



SHOP MANUAL

WHEEL LOADER

L3-2

L4-2

L5-2

L6-2

TCM CORPORATION

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Scope of Description and Usage of This Manual

■ To Readers of This Manual

This manual provides service staff who have completed basic training with technical information necessary for service activity. For obtaining satisfaction and trust from customers, you are expected to read through this manual and acquire correct product knowledge and service technique.

■ Reference Material

This manual does not, in principle, describe basic items and overlapped areas with other materials (below) to eliminate redundancy.

- For handling and inspection procedures, refer to "Operation & Maintenance Manual."
- For structure and component parts, refer to "Parts Manual."
- For handling, maintenance procedure and parts of the engine, refer to materials issued by the engine manufacturer.

■ Organization

This manual is organized into four parts: 1. General Instructions 2. Construction and Function 3. Oveahaul 4. Troubleshooting

1. General Instructions

Safety during maintenance work and general cautionary instructions are compiled.

2. Construction and Function

An explanation of the construction and function and an explanation of operation (function) by illustrations, circuit diagrams and system diagrams are compiled.

3. Oveahaul

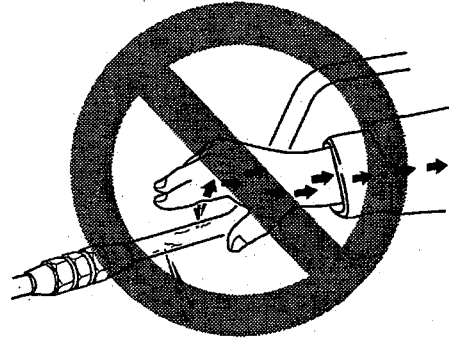
Methods of removing hydraulic equipment from a vehicle, its disassembly and reassembly, its adjusting method, standard values used for service work and service limits are compiled.

4. Troubleshooting

Probable causes and corrections for troubles are compiled.

General Precautions for Safety Operation

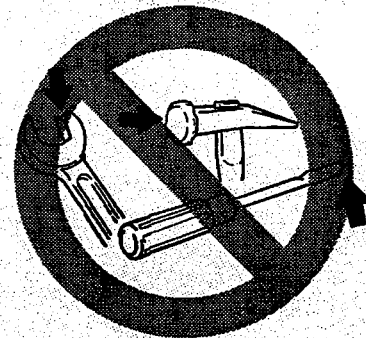
17. DO NOT check an oil leakage with your hand. If oil gets into your body, it is very dangerous. Especially, DO NOT approach oil leakage from pin-hole.



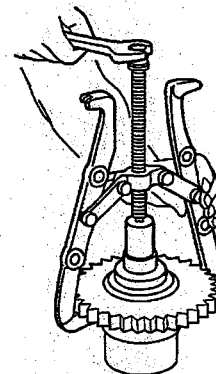
18. Before disconnecting a pipe or a hose for hydraulic and pneumatic systems is to be removed, relieve the internal pressure. Before disconnecting an air piping, discharge the air in the tank. Before disconnecting a hydraulic piping, move the working equipment control levers to relieve the internal pressure, and then remove the tank cap. If high pressure oil blows out it is very dangerous.



19. Always check the tools to be used. DO NOT use any spanner whose corners are chipped, a hammer whose edges are folded, a broken screwdriver, etc. If an improper tool is used, the part is damaged and, further, you may be injured. use proper tools and work carefully.



20. For work where a special tool is recommended, always use the specified special tool. If any unspecified tool is used, it might cause damage or injury.



Disassembly and Assembly

Tightening Torque for Metric Bolts and Nuts

The following are the metric bolt and nut tightening torques in servicing a construction machine, except the torques stated specially in the shop manual. The following table covers the hexagonal coarse and fine threads (Strength 8.8, 10.9). For the tightening torque of hexagonal socket head bolts, follow the grade 10.9 of this table.

Grade Nominal Diameter × Pitch	8.8		10.9	
	Standard	Range	Standard	Range
M4x0.7	3.24	2.94 ~ 3.53	4.22	3.82 ~ 4.61
M5x0.8	6.27	5.68 ~ 6.86	8.24	7.45 ~ 9.02
M6x1.0	10.9	9.80 ~ 12.0	14.3	12.8 ~ 15.7
M8x1.25 M8x1.0	25.4	22.8 ~ 27.9	33.2	29.8 ~ 36.5
M10x1.5 M10x1.25	49.1	44.2 ~ 54.0	64.3	57.8 ~ 70.7
M12x1.75 M12x1.25	85.8	77.2 ~ 94.4	112	101 ~ 123
M14x2.0 M14x1.5	136	122 ~ 149	177	159 ~ 194
M16x2.0 M16x1.5	209	188 ~ 229	273	245 ~ 300
M18x2.5 M18x1.5	288	259 ~ 316	376	338 ~ 413
M20x2.5 M20x1.5	418	375 ~ 460	545	490 ~ 600
M22x2.5 M22x1.5	549	494 ~ 604	718	646 ~ 789
M24x3.0 M24x2.0	699	629 ~ 768	910	820 ~ 1000
M27x3.0 M27x2.0	861	774 ~ 948	1132	1019 ~ 1245
M30x3.5 M30x2.0	1186	1068 ~ 1303	1539	1382 ~ 1695

(Nm)

Fuel, Water and Oil Selection and Capacities

■ Antifreeze Mixing Ratio Table

Minimum Air Temperature (°C)		-15	-20	-25	-30	-35	-45	-55
Ratio Relative to Water (%)		30	35	40	45	50	55	60
L3-2 5.5(L)	Amount of Antifreeze (L)	1.7	2.0	2.2	2.5	2.7	3.0	3.3
	Amount of Water (L)	3.8	3.5	3.3	3.0	2.8	2.5	2.2
L4-2 5.7 (L)	Amount of Antifreeze (L)	1.8	2.0	2.3	2.6	2.9	3.2	3.5
	Amount of Water (L)	3.9	3.7	3.4	3.1	2.8	2.5	2.2
L5-2/ L6-2 6.1 (L)	Amount of Antifreeze (L)	1.9	2.2	2.5	2.8	3.1	3.4	3.7
	Amount of Water (L)	4.2	3.9	3.6	3.3	3.0	2.7	2.4

- Antifreeze must always be used at a mixing ratio of from 30% to 60%, one that is appropriate for the particular air temperature. Mixing ratios less than 30% not only freeze the coolant and cause damage to the radiator, but also give insignificant corrosion prevention results. Mixing ratios exceeding 60% not only give insignificant antifreeze results, but also increase the risk of overheating.
- If the antifreeze comes into contact with your skin, immediately wash away the agent using running water.

Note) In a new machine the coolant with long-life coolant (LLC) will have been used, so no coolant change is required until the temperature goes down to -20°C or below. When the temperature goes down to -20°C or below, adjust the concentration of the coolant according to the above Antifreeze Mixing Ratio Table.

■ Applicable Oil List

Important

1. The characteristics of oils differ according to the manufacturers, so be sure to use the same oil.
2. When the type of oil is to be changed to another after overhaul, completely remove the old oil. Completely bleed air as well. When supplying oil for replenishment, be sure to supply the same oil as before.
3. When supplying oil of another brand name, carefully check its specifications.
4. The oils with a * mark have been used in the machine when it is delivered from the factory.

Engine Oil	Apoloil Motive CD-M 10W-30*
Radiator (Engine Cooling Water)	Sanshin Chemical Coaran Long Life Coolant*
Hydraulic Oil	Nisseki Mitsubishi HP46*
Brake Oil	Idemitsu Daphne Torque Oil B*
Reduction Gear	Nisseki Mitsubishi Firm Gear B (Old Name is Nisseki Mitsubishi Antoil Super B)*
Differential (Axle)	Cosmo Gear SAE90*
Grease	Cosmo Dynamac Super No. 2

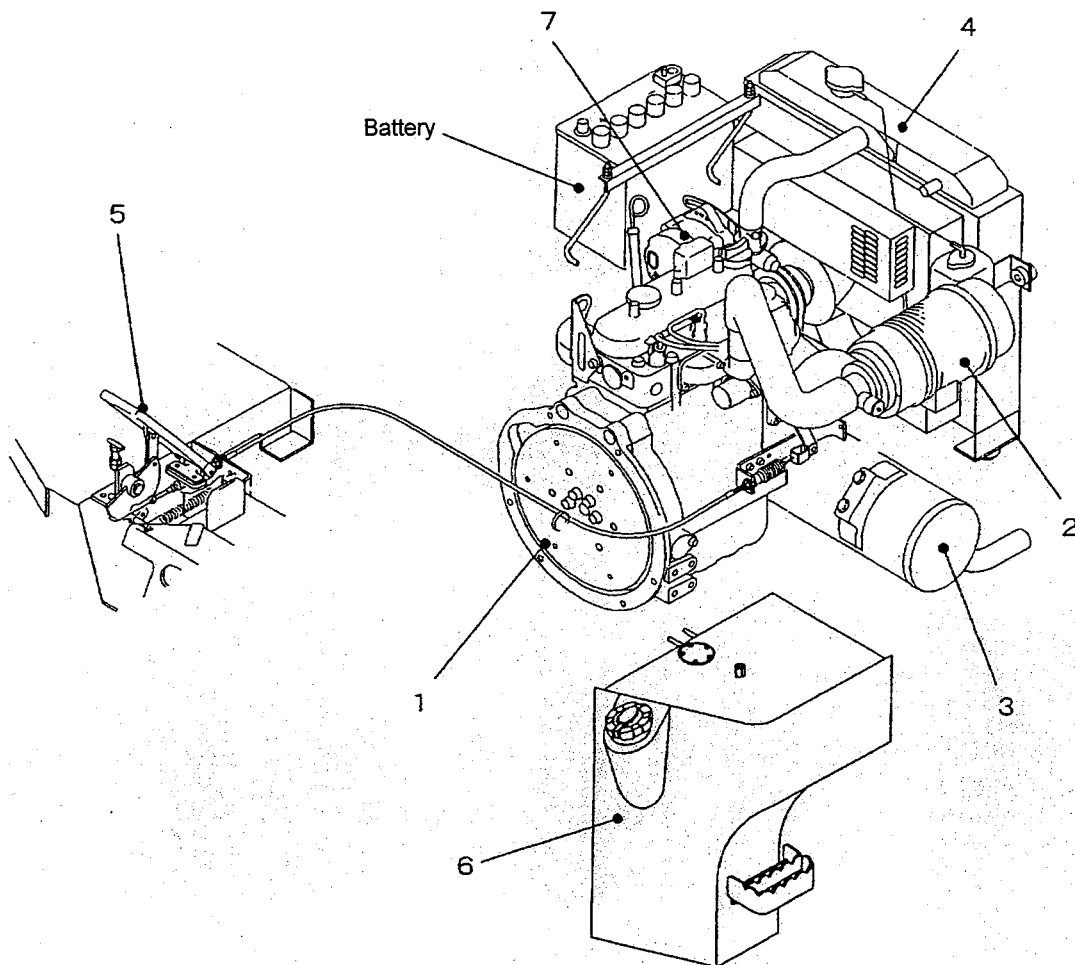
Engine

■ Engine

The type of engine for this machine is the water-cooled 4-cycle diesel engine. A turbo-charger is equipped to the engines mounted on L5-2 and L6-2.

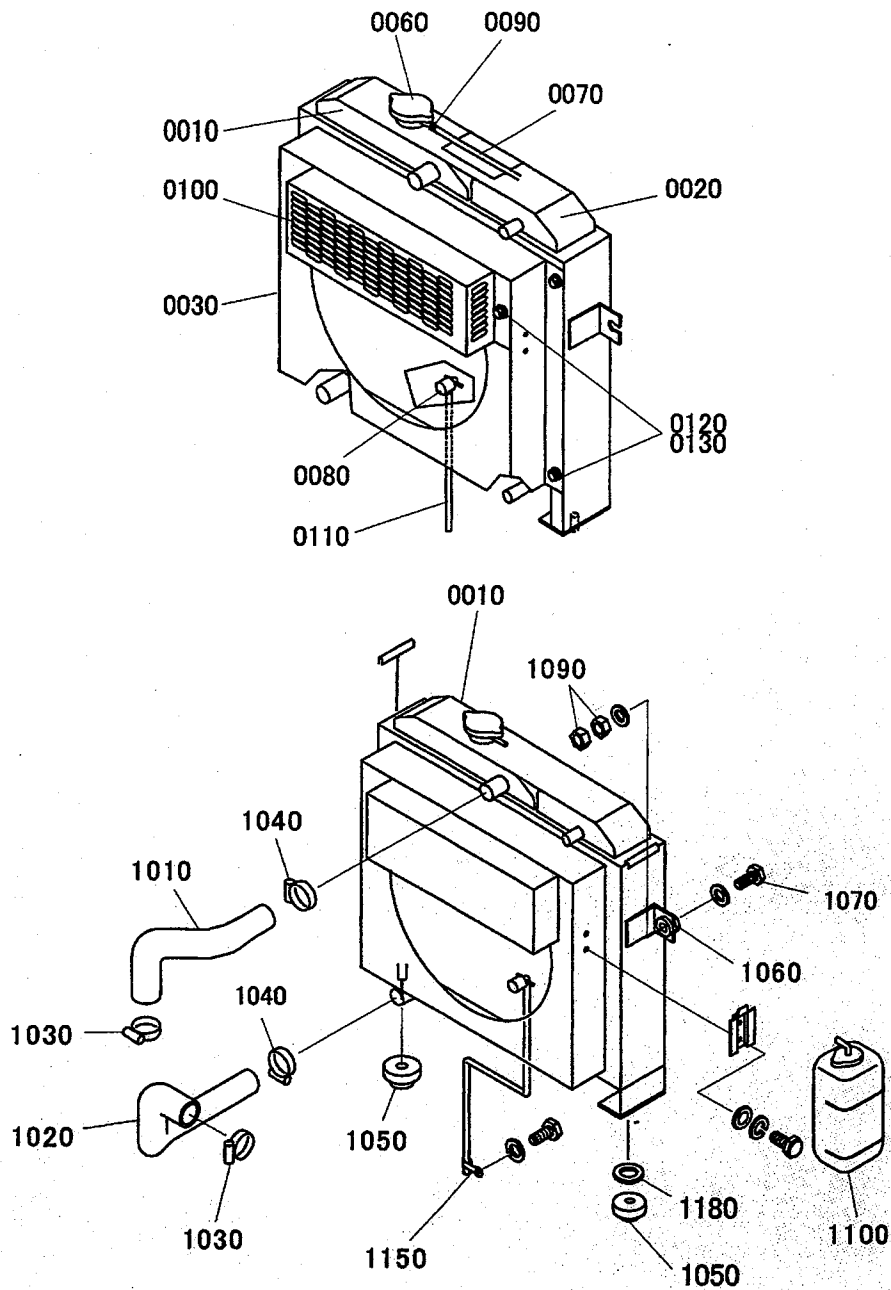
The engine components can be roughly divided into the following:

1. Engine - Engine assembly and mount
2. Air cleaner
3. Muffler
4. Radiator (oil cooler)
5. Engine control
6. Fuel system - Fuel tank, fuel pump, water separator and fuel filter



The above illustration is for L4-2

Radiator

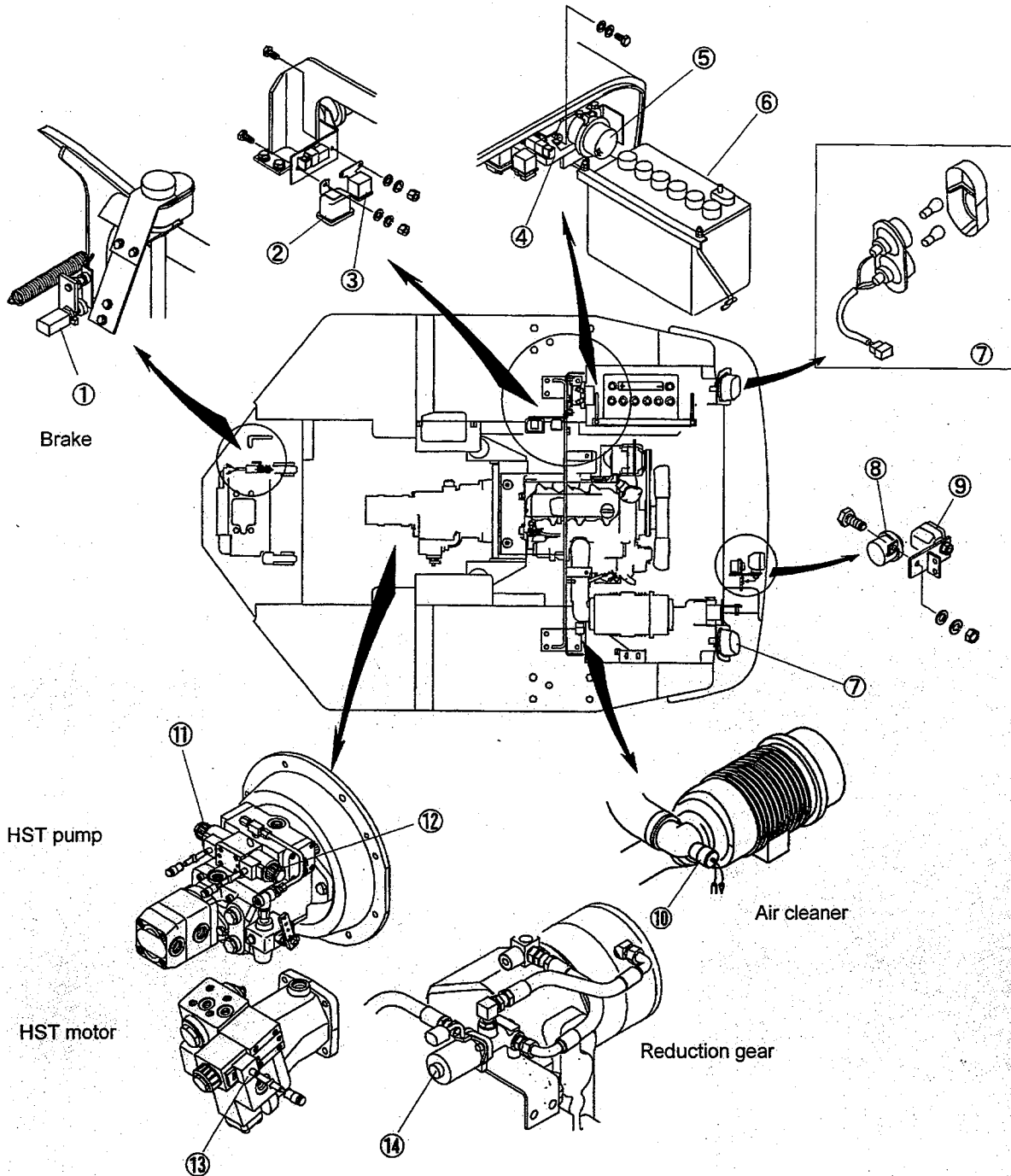


0010. Radiator assembly
 0020. Oil cooler
 0030. Duct
 0060. Cap
 0070. Hose
 0080. Drain cock
 0090. Clamp
 0100. Fan guard
 0110. Drain hose

1010. Upper hose
 1020. Lower hose
 1030. Hose clamp
 1040. Hose clamp
 1050. Cushion rubber
 1060. Cushion rubber
 1070. Bolt
 1090. Nut
 1100. Reserve tank r
 1180. Washer

Electrical Components

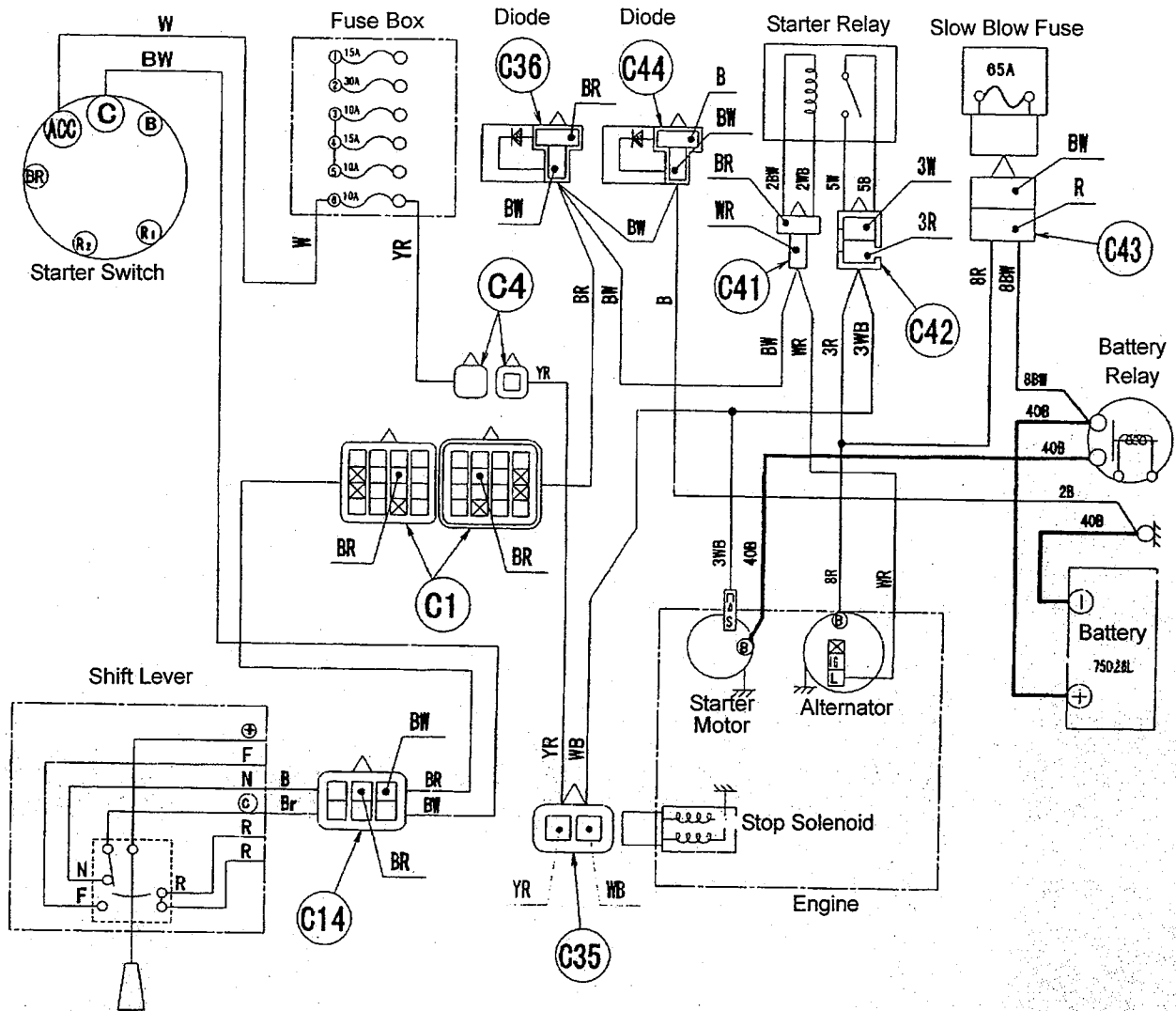
- Body Rear



- ① Brake lamp switch
- ② Starter relay
- ③ Glow relay
- ④ Slow blow fuse
- ⑤ Battery relay
- ⑥ Battery
- ⑦ Combination lamp

- ⑧ Back buzzer
- ⑨ Back lamp
- ⑩ Air cleaner indicator
- ⑪ Solenoid valve (forward)
- ⑫ Solenoid valve (back)
- ⑬ 1st-speed fixing solenoid
- ⑭ Parking brake solenoid

Electrical Circuit / Start and Stop Circuit



1. Start Circuit

- (1) Starter Switch: "ON → START" operation.

The electric current from C of starter switch is sent to coil of starter relay through neutral switch of the shift lever, so the starter relay is closed. At the same time, the positive current from battery relay runs through the starter relay to the starter motor to start the starter motor.

- (2) Starter Switch "ON → START" operation while the engine is running

When the engine is running, as the terminal L on the alternator is not grounded (alternator monitor light turned off) the current does not go to the coil of the starter relay, so the starter relay is in open condition. Therefore, the starter motor is not activated.

2. Stop Circuit

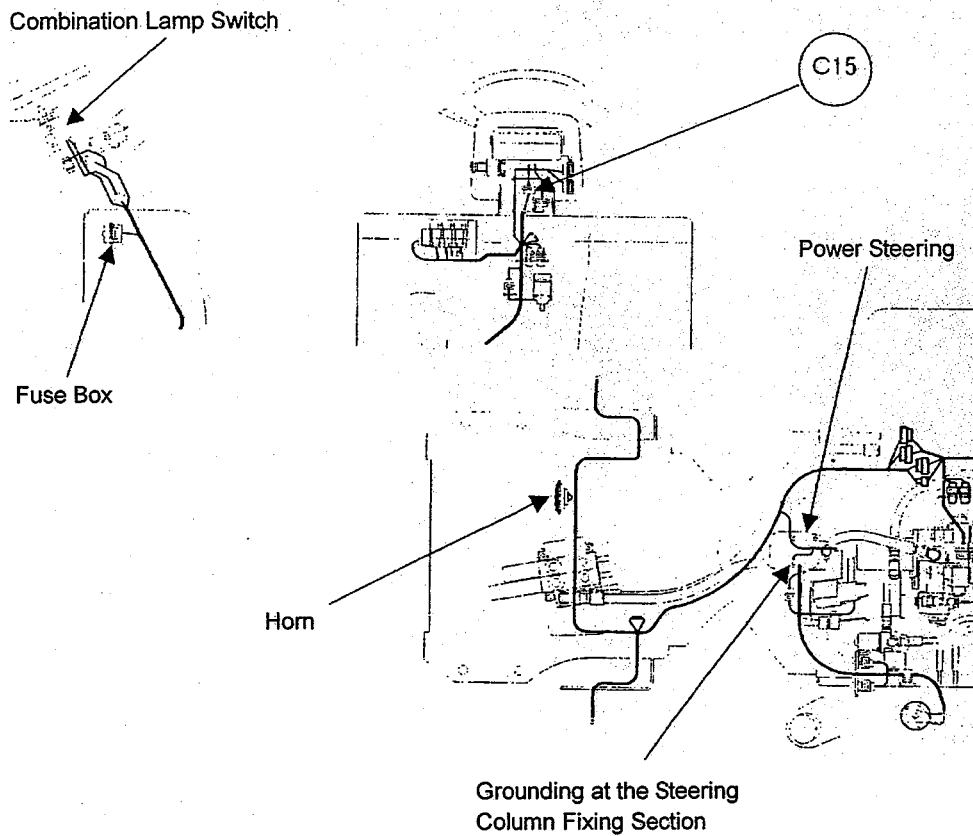
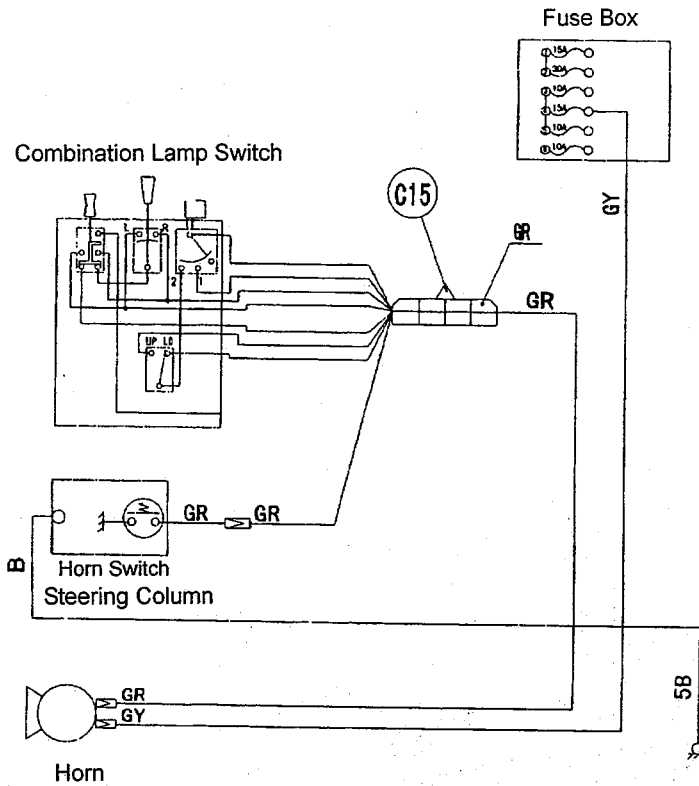
- (1) Starter Switch "ON"

The positive current from the fuse box is sent to the coil of engine stop solenoid, and the engine is running.

- (2) Starter Switch "OFF"

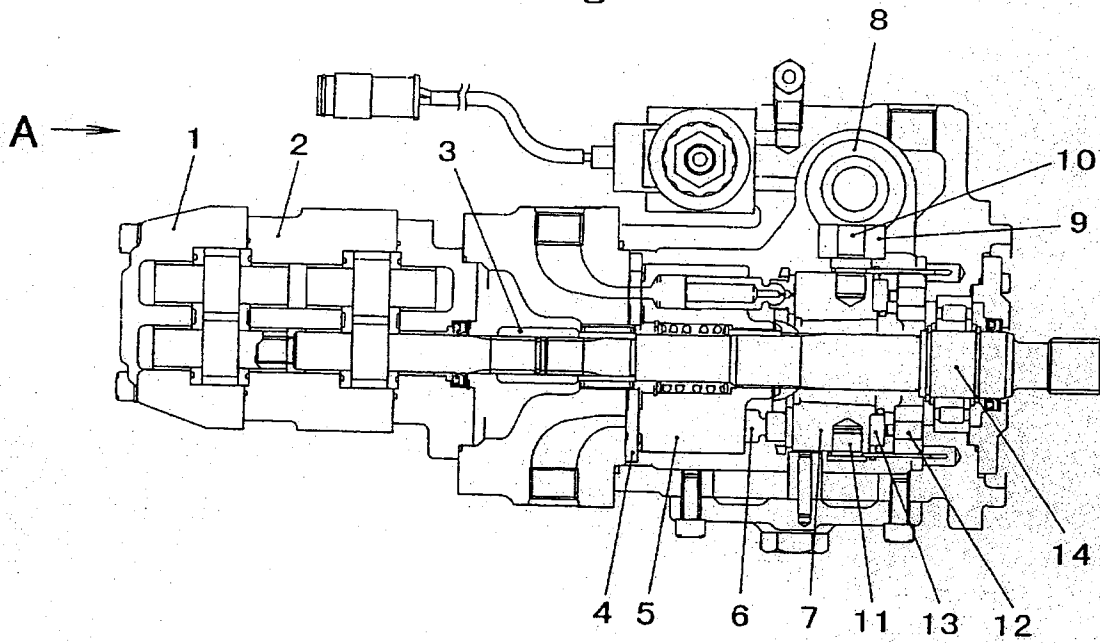
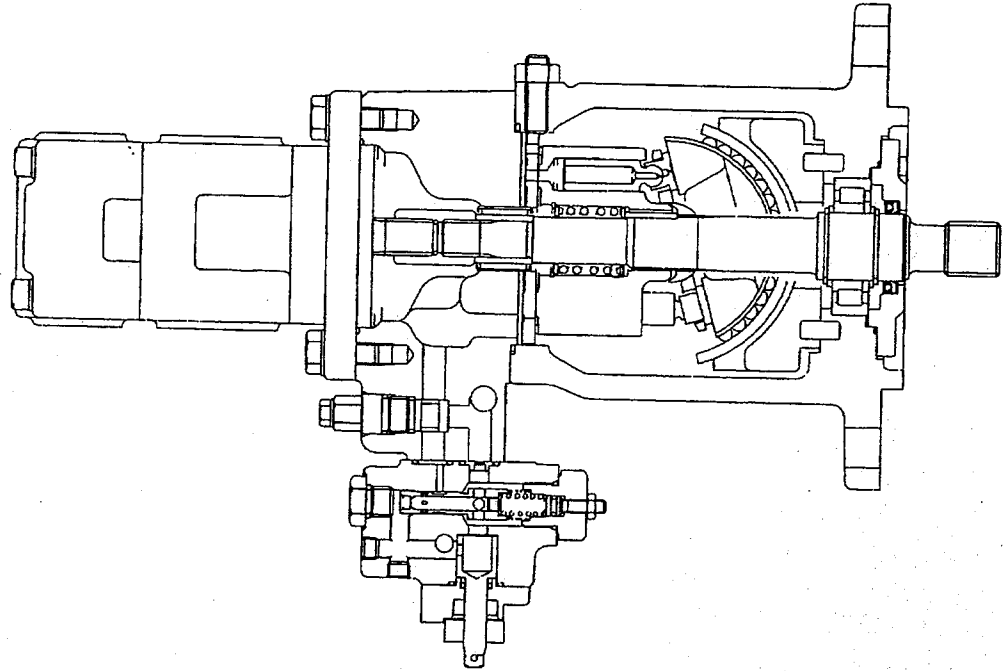
The current from fuse box to the engine stop solenoid is cut off, and engine is stopped.

Electrical Circuit / Horn Circuit



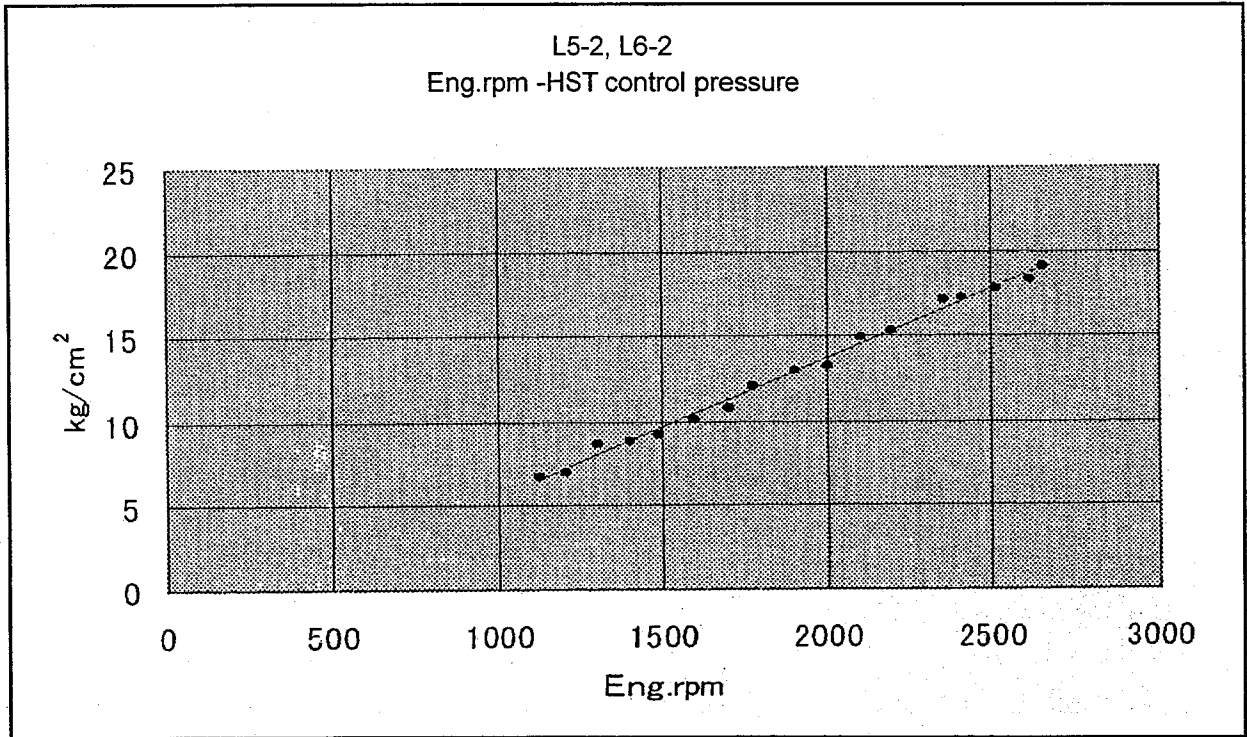
HST Pump

● HST Pump



HST Pump

● HST pump characteristic curve



HST Control

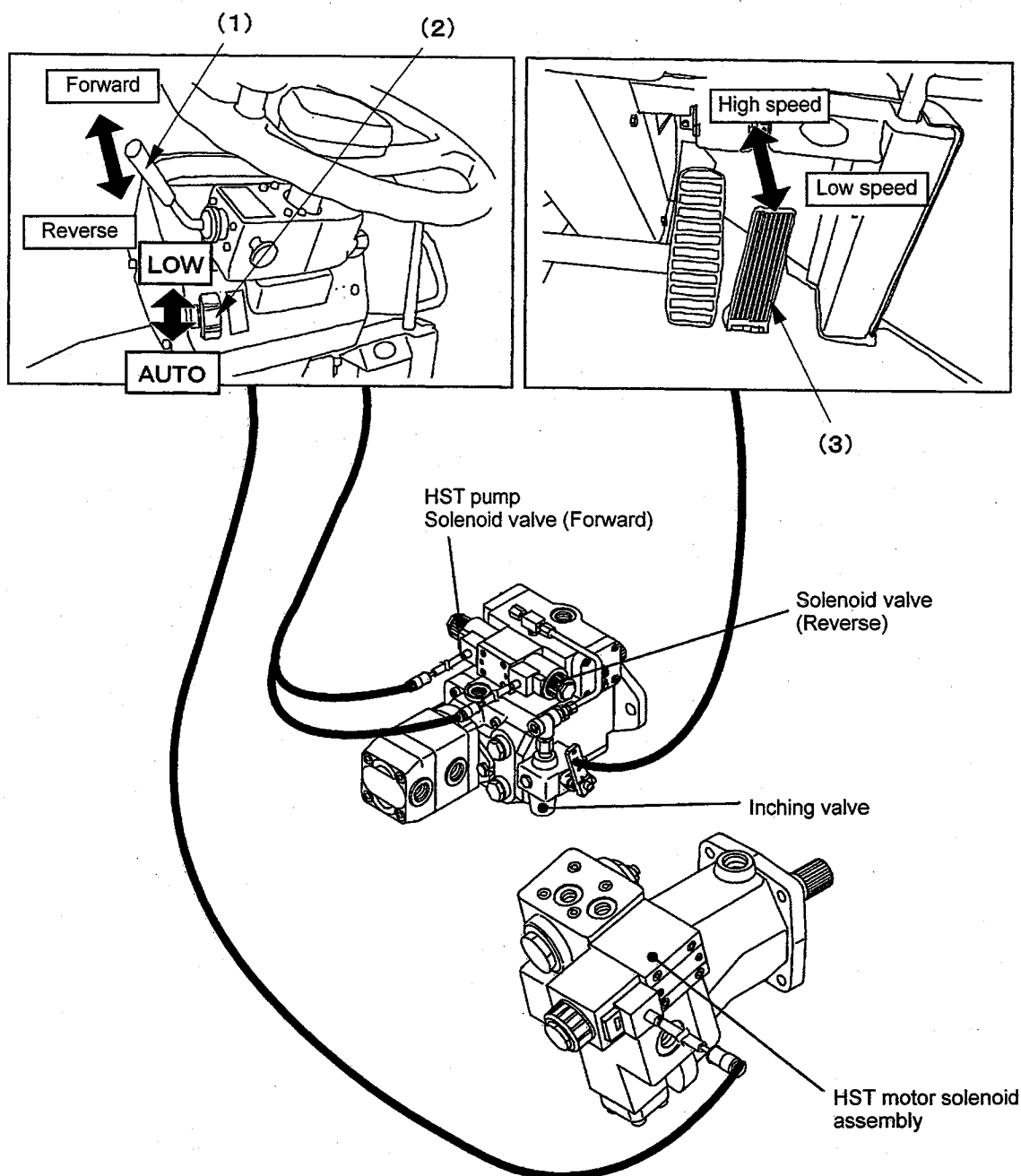
■ HST Control

The HST equipment is operated by the shift lever (1) (forward and reverse lever) installed to the steering column and the driving mode selector switch (2) in the meter panel.

Operation of the shift lever (1) actuates the direction switching valve (solenoid) of the HST pump, changing the discharge direction of the HST pump. Thus, the driving direction (forward or reverse) of the vehicle is changed.

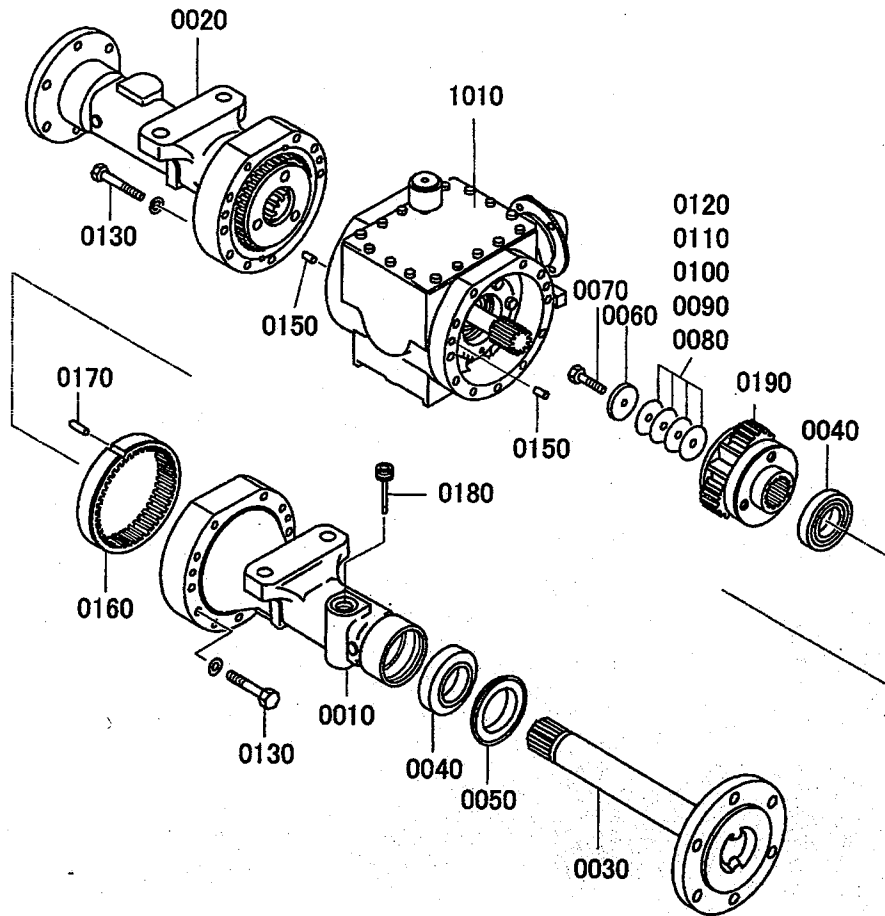
Operation of the driving mode selector switch (2) actuates the valve (solenoid) that sets an inclination of the HST motor cylinder block, changing the inclination. Thus, the speed gears (automatic and fixed 1st gear) are changed.

The vehicle speed can be continuously controlled from start to acceleration, deceleration and stop by operating the accelerator pedal (3) (engine speed).



Axle

● Front axle

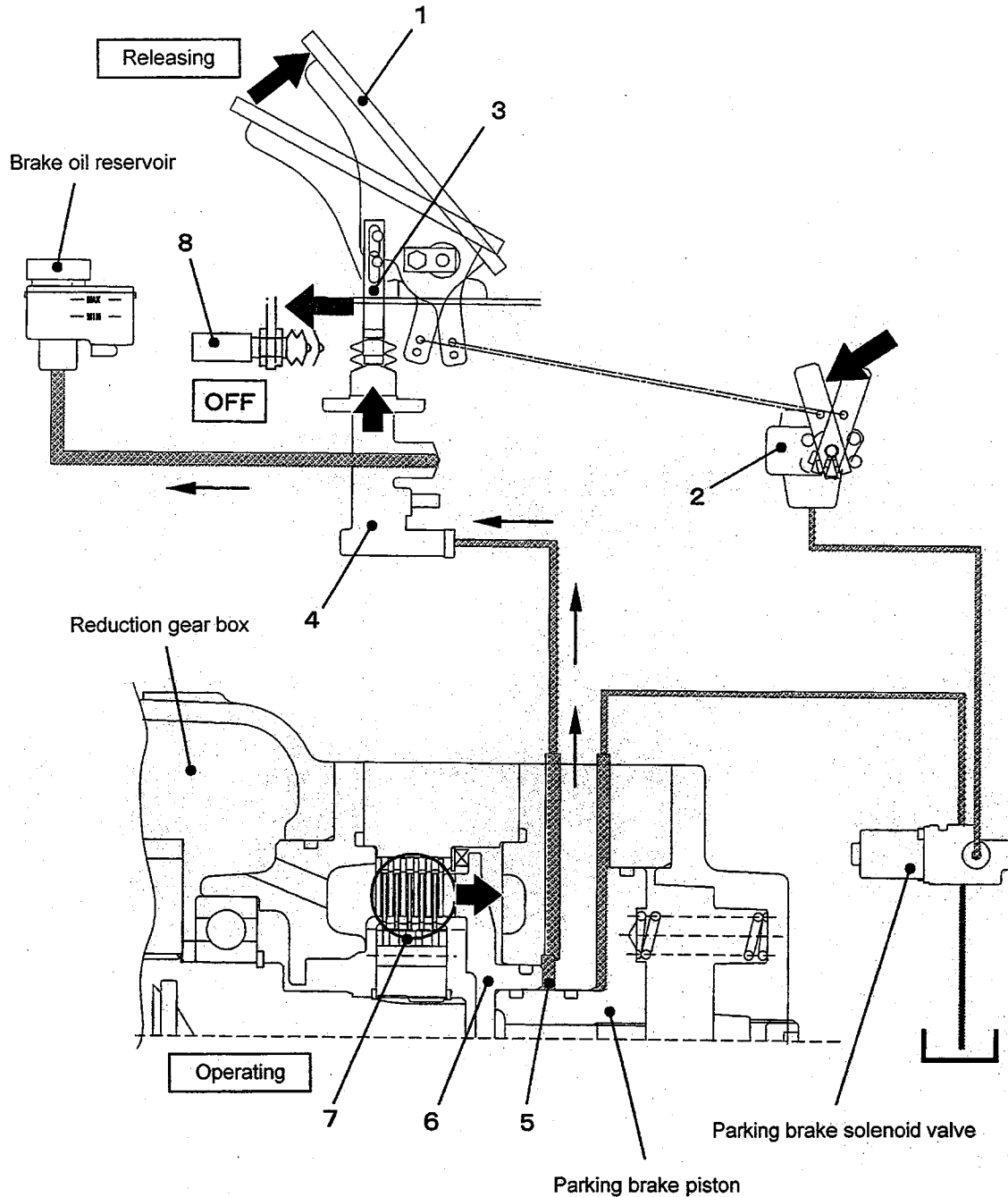


0010	Axle tube	0130	Bolt
0020	Axle tube	0150	Pin
0030	Axle shaft	0160	Ring gear
0040	Bearing	0170	Pin
0050	Oil seal	0180	Level gauge
0060	Retainer plate	0190	Planetary carrier assembly
0070	Bolt	1010	Differential assembly
0080-0120	Shim		

Brake System

● Service brake is released

1. When the brake pedal (1) is released (either right or left), the push rod (3) is returned to its original position and a piston in the master cylinder (4) is also returned to upward. Consequently the brake oil pressure in the chamber (5) is released.
2. The service brake piston (6) becomes free and the brake disks (7) are released.
3. At the same time, the HST pump inching valve (2) lever is returned to its original position and the inching (HST brake) function is released.
4. The stop lamp switch (8) is turned OFF and so the stop lamp is turned OFF.



Steering

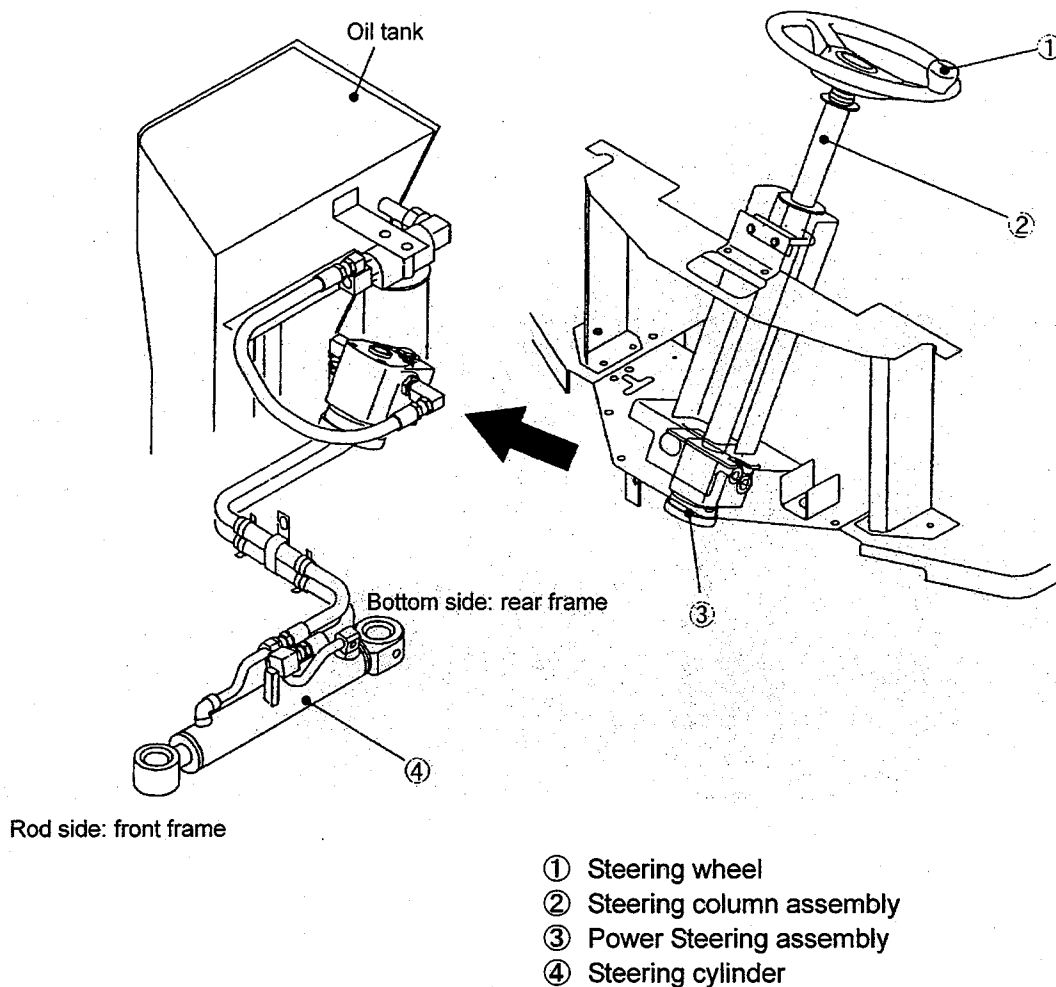
■ Steering

The steering system mainly consists of the steering wheel, power steering ass'y, steering cylinder and hydraulic oil piping.

When the steering wheel is turned (by hand) the power steering ass'y directly installed to the steering shaft in the steering column assembly is turned and pressurized hydraulic oil is sent to the steering cylinder to turn the machine.

● Power steering

The use of the steering wheel (turning it by hand) changes the oil passage using the power steering ass'y and the pressurized hydraulic oil caused by above makes the steering operation easy.



2-7. HYDRAULIC SYSTEM

Main Piping	.....	2-7-2
Control Valve	.....	2-7-3
Main Pump	.....	2-7-10
Oil Tank	.....	2-7-11
Return Filter	.....	2-7-12
Lift/Tilt Cylinder	.....	2-7-13

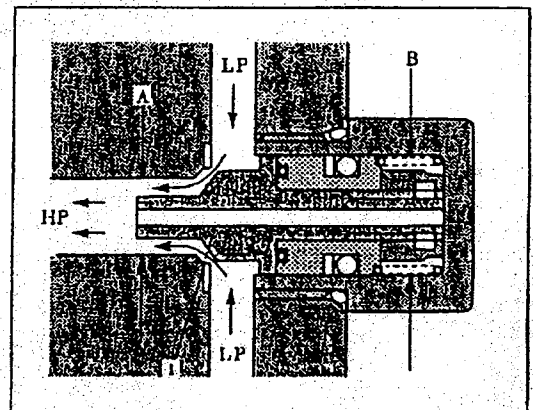
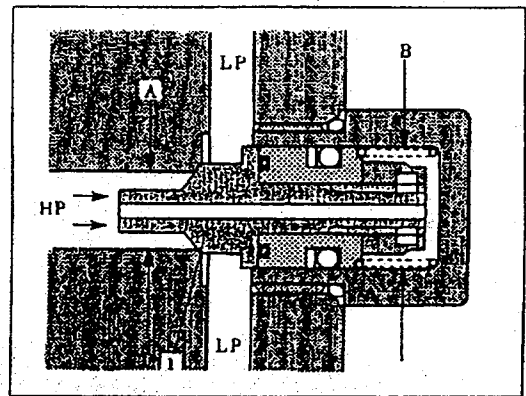
Control Valve

● Anti-void valve

When a negative pressure is created on the rod side of the lift cylinder, the anti-void valve refills the rod side directly with the oil in the tank port.

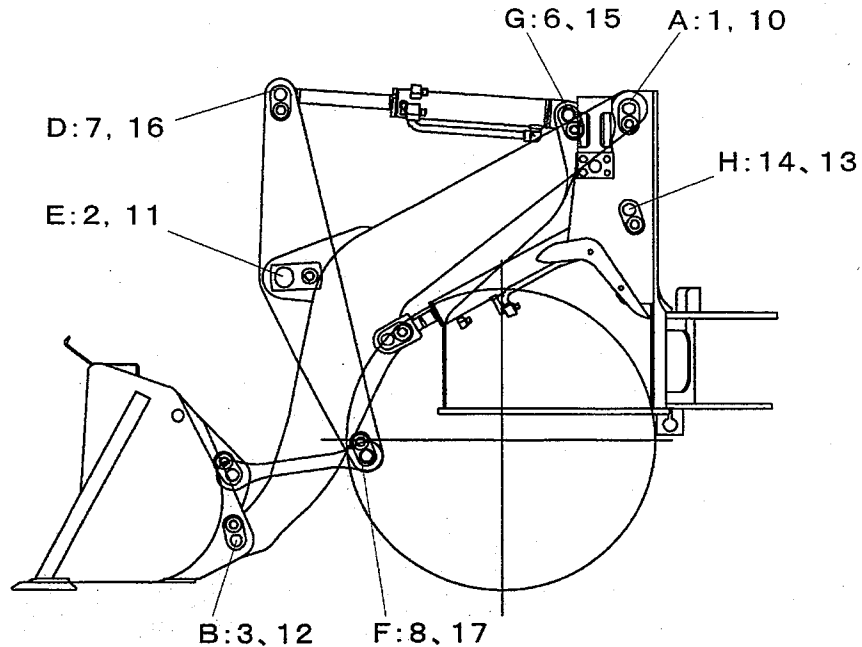
● Operation

1. The oil from the cylinder port HP is sent into the anti-void valve through the hole in the poppet (1). The poppet (1) is positioned as shown due to the difference in area between (A) and (B).
2. When the pressure in the cylinder port HP is lower than in the tank port LP, the poppet (1) moves to the right due to the difference in area between (A) and (B). At this time, sufficient oil flows to the cylinder port HP from the tank port LP to prevent a cavitation in the cylinder.



Shovel Linkage

● Shovel linkage



Pin		Bushing					
		(mm)					
No.		ΦA x L	ΦA x L			ΦB x L	ΦB x L
		L3-2	L4-2, L5-2, L6-2			L3-2	L4-2, L5-2, L6-2
1	Lift arm and front frame	35 x 133	45 x 170	10	Lift arm	45 x 35	55 x 40
2	Lift arm and bell crank	50 x 178	60 x 244	11	Bell crank (2 pcs.)	60 x 35	75 x 65
3	Lift arm and bucket	35 x 98	45 x 123	12	Lift arm	45 x 35	55 x 40
4	Lift cylinder and front frame	30 x 134	40 x 163	13	Lift cylinder	40 x 30	50 x 40
5	Lift cylinder and lift arm	30 x 100	40 x 115	14	Lift arm	40 x 35	50 x 40
6	Tilt cylinder and front frame	35 x 98	40 x 115	15	Tilt cylinder	45 x 35	50 x 40
7	Tilt cylinder and bell crank	35 x 98	40 x 115	16	Tilt cylinder	45 x 35	50 x 40
8	Bucket link and bell crank	35 x 98	40 x 123	17	Bucket link	45 x 35	55 x 40
9	Bucket link and bucket	35 x 98	45 x 123	18	Bucket link	45 x 35	55 x 40

Removal of Engine

L3-2

■ Removal of Engine

● L3-2

1. Fig12-51: Disconnect the battery negative cable (0030).

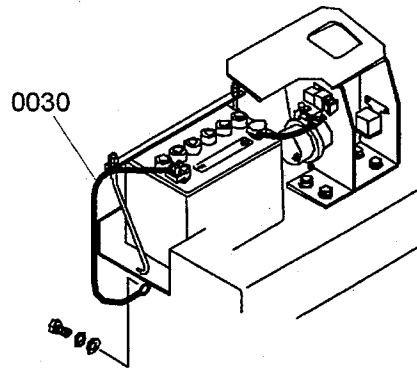


Fig12-51:

2. Fig63-00: Remove the bolts (0020), then remove the seat assembly (0010).



Seat assembly (0010): 10 kg

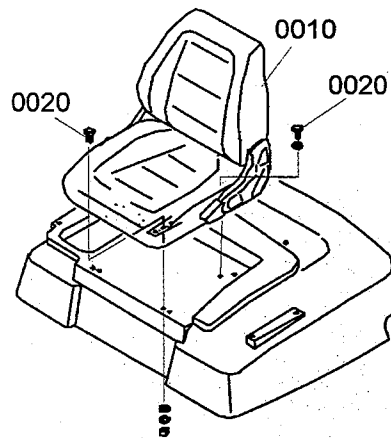


Fig63-00:

3. Fig2-11: Remove the bolts (0320), then remove the hood (0300).



Hood (0300): 9 kg

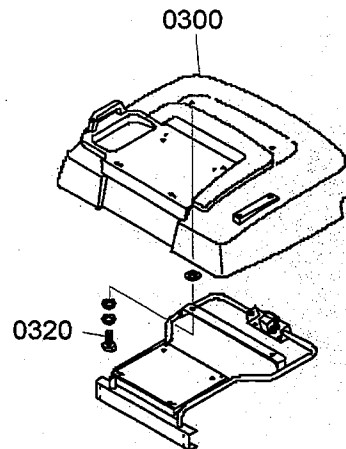


Fig2-11:

4. Fig2-11: Disconnect the wiring (A) of the right and left rear combination lamp, remove the bolts (0431), then remove the grille (0410).

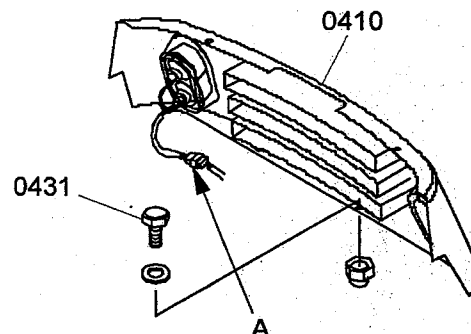


Fig2-11:

Installation of Engine

L3-2

10. Fig43-11: Connect the rod (0181) to the inching valve lever, and secure it with the nut (0181's fastener). Refer to "Adjustment of Engine Control."

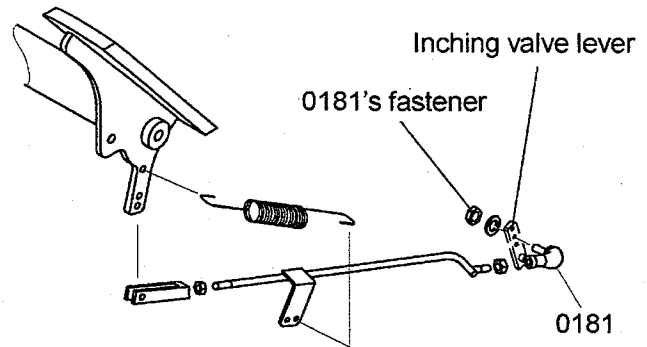


Fig43-11:

11. Fig06-21: Install the fuel hoses (0110), (0100), and tighten the hose clamps (0130).



Hose clamp (0130): 3.4 Nm

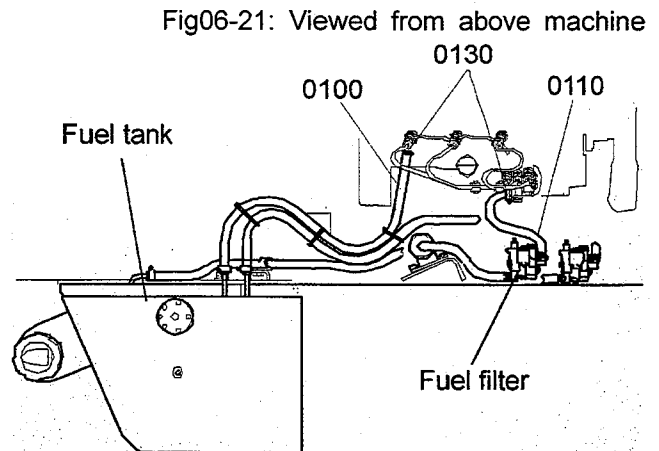


Fig06-21: Viewed from above machine

12. Fig05-11: Install the cable assembly (0200), then install the cable clamp (0250).

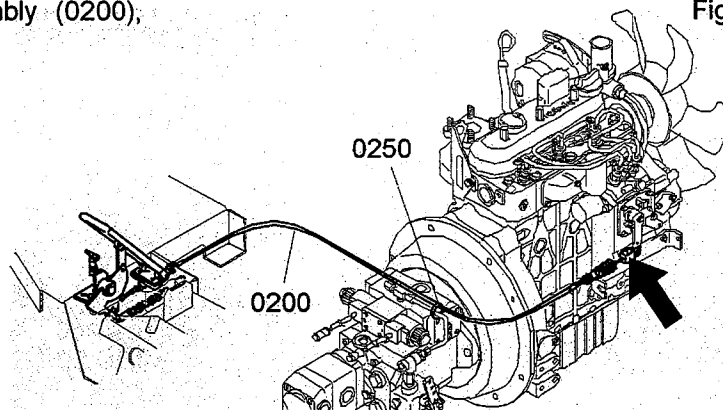


Fig05-11:

13. Fig12-51 (1): Connect the wiring (K) of the front and rear solenoid valves on the top of the HST pump, then install the cable clamp (0230) while adjusting the length of the wiring (K).

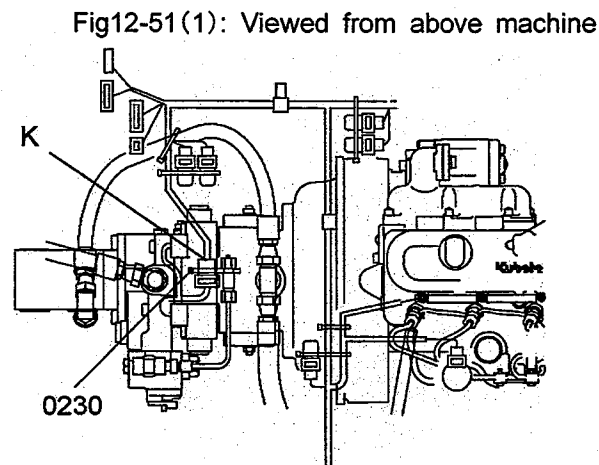


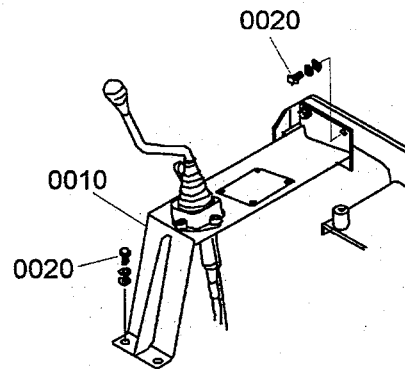
Fig12-51 (1): Viewed from above machine

Removal of Engine

L4, L5, L6-2

12. Fig84-11: Remove the bolts (0020), then remove the support (0010). Do not remove the shovel control cable.

Fig84-11:

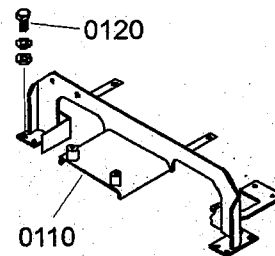


13. Fig62-11: Remove the bolts (0120), then remove the support (0110) together with the air cleaner.

Fig62-11:

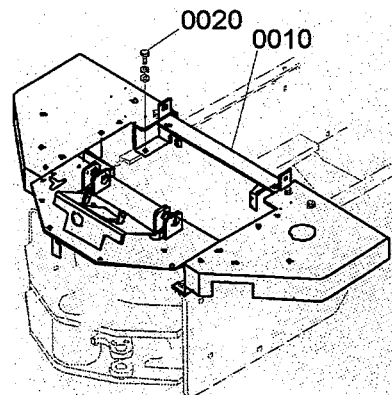


Support (0110) + air cleaner: 17 kg



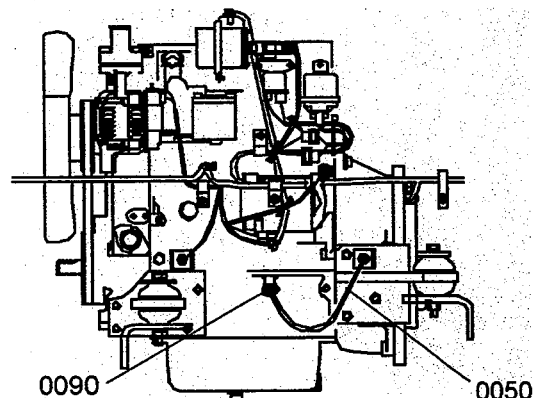
14. Fig61-13: Remove the bolts (0020), then remove the bracket (0010).

Fig61-13:



15. Fig12-51 (1): Remove the bolt (0090), then remove the engine ground cable (0050) (from the right side of the machine).

Fig12-51: (1)

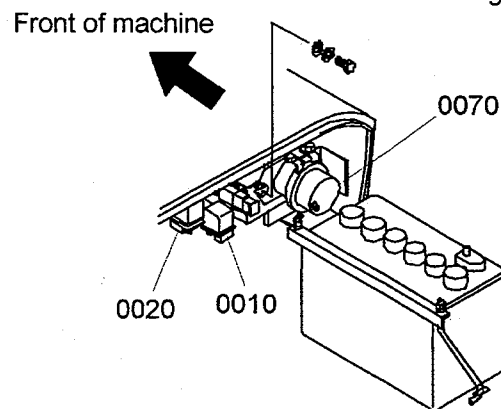


Installation of Engine

L4, L5, L6-2

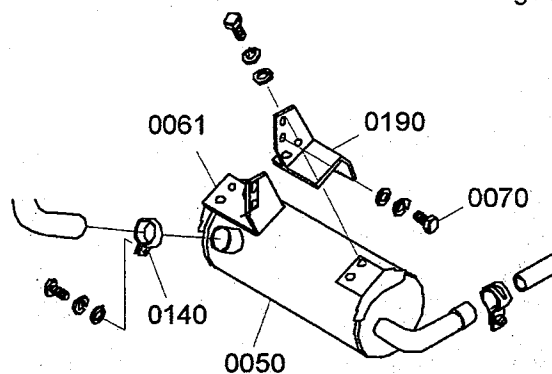
23. Fig12-52: Install the battery relay (0070), starter relay (0020) and glow plug relay (0010).

Fig12-52:



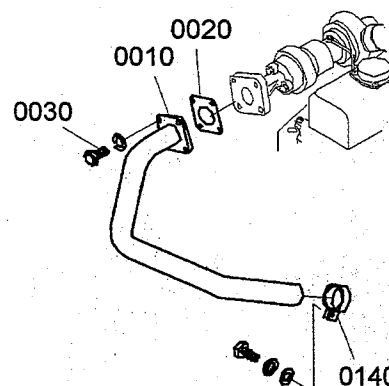
24. [L4-2] Fig03-00: Temporarily install the brackets (0061), (0190) and muffler clamp (0140) on the muffler (0050), then install the assembly on the engine mount bracket. Make sure that the center of the exhaust pipe (0010) is aligned with that of the muffler (IN) (0050), then tighten the bolts (0070).

Fig03-00:



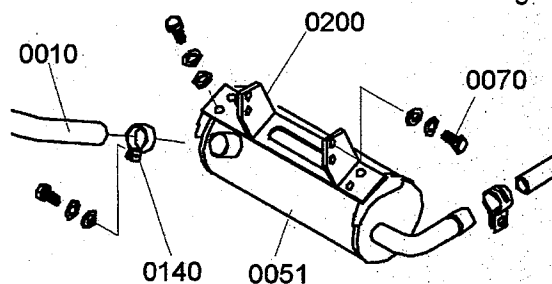
24. [L5, L6-2] Fig03-00: Put the exhaust pipe (0010) and gasket (0020) together, then connect the pipe using the bolts (0030).

Fig03-00:



25. [L5, L6-2] Fig03-00: Temporarily install the bracket (0200) and muffler clamp (0140) on the muffler (0050), then install the assembly on the engine mount bracket. Make sure that the center of the exhaust pipe (0010) is aligned with that of the muffler (IN) (0050), then tighten the bolts (0070).

Fig03-00:



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Installation of Radiator

L3-2

10. Fig27-00: Install the hose (0180), then tighten the hose clamp (0201).

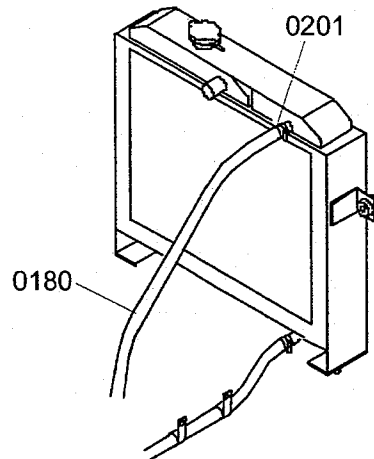


Fig27-00:

11. Fig04-00: Install the upper hose (1010), then tighten the hose clamps (1030).

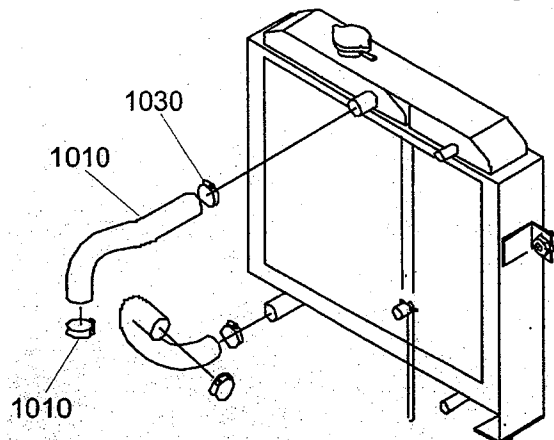


Fig04-00:

12. Fig78-21: Fill the hydraulic fluid tank (0010) with the specified amount of hydraulic fluid. Refer to "Level Check and Addition of Fluid in Hydraulic Fluid Tank."



Hydraulic Fluid (maximum): 25 L

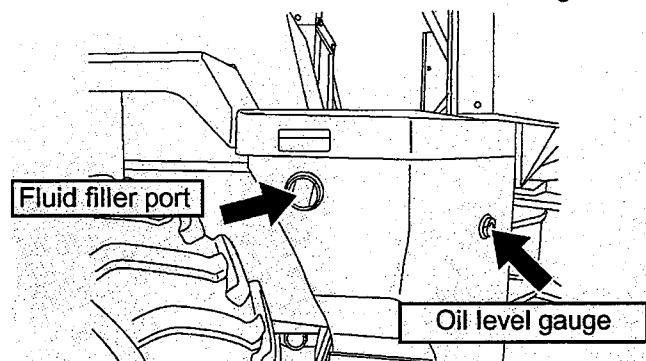


Fig78-21:

13. Fig04-12: Fill the radiator (0010) with the specified amount of coolant. Refer to "Level Check and Addition of Coolant."



Coolant in the radiator and engine: 5.5 L

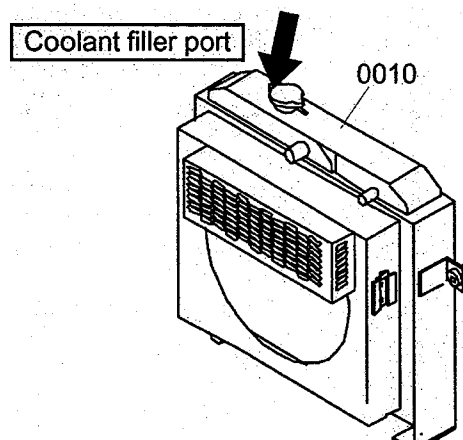


Fig04-12:

Removal of Fuel Tank

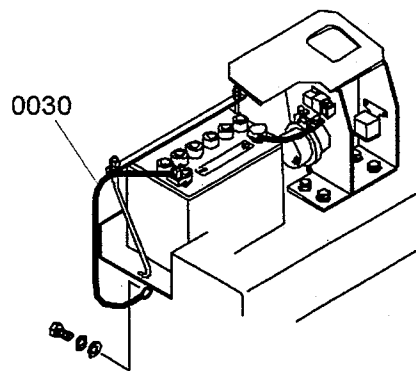
L3, L4, L5, L6-2

■ Removal of Fuel Tank

Fig12-51:

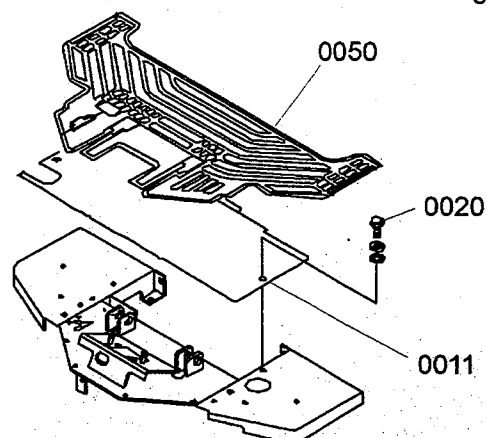
● L3, L4, L5, L6-2

1. Fig12-51: Disconnect the battery negative cable (0030).



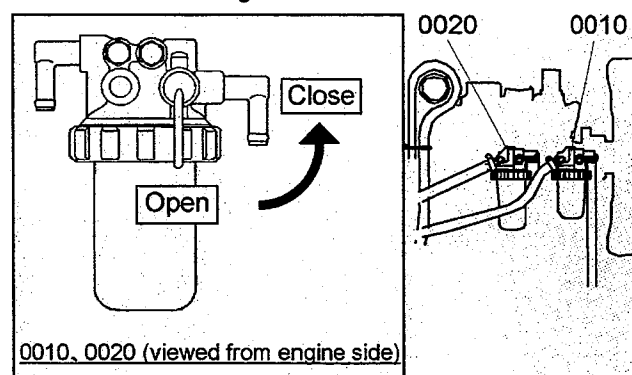
2. Fig62-12: Remove the floor mat (0050), then remove the bolts (0020) to detach the floor plate (0011).

Fig62-12:



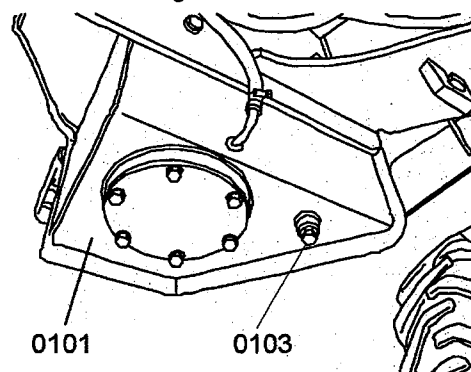
3. Fig06-21 (1): Turn the levers of both the water separator (0010) and fuel filter (0020) to the "CLOSE" positions.

Fig06-21(1): Left side of machine



4. Fig06-21 (2): Remove the plug (0130) to allow the fuel in the fuel tank (0101) to drain. After the fuel has been drained out, install the plug (0130).

Fig06-21(2): Bottom of fuel tank



Fuel tank capacity (maximum)

L3-2 — 33 L

L4, L5, L6-2 — 50 L

Removal of HST Pump

L3-2

11. Support the weight of the HST pump (0070) using a hoist and nylon sling.



Weight of HST pump (0070): 39 kg

12. Fig25-00: Remove the bolts (0080) to detach the HST pump (0070).

13. Lift the HST pump (0070) to remove it from the machine.

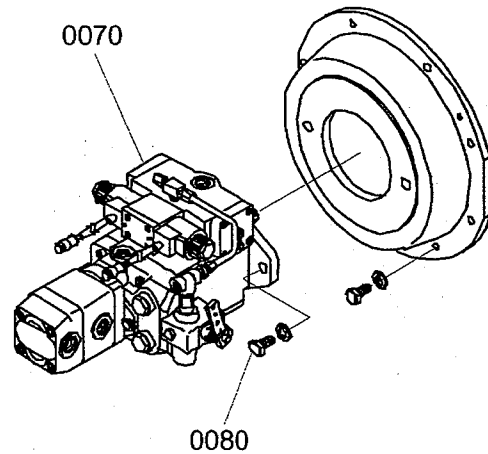


Fig25-00:

Disassembly of HST Pump

L3, L4, L5, L6-2

■ Disassembly of HST Pump

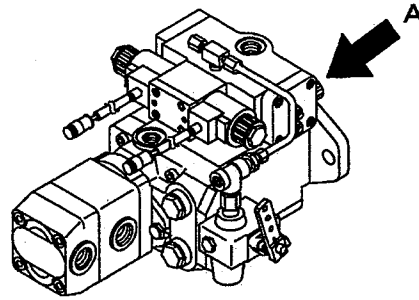
- L3, L4, L5, L6-2



CAUTION

As the HST pump cannot be adjusted correctly in the field, do not perform any work beyond the extent described in the following disassembly and assembly procedures.

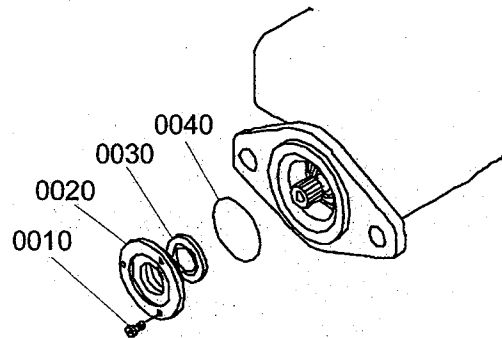
Fig25-11(1):



● Pump group

1. Fig25-11 (2): Remove the bolts (0010), then remove the oil seal cover (0020). Now you can replace the oil seal (0030) and O-ring (0040).

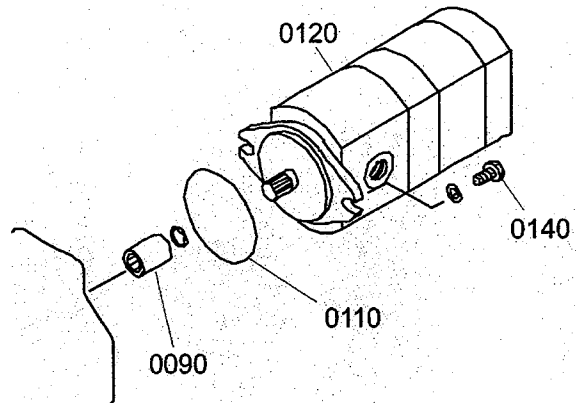
Fig25-11(2): Viewed in direction of arrow A



● Control group (1)

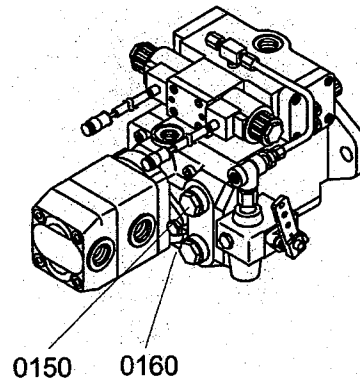
1. Fig25-11 (3): Remove the bolts (0140), then remove the gear pump (0120). Now you can remove the coupling (0090) and replace the O-ring (0110).

Fig25-11(3): Viewed in direction of arrow A



2. Fig25-11 (4): You can remove and replace the high-pressure relief valve (0150) and low-pressure relief valve (0160).

Fig25-11(4):



Disassembly of HST Motor

L3-2

■ Disassembly of HST Motor

● L3-2



CAUTION

As the HST motor cannot be adjusted correctly in the field, do not perform any work beyond the extent described in the following disassembly and assembly procedures.

Fig25-21(1):

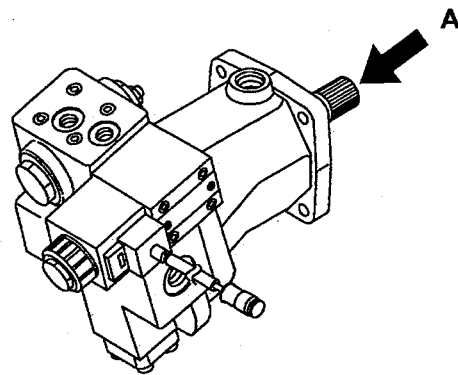


Fig25-21(2):

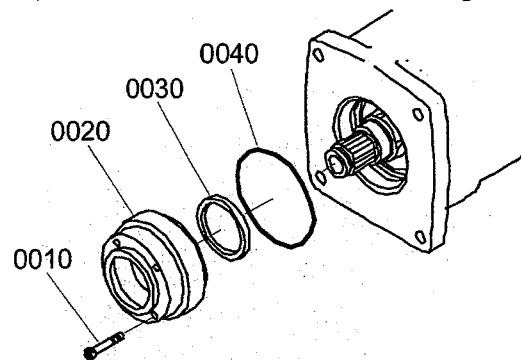
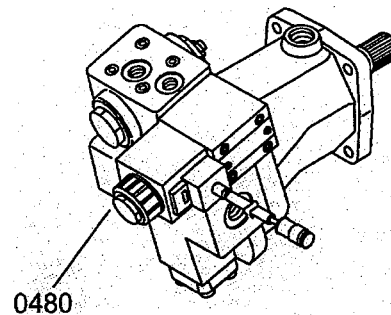


Fig25-21 (3):



● Motor group

1. Fig25-21 (2): Remove the bolts (0010), then remove the oil seal cover (0020). Now you can replace the oil seal (0030) and O-ring (0040).
2. Fig25-21 (3): You can remove the solenoid valve (0480) and replace it.

Bleeding Brake Fluid Tank

L3, L4, L5, L6-2

■ Bleeding Brake Fluid Tank

Fig42-00 (1):

⚠ WARNING

Use only the specified type of brake fluid. Use of wrong brake fluid causes faulty brake operation. (Refer to the table of recommended oils and fluids.)

IMPORTANT

Two persons are needed for brake fluid change as the operation involves air bleeding. During air bleeding, one person depresses the brake pedal ①, while the other opens and closes the bleeder screw ②.

1. Fig42-00 (1): Connect a transparent vinyl tube to the bleeder screw ①, and put the other end of the tube in a clean jar to collect brake oil.
2. Fig42-00 (1): After depressing the brake pedal ② a few times, keep the pedal depressed and loosen the bleeder screw ① by 1/2 to 1 turn to allow brake fluid to flow out.
3. Fig42-00 (1): Close the bleeder screw ①, then release the brake pedal ②.
4. Repeat the steps 2 and 3 until brake fluid flowing through the vinyl tube becomes clean and contains no air bubbles.
5. Fig42-00 (2): After making sure that no air bubbles are visible in the tube, tighten the bleeder screw ① with the brake pedal ② depressed.
6. Fig42-00 (2): After air bleeding, refill the brake fluid tank ③ with the specified brake fluid to the correct level.

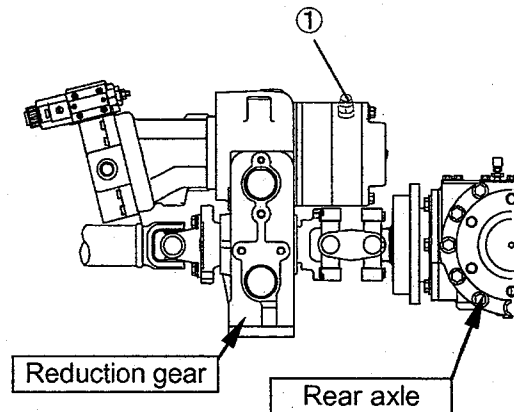


Fig42-00 (1):

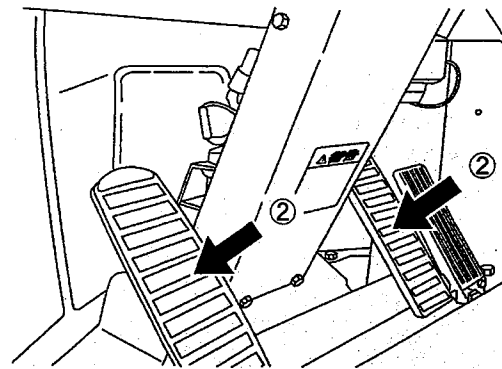


Fig42-00 (2):

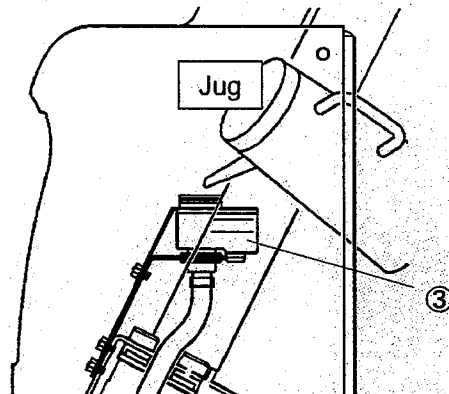
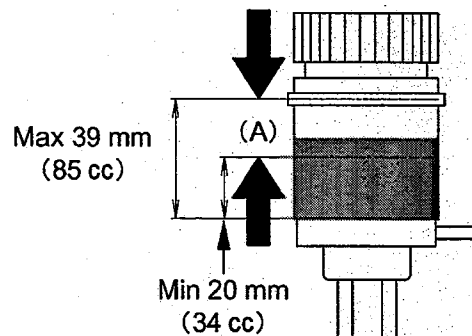


Fig42-00 (2): Brake fluid tank ③

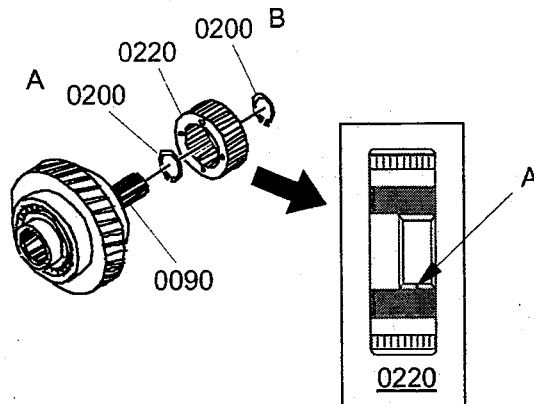


Assembly of Reduction Gear

L3, L4, L5, L6-2

4. Fig26-11 (3): Install on the input shaft (0090) the snap ring (A) (0200), disk hub (0220) and snap ring (B) (0200) in that order.

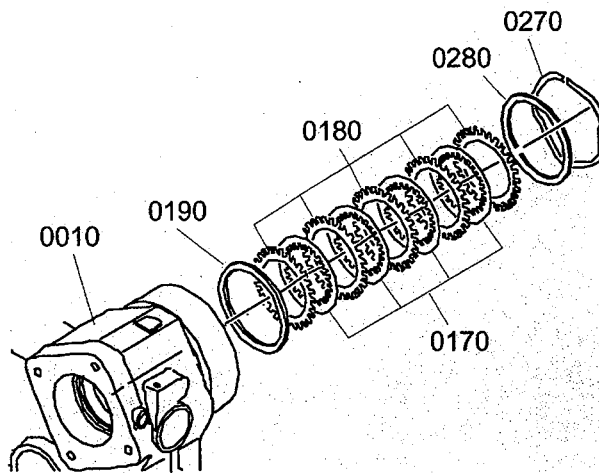
Fig26-11 (3):



CAUTION
Install the disk hub (0220) with its internally splined end (A) outward.

5. Fig26-11 (4): Install the end plate (0190) (L3, L4-2) in the case (brake housing) (0010), then install the brake plates (0180) and brake disks (0170) alternately. Install the plate (0280) and wave spring (0270) on the outermost brake disk.

Fig26-11 (4):



CAUTION
Soak the brake disks (0170) in brake fluid before installing them.

	Brake plate (0180)	Brake disk (0170)
L3-2	4	3
L4-2	5	4
L5, L6-2	6	5

Installation of Front Axle

L3, L4, L5, L6-2

■ Installation of Front Axle

● L3, L4, L5, L6-2

1. Fig35-00: Place the front axle (0010) into position, then install the nuts (0040). Apply a thread locking adhesive to the threads of the bolts (0020).



Nut (0040): 418-460 Nm

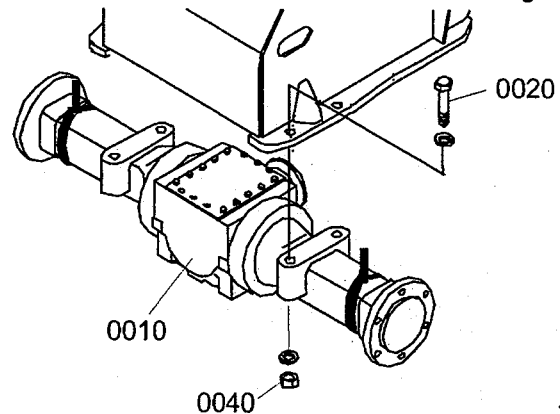


Fig35-00

2. Fig37-00: Install the tire assemblies with the bolts (0030) temporarily tightened.

3. Using a jack or crane, raise the machine until the tire assemblies come off the ground, then remove the stands under the front frame. Lower the jack or crane to let the tire assemblies bear the weight of the machine.

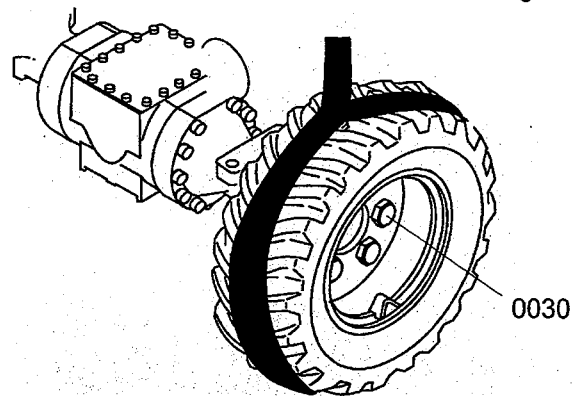


Fig37-00:

4. Fig37-00: Finally tighten the bolts (0030) that are temporarily tightened in step 2.



Bolts (0030):

L3-2 — 273-300 Nm

L4, L5, L6-2 — 375-412 Nm

5. Fig34-00: Connect the propeller shaft assembly (0010) to the front axle by tightening the bolts (0030).



Bolt (0030): 113-123 Nm

Apply a thread locking adhesive.

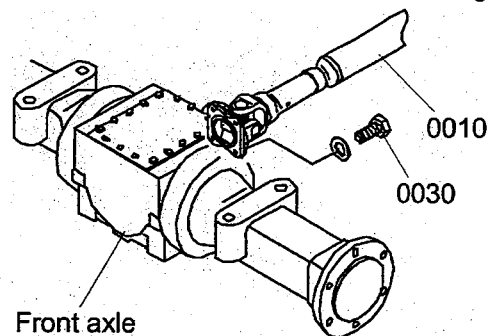


Fig34-00:

Disassembly of Axle

L3, L4, L5, L6-2

● Disassembly of axle tube

1. Fig35-32 (1): Remove the bolt (0070) in the axle tube (0010), then remove the retainer plate (0060) and shims (0080-0120).
2. Fig35-32 (1): Remove the final reduction gear assembly (planetary carrier) (0190).

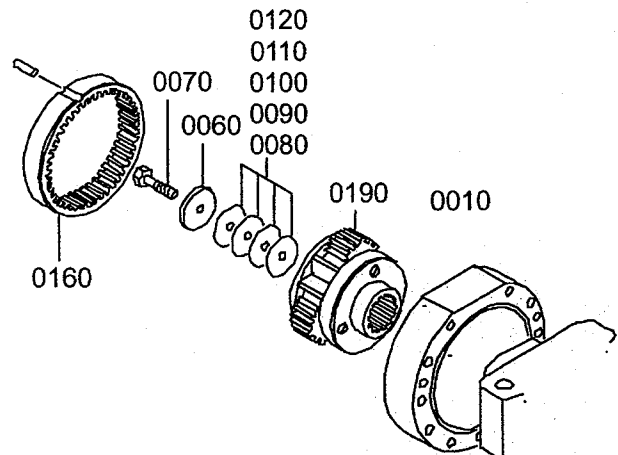


Fig35-32 (1):

3. Fig35-32 (2): Remove the axle shaft (0030) out of the axle tube (0010) by tapping the end of the axle shaft with a soft-faced hammer.



Axle shaft (0030):
L3-2 — 7 kg
L4, L5, L6-2 — 12 kg

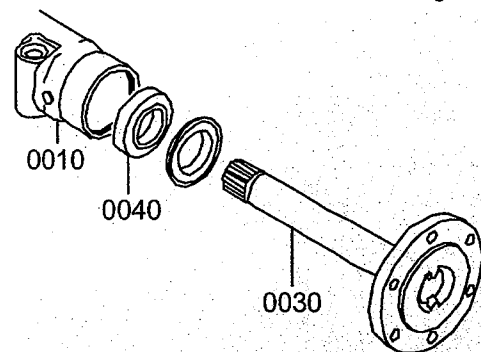
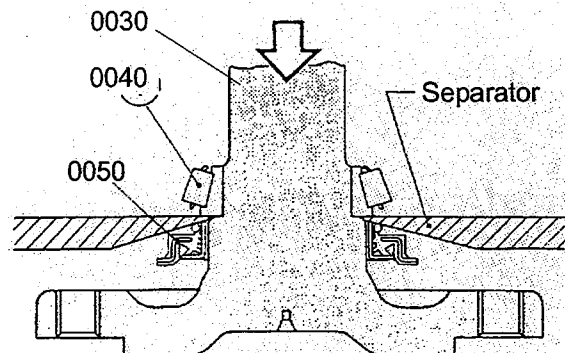


Fig35-32 (2):

4. Fig35-32 (2): Remove the cone of the bearing (0040).
5. Fig35-32 (3): Remove the cone of the bearing (0040) from the axle shaft (0030).

Fig35-32 (3):



NOTE

Use a press and jig (Separator) attached to the bearing (0040) to remove the bearing.

6. Fig35-32 (3): Remove the oil seal (0050).
7. When replacing the bearings (0040, two pieces), remove the cup of the bearing (0040) from the axle tube (0030).

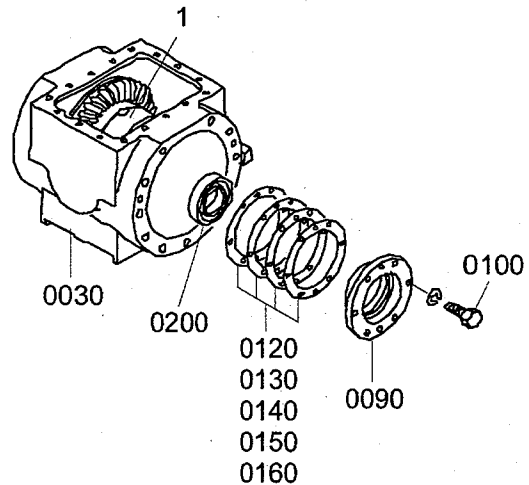
Assembly of Axle

L3, L4, L5, L6-2

Fig35-31 (1):

● Assembly of differential

- Fig35-31 (1): After replacement of the bearings (0200), install the bearing (0200) cups in the bearing retainers (0090) on both sides, using a press.
- Fig35-31 (1): Put the differential case assembly (1) in the differential body (0030). Temporarily install the bearing retainers (0090) and shims (3) on both sides to hold the differential case assembly (1).



NOTE

Install the shims of the same thicknesses as those of the originally installed shims.

- Fig35-31 (1): Adjust the thickness of the shims (0120-0160) so that there is no lateral looseness in the differential case assembly (1) and it turns smoothly.
Shim thickness:
(0120): 0.1 mm, (0130): 0.2 mm
(0140): 0.25 mm, (0150): 0.5 mm
(0160): 1.0 mm

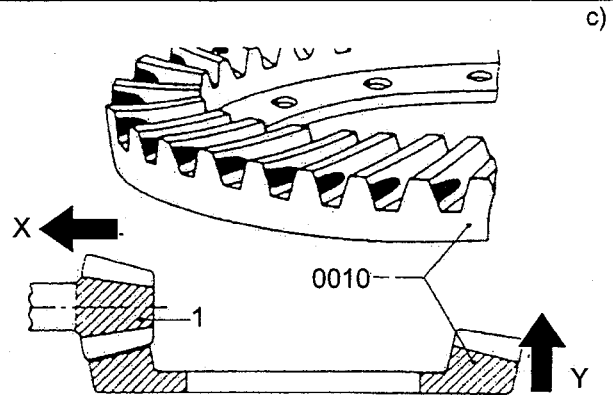
Post-Assembly Adjustment of Axle

L3, L4, L5, L6-2

c) Heel contact

Move the ring gear (0010) toward the drive pinion (1) by transferring a proper thickness of shims from the case B side to the case A side. (Move in the direction X.)

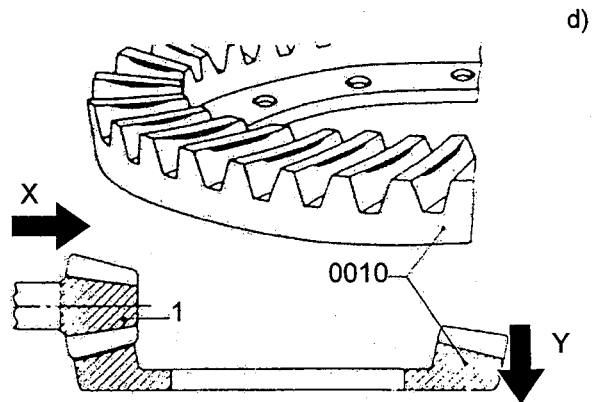
Then, move the drive pinion (1) away from the ring gear (0010) by increasing the thickness of the shims of the bearing cage. (Move in the direction Y.)



d) Face contact

Move the drive pinion (1) toward the ring gear (0010) by reducing the thickness of the shims of the bearing cage. (Move in the direction X.)

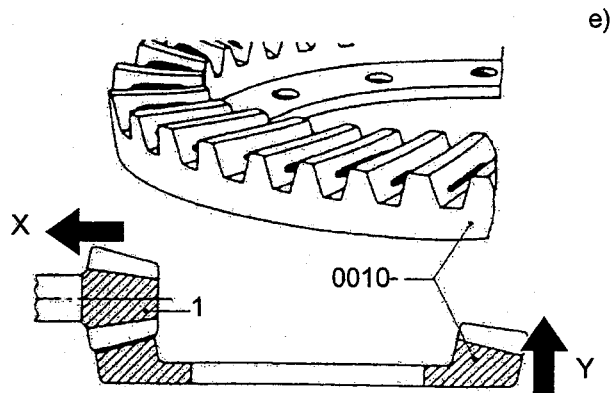
Then, move the ring gear (0010) away from the drive pinion (1) by transferring a proper thickness of shims from the case A side to the case B side. (Move in the direction Y.)



e) Flank contact

Move the drive pinion (1) away from the ring gear (0010) by increasing thickness of the shims of the bearing cage. (Move in the direction X.)

Then, move the ring gear (0010) toward the drive pinion (1) by transferring a proper thickness of shims from the case B side to the case A side. (Move in the direction Y.)



Assembly of Master Cylinder

L3, L4, L5, L6-2

■ Assembly of Master Cylinder

● L3, L4, L5, L6-2

1. Fig42-25 (1): Insert the piston assembly (0020) into the cylinder, then install the snap ring (0030).



WARNING

Be careful not to damage the P cup of the piston assembly (0020).

Fig42-25 (1):

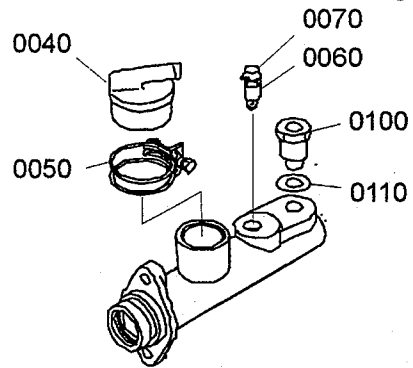
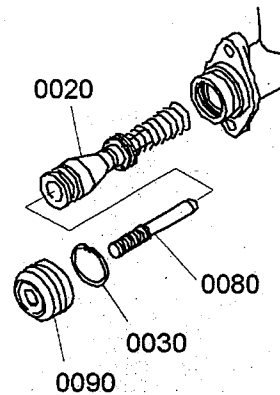


Fig42-25 (2):



2. Fig42-25 (2): Install the boot (0090), then install the rod (0080).

Installation of Orbit-Roll

L3, L4, L5, L6-2

7. Start the engine and run it at idle to check for fluid leakage.

8. Stop the engine, wait for 5-10 minutes, then check the coolant and hydraulic fluid levels. Refer to "Level Check and Addition of Coolant" and "Level Check and Addition of Fluid in Hydraulic Fluid Tank."

Assembly of Orbit-Roll

L3, L4, L5, L6-2

6. Fig51-21 (4): Install the O-ring (0180) on the rotor (0040), then install the rotor on the plate (0060).



WARNING

Be sure to align all necessary portions carefully. Misalignment may cause faulty operation, possibly resulting in serious accidents.



CAUTION

- When installing the rotor (0040), be sure to face the O-ring side toward the housing.
- All the lines A, B and C must be in parallel as shown in the drawing (Fig51-21 (5)).

NOTE

To ensure correct alignment, draw on the end surface of the drive (0070) a line parallel with the pin (0080) with an oil ink felt pen.

Fig51-21 (4):

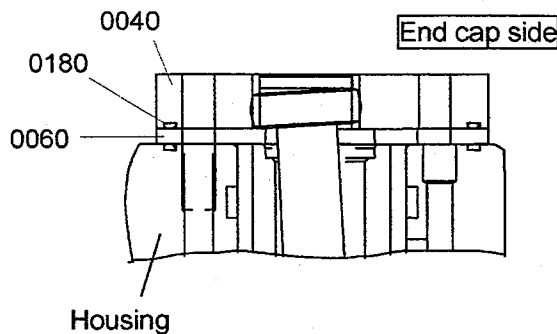


Fig51-21 (5):

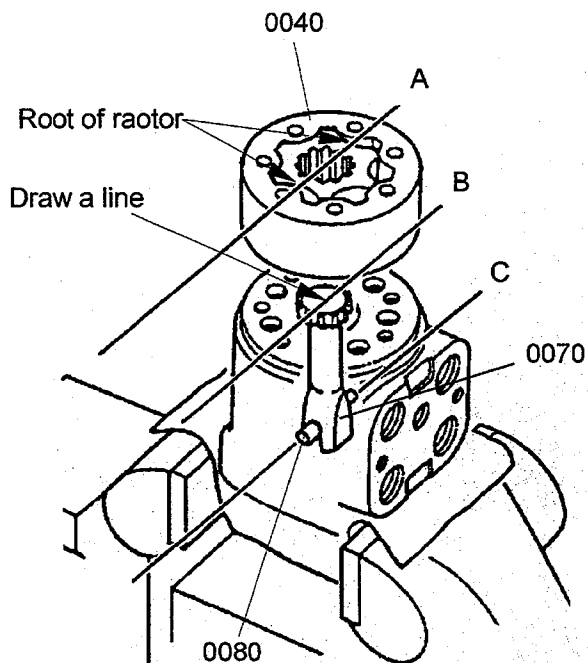
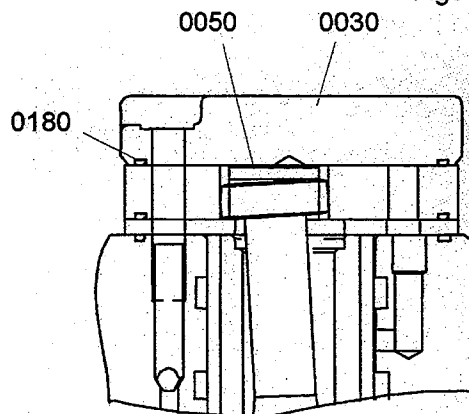


Fig51-21 (6):

7. Fig51-21 (6): Install the spacer in the internally splined section of the star of the rotor (0040).

8. Fig51-21 (6): Install the O-ring (0180) on the end cap (0030), place the end cap on the rotor (0040), and align the bolt holes.



Removal of Control Valve

L3, L4, L5, L6-2

■ Removal of Control Valve

● L3, L4, L5, L6-2

1. Lower the bucket to the ground, stop the engine, and release the residual pressure in the cylinder by operating the shovel control lever.

2. Fig12-51: Disconnect the battery negative cable (0030).

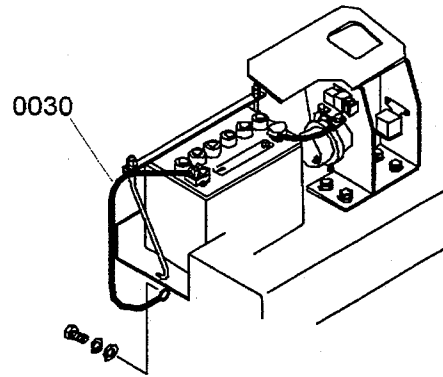


Fig12-51:

3. Fig84-11: Undo the nut (0090), then turn the rod end (0080) to remove the cables (0070, two pieces) from the control valve (0010).

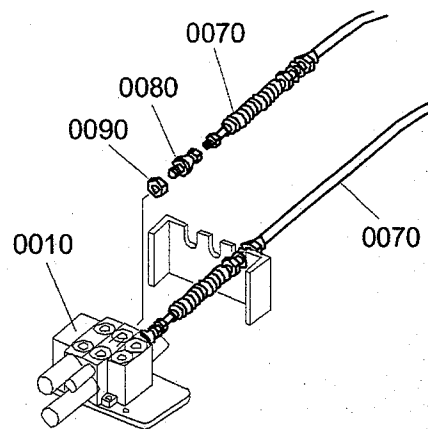


Fig84-11:

4. Fig85-11: Remove the wiring (A) of the automatic leveler.

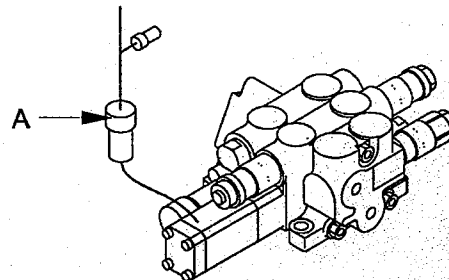


Fig85-11:



WARNING

Place a recipient under the control valve to catch hydraulic fluid in the piping that will come out when hoses are disconnected. Wipe off spilled hydraulic fluid completely to prevent fire.

5. [L3-2] Fig82-11 (1): Disconnect the hoses (0030, two pieces) and (0150, two pieces).

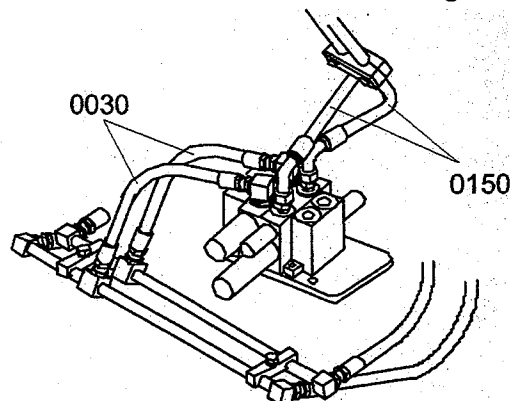


Fig82-11 (1):

Disassembly of Control Valve

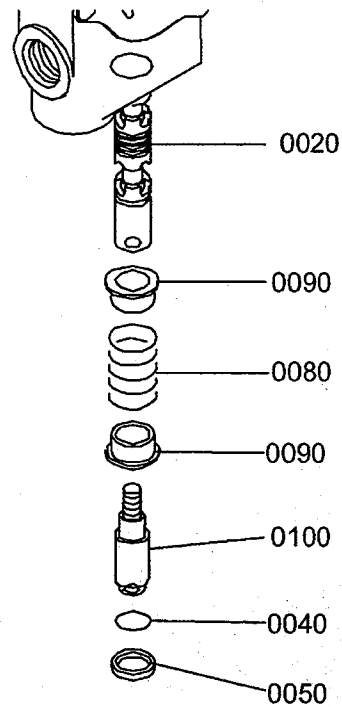
L3, L4, L5, L6-2

5. Fig73-31 (4): Remove the wiper ring (0050) and O-ring (0040) from the housing.

Fig73-31 (4):

6. Fig73-31 (4): Remove the plunger (0020) from the housing.

7. Fig73-31 (4): Remove the screw (0100) from the plunger (0020), then remove the seats (0090, two pieces) and spring (0080).



Assembly of Control Valve

L3, L4, L5, L6-2

9. Fig73-32 (5): Install the plunger (0020) in the housing.

Fig73-32 (5):



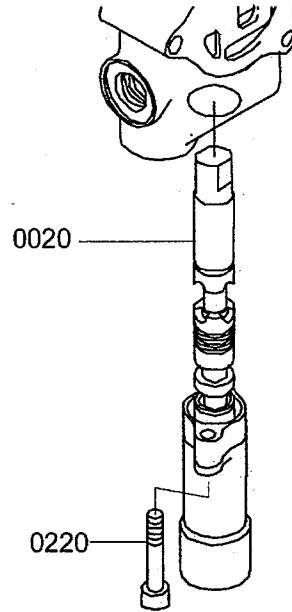
CAUTION

Facing against the O-ring fitted side of the housing, install the plunger (0020) from the right side.

10. Fig73-32 (5): Install the bolt (0220).



Bolt (0220): 9.8 Nm



11. Fig73-32 (6): Install the O-ring (0040), wiper (0050) and seal plate (0030), then install the screw (0210).

Fig73-32 (6):

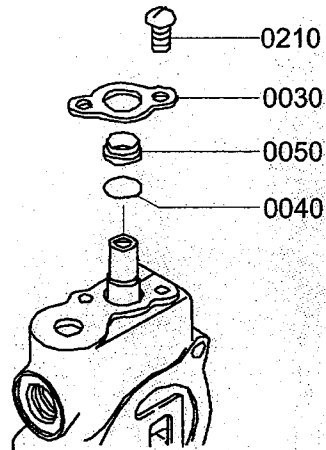


CAUTION

Install the wiper (0050) with its lip facing the seal plate (0030).



Screw (21): 2.94 Nm



Level Check and Addition of Fluid in Hydraulic Fluid Tank

L4, L5, L6-2

Level Check and Addition of Fluid in Hydraulic Fluid Tank

WARNING

- The hydraulic fluid in the tank is under pressure and hot especially immediately after operation. Remove the fluid filler plug only after making sure that the tank is cool. Also turn the plug slowly to relieve the pressure.
- Use only a wrench that exactly fits to the fluid filler plug to remove it when refilling. It is dangerous to use an inappropriate tool as it may slip on the plug.

The hydraulic fluid tank is located at the right side of the machine.

1. Park the machine on a level ground with the wheels in straight-ahead positions. Lower the bucket flat to the ground, then stop the engine.
2. Fig78-00 (1): Check the fluid level through the level gauge ① at the side of the tank.
3. Fig78-00 (1): The fluid level should be between the upper and lower limits.
4. Fig78-00 (1): If the fluid level is below the lower limit, remove the filler plug ② (width across flats: 32 mm), and add the specified hydraulic fluid. (Refer to the table of recommended oils and fluids.)
5. Fig78-00 (1): Securely install the filler plug ②.

Fig78-00 (1):

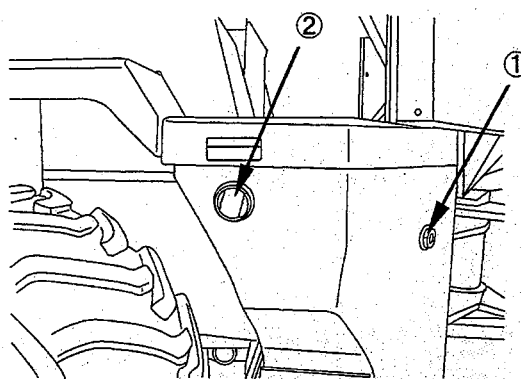
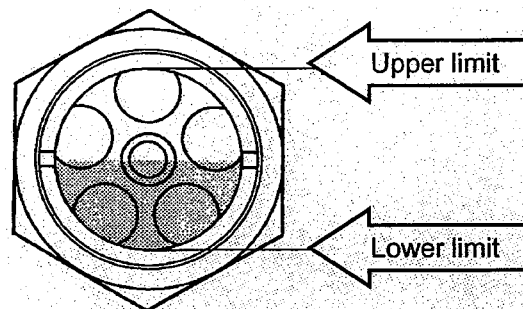


Fig78-00 (1): Oil level gauge ①



4. TROUBLESHOOTING / DIAGNOSIS

4-0. Engine	.....	4-0-1
4-2. Powertrain I	.....	4-2-1
4-3. Powertrain II	.....	4-3-1
4-4. Brake System	.....	4-4-1
4-5. Steering System	.....	4-5-1
4-7. Hydraulic System	.....	4-7-1

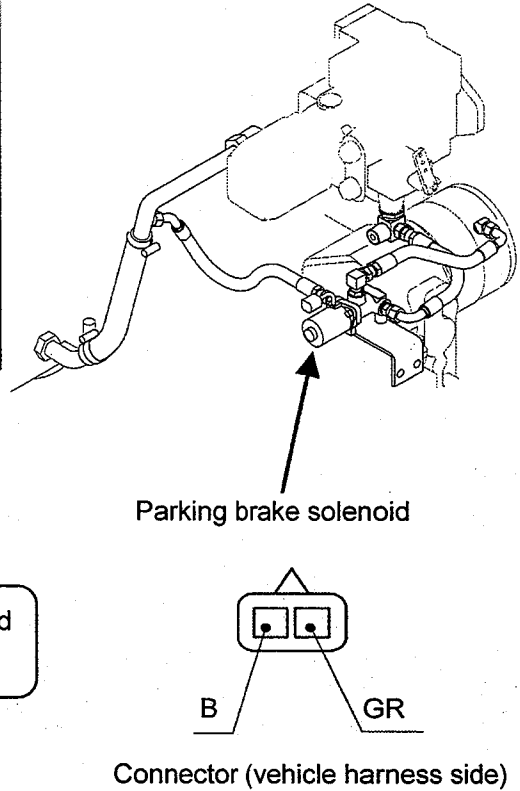
1. Machine can be moved neither in forward nor reverse direction

1-F. Faulty parking brake solenoid and parking brake switch (brakes drag)

Measure the terminal voltage of parking brake solenoid.

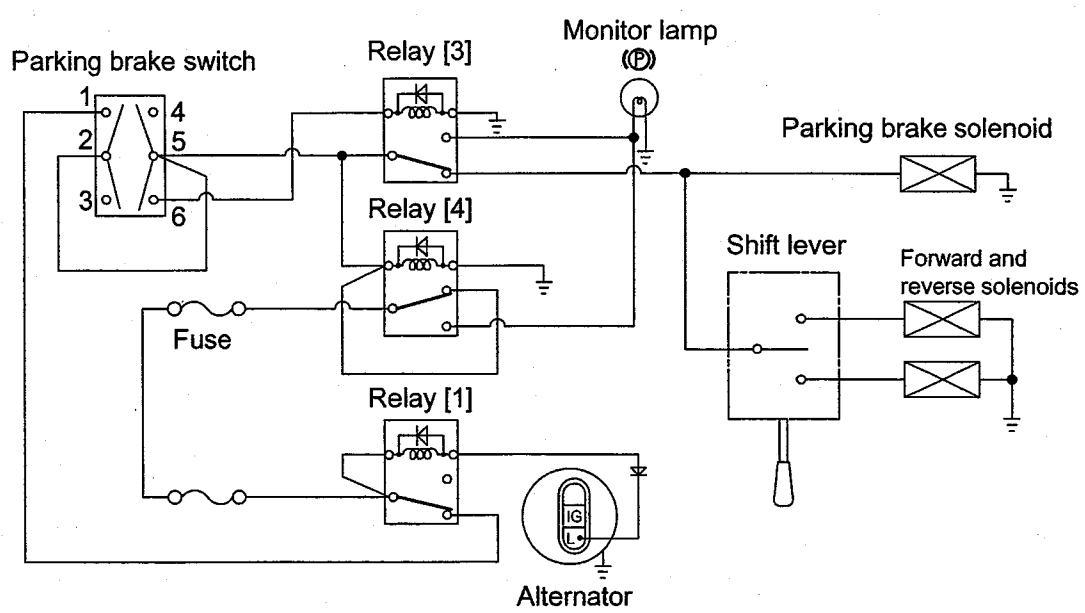
1. After starting the engine, place the parking switch in the "RESET" operation.
2. Check that the shift lever is locked in the neutral position.
3. Disconnect the parking brake solenoid connector.
4. While turning the parking brake switch from "ON" to "OFF", measure the terminal voltage (make measurement on the machine side connect with the parking brake monitor lamp turned off).

Standard value: Voltage 10.95 - 14.4 V



```

    graph TD
      A[Measure the terminal voltage of parking brake solenoid.] --> B{Out of standard value}
      A --> C{Standard value}
      B --> D["① Parking brake switch is faulty.  
② Relay [3] is faulty.  
③ Connector and/or ground connection are in poor contact."]
      C --> E["① Parking brake solenoid is faulty."]
      D --> F[Replace faulty part(s)]
      E --> F
    
```



Traveling system circuit (parking brake switch ON→OFF)

3. Movement speed is normal in "work mode" (LOW) but top speed is not reached in "travel mode" (AUTO).

3-A. Faulty mode selector switch or electrical wiring

Check that, when the mode selector switch is changed from "work mode" to "travel mode", the "tortoise" lamp in the meter panel goes off and the "rabbit" lamp illuminates.

Abnormal

Normal

Check and replace the selector switch.

Measure the terminal voltage of the mode selector solenoid.

1. Disconnect the connector ① of the mode selector solenoid valve.
2. Measure the voltage between terminals of the machine side harness connector of the connector ①, when the starter switch is set to "ON" and the mode selector switch is set to the "travel mode."
3. Standard value: 0 V

In normal condition, voltage is present when the mode selector switch is set to the "work mode" and no voltage is present when it is set to the "travel mode".

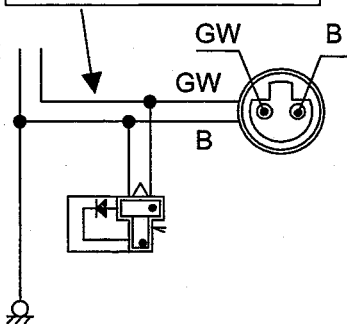
Voltage is present

Standard value (no voltage)

Faulty wiring between mode selector switch and mode selector solenoid

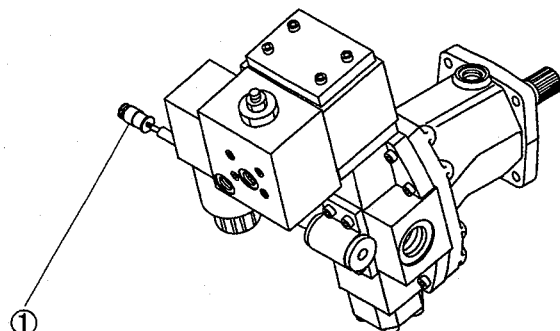
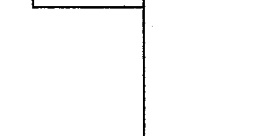
Faulty operation of mode selector solenoid valve

Harness on machine side



HST motor

[1st gear fix] solenoid



6. Abnormal noise or inability to travel

6-E. Worn or damaged inner parts of front and rear axles

6-F. Worn or damaged inner parts of reduction gear box

Drain and collect oil to check for presence of foreign matter (fragments and metal particles from gears and bearings)

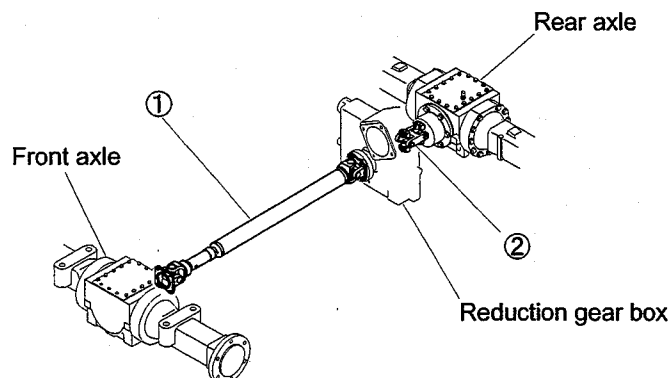
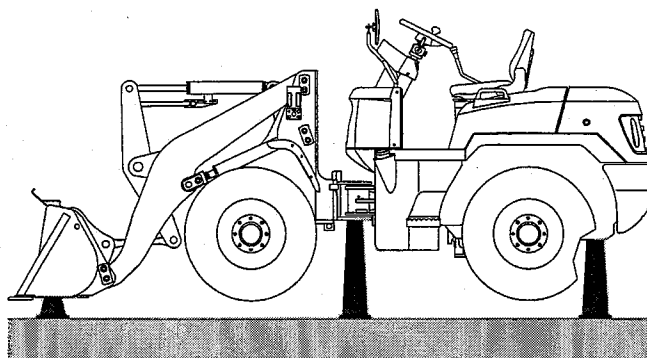
Foreign matter is present

Replace faulty parts.

If noise-producing location (front axle, rear axle, or reduction gear box) cannot be identified, use the following method.

1. Jack up the machine and support it with stands.
2. Remove the propeller shaft ① (reduction gear to front axle) and move only the rear wheels. If no abnormal noise is heard, there will be a problem in the front axle.
3. If abnormal noise still exists in step 2 above, install the propeller shaft ①, remove the propeller shaft ② (reduction gear box to rear axle), then move only the front wheels. If no abnormal noise is heard, there will be a problem in the rear axle.

If abnormal noise still exists, there will be a problem in the reduction gear box.



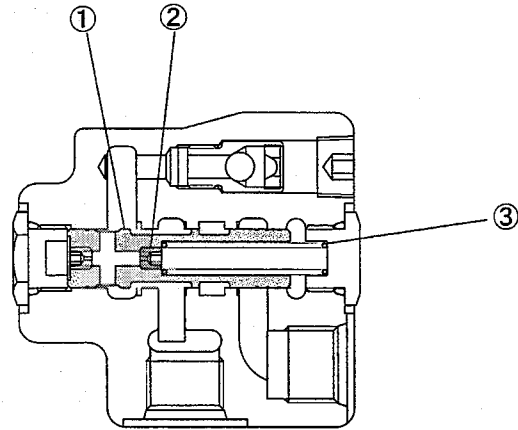
1. Steering is impossible or hard

1-F. Faulty operation of priority valve

Disassemble and check the priority valve.

Faulty operation of the priority valve may be caused by the following:

- 1. Sticking spool ①
- 2. Clogged orifice ②
- 3. Weak spring ③



Repair or replace the priority valve.

2. Machine pulls to one side

2-A. Faulty orbit-roll (sticking and worn of spool and sleeve)

2-B. Damaged to piston seals in steering cylinder

2-C. Loose steering cylinder mounting pins and/or center pin

2-D. Unevenly worn or inflated tires

Refer to the items 1-D and 1-E

Check for looseness.

Check for looseness.

Check for abnormal wear of a certain tire, too low tire inflation pressure (blowout) and use of tires of non-recommended sizes.

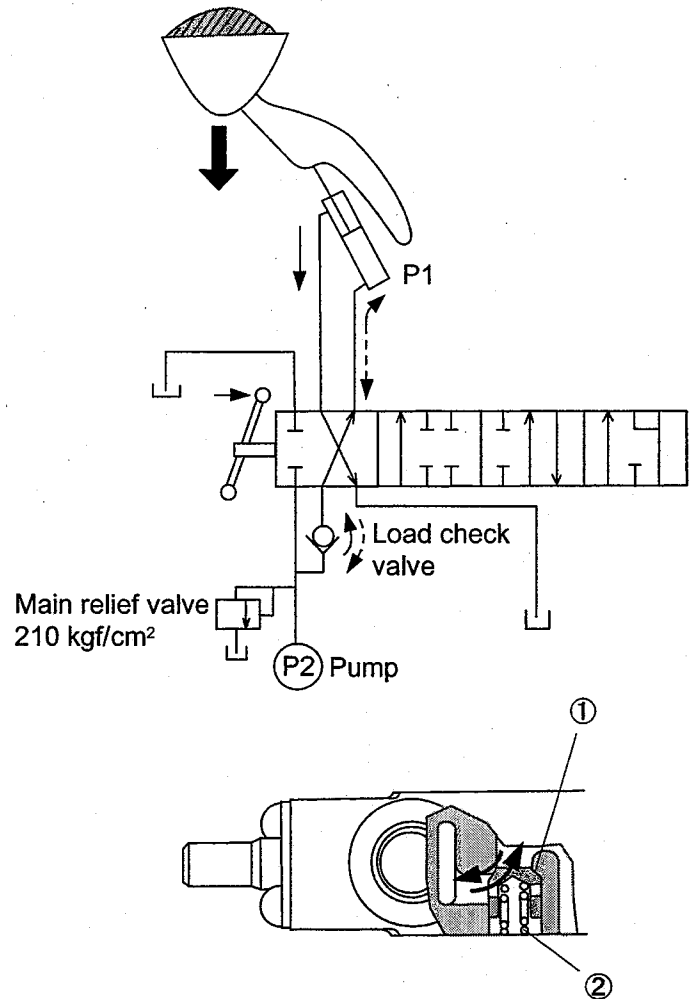
Replace pins and bushings.

5. With load in bucket, lift arm lowers momentarily, then rises when lift lever is moved from "Hold (Neutral)" to "Raise" position.

5-A. Faulty operation of load check valve

If drift of the lift arm is normal but the lift arm momentarily lowers and then starts to rise when the lift lever is moved to the "Raise" position with the bucket loaded, remove and check the load check valve for the lift position.

1. When the load check valve is normal, fluid can flow in the directions indicated by arrows \rightarrow , but not in the directions indicated by \dashrightarrow .
2. Therefore, even if the pressure P1 acting on the lift cylinder piston becomes greater due to the load on the bucket than the pump pressure P2, the lift arm does not lower.
3. However, if the poppet seat ① surface is damaged, foreign matter is jammed, the poppet is sticking or the springs ② is damaged, the fluid on the P1 side flows to the P2 side, causing the lift arm to lower momentarily.



Clean or replace the load check valve.

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