that the play between the boom and the undercarriage is 4 to 6.5 mm. If required, remove the pin (3) and add one or more shims (5) in order to get the correct play. Install the pin (3).

STEP 6

Install the screw (1) and the washer (2).

STEP 7

Connect the boom cylinder rods to the boom, see Section 8005.

STEP 8

CRPH06F009A

Start the vacuum pump and remove the plugs from the hoses. Connect the bucket and dipper supply hoses at the bottom of the boom. If equipped, connect the option hoses. Stop the vacuum pump. If equipped, clamp the pilot hoses of the dipper cylinder safety valve on the boom. Connect the electrical harness for the boom working light.

STEP 9

Install the dipper cylinder on the boom, see Section 8005.

STEP 10

Install the dipper and the bucket, see page 8.

STEP 11

Bleed the cylinders, see Section 8000.

STEP 12

Grease the linkages.

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

SPECIFICATIONS

Cab weight	255 kg

SPECIAL TORQUE SETTINGS

Cab retaining screws	78 to 80 Nm (57.5 to 59 lb-ft)
Battery housing retaining screws	20 to 29 Nm (14.7 to 21.3 lb-ft)

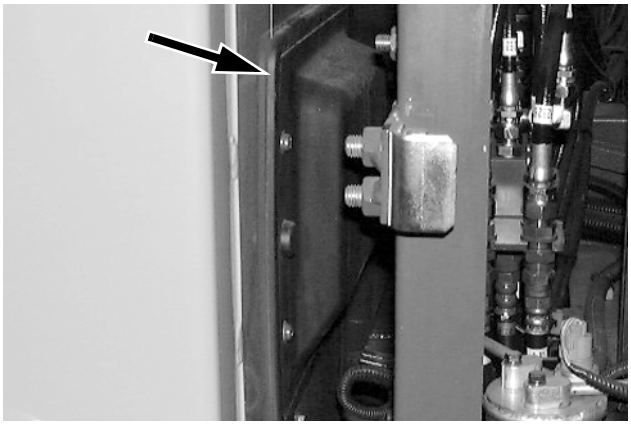
Installation

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

STEP 1

Install the heating or air-conditioning block in the cab using screws (6), brake washers and flat washers.

STEP 2



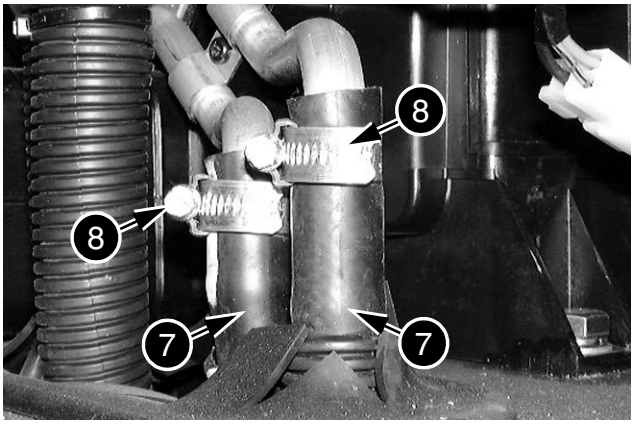
CD00G007

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

STEP 3

Install the ventilation conduits (1), (2) and (3) of the cab (see page 8).

STEP 4

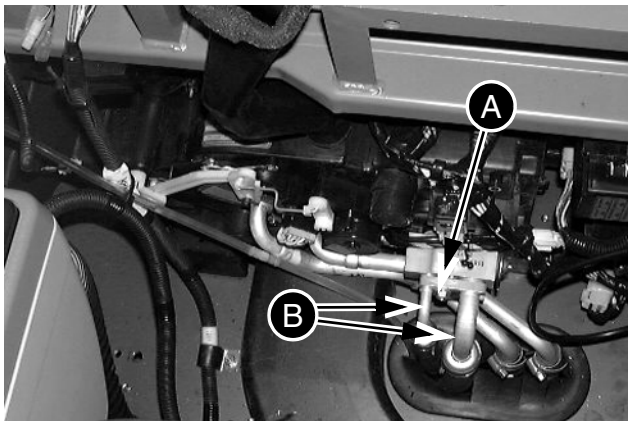


CD00G044

Install the heater hoses (7) and tighten the retaining clips (8).

NOTE: *Carry out Steps 5 and 6 only on air-conditioned machines.*

STEP 5



CD00G006

Remove the plugs from the air-conditioner and the hoses (B), install new O-rings on the hoses (B) and install the hoses (B) on the air-conditioner, tighten the screw (A) to a torque of 7.8 to 11.8 Nm (5.7 to 8.7 lb-ft).

STEP 6

Fill the air-conditioning circuit, contact an authorized engineer.

STEP 7

Connect the blower supply electrical harness.

STEP 8

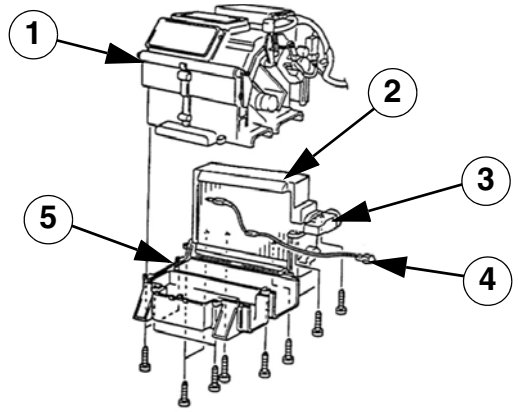
CD00G003

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

STEP 9

Install the operator's seat in the cab (see Section 9004).

STEP 7



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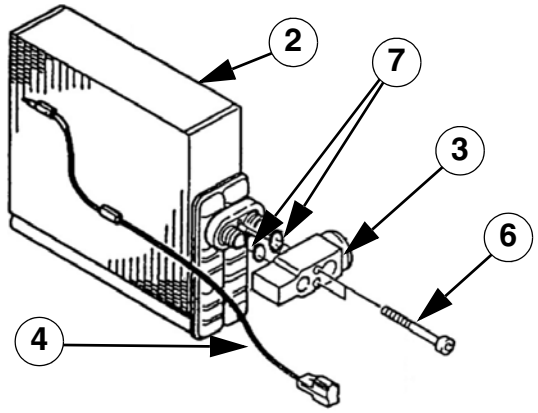
Remove the motor actuator mounted on the lower unit case (5) and the upper unit case (1) by removing 3 screws.
Remove the 11 mounting screws (5 x 16) from the lower unit case (5) and the upper unit case (1).
Pull upward the upper unit case (1).
WARNING: *Paying attention not to have evaporation sensor cords caught by the case.*

STEP 8



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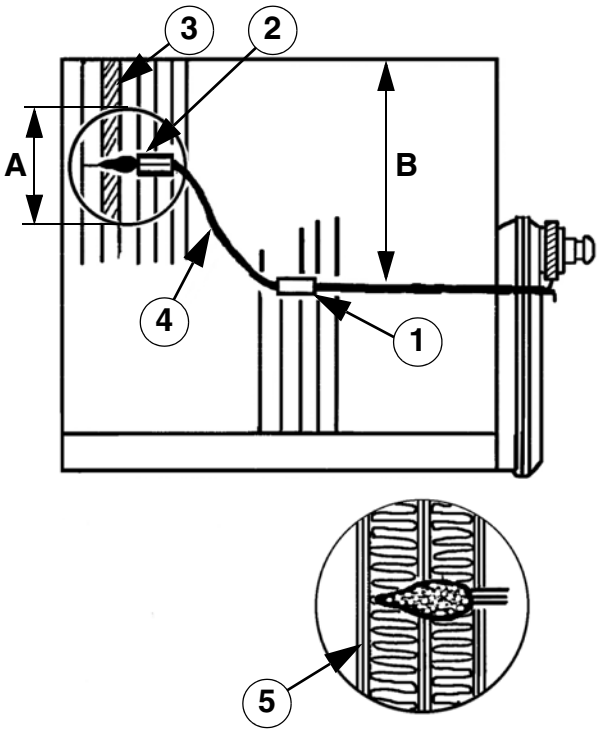
Pull out the evaporator (2) with its heat insulating material attached from the lower unit case.
Pull out the evaporation sensor (4) with its sensor holder attached from the evaporator.
Remove the 2 hexagon bolts (6) (M5x40) from the evaporator, and then, remove the expansion valve (3) from evaporator.
Install O-rings (7) (5/8 and 1/2 NFO rings) onto a new evaporator and then fit the expansion valve.

NOTE: *Special care should be taken while installing to avoid O-ring engagement. Do not reuse O-rings. Install O-rings with bare hands.*

STEP 9



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Installing the evaporation sensor:

NOTE: *Attach the evaporation sensor to the holder, place the tip of the holder and sensor in place as shown in the figure above.*
A = 70 mm (2.75 in)
B = 150 mm (5.90 in)
(1) Insert sensor holder into 13th and 14th columns.
(2) Insert sensor holder into 5th and 6th columns.
(3) 3RD column.
(4) Ensure no unnecessary looseness.
(5) Do not allow tip of the thermistor to extrude from tube to the left.

TORQUE SPECIFICATIONS

Tightening torque of the bolts connecting the center frame to the power side frame:

..... M36: 2750 Nm 2025 lb-ft, 280 kgf.m)
M30: 1960 Nm (1446 lb-ft, 200 kgf.m)
Tightening torque for the piping cover bolt ..... 137 Nm (101 lb-ft, 14 kgf.m)
Tightening torque for the counterweight ..... 2260 Nm (21664 lb-ft; 230 kgf.m)

MATTERS TO REQUIRING ATTENTION

1. Do not remain in the lifting area, under the load lifted. This may cause accidents if the load happens to fall.
2. For the work in the high position, take special care not to drop any tools parts from the work place.
3. Do not remain in the machine working radius while it is working. This may cause accidents or personal injury.
4. Take special care for any accident due to something put in the tool or machinery.
5. Make sure to carry out the safety check. Check prior to the start of the work before the engine starts:

   - Be always sure to make safety check, for the surrounding environment.

   - Make sure to confirm the hydraulic oil quantity.

6. For preventing any dust contamination, take off your gloves when connecting hoses.
7. When tightening the nuts for the attachment connecting pins and the detent bolts, loosen one pitch first and then start tightening.
8. Check the designated torque amount for any portion where the tightening torque is specified.
9. Refer to the discharging pressure in the pressure measurement and adjustment procedure.

PREPARATION

Preparing to assembly/ disassembly work area

1. Mapping out the access road.
2. Major layout and position.

Purpose

1. To prepare the assembly/disassembly work place (the space needs 20 m x 35 m (65x115 ft) area and the ground must be level and firm).
2. To map out the access road (access road is required for large trailer truck, attention to the width and gradient).
3. To set up major layout in the work place (obtaining heavy machinery and operating place for it).

Matters requiring attention

1. Preparation and care before the excavator components are brought in when the machine is disassembled and is loaded, the uppers machine are to be placed in such position where the machine body and the lower frame sit sideways (since they are assembled in the side way position).
2. Mapping out the area for assembling.
3. Since the crane is used for lifting work, the site must be on firm and level ground.
4. Space: A total of about 20 m x 35 m (165x115 ft) is needed, working space calls for 6.5 m (22 ft), width x 8 m (27 ft) length area.

MOUNTING TRAVEL MOTOR LINES

Mounting work procedure

1. Take off the motor piping cover.
2. Connect the pipes to the travel motor.
3. Fit the cover of the motor piping.
4. Other fitting (Catwalk, handrails, etc....).

Purpose

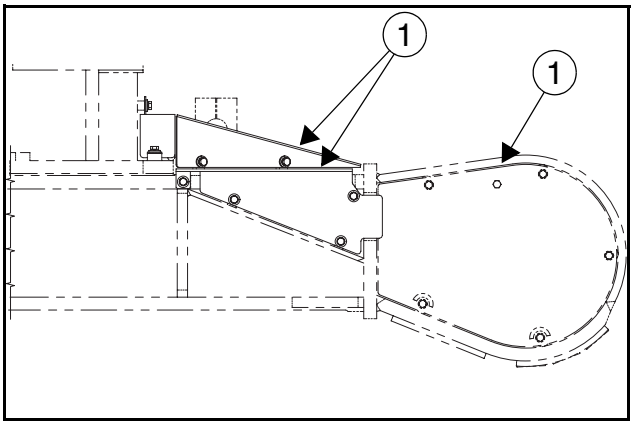
To mount the travel motor lines and to fit the catwalk, handrails, etc....

Warning

1. Hose connection work must be carried out without hand gloves for prevention of dust/dirt contamination.
2. After the piping connection is completed, start the engine and check there is no oil leakage.
3. Since the right side handrail for the operator's cab hinders the mounting work on the boom, it is not necessary to fit it at this time.
4. Tightening torque for the piping flange screws is 101 lb-ft (14 kgf.m).

PROCEDURE FOR MOUNTING TRAVEL MOTOR LINES

To connecting the piping of the travel motor



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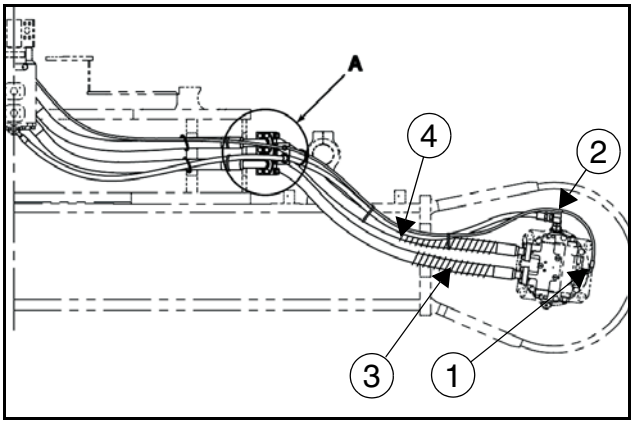
1. Take off the piping cover (1).



800-1-06-00-05F

2. Connect the hoses of the travel motor line to the pipes.

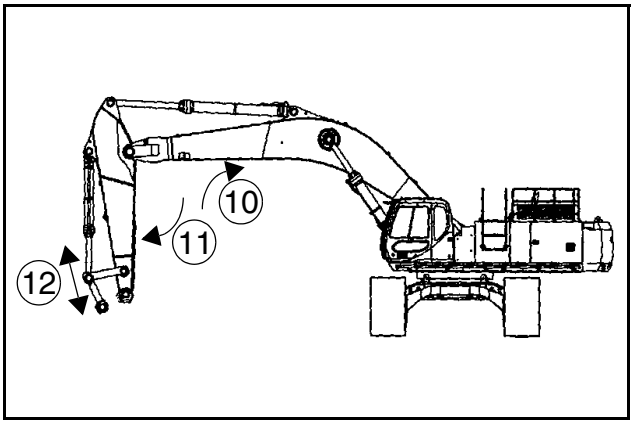
   - Prepare an oil tray before the hoses are taken off.

   - Connect the hoses (pilot (1), drain (2), forward (3), and reverse (4)).

   - Fix the hoses with the band and clean the hoses with the cleaning liquid to eliminate all trace of oil.

   - Check the hydraulic oil amount and, if necessary, add oil.

   - Start an run the engine at low speed. Check there is no oil leakage after shifting the control lever to the forward and reverse travel positions.



CS01K588

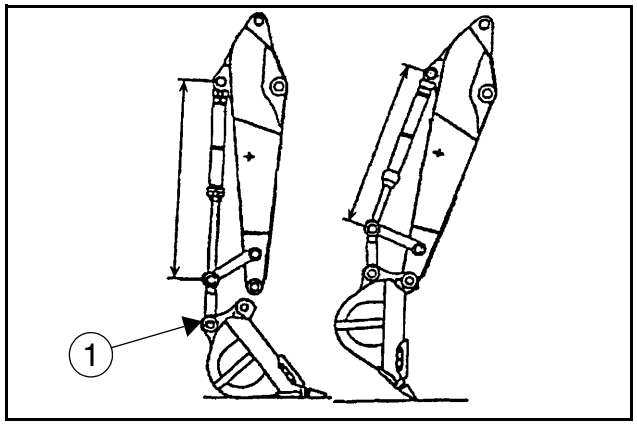
6. Bleed the out air inside the cylinder by slowly extending and retracting the bucket cylinder.

   Raise the boom (10).

   Extend the dipper (11).

   Move the dipper to the vertical position (12). (Use elevated platform vehicle).

Bucket fitting



CS01K589

1. Insert the dummy pin (Ø50x1200 mm, Ø2x5 in) (1) in the bucket link and bucket pin holes.
2. Raise the bucket and align the dipper top and bucket.
3. Align the position of both holes of the dipper top boss and the bucket boss (mount the O-rings).
4. Apply grease to the dipper top pin.
5. Drive in the dipper top pin.
6. Insert the detent pin and fix with safety ring.
7. Place the bucket on the ground and remove the dummy pin.
8. Align the position of the boss holes of the bucket link and of the bucket by extending and retracting the bucket cylinder.
9. At the same time, mount the O-ring.
10. Apply grease to the bucket pin.
11. Drive in the bucket pin.
12. Insert the detent pin and fix with the safety ring.